Industry-Funded Monitoring

An Omnibus Amendment to
the Fishery Management Plans of the
New England Fishery Management Council

December 2018

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Amendment 7 to the Atlantic Herring FMP;

Amendment 5 to the Atlantic Salmon FMP;

Amendment 17 to the Atlantic Sea Scallop FMP;

Amendment 5 to the Deep-Sea Red Crab FMP;

Amendment 21 to the Northeast Multispecies FMP; and

Amendment 6 to the Northeast Skate Complex FMP

Including an Environmental Assessment

December 2018

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Draft Environmental Assessment Adopted by NEFMC: June 23, 2016
Draft Environmental Assessment Available for Public Comment: September 23, 2016
Final Environmental Assessment Submitted to NMFS: May 7, 2018

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Executive Summary

The New England Fishery Management Council (Council) is interested in increasing monitoring in some fishery management plans (FMPs) to assess the amount and type of catch and more precisely monitor annual catch limits. This increased monitoring would be in addition to coverage required through the Standardized Bycatch Reporting Methodology (SBRM), the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA). The amount of available Federal funding to support additional monitoring and legal constraints associated with industry-funded monitoring cost responsibilities have prevented the National Marine Fisheries Service (NMFS) from approving recent industry-funded monitoring proposals, specifically Atlantic Herring Amendment 5 and Northeast (NE) Multispecies Framework Adjustment 48.

The New England Industry-Funded Monitoring Omnibus Amendment would provide the measures necessary for industry funding and available Federal funding to pay for additional monitoring to meet specific monitoring coverage targets for each FMP. This amendment would allow the Council to prioritize industry-funded monitoring programs across FMPs, should available Federal funding fall short of the total needed to fully fund all monitoring programs. This amendment would also ensure consistency for industry-funded monitoring programs across FMPs.

This amendment includes a set of Omnibus Alternatives that would modify all the FMPs managed by the Council to allow standardized development and administration of future FMP-specific industry-funded monitoring programs. Additionally, this amendment includes alternatives for an industry-funded monitoring program for the Atlantic Herring FMP.

Preferred Omnibus Alternatives

The Council selected Omnibus Alternative 2 as a preferred alternative. Omnibus Alternative 2 would standardize the development and administration of future industry-funded monitoring programs, including:

- Standard definition for cost responsibilities of industry and NMFS;
- Standard amendment process to implement industry-funded monitoring programs and standard framework adjustment process to revise industry-funded monitoring programs;
- Standard monitoring service provider requirements;
- Process for prioritizing industry-funded monitoring programs in order to allocate available Federal resources across all FMPs; and
- Standard framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternative 2 would apply to new at-sea monitoring, portside monitoring, and electronic monitoring programs.

The Council also selected Omnibus Alternative 2.2 as a preferred alternative. Omnibus Alternative 2.2 would specify a Council-led process to prioritize available Federal funding to cover NMFS cost responsibilities associated with administering industry-funded monitoring programs across all FMPs.

When there is no Federal funding available to cover NMFS cost responsibilities above SBRM coverage in a given year, then no industry-funded monitoring program would operate during that year. If some Federal funding is available, but it is not sufficient to cover NMFS cost responsibilities for all industry-funded monitoring programs, the Council would apply an equal weighting approach to prioritize available funding to support industry-funded monitoring coverage targets across FMPs. This equal weighting approach would be revised on an as-needed basis. This prioritization process would apply to new industry-funded monitoring programs and would not apply to the existing scallop and groundfish industry-funded monitoring programs.

Lastly, the Council selected Omnibus Alternative 2.6 as a preferred alternative. Omnibus Alternative 2.6 would standardize the development of future monitoring set-aside programs. Monitoring set-aside programs would allocate a portion of an annual catch limit to help offset industry cost responsibilities associated with industry-funded monitoring. The details and impacts analysis of any monitoring set-aside program would be specified in a subsequent framework adjustment to the relevant FMP.

Preferred Herring Alternatives

The Council selected Herring Alternative 2 as a preferred alternative. Herring Alternative 2 would establish an industry-funded monitoring program for the Atlantic herring fishery.

Under Herring Alternative 2, monitoring coverage targets would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities and would fall somewhere between no additional coverage in addition to SBRM and the specified coverage target.

The Council selected several sub-options as preferred alternatives:

- Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements; for either a trip or the fishing year, if coverage was unavailable due to funding or logistics;
- Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not pump or carry any fish onboard;

- Sub-Option 4 would require the Council to examine the results of any increased coverage in the herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted; and
- Sub-Option 5 would exempt trips that land less than 50 mt of herring from industry-funded monitoring requirements.

Herring Alternative 2 would also specify monitoring service provider requirements for the herring fishery. It would specify that requirements for industry-funded observers and at-sea monitors include a high volume fisheries (HVF) certification.

The Council also selected Herring Alternative 2.5 as a preferred alternative. Herring Alternative 2.5 would maintain the existing requirement that midwater trawl vessels fishing in the Groundfish Closed Areas to carry a NEFOP-level observer, but would allow vessels to pay for observer coverage to access the Groundfish Closed Areas. Sub-options do not apply to Herring Alternative 2.5. If the Groundfish Closed Areas are modified or eliminated in the future, coverage requirements for midwater trawl vessels will be adjusted accordingly. Existing slippage restrictions, reporting requirements, and consequence measures would apply to midwater trawl vessels fishing in Groundfish Closed Areas.

Lastly, the Council selected Herring Alternative 2.7 as a preferred alternative. Herring Alternative 2.7 would specify a 50% monitoring coverage target on vessels with Category A or B herring permits. The 50% coverage target would apply to at-sea monitoring coverage or electronic monitoring in conjunction with portside sampling, once electronic monitoring and portside sampling is approved by the Council and NMFS. Preferred sub-options would apply under Herring Alternative 2.7, along with existing slippage restrictions and reporting requirements. Existing slippage consequence measures would apply on all trips with at-sea monitoring coverage and the existing requirement to move 15 nautical miles following a slippage event would apply on all trips selected for portside sampling.

At its April 2018 meeting, the Council determined that electronic monitoring, used in conjunction with portside sampling coverage, is an adequate substitute for at-sea monitoring coverage aboard vessels using midwater trawl gear, but did not recommend requiring electronic monitoring and portside sampling as part of this amendment. Instead, the Council recommended NMFS use an exempted fishing permit (EFP) to further evaluate how to best permanently administer an electronic monitoring and portside sampling program. The EFP would exempt midwater vessels from the proposed requirement for industry-funded at-sea monitoring coverage and would allow midwater trawl vessels to use electronic monitoring and portside sampling coverage to comply with the Council-recommended 50% coverage target. An EFP would enable NMFS to further evaluate how to best permanently administer an electronic monitoring and portside sampling program. The Council previously recommended reconsidering herring industry-funded monitoring requirements two years after implementation. Using the results of the EFP, the Council would consider establishing electronic monitoring and portside sampling program requirements into regulation via a framework adjustment at that time.

The Massachusetts Division on Marine Fisheries and Maine Department of Marine Resources currently administer voluntary portside sampling programs for the herring fishery. Both states have funding to continue to administer those portside programs through 2018. Therefore, in 2018, the portside sampling of Category A and B vessels using midwater trawl gear would be administered by the states, participation in the sampling program would be voluntary, and the resulting data would be considered by NMFS for catch monitoring. In 2019 (or possibly 2020) and beyond, NMFS would administer a Federal portside sampling program with a 50% coverage target for vessels with Category A or B herring permits using midwater trawl gear.

Affected Environment

The Affected Environment describes valued ecosystem components (VECs) for this amendment. The VECs associated with the Omnibus Alternatives include biological resources (target, non-target, and protected species), the physical environment, and fishery-related businesses and human communities. The VECs associated with the Herring Alternatives include the herring resource, non-target species (haddock, river herring and shad, and mackerel), protected species (fish, turtles, and marine mammals), the physical environment, and fishery-related businesses and human communities.

Impacts Associated with Preferred Omnibus Alternatives

There are no direct impacts on biological resources (target, non-target, and protected species), the physical environment, or fishery-related businesses and human communities associated with the preferred Omnibus Alternatives because they are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and do not directly affect fishing effort, fishing operations, amount of fish harvested, or area fished.

Under Omnibus Alternative 2, there is the potential for an indirect low positive impacts on biological resources associated with establishing standardized industry-funded monitoring service provider requirements. Standardized provider requirements may lead to greater consistency in the information collected about target, non-target, and protected species through industry-funded monitoring programs. Improved catch information resulting from greater consistency in how information is collected may lead to better management of biological resources.

Omnibus Alternative 2 may provide an indirect low positive impact on biological resources if the prioritization process increases the likelihood that available Federal funding would be used to support industry-funded monitoring programs. Additionally, Omnibus Alternative 2.2 may have the greatest potential for indirect low positive impacts to biological resources because it would provide the discretion to prioritize available Federal funding towards industry-funded monitoring programs that improve information about specific target, non-target, and protected species.

In the future, if the Council developed an IFM program for a particular FMP, there would be direct negative economic impacts to fishing vessels resulting from the standardized cost responsibilities included in Omnibus Alternative 2, provided there was available Federal funding to support that IFM program and vessels were required to pay for increased monitoring. However, any direct negative economic impacts to fishing vessels resulting from a future IMF program would be evaluated in the amendment to establish that IFM program and are not considered in this amendment.

There may be indirect low positive economic impacts associated with standardizing a process to develop new industry-funded monitoring programs on fishery-related business and communities resulting from Omnibus Alternative 2 if standardizing that process increases the potential for improved management.

Under Omnibus Alternative 2, there is a potential for indirect low positive economic impacts associated with the establishment of standardized IFM service provider requirements. If standardized service provider requirements leads to greater consistency in the information collected by industry-funded monitoring programs, that may lead to better management of biological resources, which may eventually lead to higher harvest levels.

Establishing standardized cost responsibilities under Omnibus Alternative 2 may have low positive economic impacts if it provides the industry with information to better understand and plan for their industry-funded monitoring cost responsibilities, as well as negotiate better contracts with service providers, which may ultimately reduce the dollar amount associated with industry cost responsibilities.

Lastly, Omnibus Alternative 2.2 may have the greatest potential for indirect low positive impacts on businesses and communities because it may help align available Federal funding with the Council's monitoring priorities. Improved catch information that results from the opportunity to align funding with the most critical industry-funded monitoring programs may lead to better management of biological resources, which may eventually lead to higher harvest levels.

TABLE 1. SUMMARY OF THE INDIRECT IMPACTS OF OMNIBUS ALTERNATIVES (*PREFERRED ALTERNATIVES IN BOLD*)

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 1: No Standardized Industry-Funded Monitoring Programs (No Action)	Low negative impact related to allocating funding to IFM programs on a case-by-case basis, rather than evaluating funding across FMPs	Low negative impact related to continued uncertainty about catch rates that may lead to overly cautious management

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 2: Standardized Industry-Funded Monitoring Programs (Action Alternative)	**Negligible impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**	**Low positive impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**
Alternative 2.1: NMFS-Led Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.2: Council-Led Prioritization Process	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**
Alternative 2.3: Proportional Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.4 and 2.5: Coverage Ratio-Based Prioritization Processes	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.6 Monitoring Set-Aside	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**
Impacts to physical environment are not described in this table because they are negligible. These alternatives will not alter fishing behavior or directly impact fishing regulations (gears used or areas fished).		

Impacts Associated with Preferred Herring Alternatives

The impacts of preferred Herring Alternatives on biological resources (herring resource, non-target species, and protected species) are indirect because they affect levels of monitoring rather than harvest specifications.

Indirect low positive impacts to biological resources are possible if the increased monitoring associated with Herring Alternatives 2.5 and 2.7 can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management. However, these preferred Herring Alternatives may lead to direct positive impacts on biological resources if herring fishing effort is limited, by increased information on catch tracked against catch limits, leading to increased reproductive potential of the herring resource and non-target species and reduced interactions between the herring fishery and protected species.

Because additional monitoring under Herring Alternative 2.5 is confined to the Groundfish Closed Areas, a low positive biological impact is likely because the area with 100% observer coverage is limited. The 50% coverage associated with Herring Alternative 2.7 is expected to have low positive impacts on the herring resource and non-target species (haddock and river herring and shad) if the uncertainty around catch track against catch caps is reduced.

Sub-Options 1 and 2 have the potential for low negative impacts on biological resources if additional coverage is waived. Sub-Option 5 also has the potential for a low negative impact on the herring resource and non-target species. A low negative impact is possible if the disconnect between vessels with additional monitoring (trips greater than 50 mt of herring) and trips subject to fishery catch caps (trips greater than either 1 lb of herring or 6,600 lb of herring) if it biases data used to track catch against catch caps.

The impacts of these preferred Herring Alternatives on biological resources are not significant because they would not cause any biological resource to become overfished, would not result in overfishing, and/or would not cause a change in population status.

The impacts of preferred Herring Alternatives on the physical environment are expected to be negligible. The impact of the herring fishery on the physical environment is thought to be minimal and temporary. Therefore, the expected impact on the physical environment of increased monitoring in the herring fishery is expected to be negligible under Herring Alternatives 2.5 and 2.7.

If fishing effort is limited, by increased information on catch tracked against catch limits, and there are few interactions between fishing gear and the physical environment, there is the potential for a positive impact on the physical environment associated with the preferred Herring Alternatives. However, the magnitude of any potential positive impact is low because the herring fishery has only minimal and temporary impacts on the environment.

The impacts of preferred Herring Alternatives on fishery-related businesses and human communities are negative and result from reductions in returns-to-owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue and was used rather than net revenues to more accurately reflect income from fishing trips. Reductions in RTO are related to paying for monitoring coverage. Under Herring Alternative 2.7, the potential reduction in RTO may be up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring in conjunction with portside sampling. Annual returns-to-owner for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. The total annual cost to the herring fishery is up to $294,999 for Herring Alternative 2.7 and $75,000 for Herring Alternative 2.5.

Because midwater trawl vessels average more sea days than other gear types, midwater trawl vessels have a greater negative economic impact associated with paying for monitoring coverage, followed by purse seine vessels, and small mesh bottom trawl vessels.

Sub-Options 1 and 2 have the potential to reduce monitoring costs for herring vessels if coverage is waived. Sub-Option 5 would eliminate monitoring costs for vessels that always land less than 50 mt of herring on a trip. Additionally, Sub-Option 5 may reduce monitoring costs for vessels than often land less than 50 mt of herring on a trip. There benefits will vary with gear type. Small mesh bottom trawl vessels and single midwater trawl vessels take the most trips that land less than 50 mt of herring, 81% and 60%, respectively, followed by purse seine vessels (33% of trips) and paired midwater trawl vessels (13% of trips). The potential reduction in RTO associated with at sea-monitoring coverage in combination with Sub-Option 5 is up to 16% for paired midwater trawl vessels, up to 4% for single midwater trawl vessels, and up to 3% for purse seine and small mesh bottom trawl vessels.

Indirect positive economic impacts on herring vessels associated with preferred Herring Alternatives may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs.

Conversely, indirect negative economic impacts on herring vessels associated with preferred Herring Alternatives may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, such that vessels would be less likely be less likely to be able to fully harvest herring sub-ACLs because they were constrained by catch caps.

TABLE 2. SUMMARY OF OVERALL IMPACTS ASSOCIATED WITH HERRING COVERAGE TARGET ALTERNATIVES (*PREFERRED ALTERNATIVES IN BOLD*)

Alternatives	Herring Resource	Non-Target Species	Protected Species	Physical Environment	Fishery-Related Businesses and Communities
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	Low Positive	Low Positive	Low Positive	Negligible	Low Positive
Herring Alternative 2: Coverage Target Specified For IFM Programs	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.1: 100% NEFOP-Level Observers Coverage on Category A and B Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**

List of Acronyms and Abbreviations

ABC	Acceptable Biological Catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACFCMA	Atlantic Coastal Fishery Cooperative Management Act
ACL	Annual Catch Limit
AM	Accountability Measure
APA	Administrative Procedure Act
APAIS	Access Point Angler Intercept Survey
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council of Environmental Quality
CFDBS	Commercial Fisheries Database System
CV	Coefficient of Variation
CZMA	Coastal Zone Management Act
DAS	Days-at-sea
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
eVTR	Electronic Fishing Vessel Trip Report
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FONSI	Finding Of No Significant Impact
FVTR	Fishing Vessel Trip Report
GAM	Generalized Additive Model
GARFO	Greater Atlantic Regional Fisheries Office (formerly NERO)
GPS	Global Positioning System
IBS	Industry-Based Survey
ICNAF	International Commission for the Northwest Atlantic Fisheries
IFQ	Individual Fishing Quota
IQA	Information Quality Act (also known as the Data Quality Act or DQA)

IRFA	Initial Regulatory Flexibility Analysis
ITQ	Individual Transferable Quota
km	Kilometer
lb	Pounds
MA	Mid-Atlantic
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistics Survey
MSR	Master Site Register
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NE	New England
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office (renamed GARFO in 2014)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council of the National Academies of Science
NWGB	National Working Group on Bycatch
OLE	NOAA Office of Law Enforcement
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
PSP	Paralytic Shellfish Poisoning
QA/QC	Quality Assurance/Quality Control
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SAFIS	Standard Atlantic Fisheries Information System
SAP	Special Access Program

SAW/SARC	Stock Assessment Workshop/Stock Assessment Review Committee
SBRM	Standardized Bycatch Reporting Methodology
SFCPO	State-Federal Constituent Programs Office
SSC	Scientific and Statistical Committee
TAC	Total Allowable Catch
TAL	Total Allowable Landings
U.S.	United States
USFWS	United States Fish and Wildlife Service
VMS	Vessel Monitoring System

Table of Contents

1.0 INTRODUCTION AND BACKGROUND 28

1.1.1 GENERAL QUESTIONS AND ANSWERS ABOUT THE INDUSTRY-FUNDEDED MONITORING OMNIBUS AMENDMENT 30

1.1.2 QUESTIONS AND ANSWERS ABOUT COST RESPONSIBILITIES 37

1.1.3 QUESTIONS AND ANSWERS ABOUT NMFS ADMINISTATIVE COSTS 40

1.1.4 QUESTIONS AND ANSWERS ABOUT INDUSTRY COSTS 44

1.2 PURPOSE AND NEED FOR ACTION 46

2.0 MANAGEMENT ALTERNATIVES 46

2.1 OMNIBUS ALTERNATIVES 47

2.1.1 OMNIBUS ALTERNATIVE 1: NO STANDARDIZED INDUSTRY-FUNDED MONITORING PROGRAMS 49

2.1.2 OMNIBUS ALTERNATIVE 2: STANDARDIZED INDUSTY-FUNDED MONITORING PROGRAMS (*PREFERRED ALTERNATIVE*) 51

2.1.3 CONSIDERED BUT REJECTED OMNIBUS ALTERNATIVES 69

2.2 ATLANTIC HERRING MONITORING ALTERNATIVES 70

2.2.1 HERRING ALTERNATIVE1: NO COVERAGE TAREGET SPECIFIED FOR INDUSTRY-FUNDED MONITORING PROGRAM 76

2.2.2 HERRING ALTERNATIVE 2: COVERAGE TAREGET SPECIFIED FOR INDUSTRY-FUNDED MONITORING PROGRAM (*PREFERRED ALTERNATIVE*) 79

2.2.3 CONSIDERED BUT REJECTED HERRING ALTERNATIVES 102

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT 102

3.1 INTRODUCTION 102

3.1.1 TARGET SPECIES 103

3.1.2 NON-TARGET AND BYCATCH SPECIES 134

3.1.3 PHYSICAL ENVIRONMENT 136

3.1.4 ENDANGERED AND OTHER PROTECTED SPECIES 138

3.1.5 HUMAN COMMUNITIES....152
4.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES....178
4.1 OMNIBUS ALTERATIVE IMPACTS.... 178
4.1.1 IMPACTS SUMMARY FOR PREFERRED OMNIBUS ALTERNATIVES....180
4.1.2 OMNIBUS ALTERNATIVE IMPACTS TO BIOLOGICAL RESOURCES....181
4.1.3 OMNIBUS ALTERNATIVE IMPACTS TO PHYSICAL ENVIRONMENT....184
4.1.4 OMNIBUS ALTERNATIVE IMPACTS TO HUMAN COMMUNITIES....184
4.1.5 IMPACTS SUMMARY FOR OMNIBUS ALTERNATIVES....187
4.2 ATLANTIC HERRING ALTERNATIVE IMPACTS.... 189
4.2.1 IMPACTS SUMMARY FOR PREFERRED HERRING ALTERNATIVES....190
4.2.2 BACKGROUND ON BIOLOGICAL IMPACTS OF HERRING ALTERNATIVES....192
4.2.3 IMPACTS OF HERRING ALTERNATIVES ON TARGET SPECIES....209
4.2.4 IMPACTS OF HERRING ALTERNATIVES ON NON-TARGET SPECIES....220
4.2.5 IMPACTS OF HERRING ALTERNATIVES ON PROTECTED RESOURCES....231
4.2.6 IMPACTS OF HERRING ALTERNATIVES ON THE PHYSICAL ENVIRONMENT.240
4.2.7 BACKGROUND ON ECONOMIC IMPACTS OF HERRING ALTERNATIVES....242
4.2.8 IMPACTS OF HERRING ALTERNATIVES ON HUMAN COMMUNITIES....252
4.2.9 IMPACTS SUMMARY FOR HERRING ALTERNATIVES....288
5.0 CUMULATIVE EFFECTS ANALYSIS....289
5.1 VALUED ECOSTEM COMPONENTS.... 289
5.2 SPATIAL AND TEMPORAL BOUNDARIES.... 290
5.3 ANALYSIS OF TOTAL CUMULATIVE EFECTS.... 292
5.4 PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE ACTIONS.... 293
5.4.1 ATLANTIC HERRING RESOURCE....294
5.4.2 NON-TARGET SPECIES....296

5.4.3 FISHERY-RELATED BUSINESSES AND COMMUNITIES 298
5.5 BASELINE CONDITIONS 302
5.6 SUMMARY OF IMPACTS FROM PREFERRED OMNIBUS ALTERNATIVES 304
5.7 SUMMARY OF IMPACTS FROM PREFERRED HERRING ALTERNATIVES 306
5.8 CUMMULATIVE EFFECTS SUMMARY 310
6.0 OTHER APPLICABLE LAWS 312
6.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT 312
6.2 NATIONAL ENVIRONMENTAL POLICY ACT 326
6.2.1 FINDING OF NO SIGNIFICANT IMPACT 326
6.3 MARINE MAMMAL PROTECTION ACT (MMPA) 333
6.4 ENDANGERED SPECIES ACT (ESA) 333
6.5 PAPERWORK REDUCTION ACT (PRA) 334
6.6 INFORMATION QUALITY ACT 334
6.7 IMPACTS OF FEDERALISM/EXECTIVE ORDER 13132 337
6.8 ADMINISTRATIVE PROCEDURES ACT 337
6.9 COASTAL ZONE MANAGEMENT ACT (CZMA) 338
6.10 REGULATORY FLEXIBILITY ACT/EXECUTIVE ORDER 12866 338
6.10.1 E.O. 12866 (REGULATORY PLANNING AND REVIEW) 338
6.10.2 REGULATORY FLEXIBILITY ACT - INITIAL REGULATORY FLEXIBILITY ANALYSIS 340
7.0 LITERATURE CITED 347
8.0 LIST OF PREPARERS AND AGENCIES CONSULTED 358
9.0 LIST OF MEETINGS 359
10.0 GLOSSARY OF TERMS 365
11.0 APPENDIX 369

List of Tables

Table 1. Summary of the Indirect Impacts of Omnibus Alternatives (*preferred alternatives in bold*) ix

Table 2. Summary of Overall Impacts Associated with Herring Coverage Target Alternatives (*preferred alternatives in bold*) xiii

Table 3. Status Quo Timing of Greater Atlantic Region SBRM, Sector and Scallop Monitoring Allocation and Analysis 50

Table 4. Summary of Prioritization Alternatives 56

Table 5. Timing for Discretionary Alternatives (Alternatives 2.1 and 2.2) 62

Table 6. Timing for Formulaic Alternatives (Alternatives 2.3, 2.4, and 2.5) 67

Table 7. Purpose and Need of Amendment 5 to Herring FMP 71

Table 8. Monitoring Needs of Herring Fishery 72

Table 9. Range of Industry-Funded Monitoring Herring Coverage Target Alternatives (*Preferred alternatives in bold*) 76

Table 10. Proposed and Observed Sea Days for Fleets that Target Herring 77

Table 11. List of Example Biological Resources and the Geographic Regions Where the Resources are Most Commonly Found 104

Table 12. Recent Commercial Landings and Ex-vessel Values of Atlantic Herring. 106

Table 13. Primary Ports Associated with the Atlantic Herring Fishery (values are averaged for 2010-2014). 106

Table 14. Recent Commercial Landings and Ex-vessel Values of Atlantic Sea Scallops. 109

Table 15. Primary Ports Associated with the Sea Scallop Fishery (values are averaged for 2010-2014). *Data excluded for confidentiality 109

Table 16. Recent Commercial Landings and Ex-vessel Values of Deep-sea Red Crabs. *Data excluded for confidentiality 111

Table 17. Recent Commercial Landings and Ex-vessel Values in the Atlantic Mackerel, Butterfish, and Squid Fisheries. 113

Table 18. Primary Ports Associated with the Atlantic Mackerel, Butterfish, and Squid Fisheries (values are averaged for 2010-2014). *Data excluded for confidentiality 113

Table 19. Recent Commercial Landings and Ex-vessel Values of Monkfish. 115

Table 20. Primary Ports Associated with the Monkfish Fishery (values are averaged for 2010-2014). 115

Table 21. Recent Commercial Landings and Ex-vessel Values of Large-mesh Multispecies (aggregated). 121

Table 22. Primary Ports Associated with the Large-mesh Multispecies Fishery (values are aggregated and averaged for 2010-2014). 121

Table 23. Recent Commercial Landings and Ex-vessel Values of Small-mesh Multispecies (aggregated). 121

Table 24. Primary Ports Associated with the Small-mesh Multispecies Fishery (values are aggregated and averaged for 2010-2014). 121

Table 25. Recent Commercial Landings and Ex-vessel Values of Skates (aggregated). 123

Table 26. Primary Ports Associated with the Skate Fishery (2010-2014 values are averaged). *Data excluded for confidentiality. 124

Table 27. Recent Commercial Landings and Ex-vessel Values of Spiny Dogfish. 125

Table 28. Primary Ports Associated with the Spiny Dogfish Fishery (values averaged for 2010-2014). *Data excluded for confidentiality. 126

Table 29. Recent Commercial Landings and Ex-vessel Values in the Summer Flounder, Scup, and Black Sea Bass Fisheries. 130

Table 30. Primary Ports Associated with the Summer Flounder, Scup, and Black Sea Bass Commercial Fisheries (values are averaged for 2010-2014). 130

Table 31. Recent Commercial Landings and Ex-vessel Values in the Surfclam and Ocean Quahog Fisheries. 132

Table 32. Primary Ports Associated with the Surfclam and Ocean Quahog Commercial Fisheries (values are averaged for 2010-2014). *Data excluded for confidentiality. 133

Table 33. Recent Commercial Landings and Ex-vessel Value of Golden Tilefish. 134

Table 34. Primary Ports Associated with the Golden Tilefish Fishery (values are averaged for 2010-2014). 134

Table 35. Species Protected Under the ESA and/or MMPA that May Occur in the Affected Environment of the Atlantic Herring FMP. 140

Table 36. LOF Fisheries Likely to Occur in the Affected Environment of the Herring Fishery. 146

Table 37. Small Cetacean and Pinniped Species Observed Seriously Injured and/or Killed by Trawl Fisheries in the Affected Environment of the Amendment 147

Table 38. 2004-2014 Observed Gray and Harbor Seal Interaction with the GOM Atlantic Herring Purse Seine Fishery 149

Table 39. 2016-2018 Atlantic Herring Fishery Specifications (Initial allocations). 154

Table 40. Atlantic Herring Catch by Year and Management Area, 2004-2014 155

Table 41. Total Annual Atlantic Herring Catch 2003-2014 157

Table 42. Fishing Vessels with Federal Atlantic Herring Permits, 2009-2014 158

Table 43. Fishing Gear Distribution of Total Herring Landings from Atlantic Herring Management Areas (2008-2011) 159

Table 44. Fishing Gear Distribution of Total Herring Landings from Atlantic Herring Management Areas (2012-2014) 159

Table 45. Fishing Gear Distribution of Herring Landings by Permit Category (2008-2011) 160

Table 46. Distribution of 2012 Atlantic Herring Permit Holders that have an Atlantic Herring Community of Interest as a Homeport 163

Table 47. Atlantic Herring Landing Distribution by Port and Management Area 163

Table 48. Atlantic Mackerel Quota Performance 171

Table 49. 2014 Data for Permitted and Active Atlantic Mackerel Vessels 172

Table 50. 2014 Vessel Dependence on Mackerel (revenue-based) 172

Table 51. Recent Landings by State (mt) 172

Table 52. Recent Landings by Month (mt) 173

Table 53. Recent Landings by Gear (mt) 173

Table 54. Tier 1/2 Homeports 174

Table 55. Tier 1/2 Principal Ports 175

Table 56. Recent Numbers of Active Dealers 175

Table 57. Kept Catch (mt) in Statistical Areas with at Least 1,000 mt of Mackerel Caught in at Least One Recent Year 176

Table 58. Recreational Harvest (rounded to nearest mt) of Mackerel, 2005-2014. 178

Table 59. Summary of the Indirect Impacts of Omnibus Alternatives (*Preferred alternatives shown in bold*) 187

Table 60. Range of Industry-Funded Monitoring Herring Coverage Target Alternatives (*preferred alternatives shown in bold*) 189

Table 61. Comparison of Information Collected Across Herring Coverage Target Alternatives 193

Table 62. 2015 Midwater Trawl[1], Purse Seine[2], and Small Mesh Bottom Trawl[3] Observer Coverage Rates 194

Table 63. Herring Catch Cap CV and observer coverage, 2011-2015 196

Table 64. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage 200

Table 65. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage with 25 mt trip exemption 201

Table 67. Pros and Cons of Allocating Monitoring Coverage by Fleet Versus Permit Category 208

Table 68. Proposed and Observed Sea Days for Fleets that Target Herring 210

Table 69. Impacts Summary of Herring Alternatives on Herring Resource (*Preferred Alternatives shown in bold*) 219

Table 70. Impacts Summary of Herring Coverage Target Alternatives on Non-target Species (*Preferred alternatives shown in bold*) 230

Table 71. Impacts Summary of Herring Alternatives on Protected Species (*Preferred alternatives shown in bold*) 239

Table 72. Summary of Physical Environment Impacts of Herring Alternatives (*Preferred alternatives shown in bold*) 242

Table 73. Monitoring Cost estimates for the Herring Fishery 243

Table 74. Industry Cost Responsibilities for NEFOP-level Observer and At-Sea Monitors 244

Table 75. Industry Cost Responsibilities for Electronic Monitoring Implementation 245

Table 76. Industry Cost Responsibilities for Ongoing Electronic Monitoring Costs per sea day 245

Table 77. Landing Ports for MWT Vessels and Portside Sampling Issues 246

Table 78. Summary of Total Trip Costs for Herring and Mackerel Vessels in 2014 249

Table 79. Monitoring Costs Associated with Declared Herring Trips that Did Not Land Herring in 2014. 250

Table 80. Number of Category A and B herring vessels by trip size during 2012-2014. 251

Table 81. Trips by Category A and B herring vessels by size and gear type during 2012-2014. 251

Table 82. Potential Reduction to Return-To-Owner for Herring Coverage Target Alternatives 262

Table 83. Summary of Economic Impacts of Herring Coverage Target Alternatives (*Preferred alternatives shown in bold*) 266

Table 84. Herring Alternatives 2.1, 2.2, 2.3, 2.7 (purse seine and smbt) – Annual Average Per Vessel Summary 269

Table 85. Herring Alternatives 2.1, 2.2, 2.3 (purse seine and smbt) – Annual Fleet Summary 276

Table 86. Herring Alternatives 2.3 and 2.4 – Annual Average Per Midwater Trawl Vessel Summary 276

Table 87. Herring Alternatives 2.3 and 2.4 – Annual Midwater Trawl Fleet Summary 279

Table 88. Herring Alternative 2.5 – Annual Average Per Midwater Trawl Vessel Summary 280

Table 89. Herring Alternative 2.5 – Annual Midwater Trawl Fleet Summary 281

Table 90. Herring Alternative 2.7 – Annual Fleet Summary 282

Table 91. Summary of Overall Impacts Associated with Herring Alternatives (*preferred alternatives shown in bold*) 288

Table 92. Summary of Effects of Past, Present, and Reasonable Foreseeable Future Actions on VECs 302

Table 93. Cumulative Effects Assessment Baseline Condition of VECs 303

Table 94. Summary of Impacts of Omnibus Alternatives 305

Table 95. Summary of Impacts of Herring Alternatives 308

Table 96. Annual Cost to Vessels Associated with preferred Herring Alternatives.....339

Table 97. Gross Revenues and Revenues from Herring for the directly Regulated Small Entities.....341

Table 98. Gross Revenues and Revenues from Herring for the Active directly Regulated Small Entities.....342

Table 99. Impacts on the Small, Active Directly Regulated Entities.....344

Table 100. Impacts on the Large, Active Directly Regulated Entities.....344

Table 101. Vessel-Level Impacts on the Small, Active Directly Regulated Entities.....346

Table 102. Vessel-Level Impacts on the Large, Active Directly Regulated Entities 346

List of Figures

Figure 1. Map of the Gulf of Maine, Georges Bank, and Mid-Atlantic Bight. 136

Figure 2. Atlantic Herring Management Areas. 153

Figure 3. Monthly average price per metric ton for Atlantic herring. 160

Figure 4. Historical Atlantic Mackerel Landings in the U.S. EEZ. 170

Figure 5. Mackerel Nominal Ex-Vessel Revenues 1982-2013. 171

Figure 6. NMFS Statistical Areas 176

Figure 7. World Production of Mackerel, 1950-2013. 177

Figure 8. Herring Catch Cap CV and observer coverage (dot size) in relation to a 30% CV. 197

Figure 9. 2011-2015 derived CV curve for each catch cap based on SBRM sample size analysis methodology, with realized CV for each catch cap year (black dot). 198

Figure 10. 2011-2015 simulated GB Haddock Catch Cap mean CV (+/- 2 standard errors) in response to increasing observer coverage on Category A/B herring vessels, with realized CV for each fishing year (black dot). Includes 25 MT trip exemption option. 204

Figure 11. 2014-2015 simulated RHS Catch Cap mean CV (+/- 2 standard errors) in response to increasing observer coverage on Category A/B herring vessels, with realized CV for each fishing year (black dot). Includes 25 MT trip exemption option. 205

Figure 12. 2011-2015 simulated GB Haddock Catch Cap mean CV (+/- 2 standard errors) in response to increasing observer coverage on Category A/B herring vessels, with realized CV for each fishing year (black dot). Includes 50 MT trip exemption option. 206

Figure 13. 2014-2015 simulated RHS Catch Cap mean CV (+/- 2 standard errors) in response to increasing observer coverage on Category A/B herring vessels, with realized CV for each fishing year (black dot). Includes 50 MT trip exemption option. 207

Figure 14. Herring Alternative 2.1 100% NEFOP Cost and percent of RTO 270

Figure 15. Herring Alternative 2.2 100% ASM Cost and Percent of RTO 272

Figure 16. Herring Alternative 2.2 75% ASM Cost and Percent of RTO 273

Figure 17. Herring Alternative 2.2 50% ASM Cost and Percent of RTO 274

Figure 18. Herring Alternative 2.2 25% ASM Cost and Percent of RTO 275

Figure 19. Herring Alternative 2.4 100% EM and Portside Cost and Percent of RTO 277

Figure 20. Herring Alternative 2.4 50% EM and Portside Cost and Percent of RTO 278

Figure 21. Herring Alternative 2.5 100% NEFOP for Midwater Trawl vessels in Groundfish Closed Areas Cost and Percent of RTO 280

Figure 22. Herring Alternative 2.7 100% EM and Portside on all vessels 283

Figure 23. Herring Alternative 2.7 75% EM and Portside on all vessels 284

Figure 24. Herring Alternative 2.7 50% EM and Portside on all vessels 285

Figure 25. Herring Alternative 2.7 25% EM and Portside on all vessels 286

1.0 INTRODUCTION AND BACKGROUND

The New England Fishery Management Council (Council) is interested in increasing monitoring in some fishery management plans (FMPs) to assess the amount and type of catch, to more precisely monitor annual catch limits, and/or provide other information for management. This increased monitoring would be in addition to coverage required through the Standardized Bycatch Reporting Methodology (SBRM), the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA). The Council previously proposed industry-funded monitoring requirements in some fisheries to meet monitoring goals beyond SBRM. However, the National Marine Fisheries Service (NMFS) disapproved these proposals because they were inconsistent with Federal law (see Appendix 1).

The New England Industry-Funded Monitoring (IFM) Omnibus Amendment would provide the measures necessary for industry funding and available Federal funding to pay for additional monitoring to meet specific monitoring coverage targets for each FMP. This amendment would allow the Council to prioritize industry-funded monitoring programs across FMPs should available Federal funding fall short of the total needed to fully fund all monitoring programs. This amendment would also ensure consistency for industry-funded monitoring programs across FMPs. These programs would be used in conjunction with existing monitoring programs to provide for additional monitoring to meet fishery-specific coverage targets in a way that would not conflict with other Federal laws.

Industry-funded monitoring is a complex and highly sensitive issue. In addition to accounting for socioeconomic conditions of the fleets that must bear the cost of industry-funded monitoring requirements, it involves the Federal budgeting and appropriations process and a diverse suite of Federal mandates. In an effort to simplify these issues for fisheries stakeholders, we use a question and answer format for the introduction and background section of this document. We hope this approach helps clarify the considerations that drove the development of the alternatives considered in this action, as well as the expected function and impacts of the alternatives.

Initially, the Mid-Atlantic Fishery Management Council and the New England Council were jointly developing an omnibus amendment to allow for industry-funded monitoring. The amendment included omnibus alternatives that would have modified all the fishery management plans managed by both Councils to allow for the standardized development and administration of future industry-funded monitoring programs. Additionally, the amendment included alternatives for industry-funded monitoring coverage for the Atlantic Herring Fishery Management Plan (FMP) and the Atlantic Mackerel, Squid, and Butterfish FMP. In April 2017, the Mid-Atlantic Council decided to postpone action on the amendment, while the New England Council selected preferred alternatives and recommended the amendment to NMFS for approval and implementation. Therefore, the joint omnibus amendment has become the New England Industry-Funded Monitoring Omnibus Amendment. If approved by NMFS, this amendment will only apply to FMPs managed by the New England Council. Specifically, this amendment would modify New England Council FMPs to allow for the standardized development and administration of

future industry-funded monitoring programs. This amendment would also implement an industry-funded monitoring program in the Atlantic Herring FMP. If the Mid-Atlantic Council re-considers an amendment to allow industry-funded monitoring, that amendment would only apply to FMPs managed by the Mid-Atlantic Council. The New England Industry-Funded Monitoring Omnibus Amendment will undergo rulemaking in 2018 and, if approved, the amendment would likely be implemented during 2019 or 2020.

The introduction and background section includes four categories of questions and answers, including: 1) General questions about the Industry-Funded Monitoring Omnibus Amendment; 2) Cost responsibilities; 3) NMFS administrative costs; and 4) Industry Costs. The list of questions under each of these categories is summarized below.

If you are viewing this document electronically, click on any question of interest, and the hyperlink will take you to the page with the answer.

General Questions and Answers about the Industry-Funded Monitoring Omnibus Amendment

- How is this document organized?
- Why is the Council establishing industry-funded monitoring programs?
- How is the Federal budget for monitoring decided each year?
- Why did NMFS disapprove past Council proposals for industry-funded monitoring programs?
- How does this amendment address the issues that resulted in the recent disapprovals?
- Under this amendment, would setting an industry-funded monitoring coverage target for a given FMP mean the fishery is guaranteed that level of coverage for a given year? For example, if the Atlantic Herring FMP sets a coverage target of 100% for 2019, does this amendment ensure that level of coverage would be achieved?
- How are existing industry-funded monitoring programs administered in the Greater Atlantic Region?
- Why does this action propose to consider industry-funded monitoring programs in a different way than they are considered for the NE Multispecies and Scallop FMPs?
- Why does NMFS caution the Council about additional costs for monitoring but not for other FMP requirements, such as vessel trip reports?
- What types of monitoring are considered in this amendment?

Questions and Answers about Cost Responsibilities

- What are the cost components for monitoring programs?
- Why can't industry split the cost of monitoring with the government by some percent (e.g., industry pays for 30%, NMFS pays for 70%) or some dollar amount (e.g., industry pays for $325, NMFS pays for the rest)?
- Why can't NMFS directly collect fees for monitoring programs?
- Why has it been difficult for NMFS to give cost estimates for various types of monitoring programs?

Questions and Answers about NMFS Administrative Costs

- How was the use of certain funding lines changed in relation to SBRM?
- What funding lines are available to fund administrative costs for industry-funded monitoring programs?
- Can NMFS accept funding from external groups to fund administrative costs for fisheries monitoring?
- How does NMFS cover its administrative costs for the groundfish at-sea monitoring program? (
- When could SBRM funds be used to cover the administrative costs for monitoring?
- If SBRM isn't fully funded every year, how could there be discretionary funding available to cover industry-funded programs?

Questions and Answers about Industry Costs

- The expected industry contribution for monitoring in the Greater Atlantic Region seems a lot higher than other regions. Don't Alaska fishermen only pay $325 per sea day for observer coverage?
- The scallop fishery has an observer set-aside to help defray industry costs for monitoring. Can other FMPs use this approach? What are some of the challenges of using a monitoring set-aside to pay for industry costs?
- Can there be a fully industry-funded program where industry pays for both administrative and monitoring costs, and hands packaged data over to NMFS?
- If NMFS has extra funding available, can the money be passed along to industry to help defray its cost responsibilities for monitoring?

1.1.1 GENERAL QUESTIONS AND ANSWERS ABOUT THE INDUSTRY-FUNDEDED MONITORING OMNIBUS AMENDMENT

How is this document organized?

This amendment has three sets of alternatives.

The first set of alternatives is referred to as the "Omnibus Alternatives." These alternatives include: (1) Standard cost responsibilities associated with industry-funded monitoring for NMFS and the fishing industry; (2) a process for FMP-specific industry-funded monitoring to be implemented via amendment and revised via framework adjustment; (3) standard administrative requirements for industry-funded monitoring service providers; (4) process to prioritize available Federal funding across FMPs for new industry-funded monitoring programs, including the type of weighting approach and the timing of revising the weighting approach; and (5) process for FMP-specific monitoring set-aside programs to be implemented via a future framework adjustment action.

These alternatives would apply to all Council FMPs. The Omnibus Alternatives are described in Section 2.1 of this document. The impacts of the Omnibus Alternatives are analyzed in Section 4.1.

The second set of alternatives includes monitoring coverage target alternatives specific to the Atlantic Herring FMP. These alternatives are referred to as the "Herring Alternatives." The Herring Alternatives are described in Section 2.2 of this document. The impacts of the Herring Alternatives are analyzed in Section 4.2.

[Back to list of questions.]

Why is the Council establishing industry-funded monitoring programs?

The Council is interested in increasing monitoring and/or other types of data collection in some FMPs to assess the amount and type of catch, to more accurately monitor annual catch limits, and/or provide other information for management. NMFS has limited funding for monitoring, so the Council is considering requiring industry to contribute to the cost of monitoring. Therefore, this amendment considers measures that would provide options to allow the Council to implement industry-funded monitoring coverage in New England FMPs. Industry funding would be used in conjunction with available Federal funding to pay for additional monitoring to meet FMP-specific coverage targets. This amendment would also set priorities for meeting coverage targets when Federal funding is limited.

[Back to list of questions.]

How is the Federal budget for monitoring decided each year?

Each year, the White House Office of Management and Budget submits a budget request for the entire Federal government for the following fiscal year, which starts in October. The budget request contains numerous funding lines and Congress makes the final determination on that request. Each of these funding lines is accompanied by a brief description which explains to Congress and the public how the funding in that line will be used. Funds cannot be used for programs, projects, or activities that are not included in the description of the budget line, or as directed by Congress in appropriations bills.

[Back to list of questions.]

Why did NMFS disapprove past Council proposals for industry-funded monitoring programs?

Recent Council proposals for industry-funded monitoring either attempted to require NMFS to spend money that was not in the budget, or attempted to split monitoring costs between industry and NMFS in ways that are not consistent with Federal law. These actions raised concerns relating to the Miscellaneous Receipts Statute,[1] the Anti-Deficiency

[1] The Miscellaneous Receipts Statute provides that "an official or agent of the United States Government having custody or possession of public money shall keep the money safe" and may not lend, use, deposit in a

Act,[2] and other statutes and regulations that govern Federal budgets. More detailed explanations of recent NMFS disapprovals of industry-funded monitoring provisions in Atlantic Herring Amendment 5 and Northeast (NE) Multispecies Framework Adjustment 48 are included in Appendix 1. The concepts behind the disapprovals are also summarized here.

Congress must decide how to finance any program, project, or activity (program) it establishes. Typically, programs are funded by appropriating funds from the U.S. Treasury. In addition to designating the funds necessary for a program, a congressional appropriation sets a maximum authorized program level. The maximum authorized program level functions as a cap on funding for a program. A Federal agency cannot spend money on a program beyond the maximum authorized program level without authorization from Congress. A Federal agency also cannot get around the maximum authorized program level by adding to its appropriations from sources outside the government without permission from Congress.

The disapproved monitoring provision in Herring Amendment 5 would have required NMFS to fund very high levels of observer coverage in the herring fishery. Because NMFS's spending is limited by its Congressional appropriations, NMFS cannot approve a monitoring program that it does not have enough money to fund. NMFS also cannot take money from budget lines intended for other activities in order to fund monitoring programs.

Second, the Herring Amendment 5 attempted to specify a set industry contribution for industry-funded monitoring (i.e., industry would only pay $325 per sea day). Similarly, the NE Multispecies Framework 48 attempted to limit the types of costs that industry would be responsible for in an industry-funded program (i.e., industry would only have to pay for observer salary). These proposals were disapproved because the government cannot commit to pay for costs that are not inherently the responsibility of the government. In the case of industry-funded monitoring, NMFS interpreted this to mean that it is only obligated to pay for its administrative costs to support industry-funded programs and is not obligated to pay for any costs generated from sampling activities for these programs. This standard was applied to the monitoring cost provisions recently proposed in the Herring and NE Multispecies FMPs and resulted in the disapproval of those measures.

[Back to list of questions.]

bank or exchange the money for other amounts. 31 U.S.C. § 3302(a). It obliges government officials "receiving money for the Government from any source [to] deposit the money in the Treasury as soon as practicable without deduction for any charge or claim." *Id.*

[2] The Anti-Deficiency Act prevents federal officers from "mak[ing] or authoriz[ing] an expenditure or obligation exceeding an amount available in an appropriation" from Congress or "involv[ing] either government in a contract or obligation for the payment of money before an appropriation is made [by Congress] unless authorized by law." 31 U.S.C. § 1341(a)(1).

How does this amendment fix the issues that resulted in the recent disapprovals?

The amendment addresses the disapprovals by: (1) Establishing a process through which NMFS can approve new monitoring programs without committing funding that is not in the budget; and (2) establishing a legal approach to allow industry funding to be used in conjunction with Federal funding to pay for additional monitoring to meet fishery-specific coverage targets.

First, the concept of a monitoring *coverage target*, as opposed to a mandatory monitoring coverage level, allows NMFS to approve new monitoring programs without committing to support coverage levels above appropriated funding or before funding is determined to be available. The realized coverage in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities in a given year. Fishery management plans interested in coverage above SBRM would set coverage targets in individual fishery management plan amendments. Realized coverage for a fishery in a given year would be anywhere from no additional coverage above SBRM up to the specified coverage target.

Second, this amendment establishes a description of the division of cost responsibilities for industry-funded monitoring programs between industry and NMFS that is consistent with legal requirements. This division of costs is described under the heading "Standardized Cost Responsibilities" in Omnibus Alternative 2. Department of Commerce General Counsel has advised NMFS that monitoring cost responsibilities may be allocated between industry and the government as long as government cost responsibilities are paid by the government, and the government's costs are differentiated from the industries responsibilities. Currently, the delineation has been made between administrative and sampling costs. This amendment will set a standard delimitation to avoid confusion and ensure compliance with appropriations requirements. Establishing a common definition means that all future Council proposals for industry-funded monitoring programs would consider NMFS and industry cost responsibilities in the same way.

[Back to list of questions.]

Would setting an industry-funded monitoring coverage target for a given FMP in this amendment mean that the fishery is guaranteed that level of coverage for a given year? For example, if the Herring FMP sets a coverage target of 100% for 2019, does this amendment ensure that level of coverage would be achieved?

No. This amendment establishes tools that NMFS and the Council could use to provide for and prioritize additional monitoring across New England fisheries when Federal funding is available, but it cannot resolve the underlying issue of limited Federal funding. This means that this Industry-Funded Omnibus Amendment WOULD NOT automatically allow for higher coverage levels in New England fisheries. During years when there is no additional funding to cover NMFS cost responsibilities above funding for SBRM, there would be no additional monitoring coverage, even if industry is able to fully fund their cost responsibilities.

[Back to list of questions.]

How are existing industry-funded monitoring programs administered in the Greater Atlantic Region?

The Greater Atlantic Region currently administers an industry-funded monitoring program for the Atlantic sea scallop FMP and for groundfish sectors in the NE Multispecies FMP. Additional details about the industry-funded monitoring programs for these fisheries are provided below.

The IFM Omnibus Amendment would not modify the coverage levels or allocation of funding for NMFS administrative costs for the scallop or groundfish sector industry-funded monitoring programs. The standardized structure and prioritization process considered in the IFM Omnibus Amendment could apply to groundfish sectors and/or the scallop fishery if, in a future action, if the Council wants to include those programs in this prioritization process, or develops new IFM programs within those FMPs.

Scallop Industry-Funded Observer Program. NMFS incorporated the industry-funded observer program into the Atlantic Sea Scallop FMP in 1999 in Framework Adjustment 11 (64 FR 31144, June 10, 1999). The scallop industry-funded observer program first applied to the Closed Area II scallop fishery exemption program. Six subsequent management actions addressed major aspects of the industry-funded observer program:

- Framework 13 to the Scallop FMP (65 FR 37903, June 19, 2000) kept the program in place for the Closed Area I, Closed Area II, and Nantucket Lightship exemption program;
- Framework 14 to the Scallop FMP (66 FR 24052, May 11, 2001) kept the program in place for the Hudson Canyon and Virginia Beach Area Access program;
- Amendment 10 to the Scallop FMP (69 FR 35194, June 23, 2004) formally included the program for all limited access scallop fishing under the area access and open area days-at-sea programs;
- Framework 16 to the Scallop FMP (69 FR 63460, November 2, 2004) established observer coverage levels to meet a 30-percent coefficient of variation (CV) (a measurement of the precision of the estimate) for Closed Area I, Closed Area II, and the Nantucket Lightship area access fisheries;
- Secretarial Emergency Rule (71 FR 34832, June 16, 2006; extension 71 FR 69073, November 29, 2006) established a mechanism for vessels to contract directly with observer service providers to resolve legal constraints of industry paying for observer coverage; and
- Amendment 13 to the Scallop FMP (72 FR 32549, June 13, 2007) formally incorporated the emergency action industry-funded observer measures into the Scallop FMP.
- As monitoring needs expanded and administration of the program became more efficient, the Council and NMFS ultimately expanded the scallop industry-funded monitoring program to all access areas, open areas, and to the limited access general

category individual fishing quota fleet. The Council and NMFS have made minor operational modifications to the program over the years. The Scallop FMP's program is a good example of an effective industry-funded program that phased in changes as program and administration needs evolved.

The need for the scallop industry-funded program consistently has been to collect catch information (kept fish and bycatch) through levels of at-sea observer coverage that could not otherwise be consistently achieved through NMFS observer program funding alone. NMFS has, and continues to be able to pay for its costs of administering the scallop industry-funded observer program because the coverage level is primarily set through SBRM. Prior to the implementation of the 2007 SBRM amendment, the Council concluded that industry-funded coverage levels set to achieve a 30% CV performance standard would appropriately reduce variability in bycatch estimates for yellowtail flounder, other finfish, and sea turtles. When the SBRM was first implemented, this goal for monitoring the scallop fishery was included in the SBRM coverage goals. The scallop industry-funded observer program provides funding through a quota set-aside (described below) that enables the scallop fishery to pay for coverage levels that meet or exceed the SBRM coverage targets.

The observer set-aside model works well in the scallop fishery because the high value of scallops allocated to vessels that carry an observer helps compensate the vessel for the cost of the observer. The vessel receives extra pounds or days-at-sea on each observed trip that provides additional funds to pay for the observer. However, vessel owners are required to pay for the observer even if the vessel does not catch any scallops or the additional set-aside of scallops, or if there is insufficient set-aside allocated to compensate the vessel. NMFS's goal is to set a compensation rate (the amount of extra pounds of scallops allocated to trips that carry observers) that covers the cost of an observer, without providing financial incentive for a vessel to desire observer coverage, which could bias sampling.

Groundfish Industry-Funded At-Sea Monitoring (ASM). The groundfish sector ASM program was first developed by the Council in Amendment 16 to the Northeast Multispecies FMP (75 FR 18262, April 9, 2010). Amendment 16 stated that the primary purpose of the groundfish ASM program was to verify area fished, catch, and discards by species on sector trips, and that coverage levels must be sufficient to at least meet the CV performance standard in SBRM (i.e., a 30% CV). This CV standard is achieved through a combination of SBRM (fully-NMFS funded) and ASM (industry-funded) coverage. Framework 48 to the Northeast Multispecies FMP (78 FR 26118, May 3, 2013) further defined specific goals and objectives for the ASM program, and also clarified that the 30% CV standard for ASM should apply at the stock level (i.e., each stock of fish for the fishery as a whole). In contrast, the SBRM CV standard for groundfish applies at the stock complex level (e.g., for all groundfish stocks in aggregate).

The groundfish ASM program was designed to transition to an industry-funded program in 2012, but from groundfish fishing years 2010 through 2014, NMFS was able to fully fund both the NMFS and industry cost responsibilities for groundfish ASM. Though NMFS has paid both sampling and administrative costs for ASM for groundfish sectors since 2010,

groundfish sectors are responsible for covering the sampling costs for the ASM program if NMFS is unable. Fishermen have recently begun to fund their ASM program costs.

[Back to list of questions.]

Why does this action propose to consider industry-funded monitoring programs in a different way than it is considered for the NE Multispecies and Scallop FMPs?

The Atlantic sea scallop and NE Multispecies monitoring programs have already been established by the Council, and the operation of their fisheries depends on these programs. For example, the sector fishery requires at-sea monitoring to reliably estimate catch to ensure that the groundfish catch limits are not exceeded and that overfishing does not occur. Sectors could not operate without sufficient at-sea monitoring programs. In addition to the programs they already established, the Council has been increasingly interested in requiring monitoring coverage for purposes different than those for which NMFS is legally required to provide monitoring coverage (e.g., Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), MMPA, ESA). NMFS's limited budget requires NMFS to prioritize resources across competing monitoring interests. The standardized process for industry-funded programs described in this amendment, including the prioritization process detailed under Omnibus Alternative 2, provides a method to address the Council's identified monitoring needs and priorities in consideration of NMFS's budget limitations. This process would allow available funding for coverage to be applied where it is most needed to achieve the highest priority objectives, and allows both the Council and the public to be informed about funding limitations and to contribute to the decision-making process.

[Back to list of questions.]

Why does NMFS caution the Council about additional costs for monitoring but not for other FMP requirements, such as vessel trip reports?

NMFS evaluates its ability to financially administer all of the Council's recommendations prior to approval. Certain requirements, for example, an increase to weekly vessel trip reports (VTRs) for a fishery, can be administered within existing resources because they are either cost neutral under the existing administrative infrastructure, or they only add marginally to NMFS costs. In the example of VTRs, NMFS already has staff processing weekly VTRs for a number of fisheries, and most Greater Atlantic Region permit holders already submit VTRs weekly related to permit requirements for the NE Multispecies and Atlantic herring fisheries.

In contrast, the costs associated with implementing new at-sea monitoring, portside sampling, or electronic monitoring programs are often substantial and cannot be easily completed by existing staff using the existing budget. In addition, the amount of money Congress appropriates to fund monitoring costs fluctuates from year to year, so NMFS cannot commit to pay for new, expensive monitoring programs indefinitely. For these

reasons, NMFS has made efforts to communicate to the Council that funding for new monitoring programs must be a significant consideration during program development.

[Back to list of questions.]

What types of monitoring are considered in this amendment?

This amendment discusses industry-funded programs to implement four types of monitoring: (1) NEFOP-level observer monitoring; (2) at-sea monitoring; (3) portside monitoring; and (4) electronic monitoring. These four types of monitoring are briefly described below, and described in more detail in Appendix 3 to this document.

1. NEFOP-level observer monitoring focuses on data collection at sea, recording an advanced and diverse set of information on the type and quantity of retained and discarded catch on fishing trips.
2. At-sea monitoring focuses on data collection at sea, recording the type and quantity of retained and/or discarded catch, but a more limited set of information on fishing trips than NEFOP-level observers. There are fishery-specific at-sea monitoring programs that support FMP-specific goals (i.e., groundfish ASM program).
3. Portside monitoring focuses on data collection at the dock, accounting for landings of target species and incidental catch. If all fish caught are retained and landed, portside monitoring can also record type and quantity of total catch.
4. Electronic monitoring (EM) uses video cameras and other sensors to monitor discards at sea or to monitor compliance with retention requirements.

[Back to list of questions.]

1.1.2 QUESTIONS AND ANSWERS ABOUT COST RESPONSIBILITIES

What are the cost components for monitoring programs?

There are two types of costs associated with monitoring programs: (1) Sampling costs, such as observer salary and travel costs; and (2) NMFS administrative costs, such as observer training and data processing. This amendment would codify the separation of monitoring cost responsibilities such that industry is responsible for sampling costs and NMFS is responsible for administrative costs. This division of costs is described under the heading "Standardized Cost Responsibilities" in Omnibus Alternative 2.

[Back to list of questions.]

What is cost sharing? Can industry split the cost of monitoring with the government by some percent (e.g., industry pays for 30%, NMFS pays for 70%) or some dollar amount (e.g., industry pays for $325, NMFS pays for the rest)?

The concept of "cost sharing" has come up throughout the discussions of industry-funded monitoring. Conceptually, cost sharing implies that industry and the government both contribute to the cost of the monitoring program. However, legal constraints prevent NMFS from receiving industry funds to pay for government costs in an industry-funded monitoring program. Therefore, it is necessary to specify appropriate cost responsibilities for NMFS and industry to avoid NMFS and industry sharing costs.

Department of Commerce General Counsel has advised NMFS that monitoring cost responsibilities can be allocated between industry and the government by delineating the sampling and administrative portions of the costs of monitoring. Industry would be responsible for costs directly attributable to the sampling portion of a monitoring program, and NMFS would be responsible for costs directly attributable to the administrative portion of the monitoring program (See Omnibus Alternative 2 under "Standardized Cost Responsibilities"). This division of cost responsibilities should remain the same and should differentiate between inherently governmental responsibilities and industry costs.

It is illegal for industry to pay inherently government costs (e.g., administrative costs), but either group can pay for sampling costs. Actual payment of different cost responsibilities for monitoring programs can work in two ways: (1) NMFS can pay for its cost responsibilities, such as support and administrative costs, and also pay for the industry's cost responsibilities, such as sampling costs (e.g., the Northeast Fisheries Observer Program); or (2) NMFS can pay for its cost responsibilities, such as support and administrative costs, and industry can pay for its cost responsibilities, such as sampling costs (e.g., industry-funded Atlantic scallop observer program). Additionally, NMFS can help to offset industry's monitoring cost responsibilities by reimbursing vessel owners through cooperative agreements with third parties when funding is available.

[Back to list of questions.]

Why cannot NMFS directly collect fees for monitoring programs?

The Miscellaneous Receipts Act requires Federal employees to deposit any money received on behalf of the government into the general Treasury, unless otherwise directed by law. This means that if NMFS accepted funds from the industry, NMFS would be required to direct those funds to the Treasury and would not be able to reserve them to pay for monitoring in the Greater Atlantic Region without a change in law to allow that to happen. For example, the Alaska Region has special authorization in the Magnuson-Stevens Act to collect fees from the industry and to put those fees into a fund to be used to defray the costs of monitoring in that region (Magnuson-Stevens Act § 313). The Greater Atlantic Region does not have such authority, except for cost recovery for Limited Access Privilege Programs (LAPPs). Currently, cost recovery is applicable only to the Atlantic sea scallop limited access general category individual fishing quota (IFQ) and the golden tilefish IFQ programs (both are forms of LAPPs). These fisheries, along with the surfclam and ocean quahog fisheries, are the only programs in the Greater Atlantic Region that are subject to the cost recovery requirement.

Under the LAPP cost recovery authority (Magnuson-Stevens Act § 303A(e)) and the authority to establish fees (Magnuson-Stevens Act § 304(d)), the Magnuson-Stevens Act requires NMFS to collect a fee to recover the actual costs directly related to the management, data collection, and enforcement of any LAPP and community development quota program that allocates a percentage of the total allowable catch of a fishery to such program. NMFS must collect a fee not to exceed 3% of the ex-vessel value of fish harvested under these programs. The fees are deposited into a unique fund that NMFS uses to directly pay for the management, data collection, and enforcement of the program. The relevant costs to recover are the incremental costs, meaning those costs that would not have been incurred but for the LAPP. If the Council decides at some future point to develop LAPPs in other fisheries, cost recovery programs could be implemented in those fisheries. Development of LAPPs and cost recovery programs are complex and often take several years.

[Back to list of questions.]

Why has it been difficult for NMFS to give cost estimates for various types of monitoring programs?

Monitoring program costs include a variety of administrative and sampling costs that vary substantially within and between years. This variability affects the estimates of both NMFS and industry costs for monitoring programs, which means that the estimate of the total or per sea day cost for the same monitoring program can vary depending on the time period of interest. A discussion of the difficulties with generating a cost estimates for monitoring is included in the 2015 Program Review of the Northeast Fisheries Science Center Fisheries Sampling Branch, available at http://www.nefsc.noaa.gov/fsb/index.html#fsb-review.

Some of the reasons why estimates of NMFS administrative costs can vary include:

- The costs associated with training vary substantially within and between years because of the high monitor turnover rate.
- The costs associated with data editing varies greatly depending on the experience of the cohort of monitors for a given time period. Data editing costs may be lower for a given period if the cohort of monitors is highly experienced. Conversely, data editing costs may be higher for a period with a large cohort with less experienced monitors.

In addition, the breakdown of industry costs for sampling for a single sea day can vary depending on:

- How close the monitor's home port is to the port of deployment (an observer will be reimbursed travel costs which include mileage and an hourly wage for time traveling if traveling greater than 50 miles from their assigned home port);

- How long monitors are retained by the service provider (training costs are amortized over the career span of the monitors);
- Trip length;
- How accurately a vessel schedules its departure time; and
- A given service providers' business models (provider observer support, strategies for retention, observer bonus structure, benefits).

Finally, with the exception of the industry-funded scallop observer program, industry-funded monitoring is a relatively new arrangement for funding monitoring programs in the Greater Atlantic Region. Most of the monitoring program cost estimates in this document are based on costs negotiated and structured as part of Federal contracts between NMFS and various monitoring service providers. When individual vessels or groups of vessels form contracts with service providers for monitoring coverage in future industry-funded monitoring programs, the terms and structure of the contracts may differ from those in recent and existing Federal contracts. This means that the actual costs that industry may pay to service providers for monitoring may differ from the available estimates.

For these reasons, this document presents several of the available Greater Atlantic Region and national cost estimates for at-sea, dockside, and electronic monitoring programs. With each estimate, we state the source and assumptions that generated the estimate. Although this may be confusing, we hope that providing the managers and the public a full understanding of the potential costs will allow for informed decision making when establishing industry-funded monitoring programs.

[Back to list of questions.]

1.1.3 QUESTIONS AND ANSWERS ABOUT NMFS ADMINISTRATIVE COSTS

How was the use of certain funding lines changed in relation to SBRM?

The Court order in *Oceana* v. *Locke*, which vacated the 2007 SBRM Omnibus Amendment, found legal fault with two aspects of the process used to prioritize funding for observer coverage. First, the Court found that NMFS had too much discretion in determining whether there were sufficient resources available to fully implement the estimated number of sea days needed to achieve the CV-based SBRM performance standard. Second, the Court found that NMFS had too much discretion in how observer sea days were redistributed under the prioritization process. To address these two aspects of the court order, the revised SBRM established a process for distributing the available observer sea days if resources are limited.

Under the revised SBRM prioritization process, the amount of money available for the SBRM will be the funding allocated to the Region under four specific historically-appropriated observer funding lines. The Northeast Fisheries Observer funding line is now fully committed to funding SBRM. The three other observer funding lines now dedicated to SBRM are allocated among different NMFS regions, including the Greater Atlantic Region, to

meet national observer program needs. The total amount of the funds allocated to the Greater Atlantic Region from these three funding lines will constitute the remainder of the available SBRM funds.

Historically, the available SBRM funding has been insufficient to fully meet the CV-based performance standard for all of the fishing modes (gear type, access area, trip category, region, and mesh group combinations analyzed under SBRM). If the available funding continues to be insufficient to meet the CV-based performance standard, the SBRM amendment establishes a non-discretionary formulaic processes for prioritizing how the available observer sea-days would be allocated to the various fishing modes to maximize the effectiveness of bycatch reporting and bycatch determinations.

[Back to list of questions.]

What funding lines are available to fund administrative costs for industry-funded monitoring programs?

A number of different funding lines contribute to monitoring programs in the Greater Atlantic Region.

NMFS Greater Atlantic Regional Fisheries Office (GARFO) and Northeast Fisheries Science Center (NEFSC) receive funding amounts through specific budget line items to cover its costs for monitoring programs. Some of the funding lines must be used for specific monitoring programs. With implementation of the Greater Atlantic Region SBRM amendment, NMFS no longer has the flexibility to use certain funding lines as we have in the past, as described above. In addition, there are certain funding lines specifically designated for other monitoring priorities (e.g., protected species monitoring). Thus, there are certain funding lines that will not be available to support industry-funded programs, unless there is excess available funding in these lines above the amount needed to meet the designated monitoring obligations for that year.

Other funding lines that include monitoring or administrative aspects of monitoring programs in their described purpose could be used to cover NMFS costs for industry-funded monitoring programs. Once the Council establishes industry-funded monitoring programs, NMFS will be able to determine the funding lines that could contribute to NMFS costs for industry-funded monitoring programs. If there is not enough money to cover NMFS costs related to industry-funded monitoring programs for a given year, depending on the alternatives chosen the Amendment, either NMFS or the Council would need to prioritize which programs are funded first.

[Back to list of questions.]

Can NMFS accept funding from external groups to fund administrative costs for monitoring programs?

Consistent with current law, there are two mechanisms by which the Greater Atlantic Region may accept outside resources for monitoring. First, Section 208 of the Magnuson-Stevens Act established a Fisheries Conservation and Management Fund, which may be funded through quota set-asides, appropriations, states or other public sources, and private or nonprofit organizations. This fund may be used to expand the use of electronic monitoring, and each region must be apportioned at least 5% of any money contributed to this fund. There have been inquiries about the fund over the years, but to date no contributions have been made.

Second, Section 403(b) of the Magnuson-Stevens Act allows for NMFS to accept resources and facilities for observer training from state, university, and any appropriate private nonprofit organizations on a limited basis. This provision has not been previously implemented and may have limitations that might undermine its utility for this region's fisheries.

[Back to list of questions.]

How does NMFS cover its administrative costs for the groundfish ASM program?

In part, NMFS has used funding in budget line items related to Catch Shares to fund administrative and sampling costs for the groundfish ASM program. The groundfish ASM program was designed to be an industry-funded program, but from groundfish fishing years 2010 through 2014, NMFS was able to fully fund both the NMFS and industry cost responsibilities for groundfish ASM. Groundfish sectors are required to pay for their sampling costs responsibilities for the ASM program if NMFS is unable. Fishermen have recently begun to pay for their ASM program costs.

[Back to list of questions.]

When could SBRM funds be used to cover the administrative costs for monitoring?

SBRM funding is used to cover the administrative costs for the industry-funded Atlantic sea scallop observer program. NMFS could explore using SBRM funding to cover the administrative costs for NEFOP-level observer coverage for other FMPs, but there three important considerations for this approach.

First, the sampling criteria (i.e., the gears and areas combinations) that the observer coverage applies to would need to match SBRM modes (gear type, access area, trip category, region, and mesh group combinations analyzed under SBRM). This means that this approach could not be used if the Council desired to use an industry-funded program to cover specific permit categories, unless those permit categories directly aligned with SBRM modes. In the case of the scallop industry-funded observer program, the observer coverage requirements apply to gear and area combinations that match SBRM modes.

Second, industry would be fully responsible for paying the sampling costs for NEFOP-level observer coverage, currently estimated at $818 per sea day. In addition, this approach could not be used for other types of monitoring coverage, including fishery specific at-sea monitors, portside sampling, or electronic monitoring. The scallop industry-funded observer program uses a set-aside to help defray industry costs for monitoring. However, vessel owners are required to pay for the observer even if the vessel does not catch any scallops or the additional set-aside of scallops, or if there is insufficient set-aside allocated to compensate the vessel. These same requirements would apply to other FMPs desiring to use SBRM funding to cover the administrative costs for monitoring.

Third, this approach could only be used to reach SBRM monitoring coverage levels for a given FMP. SBRM seeks to allocate observer coverage to reach a 30% CV on the discard estimate for managed species. This means that if only 10% observer coverage on a given SBRM mode is needed to reach the 30% CV, then this approach would only allow for 10% coverage for that gear and area combination in a given year. The Council has been interested in higher levels of monitoring coverage for a number of FMPs, so this approach may not provide the level of coverage necessary to meet FMP goals.

[Back to list of questions.]

If SBRM isn't fully funded every year, how could there be discretionary funding available to cover administrative costs from industry-funded programs?

Under the revised SBRM prioritization process, the amount of money available for the SBRM will be the funding allocated to the Region under four specific historically-appropriated observer funding lines. Unless there is excess funding in these lines above the amount needed to meet the designated monitoring obligations for that year, SBRM funding will not be available to fund industry-funded monitoring programs. Historically, the available SBRM funding has been insufficient to fully meet the CV-based performance standard for all of the fishing modes (i.e., gear type, access area, trip category, region, and mesh group combinations analyzed under SBRM). Thus, there is stakeholder concern that there will never be funding available to cover NMFS administrative costs for industry-funded monitoring programs. However, past funding availability is not a predictor of future funding availability.

We reiterate that other funding lines that include monitoring or administrative aspects of monitoring programs in their described purpose, other than the four funding lines designated for SBRM, could be used to cover NMFS costs for industry-funded monitoring programs. Until the Council establishes industry-funded monitoring programs, it will not be clear what NMFS costs might be related to these new programs, and what amount and type of administrative support will be necessary. Thus it is not possible to list the funding lines that could contribute to NMFS costs for industry-funded monitoring programs at this time. If there is not enough money to cover NMFS costs related to industry-funded monitoring programs for a given year, either NMFS or the Council would need to prioritize which programs are funded first.

[Back to list of questions.]

1.1.4 QUESTIONS AND ANSWERS ABOUT INDUSTRY COSTS

The expected industry contribution for monitoring in the Greater Atlantic Region seems a lot higher than other regions. Do Alaska fishermen only pay $325 per sea day for observer coverage?

There are a number of factors that influence industry costs for monitoring programs. A 2012 MRAG Americas report titled "Comparison of At-Sea Catch Monitoring Programs with Full Observer Coverage to the Directed Atlantic Herring Fishery – New England" compared the industry costs for Northeast Fishery Observer Program monitoring in the Atlantic herring fisheries to the industry contribution for several other fisheries that require 100% industry-funded monitoring coverage, including the Hawaii longline swordfish fishery, the Alaska pollock midwater trawl fishery, the West Coast at-sea whiting (hake) midwater trawl fishery, and the West Coast non-whiting trawl Individual Fishing Quota fishery. The report estimated industry contributions for these programs in the range of $360-420 per sea day. However, the report noted that the short trip duration (1-5 days) and complicated deployment logistics for the herring fleet result in higher per sea day costs for monitoring. In contrast, some of the other fisheries reviewed in the report have much longer trip duration (21-90 days) and have vessels that operate out of a limited number of ports, which simplifies deployment logistics.

[Back to list of questions.]

The scallop fishery has an observer set-aside to help defray industry costs for monitoring. Can other FMPs use this approach? What are some of the challenges of using a monitoring set-aside to pay for industry costs?

There are aspects of the scallop fishery, including the health and value of the stock, the management regime, and the predictability of landings, which allow the observer set-aside model to work well.

First, the health of the scallop resource means that a certain amount of the quota can be set aside to compensate the vessel for the cost of the observer. If a fishery resource is in poor shape, it may not be possible to allocate enough of the quota to a set-aside to effectively offset industry costs for monitoring. In addition, the high value of scallops allocated to vessels that carry observers helps compensate the vessel for the cost of the observer. Other fisheries with a lower price per pound (e.g., herring fishery) may need to set aside a much larger portion of the resource to compensate industry for monitoring cost.

Second, the management regime of the scallop fishery supports the set-aside model. The scallop fishery uses trip or days-at-sea limits for many of its permits, and vessels receive extra pounds or days-at-sea on each observed trip that provides additional funds to pay for

the observer. The set-aside approach may not be appropriate for fisheries that have permits without possession limits (e.g., Herring Category A), or would require those fisheries to adjust their management regimes to allow the set-aside program to function.

Finally, scallop trips are more predictable than trips targeting other species, specifically migratory species like herring and mackerel. While it is fairly likely that a given scallop trip could land the set-aside amount necessary to offset the cost of observers, the availability of herring is much less predictable, and is influenced by a number of environmental factors. On a given herring trip, it is much less likely that a vessel may be able to land a set-aside amount necessary to offset the cost of an observer.

[Back to list of questions.]

Can there be a fully industry-funded program where industry pays for both administrative and monitoring costs, and hands packaged data over to NMFS?

All governmental agencies perform some work that is so intimately related to the public interest that it requires performance by a Federal employee, rather than a contractor or third party. This type of work is classified as an "inherently government function." Guidance about the types of work that is classified as an inherently government function can be found in the Office of Federal Procurement Policy Letter 11-01, Performance of Inherently Governmental and Critical Functions (76 FR 56227, September 12, 2011).

For NMFS, the responsibility for maintaining the public interest are governed by a number of Federal mandates, including the Magnuson-Stevens Act, the MMPA and the ESA. Because NMFS monitoring programs are used to support our mission to conserve and manage fisheries and other marine resources, NMFS is obligated to assure the quality of data collected through these programs. Ultimately, this means that there are certain aspects of monitoring programs that NMFS must manage and fund, even if industry contributes for sampling costs.

Department of Commerce General Counsel has advised NMFS that monitoring cost responsibilities may be allocated between industry and the government by delineating the sampling and administrative portions of the costs of monitoring. Industry can be responsible for costs directly attributable to the sampling portion of a monitoring program, but NMFS must be responsible for costs directly attributable to the administrative portion of the monitoring program (See Omnibus Alternative 2 under "Standardized Cost Responsibilities") in cases where the monitoring programs support our management objectives. If industry were to pay for inherently governmental costs such as the administrative costs for monitoring programs that directly support our Federal mandates, it would mean that industry was supplementing Federal appropriations, which would violate appropriations laws.

While it is not possible for industry to fully fund a monitoring program that supports our obligations under the Magnuson-Stevens Act, the MMPA and the ESA, it is possible for industry to fully fund a monitoring program to gather information in support of future

management actions. For example, industry could fully fund a monitoring program to gather data on a gear modification to reduce incidental catch of river herring and shad in midwater trawl gear. Industry could then provide the results of the study to the Council and NMFS, who could in turn make the gear modification a regulatory requirement.

[Back to list of questions.]

If NMFS has extra funding available, can the money be passed along to industry to help defray its cost responsibilities for monitoring?

Yes, NMFS could reimburse industry for sampling costs through cooperative agreements with third parties if additional funding is available. This model was used to reimburse groundfish sectors for dockside monitoring costs.

[Back to list of questions.]

1.2 PURPOSE AND NEED FOR ACTION

This amendment includes two types of alternatives, the Omnibus Alternatives and the Herring Alternatives. The Omnibus Alternatives would apply to all New England FMPs and the Herring Alternatives would only apply to the Atlantic Herring FMP.

Purpose	Need
Omnibus Alternatives	
➢ Establish separate cost responsibilities for NMFS and the industry during collection of monitoring data ➢ Establish administrative requirements for service providers of industry funded monitoring ➢ Allow industry-funded monitoring programs to be revised via framework adjustment	➢ To enable the Councils to develop industry funded monitoring programs for the collection of information in addition to that collected by SBRM
➢ Establish a process for prioritizing between new industry funded monitoring programs	➢ If funding shortfalls occur, identify process for prioritizing which monitoring programs should be funded
Herring Alternatives	
➢ Establish an industry funded monitoring program for the Atlantic herring fishery	➢ Improve the accuracy of catch monitoring, specifically for river herring/ shad and haddock catch caps

2.0 MANAGEMENT ALTERNATIVES

The Council, in collaboration with its Committees, Advisory Panels, and the Plan Development Team/Fishery Management Action Team (PDT/FMAT) for this action, has developed a range of management alternatives.

The Omnibus Alternatives would apply to all New England FMPs and include the following:

- Standard cost responsibilities associated with industry-funded monitoring for NMFS and the fishing industry;
- Process for FMP-specific industry-funded monitoring to be implemented via amendment and revised via framework adjustment;
- Standard administrative requirements for industry-funded monitoring service providers;
- Process to prioritize available Federal funding across FMPs for new industry-funded monitoring programs, including the type of weighting approach and the timing of revising the weighting approach; and
- Process for FMP-specific monitoring set-aside programs to be implemented via a future framework adjustment action.

The Herring Alternatives would only apply to the Atlantic Herring FMP and include monitoring coverage targets for specific permit categories and/or gear types in the herring fishery.

2.1 OMNIBUS ALTERNATIVES

Overview of the Omnibus Alternatives

This amendment includes a set of Omnibus Alternatives that would modify all the FMPs managed by the Council to allow standardized development of future FMP-specific industry-funded monitoring programs.

The Council adopted the following principles to guide the selection and implementation of future industry-funded monitoring programs. Data collection program for the estimation of fishery catch should:

- Be fit for purpose – the reason, or clear need, for data collection should be identified to ensure objective design criteria.
- Be affordable – the cost of data collection programs should not diminish net benefits to the nation, nor threaten the continued existence of our fisheries. However, essential data collection is needed to assure conservation and sustainability, and is reason to seek less data intensive ways to assess and manage fisheries on the economic margins.
- Should apply modern technology – data collection should prioritize the utilization of modern technology to the extent possible to meet our data collection needs, while recognizing an affordable, robust program is likely to need a mix of data collection by people and technology.
- Incentivize reliable self-reporting.

The Council finalized its selection of preferred alternatives at its April 18-20, 2017, meeting.

Omnibus Alternatives	Preferred Alternatives
Alternative 1 (No Standardized Structure for IFM Programs)	No
Alternative 2 (Standardized Structure for IFM Programs)	Yes
Alternative 2.1 (NMFS-Led Prioritization Process)	No
Alternative 2.2 (Council-Led Prioritization Process)	Yes
Alternative 2.3 (Proportional Prioritization Process)	No
Alternative 2.4 (Lowest Ratio-Based Prioritization Process)	No
Alternative 2.5 (Highest Ratio-Based Prioritization Process)	No
Alternative 2.6 (Monitoring Set-Aside)	Yes

Omnibus Alternative 1 (No Action) – No standardized structure for industry-funded monitoring programs. Programs developed on an FMP-by-FMP basis.

- No standard definition of cost responsibilities for NMFS or industry;
- No standard amendment process to implement industry-funded monitoring programs and no standard framework adjustment process to revise industry-funded monitoring programs;
- No standardized service provider requirements;
- No process for prioritizing available Federal funding to support industry-funded monitoring programs across all New England FMPs; and
- No standardized framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternative 2 (**Preferred Alternative**) – Standardized structure for industry-funded monitoring programs and option for monitoring set-aside provision.

- Standard definition for cost responsibilities for NMFS or industry;
- Standard amendment process to implement industry-funded monitoring programs and standard framework adjustment process to revise industry-funded monitoring programs;
- Standard service provider requirements;
- Process for prioritizing available Federal funding to support industry-funded monitoring programs across all New England FMP; and
- Option for standard framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternatives 2.1-2.5 are variations on the prioritization process in Omnibus Alternative 2, and consider specific options for what to do when Federal funding is not sufficient to cover NMFS cost responsibilities to support the Council's desired level of industry-funded monitoring for a given FMP.

- Omnibus Alternative 2.1 – NMFS-led prioritization process. NMFS prepares analysis and prioritization in consultation with the Councils.
- Omnibus Alternative 2.2 (**Preferred Alternative**) – Council-led prioritization process. Council prepares analysis and recommends priorities to NMFS. Council recommended an equal weighting approach that would be adjusted on an as-needed basis.
- Omnibus Alternative 2.3 – Proportional prioritization process. Available Federal funding would be allocated proportionally among all industry-funded monitoring programs.
- Omnibus Alternative 2.4 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP relative to the extra coverage needed and total fleet activity. Alternative 2.4 would favor coverage for the FMPs that need little additional monitoring to meet coverage targets and have the most active fleets.
- Omnibus Alternative 2.5 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP relative to the extra coverage needed and total fleet activity. Alternative 2.5 would favor coverage for the FMPs that need more additional monitoring to meet coverage targets and have the least active fleets.

Omnibus Alternative 2.6 (**Preferred Alternative**) (Monitoring Set-Aside) would provide a structure to develop future monitoring set-aside programs to help offset vessel/non-governmental cost responsibilities associated with industry-funded monitoring coverage targets. No monitoring set-aside programs would be established in this amendment.

Background on the development of the Omnibus Alternatives can be found in Appendix 6.

2.1.1 OMNIBUS ALTERNATIVE 1: NO STANDARDIZED INDUSTRY-FUNDED MONITORING PROGRAMS

Under Omnibus Alternative 1 (No Action), there would be no standardized structure developed for New England industry-funded monitoring programs. There would be no standard definition of costs and cost responsibility for industry-funded monitoring in the New England fisheries. Cost definitions and the determination of who pays for them would be considered individually by each FMP as industry-funded monitoring programs are developed. Under Omnibus Alternative 1, there would be no process to prioritize industry-funded monitoring programs to allocate available Federal resources to meet Council desired monitoring coverage target above SBRM coverage and no standard administrative requirements for industry-funded monitoring service providers. The allocation of available Federal funding to increase monitoring in order to meet Council desired coverage levels and observer service provider requirements for industry-funded monitoring would be evaluated on a case-by-case, FMP-by-FMP basis. Additionally, under Omnibus Alternative 1, there would be no framework adjustment process to revise FMP-specific industry-funded monitoring and no framework adjustment process to implement FMP-specific

monitoring set-aside programs. Rather, industry-funded monitoring programs and monitoring set-aside programs would be developed and established in FMP-specific amendments.

Timing for the Omnibus Alternative 1 (No Action)

The following table outlines the existing timeline for sea day allocation related to SBRM, Sector At-Sea monitoring, and the scallop fishery (compensation rate determination). The SBRM year runs from April to March, the NE Multispecies fishing year runs from May to April, and the scallop fishing year runs from March to February. The schedule below would remain unchanged under the status quo alternative.

TABLE 3. STATUS QUO TIMING OF GREATER ATLANTIC REGION SBRM, SECTOR AND SCALLOP MONITORING ALLOCATION AND ANALYSIS

Year	Month	SBRM schedule	Sector ASM Schedule	Scallop Compensation Rate Determination Schedule
Year 1	January to September	SBRM analyses are completed late January/early February		
	October	• Observer data July Year 0 – June Year 1 available • Begin analysis for SBRM	Work on analysis for sector ASM using most recent complete fishing year (May Year 0 – April Year 1)	
	November	Work on discard estimation analysis for SBRM from November through early February		
	December			
Year 2	January	Receive Year 2 budget	Sector ASM coverage rates published in proposed rule	Determine compensation rate
	February		Collect public comment	
	March	If funding shortfall, run SBRM prioritization process	Sector ASM coverage rates published in final rule	Begin Year 2
	April	Determine and begin Year 2 seaday schedule	Determine seaday schedule	Determine and begin seaday schedule
	May		Begin Sector ASM Year 2	

2.1.2 OMNIBUS ALTERNATIVE 2: STANDARDIZED INDUSTY-FUNDED MONITORING PROGRAMS (*PREFERRED ALTERNATIVE*)

Under Omnibus Alternative 2, there would be a standardized structure for new industry-funded monitoring programs in New England fisheries, including at-sea monitoring, portside monitoring, and electronic monitoring. The existing scallop and groundfish industry-funded programs would not be affected by this action.

The Council selected Omnibus Alternative 2 as a preferred alternative.

This industry-funded monitoring program structure would include the following components:

(1) Standard cost responsibilities associated with industry-funded monitoring for NMFS and the fishing industry;
(2) a process for FMP-specific industry-funded monitoring to be implemented via amendment and revised via framework adjustment;
(3) standard administrative requirements for industry-funded monitoring service providers;
(4) process to prioritize available Federal resources across FMPs for new industry-funded monitoring programs, including the type of weighting approach and the timing of revising the weighting approach; and
(5) process for FMP-specific monitoring set-aside programs to be implemented via a future framework adjustment action.

No individual FMP would be subject to an industry-funded monitoring program as a result of implementation of the Omnibus Alternatives proposed in this action. Rather, any FMP that wishes to develop an industry-funded monitoring program and, optionally, a monitoring set-aside program would need to develop the program that meets the specifications of this action in a future action.

Standard Cost Responsibilities

Omnibus Alternative 2 would include standard cost responsibilities between NMFS and the industry for supporting monitoring programs targeting coverage in addition to SBRM. As described in Section 1.0, legal requirements dictate that certain cost responsibilities must be borne by NMFS. Cost responsibilities that are dictated by legal requirements cannot be modified through this action. This action seeks to codify cost responsibilities into regulation for industry-funded monitoring in New England FMPs to ensure consistency and compliance with legal requirements. If Omnibus Alternative 2 was not selected by the Councils, cost responsibilities for industry-funded monitoring would be codified on an FMP-by-FMP basis.

The cost responsibilities described below would be considered by the Council when developing any industry-funded monitoring program for New England FMPs in future

amendments. The cost responsibilities described below are already in operation in the Atlantic Sea Scallop and NE Multispecies FMPs, although the cost responsibilities are not explicitly defined in those FMPs. Selection of the Omnibus Alternative 2 would codify NMFS cost responsibilities for industry-funded monitoring into regulation for all New England FMPs, but it would not change NMFS cost responsibilities for the industry-funded monitoring programs currently established in the scallop or multispecies fisheries.

NMFS Cost Responsibilities

NMFS would be responsible for funding the costs to set standards for, monitor performance of, and administer industry-funded monitoring programs. These program elements would include:

- The labor and facilities costs associated training and debriefing of monitors;
- NMFS-issued gear (e.g., electronic reporting aids used by human monitors to record trip information);
- Certification of monitoring providers and individual monitors; performance monitoring to maintain certificates;
- Developing and executing vessel selection;
- Data processing (including electronic monitoring video audit, but excluding electronic video review); and
- Costs associated with liaison activities between service providers, and NMFS, Coast Guard, Council, sector managers, and other partners.

NMFS cost responsibilities for all types of existing monitoring, including Northeast Fisheries Observer Program-level (NEFOP-level) observer coverage, fishery-specific at-sea monitoring programs, portside monitoring, and electronic monitoring, including details on how NMFS cost responsibilities were derived, are included in the text below.

Industry Cost Responsibilities

The industry would be responsible for funding all other costs of the monitoring program. These program elements and activities would include, but are not limited to:

- Costs to the provider for deployments and sampling (e.g., travel and salary for observer deployments and debriefing);
- Equipment, as specified by NMFS, to the extent not provided by NMFS (e.g., electronic monitoring system);
- Costs to the provider for observer time and travel to a scheduled deployment that doesn't sail and was not canceled by the vessel prior to the sail time;
- Costs to the provider for installation and maintenance of electronic monitoring systems;
- Provider overhead and project management costs (e.g., provider office space, administrative and management staff, recruitment costs, salary and per diem for trainees); and
- Other costs of the provider to meet performance standards laid out by a fishery management plan.

NMFS costs to administer industry-funded monitoring would be fully funded with Federal funds. More information on cost sharing, including external funding, can be found in Section 1.0. The industry would be responsible for its costs; unless it was determined that appropriately designated Federal funds were also available to offset industry cost responsibilities. If NMFS has funds to cover its administrative cost responsibilities with additional funds remaining, then NMFS may be able to help cover some of the industry's cost responsibilities through reimbursement. Omnibus Alternative 2 does not prevent NMFS from offsetting industry cost responsibilities through reimbursement if additional funds are available.

Cost for industry-funded monitoring programs is a very important consideration. The requirement to pay for an observer substantially increases operating costs for fishing vessels, which in turn reduces revenues. The best ways to limit the financial burden of an industry-funded monitoring program is to carefully design the program to minimize total program costs necessary to meet the FMP-specific goals for monitoring. This can be accomplished by selecting the appropriate type of coverage or setting coverage levels at the lowest level necessary to meet FMP goals.

Background information on factors that affect industry costs for monitoring can be found in Appendix 4.

Framework Adjustment Process

Omnibus Alternative 2 would include the ability for the Council to implement new industry-funded monitoring programs, including at-sea monitoring, dockside monitoring, or electronic monitoring, through amendments and revise programs through framework adjustments to the relevant FMP. If Omnibus Alternative 2 was not selected by the Council, the Council would not have the option to use a framework adjustment to revise FMP-specific industry-monitoring programs. Therefore, a full FMP amendment would be required to revise industry-funded monitoring programs for any New England fisheries, excluding existing industry funded monitoring programs in the Scallop and Multispecies FMP.

Under Omnibus Alternative 2, the details of any new industry-funded monitoring program, including at-sea, portside, or electronic monitoring, would be specified in an amendment and modified in a subsequent framework adjustment to the relevant FMP. These details may include, but are not limited to: (1) Level and type of coverage target; (2) rationale for level and type of coverage; (3) minimum level of coverage necessary to meet coverage goals; (4) consideration of coverage waivers if coverage target cannot be met; (5) process for vessel notification and selection; (6) fee collection and administration; (7) standards for monitoring service providers; and (8) any other measures necessary to implement the industry-funded monitoring program. Additional National Environmental Policy Act (NEPA) analysis would be required for any action implementing and/or modifying industry-funded monitoring programs regardless if an amendment or framework adjustment was used.

If an additional industry-funded monitoring program is established through an amendment, it would become subject to prioritization for funding under one of the alternatives for the prioritization process described in Sections 2.1.2.1 to 2.1.2.5 of this document.

Monitoring Service Providers

Omnibus Alternative 2 would include standard administrative requirements for industry-funded monitoring service providers, including at-sea monitoring, dockside monitoring and electronic monitoring. These service provider requirements would serve as the default service provider requirements for any future industry-funded monitoring programs developed through future amendments. If Omnibus Alternative 2 is not selected by the Council, service provider requirements for industry-funded monitoring programs would be developed and implemented in individual FMPs.

Monitoring service provider regulations for industry-funded at-sea and portside monitoring programs. The SBRM Omnibus Amendment modified the scallop industry-funded observer service provider requirements (at 50 CFR 648.11(h) and (i)) to apply to all New England FMPs. Specifically, the SBRM Amendment authorized observer service provider approval and certification for all applicable fisheries, should a Council develop and implement a requirement or option for an industry-funded observer program to support SBRM in other fisheries beside scallops. However, the SBRM Amendment did not address service provider requirements for other types of industry-funded monitoring programs.

Omnibus Alternative 2 would modify the SBRM observer service provider approval and certification process to be a monitoring service provider approval and certification process that would apply to observer and portside service providers for all New England FMPs. The selection of Omnibus Alternative 2 would not implement any new at-sea observer or portside monitoring programs, but would only implement a process and standards to approve and certify monitoring service providers. In the future, if the Council implements any industry-funded at-sea or portside monitoring programs through a future amendment, the service provider requirements for those monitoring programs would be standardized.

Omnibus Alternative 2 would include standard monitoring and service provider requirements based on current regulations. Appendix 2 contains existing service provider regulations for NEFOP-level observers, at-sea monitors, and portside samplers. If Omnibus Alternative 2 is not selected by the Council, server provider requirements for industry-funded monitoring program would be developed and implemented in individual FMPs.

A monitoring and service provider provision previously only considered under Herring Alternative 2 was recommend by the Council to be included in the standard monitoring and service provider requirements in Omnibus Alternative 2. That provision would allow NEFOP-level observers and at-sea monitors to be deployed on the same vessel for more than two consecutive multi-day trips or more than twice in a given month.

Monitoring service provider regulations for electronic monitoring programs. Electronic monitoring service provider regulations are currently in place for the NE multispecies fishery. At its April 2018 meeting, the Council recommended NMFS use an exempted fishing permit (EFP) to further evaluate how to best permanently administer an electronic monitoring program for the Atlantic herring fishery. Using the results of the EFP, the Council would consider establishing electronic monitoring service provider requirements into regulation via a future framework action.

Background information on monitoring service provider requirements can be found in Appendix 2.

Prioritization Process

Omnibus Alternative 2 includes a process to prioritize available Federal funding to cover NMFS cost responsibilities associated with new industry-funded monitoring programs across New England FMPs. This prioritization process would be used when Federal funding is not sufficient to support the Council's IFM coverage targets, above SBRM and independent from ESA and MMPA requirements, across FMPs with established IFM programs.

Available Federal funding refers to any funds in excess of those allocated to meet SBRM or other existing monitoring requirements that may be used to support industry-funded monitoring programs. The prioritization processes would determine how to allocate available Federal funding to cover NMFS cost responsibilities associated with new industry-funded monitoring programs across FMPs with the exception of the existing scallop and groundfish IFM programs. The prioritization process alternatives in the IFM Omnibus Amendment could apply to groundfish sectors and/or the scallop fishery if, in a future action, if the Council takes action to include these programs in the prioritization process, or develops new IFM programs within those FMPs.

When there is no Federal funding available to cover NMFS cost responsibilities above SBRM coverage in a given year, then no industry-funded monitoring program would operate during that year. In the event that some Federal funding is available in a given year, and the IFM program does not allow for vessels to be issued waivers to exempt them from industry-funded monitoring requirements, then fishing effort would be reduced to match available monitoring during that year. In the event that some Federal funding is available in a given year, and the IFM program does allow for vessels to be issued waivers to exempt them from industry-funded monitoring requirements, then there would be some additional monitoring during that year.

Due to legal and budgetary constraints described in Section 1.0, NMFS cannot approve and implement monitoring requirements for which it does not have available Federal funding to cover NMFS cost responsibilities. NMFS may, however, approve coverage targets associated with industry-funded monitoring programs for FMPs with the understanding that annual funding available to cover NMFS cost responsibilities may vary and could dictate realized coverage levels.

Omnibus Alternatives 2.1-2.5 specify different processes to prioritize available Federal funding to new IFM programs across New England FMPs. The Council would select only one prioritization process. Alternatives 2.1 and 2.2 provide the Council and NMFS with more discretion to make trade-offs between FMPs, but also require more recurring analysis and resources. The primary difference between these two alternatives is who (NMFS or the Council) would lead the prioritization process and analysis. Alternatives 2.3, 2.4, and 2.5 use formulaic approaches, eliminating much of the discretion and analytical burden of Alternatives 2.1 and 2.2. However, the formulaic approaches in Alternatives 2.3, 2.4, and 2.5 may reduce the effectiveness of the resulting outcome relative to Council priorities. Under all of the alternatives described below, the industry would be responsible for covering its cost responsibilities, unless it was determined that Federal funds were otherwise available to be used to offset industry cost responsibilities through reimbursement. If Omnibus Alternative 2 was not selected by the Councils, available Federal funding would be allocated to industry-funded monitoring on an FMP-by-FMP basis.

Revising the prioritization process (e.g., change from Council-led to NMFS-led) could be done in a future framework action. The following table summarizes the discretionary and formulaic prioritization alternatives to facilitate comparisons.

Additional information on the prioritization processes can be found in Appendix 6.

TABLE 4. SUMMARY OF PRIORITIZATION ALTERNATIVES

	Alternative	Summary
Discretio	2.1 NMFS-led	NMFS staff would use a weighting approach, in consultation with the Councils, to allocate Federal funding to applicable IFM programs.
	2.2 Council-led	The Council would use a weighting approach to allocate Federal funding to applicable IFM programs.
Formulaic	2.3 Proportional	Federal funding for each applicable IFM program would be reduced proportional to the total funding shortfall. For example, if NMFS funding is short by 20%, each applicable IFM program would receive 80% of its Federal funding.
	2.4 Lowest Coverage Ratio-based	Federal funding would be prioritized to applicable IFM programs with fisheries that have the lowest coverage needs relative to fleet activity. This alternative would favor coverage for the FMPs that do not need much additional monitoring to meet coverage targets and have the most active fleets.
	2.5 Highest Coverage Ratio-based	Federal funding would be prioritized to applicable IFM programs with fisheries that have the highest coverage needs relative to fleet activity. This alternative would favor coverage for the FMPs that need much more additional monitoring to meet coverage targets and have the least active fleets.

2.1.2.1 Omnibus Alternative 2.1: NMFS-led Prioritization Process for Industry-Funded Monitoring Programs

Under Omnibus Alternative 2.1, the Regional Administrator and Science and Research Director would use a criteria-based weighting approach to determine, in consultation with the Councils, how to prioritize available Federal funding to cover NMFS cost responsibilities associated with IFM coverage targets across New England FMPs.

If available funding in a given year was sufficient, this distribution would be based on the allocation necessary to fully implement the industry-funded monitoring coverage targets specified in each FMP. If available funding was not sufficient, NMFS would apply a weighting approach to determine how to prioritize available funding to support IFM coverage targets across FMPs.

Once NMFS costs associated with IFM coverage targets are funded, NMFS would also determine, in consultation with the Council, the allocation of any remaining available funding to offset industry costs. NMFS and industry costs would be defined as described in Omnibus Alternative 2 (Section 2.1.2). Funding for SBRM, ESA, and MMPA observer coverage would not be changed by this alternative. Any funding for industry-funded monitoring programs would be prioritized separately from any funding for SBRM or other statutory requirements and any industry-funded coverage would be in addition to coverage for SBRM or other statutory requirements.

The prioritization process would have the following steps:

1. NMFS would apply a criteria-based weighting approach to develop proposed priorities for industry-funded monitoring coverage in order to allocate Federal resources across FMPs with industry-funded monitoring programs. If available funding in a given year is sufficient, this distribution would be based on the allocation necessary to fully implement the industry-funded monitoring coverage targets specified in each FMP. If available funding is not sufficient to fully fund all industry-funded monitoring programs, then NMFS would recommend a prioritization of industry-funded monitoring coverage in order to allocate resources across FMPs that would include:
    - The total amount of funding and sea days necessary to meet the coverage targets specified by each FMP if each FMP were fully funded, including each FMP's share of the total;
    - The coverage level for each FMP if each FMP maintains its percentage share of the total funding (e.g., a fishery with a bigger proportion of the total funding would absorb a bigger proportion of the shortfall);
    - The coverage levels that incorporate the weighting approach; and
    - The rationale for the recommended prioritization.

2. At a Council meeting, the Council would review NMFS's proposed prioritization of industry-funded monitoring coverage and allocation of funding, and recommend any modifications to the prioritization.

3. NMFS would provide the Council, at the earliest practicable opportunity: (1) The estimated industry-funded monitoring coverage levels that incorporate the recommended prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including the reason for any deviation from the Council's recommendations. The Council may recommend revisions and additional considerations to be made by the Regional Administrator and Science and Research Director.

Step 3 allows the Council and NMFS to discuss any final revisions to the distribution, which might be necessary if the final budget is not known at the time of initial prioritization and is less than expected.

Weighting Approach

If the Council selects Alternative 2.1 (NMFS-led Prioritization), NMFS would use a criteria-based weighting approach to prioritize industry-funded programs in order to allocate available NMFS funding. This proposed weighting approach would compare industry-funded monitoring criteria (e.g., stock status, risk to management, ecosystem importance) to each other to determine the relative weight of each criteria. Then each industry-funded monitoring program would be evaluated to see how it meets each criteria.

The weighting approach could give NMFS a transparent, deliberative process for prioritizing industry funded monitoring coverage in order to allocate NMFS's available resources for funding of NMFS cost responsibilities required to achieve coverage targets for industry-funded monitoring.

Background information on details of this proposed weighting approach can be found in Appendix 6.

Rationale: Omnibus Alterative 2.1 would allow NMFS to determine IFM funding priorities among New England FMPs with IFM programs. Because Omnibus Alternative 2.1 is a discretionary alternative, the prioritization process is more complex, takes longer, and involves more staff resources than formulaic alternatives. However, the criteria-based weighting approach associated with Omnibus Alternative 2.1 increases the likelihood that available funding is prioritized to IFM programs that address current monitoring needs.

2.1.2.2 Omnibus Alternative 2.2 (Preferred Alternative): Council-led Prioritization Process for Industry-funded Monitoring Programs

Under Omnibus Alternative 2.2, the Regional Administrator and Science and Research Director would inform the Council of NMFS's available funding to cover NMFS cost responsibilities associated with IFM coverage targets across New England FMPs.

The Council selected Omnibus Alternative 2.2 as a preferred alternative.

If available funding in a given year was sufficient, this distribution would be based on the allocation necessary to fully implement the industry-funded monitoring coverage targets specified in each FMP. If available funding was not sufficient, the Council would apply a weighting approach to determine how to prioritize available funding to support IFM coverage targets across FMPs.

Once NMFS costs associated with IFM coverage targets are funded, NMFS would also determine, in consultation with the Council, the allocation of any remaining available funding to offset industry costs. NMFS and industry costs would be defined as described in Omnibus Alternative 2 (Section 2.1.2). Funding for SBRM, ESA, and MMPA observer coverage would not be changed by this alternative. Any funding for industry-funded monitoring programs would be prioritized separately from any funding for SBRM or other statutory requirements and any industry-funded coverage would be in addition to coverage for SBRM or other statutory requirements.

The prioritization process would have the following steps:

1. If available funding is not sufficient to fully fund all industry-funded monitoring programs, the Council would use a weighing approach to evaluate and prioritize industry-funded monitoring programs to allocate NMFS resources across FMPs with industry-funded monitoring programs that would include:
    - The total amount of funding and seadays necessary to meet the coverage targets specified by each FMP if each FMP were fully funded, including each FMP's share of the total;
    - The coverage level for each FMP if each FMP maintains its percentage share of the total funding (e.g., a fishery with a bigger proportion of the total funding would absorb a bigger proportion of the shortfall);
    - The coverage levels that incorporate the weighting approach; and
    - The rationale for the recommended prioritization.

2. The Council would propose priorities in order to allocate funding for NMFS infrastructure costs and offsets for industry costs. The Council would also coordinate any modifications to the prioritization process and recommend a prioritization to NMFS.

3. NMFS would provide the Council, at the earliest practicable opportunity: (1) The estimated industry-funded monitoring coverage levels that incorporate the recommended prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including the reason for any deviation from the Council's recommendations. The Council may recommend revisions and additional considerations to be made by the Regional Administrator and Science and Research Director.

Weighting Approach

Since the Council selected Omnibus Alternative 2.2 as its preferred alternative, the Council would also identify a weighting approach to operationalize prioritizing funding across industry-funded monitoring programs. The Council may use a criteria-based weighting approach or develop its own weighting approach for prioritization, provided that criteria used to evaluate industry-funded monitoring programs, as well as the rationale for the recommended prioritization approach, are made available to the public in advance.

The Council selected an equal weighting approach as a preferred alternative.

This amendment would establish an equal weighting approach to prioritize funding across industry-funded monitoring programs, acknowledging that a more complex weighting approach could be developed in the future. An example of an equal weighting approach would be funding all industry-funded monitoring programs at 70%, if only 70% of the Federal funding needed to administer all the programs was available.

The Council could change the weighting approach for the Council-led prioritization process by considering a new weighting approach at a public meeting, where public comment is taken, and asking NMFS to publish a notice or rulemaking modifying the weighting approach.

Rationale: Omnibus Alterative 2.2 would allow the Council to determine IFM funding priorities among Council FMPs. Because Omnibus Alternative 2.2 is a discretionary alternative, the prioritization process is more complex, takes longer, and involves more staff resources than formulaic alternatives. However, the equal weighting approach selected by the Council would be less complicated to implement than Omnibus Alternative 2.1. Establishing an equal weighting approach in this amendment would ensure equity across industry-funded monitoring programs and allow time for more complex weighting systems to be developed without delaying implementation of this amendment.

Timing for discretionary alternatives (Alternatives 2.1 and 2.2)

The discretionary prioritization alternatives (Alternatives 2.1 and 2.2) require a more time-intensive evaluation and ranking of industry funded monitoring programs, and would require rulemaking to solicit public comment on NMFS or the Council's recommended allocation of available funding. The status quo timing outlined under the status quo alternative would still apply, and this new process would apply alongside the existing timeline (Table 5).

There are two options for this process so that it could be matched with annual funding levels and the SBRM cycle:

1. Preferred Alternative - The Council would adjust the weighting approach on an as-needed basis (i.e., whenever new IFM programs are approved, or whenever existing IFM programs are adjusted or terminated), with the adjusted prioritization

implemented in time for the next SBRM cycle. This means that once the prioritization was developed, it could be in place indefinitely until the next industry-funded monitoring program was finalized. Readjusting the weighting approach on an as-needed basis would mean that, after going through the entire timeline, the process outlined in Year 2 below would repeat each year until new programs were added/old programs were adjusted or terminated, at which point the timeline would start over as outlined for Year 1.

2. Alternatively, the Council could elect to adjust the weighting approach every 3 years unless new IFM programs are approved, or whenever existing IFM programs are adjusted or terminated.

TABLE 5. TIMING FOR DISCRETIONARY ALTERNATIVES (ALTERNATIVES 2.1 AND 2.2)

Year	Month	SBRM/ASM/Scallop Schedule (status quo)	Alternatives 2.1 and 2.2
Year 1	January to April	SBRM analyses are completed late January/early February	• NMFS (2.1) prepares and analyze weighting approach for Year 2 **–OR** • Joint Committee or Council meeting to conduct weighting approach (2.2)
	April to May		Council and NFMS meet to review/finalize ranking of existing IFM programs (2.1 and 2.2)
	May to October		NMFS conducts proposed and final rulemaking to finalize rankings for IFM programs for Years 2-4 (or for indefinite period).
	October to December	• Observer data July Year 0 – June Year 1 available • Begin analysis for SBRM • Work on discard estimation analysis for SBRM from November through early February • Work on analysis for sector ASM using most recent complete fishing year (May Year 0 – April Year 1)	Begin analysis to determine necessary IFM seadays
Year 2	January to February	• Receive Year 2 budget • Sector ASM coverage rates published in proposed rule/collect public comment • Determine scallop compensation rate	
	March	• If funding shortfall, run SBRM prioritization process • Start of scallop Year 2	If funding shortfall, issue funding based on finalized weighting approach
	April	• Begin Year 2 seaday schedule • Sector ASM coverage rates published in final rule	Implement Year 2 IFM coverage levels
	May	Begin Sector ASM Year 2	
	June		NMFS briefs Council on final year 2 IFM seaday allocation

2.1.2.3 Omnibus Alternative 2.3: Proportional Prioritization Process for Industry-Funded Monitoring Programs

Under Omnibus Alternative 2.3, the amount of Federal funding available to support industry-funded monitoring in each FMP would be reduced by the same percentage as the funding shortfall. If the available Federal funding falls short, the amount of the shortfall would be deducted from the total amount of funding to be allocated to each FMP, proportional to that FMP's share of the total funding need. For example, an FMP that represents 20% of the total funding need would absorb 20% of the total funding shortfall.

There could be a scenario where the available Federal funding for a given FMP would produce a coverage level below the coverage target specified by the FMP as providing sufficient information to meet an FMP's objectives for monitoring. For example, an additional 10 observed trips may provide additional data, but not sufficient data to provide a robust estimate of bycatch of the species of interest. In this case, that FMP would not receive additional coverage and the funding for that FMP would be re-allocated proportionally to other FMPs.

NMFS would determine and provide the Council with: (1) The estimated industry-funded monitoring coverage levels that incorporates the proportional adjustments, based on available funding; and (2) the rationale for the recommended prioritization, including how it deviates from the fully funded coverage levels across all FMPs. This could be done on an annual basis or the allocation of resources could remain as specified unless revised.

Example FMP 1 needs $3 million, FMP 2 needs $5 million, and FMP 3 needs $2 million to fully implement their coverage targets. The total funding need is $10 million. If there is only $8 million in Federal funds for the coming year, then there is a $2 million shortfall, or a 20% shortfall. Using the proportional prioritization process, NMFS would allocate the $8 million such that each FMP has a 20% shortfall, i.e., they would all be funded at 80%. FMP 1 would get 80% of $3 million, or $2.4 million, FMP 2 would get 80% of $5 million, or $4 million, and FMP 3 would get 80% of $2 million, or $1.6 million. These would be the total funds available to the FMPs to fund NMFS's costs for coverage days above SBRM.

Rationale: Omnibus Alterative 2.3 is a formulaic alternative that would reduce Federal funding for each IFM program proportional to the total funding shortfall. It has the advantage of taking less time and staff resources to implement, but does not allow the discretion to fund one IFM monitoring programs other another and may result in funding priorities that do not match current Council monitoring interests.

2.1.2.4 Omnibus Alternative 2.4: Lowest Coverage Ratio-based Prioritization Process for Industry-Funded Monitoring Programs

Under Omnibus Alternative 2.4, the amount of funding would be allocated to each FMP by prioritizing coverage in fisheries that have the lowest coverage needs (based on projections

for the coming year) relative to effort (based on vessel trip reports from the previous year). In practice, this would mean that fisheries with the highest ratio of coverage to effort would be sequentially eliminated until the available Federal funding is sufficient to meet the coverage targets of the remaining FMPs. This alternative would favor fleets with low additional needed coverage days and/or high overall activity.

NMFS would determine and provide the Council with: (1) the estimated industry-funded monitoring coverage levels that incorporate the prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including how it deviates from the fully funded coverage levels across all FMPs. This could be done on an annual basis or the allocation of resources could remain as specified unless revised.

Example FMP 1 needs $3 million, FMP 2 needs $5 million, and FMP 3 needs $2 million to fully implement their coverage targets. The total funding needed is $10 million, but there is only $8 million in Federal funds for the coming year, so there is a $2 million shortfall. Under the coverage ratio-based prioritization approach, NMFS would calculate the following ratio for each FMP:

$$\text{Coverage Ratio} = \frac{\text{Projected coverage days needed in the coming year}}{\text{Level of effort in the previous year}}$$

If FMP 1 had a ratio of 0.1, FMP 2 a ratio of 0.08, and FMP 3 a ratio of 0.2, FMP 3 would be eliminated from coverage first. Because the total funding need of the remaining programs, $8 million, can be met by the available Federal funding, $8 million, coverage for FMP 1 and FMP 2 would be fully funded. FMP 3 would receive no additional coverage in the coming year. The key here is that fewer needed coverage days and/or higher levels of effort in the previous year will both lead to a higher prioritization, and it is the interplay of these two factors that would determine the prioritization.

This alternative is based on an approach selected by the Council in the SBRM amendment. SBRM sets "minimum pilot coverage" levels for each fishing mode to ensure that a fleet is not allocated too few observer sea days to generate meaningful discard estimations. If the total of agency funded sea days is greater than the total minimum pilot coverage, then the Penultimate Cell approach would be applied. If the funded days exactly equals the total minimum pilot coverage sea days then the sea days would be assigned to fishing modes according to the minimum pilot coverage. However, it is theoretically possible that the available funding for SBRM observers in a given year could be so restricted that the minimum pilot coverage for each fleet could not be achieved. In such a case, it would be necessary to determine which fleets would get enough observer coverage to reach the minimum pilot coverage and which would not. The Council's preferred alternative for adjusting coverage levels below minimum pilot coverage would eliminate the funding shortfall by sequentially removing coverage in fleets that had the highest ratio of minimum pilot coverage to days absent from port based on VTR reports in the previous year. Because the number of days absent from port is typically much larger than the minimum

pilot coverage for a fishing mode, this alternative would maintain at-sea observer coverage on the most active fishing modes.

Rationale: Omnibus Alterative 2.4 is a formulaic alternative that would prioritize Federal funding to IFM programs with fisheries that have the lowest coverage needs relative to fleet activity. It has the advantage of taking less time and staff resources to implement, but does not allow the discretion to fund one IFM monitoring programs other another and may result in funding priorities that do not match current Council monitoring interests. This alternative would favor funding for FMPs that do not need much additional monitoring to meet coverage targets and have the most active fleets.

2.1.2.5 Omnibus Alternative 2.5: Highest Coverage Ratio-based Prioritization Process for Industry-Funded Monitoring Programs

Under Omnibus Alternative 2.5, the amount of funding would be allocated to each FMP by prioritizing coverage in fisheries that have the highest coverage needs (based on projections for the coming year) relative to effort (based on vessel trip reports from the previous year). In practice, this would mean that fisheries with the lowest ratio of coverage to effort would be sequentially eliminated until the available Federal funding is sufficient to meet the coverage targets of the remaining FMPs. This alternative would favor fleets with high additional needed coverage days and/or low overall activity.

NMFS would determine and provide the Council with: (1) the estimated industry-funded monitoring coverage levels that incorporate the prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including how it deviates from the fully funded coverage levels across all FMPs. This could be done on an annual basis or the allocation of resources could remain as specified unless revised.

Example

FMP 1 needs $3 million, FMP 2 needs $5 million, and FMP 3 needs $2 million to fully implement their coverage targets. The total funding needed is $10 million, but there is only $8 million in Federal funds for the coming year, so there is a $2 million shortfall. Under the coverage ratio-based prioritization approach, NMFS would calculate the following ratio for each FMP:

$$\text{Coverage Ratio} = \frac{\text{Projected coverage days needed in the coming year}}{\text{Level of effort in the previous year}}$$

If FMP 1 had a ratio of 0.1, FMP 2 a ratio of 0.08, and FMP 3 a ratio of 0.2, FMP 2 would be eliminated from coverage first. Because the total funding need of the remaining programs, $5 million, can be met by the available Federal funding, $8 million, coverage for FMPs 1 and 3. FMP 2 would receive no additional coverage in the coming year. The key here is that greater needed coverage days and/or lower levels of effort in the previous year will both lead to a higher prioritization, and

it is the interplay of these two factors that would determine the prioritization.

Rationale: Omnibus Alterative 2.5 is a formulaic alternative that would prioritize Federal funding to IFM programs with fisheries that have the highest coverage needs relative to fleet activity. It has the advantage of taking less time and staff resources to implement, but does not allow the discretion to fund one IFM monitoring programs other another and may result in funding priorities that do not match current Council monitoring interests. This alternative would favor funding for FMPs that need much more additional monitoring to meet coverage targets and have the least active fleets.

Timing for formulaic alternatives (Alternatives 2.3, 2.4 and 2.5)

The formulaic alternatives (Alternatives 2.3, 2.4, and 2.5) could be implemented annually in concert with the existing SBRM cycle. Rulemaking would not be required, and the process outlined in Year 2 below would occur on an annual basis for all subsequent years (Table 6).

TABLE 6. TIMING FOR FORMULAIC ALTERNATIVES (ALTERNATIVES 2.3, 2.4, AND 2.5)

Year	Month	SBRM/ASM/Scallop Schedule (status quo)	Alternatives 2.3, 2.4, and 2.5
Year 1	January to September	SBRM analyses are completed late January/early February	
	October	• Observer data July Year 0 – June Year 1 available • Begin analysis for SBRM • Work on discard estimation analysis for SBRM from November through early February • Work on analysis for sector ASM using most recent complete fishing year (May Year 0 – April Year 1)	Begin analysis for required IFM coverage rates
	November		
	December		
Year 2	January	• Receive Year 2 budget • Sector ASM coverage rates published in proposed rule/collect public comment • Determine compensation rate	
	February		
	March	• If funding shortfall, run SBRM prioritization process • Start of scallop Year 2	If funding shortfall exists, run IFM prioritization
	April	• Begin Year 2 sea day schedule • Sector ASM coverage rates published in final rule	Implement Year 2 IFM coverage levels
	May	Begin Sector ASM Year 2	
	June		NMFS briefs Council on final year 2 IFM sea day allocation

2.1.2.6 Omnibus Alternative 2.6 (Preferred Alternative): Monitoring Set-Aside

Omnibus Alternative 2.6 would include general language in the regulations of each FMP that would allow monitoring set-aside provisions to be implemented via a framework adjustment. A monitoring set-aside program would devote a portion of the annual catch limit (ACL) from a fishery to offset the industry cost responsibilities for at-sea, electronic, or dockside monitoring. However, there are many possible ways to structure a monitoring set-aside program, and the details of each program would need to be developed on an FMP-by-FMP basis. All potential monitoring set-aside programs should be considered as an alternative to off-set monitoring cost, and should not be expected to fully cover monitoring costs. Most fisheries will not have enough value, capacity, or abundance/availability (i.e., stock size, distribution, etc.) to fully cover the costs of intense monitoring goals.

The Council selected Omnibus Alternative 2.6 as a preferred alternative.

One monitoring set-aside model for a fishery that uses possession limits could consist of reserving some percentage of the ACL (e.g., up to 3 percent) to be allocated to certain vessels to help off-set the additional monitoring costs. In this example, if a vessel in that fishery is selected to carry an at-sea observer, that vessel would be granted a certain amount of pounds from the monitoring set-aside allocation to land above the possession limit. The revenue obtained from the sale of the additional landings would help offset the vessel's costs of carrying an at-sea observer. This example is very similar to the monitoring set-aside program that currently operates in the scallop fishery. Preliminary analysis suggests that set-asides for monitoring will work best in profitable fisheries and when only a modest increase in monitoring is desired (like scallops).

Absent this measure, a full FMP amendment would be required for all fisheries to implement a monitoring set-aside to defray industry costs for monitoring programs. Adopting this measure would not implement a monitoring set-aside for any individual FMP. Rather, it would expedite the development of monitoring set-aside provisions for FMPs in future framework adjustments.

Under Omnibus Alternative 2.6, the details and impacts analysis of any monitoring set-aside program would be specified and/or modified in a subsequent framework adjustment to the relevant FMP. These details may include, but are not limited to: (1) the basis for the monitoring set-aside; (2) the amount of the set-aside (e.g., quota, DAS, etc.); (3) how the set-aside is allocated to vessels required to pay for monitoring (e.g., an increased trip limit, differential DAS counting, additional trips, an allocation of the quota, etc.); (4) the process for vessel notification; (5) how funds are collected and administered from the industry to cover the costs of monitoring coverage; and (6) any other measures necessary to develop and implement a monitoring set-aside. Additional NEPA analysis would be required for any action implementing and/or modifying monitoring set-aside provisions, regardless if it required a framework adjustment or full amendment.

Additional information on considerations for monitoring set-asides can be found in Appendix 6.

Rationale: Omnibus Alterative 2.6 would provide a structure to develop future monitoring set-aside programs to help offset vessel/non-governmental cost responsibilities associated with IFM coverage targets. Standardizing monitoring set-aside programs and allowing them to be implemented via a framework may help reduce the administrative burden associated with implementing new monitoring set-aside programs and the economic burden associated with IFM coverage targets.

2.1.3 CONSIDERED BUT REJECTED OMNIBUS ALTERNATIVES

2.1.3.1 Vessel Cancellation Charge

This alternative included discussion of a fee to be paid by the vessel to the at-sea observer service provider when vessels are a "no show" or when they cancel trips less than 12 hours before the scheduled departure time. That option also discussed that payment of fees would be a vessel permit requirement and that outstanding fees would result in non-renewal of vessel permits.

As the PDT/FMAT further developed this option, the Department of Commerce Office of General Counsel advised that the government may not dictate the terms of a private transaction such as this fee. As a result, the Vessel Cancellation Charge Option is likely not legal because it involves the terms of a private business contract between a vessel and an observer service provider. While an observer service provider or a vessel could specify a cancellation fee as part of a contract, thereby eliminating the necessity of increasing the base rate that all vessels pay, it is unlikely that NMFS could legally require or specify the amount of such a fee.

The August 2014 version of the Discussion Document contained a Cost-based Prioritization Process for Industry-Funded Monitoring Programs Option. Under that option, the Federal funding would be assigned to each FMP by sequentially eliminating coverage in FMPs that have the highest funding need until the available funding is sufficient to meet the funding needs of the FMPs remaining. That process would have prioritized fisheries with the least expensive programs first. NMFS would have determined and provided the Councils with: (1) The estimated industry-funded monitoring coverage levels that incorporates the prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including how it deviates from the fully-funded coverage target across all FMPs. This option could be done on an annual basis or the allocation of resources could remain as specified unless revised.

At its August 19, 2014, meeting the Council's Observer Policy Committee recommended that this option be considered but rejected because cost-based prioritization option lacked rationale and eliminating FMPs with the highest funding needs would not likely meet the goals/objectives of the industry-funded monitoring programs established by the Council.

2.2 ATLANTIC HERRING MONITORING ALTERNATIVES

As described in the Introduction, the Council is interested in increasing catch monitoring in the Atlantic Herring FMP. This increased monitoring is in addition to coverage required through the SBRM, the ESA, or MMPA. Limited Federal funding and legal constraints on the sharing of costs between NMFS and the fishing industry have recently prevented NMFS from approving new industry-funded monitoring programs. Examples of new industry-funded monitoring programs that were not approved include Amendment 5 to the Atlantic Herring FMP and Framework Adjustment 48 to the Northeast Multispecies FMP. This amendment is intended to remedy the industry-funded monitoring program disapproval in Herring Amendment 5 by establishing (1) a process by which available Federal funding could be allocated to the Herring FMP to support industry-funded monitoring; and (2) an industry-funded monitoring coverage target to meet Herring FMP objectives.

Establishing monitoring coverage targets would allow NMFS to approve and implement new industry-funded monitoring programs, without committing to support industry-funded monitoring coverage targets above appropriated funding or before funding is determined to be available.

Although this action may select desired coverage targets beyond SBRM requirements, the availability of Federal funds to support industry-funded monitoring may impact the realized coverage level in any given year. The realized coverage level for the Herring FMP in a given year may be constrained if available Federal funding fall short of NMFS cost responsibilities for administering new industry-funded monitoring programs. During years when there is no additional funding to cover NMFS cost responsibilities above SBRM requirements, there would be no additional monitoring coverage in the herring fishery, even if industry is able to fully fund their cost responsibilities. However, if Federal funding is available to allow NMFS to meet its administrative responsibilities for new industry-funded monitoring programs, the specified coverage target levels would likely be met. Therefore, over time, the realized coverage level for the Herring FMP would fall between SBRM requirements and the industry-funded monitoring coverage target.

Amendment 5 to the Atlantic Herring FMP

The Council is interested in improving catch and bycatch monitoring in the herring fishery consistent with recommendations in Amendment 5 to the Herring FMP. Amendment 5 to the Herring FMP recommended 100% observer coverage on vessels with the All Areas Limited Access Herring Permit (Category A) and the Areas 2/3 Limited Access Herring Permit (Category B). The provisions for observer coverage recommended in Amendment 5 were intended to enhance catch monitoring and achieve many of the goals and objectives of that amendment. Support for 100% observer coverage on Category A and B herring vessels was driven by stakeholders, as well as some members of the herring industry, who believed that 100% observer coverage was necessary for the most active vessels to either confirm or disprove the claims regarding catch and bycatch in the herring fishery.

Amendment 5 also recommended that the requirement for 100% observer coverage should apply to the most active vessels in the herring fishery. Based on analyses in Amendment 5, vessels with Category A and B permits harvest greater than 98% of the herring catch. Recognizing that NMFS would not have sufficient funding to cover the costs of additional observer coverage, Amendment 5 recommended that the industry contribute $325 per sea day to help pay the costs of expanding the herring monitoring program. The recommendation for 100% observer coverage on Category A and B vessels in Amendment 5 was ultimately disapproved. The rationale for the disapproval was described previously in the Introduction.

Amendment 5 to the Herring FMP required 100% observer coverage on midwater trawl vessels fishing in the Groundfish Closed Areas. If the Groundfish Closed Areas are modified or eliminated in the future, coverage requirements for midwater trawl vessels will be reconsidered at that time. Analyses in Amendment 5 suggest that midwater trawl vessels are not catching significant amounts of groundfish either inside or outside the Closed Areas. Additionally, the majority of groundfish catch by midwater trawl vessels is haddock, and the catch of haddock by midwater trawl vessels is already managed through a haddock catch cap for the herring fishery. However, the rationale in Amendment 5 described is important to determine the extent and nature of bycatch in the herring fishery. This measure still allowed the herring midwater trawl fishery to operate in the Groundfish Closed Areas, but it ensured that opportunities for sampling were maximized.

TABLE 7. PURPOSE AND NEED OF AMENDMENT 5 TO HERRING FMP

Purpose	Need
Address long term health of the herring resource, including how herring is harvested in order to sustain the important biological role of herring as a forage fish in the Northeast Atlantic	To improve long term catch monitoring and to ensure better compliance with the provisions of the MSA
Improve how catch and bycatch from the herring fishery are accounted for	Better monitor bycatch* in the herring fishery, including specifically monitoring river herring bycatch, and to ensure that the FMP is consistent with the bycatch provisions of the MSA
** In Amendment 5, "bycatch" means fish that are discarded or fish that are retained and/or sold when harvested in the herring fishery.*	

Monitoring of the Herring Fishery

Harvest in the herring fishery is managed by annual catch limits (ACLs) and catch caps. Catch (retained and discarded) of herring and other species is tracked against catch limits

using data reported by the herring industry (vessels and dealers) and data collected by at-sea observers.

The Council and stakeholders in the herring fishery have expressed interest in increased monitoring in the herring fishery to better estimate catch in the fishery (both of herring and other species that are incidentally caught with herring) and minimize reliance on industry-reported data. Various types of monitoring are being considered in the herring fishery to increase the use of independently collected catch data to verify industry-reported data and track catch against harvest limits.

TABLE 8. MONITORING NEEDS OF HERRING FISHERY

Monitoring Needs	Vessels to be Monitored
Sub-ACLs for Herring Management Areas	All permits, gears, and areas
Haddock catch caps	Midwater trawl vessels fishing in Georges Bank and Gulf of Maine haddock stock areas
Groundfish Closed Areas	Midwater trawl vessels fishing in Groundfish Closed Areas
River Herring and Shad Catch Caps	Midwater trawl and small mesh bottom trawl vessels harvesting more than 6,600 lb of herring from Gulf of Maine, Cape Cod, and Southern New England river herring and shad catch cap areas

Sub-ACLs for Herring Management Areas

The herring stock complex is assessed as a unit stock, but is comprised of inshore (Gulf of Maine) and offshore (Georges Bank) stock components. These stock components segregate during spawning and mix during feeding and migration. Herring management areas were developed in recognition of these different stock components and provide a method to manage the fishing mortality of each stock component somewhat independently. The management areas are located in the Gulf of Maine (Areas 1A and 1B), along the New England coast (Area 2), and Georges Bank (Area 3). The inshore herring stock component is found in 3 of the 4 management areas (i.e., Area 1A, 1B, and 2). These same management areas are of particular economic importance to the industry because of herring availability and proximity of the fishing grounds to shore.

The stock-wide herring ACL is divided by the herring management areas to create management area sub-ACLs. If herring catch reaches 92% of the management area sub-ACL before the end of the fishing year, vessels will be prohibited from possessing more than 2,000 lb of herring per trip or calendar day from that management area until the end of the fishing year. Additionally, if herring catch reaches 95% of the stock-wide ACL before the end of the fishing year, vessels will be prohibited from possessing more than 2,000 lb of herring per trip in or from any management area until the end of the fishing year.

If total herring catch exceeds the stock wide-ACL or any management area sub-ACL during a fishing year, then the amount of the overage will be deducted from that ACL or sub-ACL in a subsequent year. Overages are calculated during the year following the fishing year and deducted the next year. For example, any overages in 2015 are calculated during 2016 and deducted during 2017.

If total herring catch does not exceed the stock wide-ACL and if a management area's sub-ACL has not been fully harvested during a fishing year, then the amount of the underage, up to 10% of the sub-ACL, will be carried over and added to the sub-ACL for that management area in a subsequent year, similar to overage deductions. However, the additional herring harvest added to each sub-ACL is not also added to the stock-wide herring ACL, so the stock-wide ACL remains unchanged. Adding additional harvest to a management area sub-ACL, but not the stock-wide ACL, allows for additional harvest opportunities in particular management areas, while still limiting total catch to the stock-wide ACL.

Haddock Catch Caps

Haddock catch caps for the herring fishery are equivalent to a percentage of the haddock acceptable biological catch for each stock of haddock for each multispecies fishing year (May 1 – April 30). That percentage equals 1% for the Gulf of Maine haddock stock and 1.5% for the Georges Bank haddock stock.

When the haddock incidental catch cap for a particular haddock stock (Gulf of Maine or Georges Bank) has been caught, all herring vessels fishing with midwater trawl gear will be prohibited from fishing for, possessing, or landing, more than 2,000 lb of herring in that particular haddock accountability measure area (Gulf of Maine or Georges Bank) for the remainder of the multispecies fishing year. In addition, the haddock possession limit will be reduced to 0 lb, in the applicable haddock accountability measure area.

Midwater Trawl Vessels Fishing in Groundfish Closed Areas

In 2014, Amendment 5 expanded the existing requirements for midwater trawl vessels fishing in Groundfish Closed Area I to all herring vessels fishing with midwater trawl gear in all the Groundfish Closed Areas. These Closed Areas include: Closed Area I, Closed Area II, Nantucket Lightship Closed Area, Cashes Ledge Closure Area, and Western Gulf of Maine Closure Area.

Amendment 5 required vessels with a herring permit fishing with midwater trawl gear in the Groundfish Closed Areas to carry a NMFS-level observer and bring all catch aboard the vessel and make it available for sampling by an observer. Herring vessels not carrying a NMFS-approved observer may not fish for, possess, or land fish in or from the Closed Areas. Vessels may make test tows without pumping catch on board, provided that all catch from test tows is available to the observer when the next tow is brought aboard.

Amendment 5 allowed catch to be released before it was pumped aboard the vessel if: (1) Pumping the catch aboard could compromise the safety of the vessel, (2) mechanical failure

prevents the catch from being pumped aboard, or (3) spiny dogfish have clogged the pump and prevent the catch from being pumped aboard. But if catch is released for any of the reasons stated above, the vessel operator would be required to immediately exit the Groundfish Closed Area. The vessel may continue to fish, but it may not fish in any Groundfish Closed Area for the remainder of that trip. Additionally, vessels that release catch before it has been sampled by an observer must complete a midwater trawl released catch affidavit within 48 hr of the end of the fishing trip. The released catch affidavit details: (1) Why catch was released; (2) an estimate of the weight of fish caught and released; and (3) the time and location of the released catch.

In past years, observer coverage for midwater trawl vessels fishing in the Groundfish Closed Areas was allocated by NEFOP independent of the SBRM. However, the revised SBRM prohibited observer coverage from being allocated to midwater trawl vessels fishing in the Groundfish Closed Areas independent of the SBRM. In order to increase monitoring on midwater trawl vessels fishing in the Groundfish Closed Areas, coverage would need to be incorporated in an industry-funded monitoring program.

River Herring and Shad Catch Caps

Once abundant along the East Coast, populations of river herring (alewife and blueback herring) and shad (American and hickory) have declined compared to historical levels due to various factors. Governmental agencies, non-profit organizations, tribal groups, academia, industry, and others are currently engaged in numerous efforts to further river herring and shad conservation.

Vessels fishing for herring can encounter river herring and shad. The Council recommended river herring and shad caps for the herring fishery beginning in 2014. Managers don't currently have enough data to determine biologically based river herring and shad catch caps or to assess the potential effects of such catch caps on river herring and shad populations coastwide. However, the Council believes river herring and shad catch caps provide a strong incentive for the herring fishery to continue avoiding river herring and shad. These catch caps are intended to allow for the full harvest of herring annual catch limits, while reducing river herring and shad incidental catch Framework 3 to the Herring FMP established river herring and shad catch caps for midwater and bottom trawl gear in the herring fishery beginning in 2014. The amounts of the river herring and shad caps were based on the median of historical catch for the herring fishery, specifically for midwater trawl gear in the Gulf of Maine (86 mt), midwater trawl gear in the Cape Cod area (13 mt), and bottom trawl gear (89 mt) and midwater trawl gear (124 mt) in Southern New England. River herring and shad caught on all trips that land 6,600 pounds or more of herring would count against the caps. If the directed herring fishery harvests the river herring and shad caps, NMFS would implement a 2,000-pound herring possession limit, effectively closing the directed herring fishery for that area and gear type.

Monitoring is critical to understanding the nature and extent of river herring and shad catch in the herring and mackerel fisheries. Because the seasonal and inter-annual

distribution of river herring and shad are highly variable, the Council believes that the most effective measures to address river herring and shad catch would be those that increase at-sea sampling, improve catch accounting, and promote cooperative efforts with the industry to minimize catch

Analysis of river herring and shad catch from 2010-2013 done as part of this amendment indicates that the fleets responsible for catching the majority of river herring and shad are the midwater trawl fleet (57%) followed by the small mesh bottom trawl fleet (33%). The analysis also indicated that the purse seine fleet is responsible for a negligible amount of river herring and shad catch (0.3%).

As part of the 2016-2018 herring specifications, the Council revised the methodology used to calculate river herring and shad catch caps. Instead of the median of historical catch, the Council recommended, and NMFS implemented, catch caps based on a weighted mean of historical river herring and shad catch. The weighted mean better accounts for variable sampling levels (both at-sea and portside) by giving more weight to years with more sampling. The resulting catch caps were as follows: 76.7 mt for midwater trawl gear in the Gulf of Maine, 32.4 mt for midwater trawl gear in the Cape Cod area, 122.3 mt for bottom trawl gear in Southern New England, and 129.6 mt for midwater trawl gear in Southern New England.

Overview of Herring Industry-Funded Monitoring Coverage Target Alternatives

The Council recommended increased monitoring in the herring fishery to address the following goals: (1) Accurate estimates of catch (retained and discarded); (2) accurate catch estimates for incidental species for which catch caps apply; and (3) affordable monitoring for the herring fishery.

The industry-funded monitoring coverage target alternatives for the herring fishery provide a range of data collections and monitoring costs. This amendment evaluates how different coverage target alternatives meet specific monitoring goals identified by the Council while comparing the costs of the monitoring programs, particularly costs that would be borne by the fishing industry. The herring coverage target action alternatives include Northeast Fisheries Observer Program-level (NEFOP-level) observer, at-sea monitoring (ASM) coverage, electronic monitoring (EM), and portside sampling coverage.

Under any of the herring coverage target action alternatives, existing industry reporting requirements and observer coverage to meet MSA, ESA, and MMPA requirements under the No Action alternative would continue. Any information collected under the herring coverage target action alternatives would be in addition to existing reporting and monitoring.

The Council finalized its selection of preferred alternatives at its April 18-20, 2017, meeting. The Council selected the following preferred alternatives:

- Herring Alternative 2, including Sub-Options 1 (Waiver Allowed), 2 (Wing Vessel Exemption), 4 (2-Year Re-Evaluation), and 5 (50 mt Exemption Threshold);
- Herring Alternative 2.5 (100% NEFOP-Level Coverage on Midwater Trawl Fleet in Groundfish Closed Areas); and
- Herring Alternative 2.7 (ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage).

TABLE 9. RANGE OF INDUSTRY-FUNDED MONITORING HERRING COVERAGE TARGET ALTERNATIVES (*PREFERRED ALTERNATIVES IN BOLD*)

Gear Type	Midwater Trawl	Purse Seine	Small Mesh Bottom Trawl
Herring Alternative 1: No Coverage Target for IFM Program (No Action)	SBRM		
Herring Alternative 2: Coverage Targets for IFM Program	Includes Sub-Options: 1) **Wavier Allowed**, 2) **Wing Vessel Exemption**, 3) 2-Year Sunset, 4) **2-Year Re-evaluation**, and 5) 25 mt or **50 mt Exemption Threshold**		
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	100% NEFOP-Level Observer		
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	25%, 50%, 75% or 100% ASM		
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	50% or 100% EM/Portside	25%, 50%, 75% or 100% ASM	
Herring Alternative 2.4: EM and Portside Coverage on Midwater Trawl Fleet	50% or 100% EM/Portside	SBRM (No Action)	
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet in Groundfish Closed Areas*	**100% NEFOP-Level Coverage**	**SBRM (No Action)**	
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet in Groundfish Closed Areas	Coverage would match selected alternative 2.1-2.4	SBRM (No Action)	
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**50% ASM or EM/Portside**	**50% ASM**	**50% ASM**
* Sub-Options do not apply to Herring Alternative 2.5.			

2.2.1 HERRING ALTERNATIVE1: NO COVERAGE TARGET SPECIFIED FOR INDUSTRY-FUNDED MONITORING PROGRAM

Under Herring Alternative 1 (No Action), there would be no coverage target specified for an industry-funded monitoring program in the Herring FMP. Observer coverage for herring vessels would be allocated according to SBRM, and there would be no additional cost to the herring industry for monitoring coverage. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis.

Under SBRM, the Atlantic herring fishery receives NEFOP observer coverage under the following six fleets: New England and Mid-Atlantic small mesh otter trawl; New England and Mid-Atlantic purse seine; and New England and Mid-Atlantic paired and single midwater trawl. The Table 10 describes the sea days proposed for April 2016 through March 2017. The sea days listed below for small mesh otter trawl cover all FMPs that use this gear type, so only a portion would cover trips targeting herring. The purse seine and midwater trawl fleets are largely comprised of vessels targeting herring, so a majority of the sea days in these categories will be used to observe trips targeting herring.

TABLE 10. PROPOSED AND OBSERVED SEA DAYS FOR FLEETS THAT TARGET HERRING

Fleet	Region	Proposed sea days for April 2016 to March 2017	Observed sea days, July 2014 to June 2015	VTR sea days, July 2014 to June 2015	Observed trips, July 2014 to June 2015	VTR trips, July 2014 to June 2015
Small Mesh Bottom Trawl	MA	1,171	997	6,761	360	3,088
Small Mesh Bottom Trawl	NE	798	933	8,847	319	3,381
Purse seine	MA	6	0	174	0	172
Purse seine	NE	19	29	661	13	315
Midwater Trawl (Pair and Single)	MA	30	8	134	1	26
Midwater Trawl (Pair and Single)	NE	440	160	1,189	43	363

Source: 2016 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States; Wigley et al., 2016.

Under SBRM, NEFOP observers collect the following information on declared herring trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Whole specimens, photos, and biological samples (i.e., scales, otoliths, and/or vertebrae from fish, invertebrates, and incidental takes);

- Information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Currently, NEFOP observers are required to possess a High Volume Fisheries (HVF) certification in order to observe the herring fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in Herring Amendment 5.

NEFOP determined that data quality on herring trips was sub-optimal when collected by observers without specialized training, potentially resulting in data loss. In addition, the high variety of deck configurations, fish handling practices and fast-paced operations proved more demanding for observers. Having additional training to identify these practices allowed for improved decision-making while at sea, which, ultimately, improved data accuracy and maximized data collection.

In order to qualify for HVF training, NEFOP observers need to be certified and in a positive data quality standing with all trip data. Prior data and data quality history are critically examined in order to determine if an observer would be a good candidate for certification.

Currently, the HVF training is conducted at the NEFOP training center in Falmouth, MA and is one to two days in duration. Training consists of species identification, sampling and subsampling methodologies, practice and documentation, gear identification and a review of the regulations. Regulations are discussed in order to educate observers in regard to Groundfish Closed Area coverage, haddock and river herring/shad catch accounting, slippage and operational discarding. Sampling and subsampling high volume catch is the main focus of training to ensure that observers understand the challenges that exist in trying to account for and accurately extrapolate catch on a haul-by-haul basis. Training on the use of a Marel scale is also conducted as most of the high volume vessels have volunteered to keep Marel scales onboard for the observers to utilize. An exam is administered at the end of training and if successfully completed, an observer is certified to observe the high volume fisheries.

Vessels with limited access herring permits (Categories A, B, and C) and midwater trawl vessels fishing in the Groundfish Closed Areas are required to bring catch aboard and make it available to the observer for sampling. If catch is discarded prior to making it available to the observer for sampling, discarded catch is considered "slippage." Vessels are prohibited from slipping catch unless it is due to safety concerns, mechanical failure, or if excess catch of dogfish prevents catch from being pumped aboard the vessel. Vessels with limited access permits are required to report slippage on the daily herring VMS catch report and complete a released catch affidavit. Vessels that slip catch are subject to slippage consequence measures. Midwater trawl vessels fishing in the Groundfish Closed Areas are required to leave the Groundfish Closed Areas following a slippage event and remain out of

the Groundfish Closed Areas for the duration of that fishing trip. Additionally, vessels with Category A and B permits are required to move 15 nautical miles following a slippage event due to safety, mechanical failure, or dogfish and terminate the fishing trip following slippage for any other reason.

2.2.2 HERRING ALTERNATIVE 2: COVERAGE TARGET SPECIFIED FOR INDUSTRY-FUNDED MONITORING PROGRAM (*PREFERRED ALTERNATIVE*)

Under Herring Alternative 2, the Council would specify the details of an industry-funded monitoring program for the Herring FMP. These details may include, but are not limited to: (1) Level and type of coverage target; (2) rationale for level and type of coverage; (3) minimum level of coverage necessary to meet coverage goals; (4) consideration of coverage waivers if coverage target cannot be met; (5) process for vessel notification and selection; (6) process for payment of industry cost responsibilities; (7) standards for monitoring service providers; and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP action implementing and/or modifying the specified industry-funded monitoring programs.

The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in a given year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage in addition to SBRM and the specified coverage target.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage. But because SBRM coverage has the potential to vary year to year, the cost of monitoring paid by industry may also vary year to year and may be difficult to plan/budget.

Herring Alternative 2 would allow several sub-options to apply to the herring coverage target alternatives. Sub-options could apply to any of the alternatives except Herring Alternative 2.5.

The Council finalized its selection of preferred alternatives at its April 18-20, 2017, meeting. The Council selected Sub-Options 1 (Waiver Allowed), 2 (Wing Vessel Exemption), 4 (2-Year Re-Evaluation), and 5 (50 mt Exemption Threshold) as preferred alternatives.

- Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if

coverage was unavailable due to funding or logistics. This would include coverage for NEFOP-level observers (except in Groundfish Closed Areas), ASM, EM, and portside sampling. Selection of this sub-option preserves the Council's intent for additional monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available. Should the Council not select Sub-Option 1, the fishing effort would be reduced to match the available level of monitoring (i.e., the fleet would not fish if NMFS does not have funding for the program). Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.

- Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not pump or carry any fish onboard. Vessels would notify NMFS via the pre-trip notification system (PTNS) in advance of the wing vessel trip and NMFS would issue a waiver for IFM coverage requirements on that trip. If the vessel carried herring on that trip, the vessel would be out of compliance with IFM coverage requirements.
- Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation.
- Sub-Option 4 would require the Council to examine the results of any increased coverage in the herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via a framework adjustment or an amendment to the Herring FMP, as appropriate.
- Sub-Option 5 would exempt trips that land less than 25 mt of herring or trips that land less than 50 mt of herring from industry-funded monitoring requirements. The Council selected the 50 mt exemption threshold as a preferred alternatives. Therefore, vessels would notify NMFS via the PTNS in advance of the trip on which they intend to land less than 50 mt of herring and NMFS would issue a waiver for IFM coverage requirements on that trip. If the vessel landed more than 50 mt of herring on that trip, the vessel would be out of compliance with IFM coverage requirements.

Omnibus Alternative 2 would include standard monitoring and service provider requirements for industry-funded monitoring, including NEFOP-level observers, at-sea monitors, electronic monitoring, and portside samplers. (See Appendix 2 for the details of the standard requirements.) If Omnibus Alternative 2 is not selected by the Council, service provider requirements for industry-funded monitoring programs would be developed and implemented in individual FMPs.

Monitoring and service provider provisions previously only considered under Herring Alternative 2 was recommend by the Council in January 2016 to be included in the standard monitoring and service provider requirements in Omnibus Alternative 2. That provision would allow NEFOP-level observers and at-sea monitors to be deployed on the same vessel for more than two consecutive multi-day trips or more than twice in a given month.

In addition to the standard monitoring and service provider requirements specified in Omnibus Alternative 2, Herring Alternative 2 would specify that requirements for industry-funded observer and at-sea monitors include a HVF certification for the herring fishery. The existing NEFOP HVF certification training program would be available to industry-funded observers and NEFOP would develop a new HVF certification training program for industry-funded at-sea monitors.

Under Herring Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

The Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources currently administer voluntary portside sampling programs for the herring fishery. Both states have funding to continue to administer those portside programs through 2018. Therefore, in 2018, the portside sampling of Category A and B vessels using midwater trawl gear would be administered by the states and the resulting data would be used by NMFS for catch monitoring. In 2019 (or possibly 2020) and beyond, NMFS would administer a Federal portside sampling program for vessels with Category A or B herring permits using midwater trawl gear.

Many vessels participating in the herring fishery also participate in the Atlantic mackerel fishery. If IFM coverage targets do not match for the herring and mackerel fisheries, then the higher coverage target would apply on trips declared in both the herring and mackerel fisheries.

2.2.2.1 Herring Alternative 2.1: 100% NEFOP-Level Observer Coverage on Category A and B Vessels

Council would select 100% NEFOP-Level coverage for all Category A and B vessels regardless of gear type.

Herring Alternative 2.1 would require vessels with All Areas (Category A) and Areas 2/3 (Category B) Limited Access Herring Permits to carry a NEFOP-level observer on every declared herring trip.

NEFOP-level observers would be required to possess a NEFOP certification, including a HVF certification, and they would collect comprehensive catch data consistent with NEFOP protocols for observer data collected under the SBRM.

Prior to any trip declared into the herring fishery, representatives for vessels with Category A and B herring permits would be required to provide notice to NMFS and request a NEFOP-level observer through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative that NEFOP-level observer coverage must be procured through an industry-funded monitoring service provider. The vessel representative would then be required to contact an industry-funded monitoring service provider to obtain and pay for a NEFOP-level observer to carry on its

next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring without carrying a NEFOP-level observer on its next trip.

NEFOP-level observers would collect the following information on herring trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Whole specimens, photos, length information, and biological samples (i.e., scales, otoliths, and/or vertebrae from fish, invertebrates, and incidental takes);
- Information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

The 100% NEFOP-level observer coverage target for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage to reach the 100% coverage target in a given year. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded observer on the same trip.

The realized observer coverage level for this alternative in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities. The realized observer coverage level would fall anywhere between SBRM coverage and 100% NEFOP-level coverage on vessels with Category A and B herring permits.

Herring Alternative 2.1 would require all vessels with Category A and B permits to carry a NEFOP-level observer on every declared herring trip. If a NEFOP-level observer was not available to cover a specific herring trip (either due to logistics or a lack of funding), NMFS would issue the vessel a monitoring coverage waiver for that trip.

Under Herring Alternative 2.1, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with Category A and B herring permits.

Rationale: Amendment 5 recommended 100% NEFOP-level observer coverage on vessels with Category A and B herring permits. The increased coverage recommended in Amendment 5 was intended to help determine the true nature and extent of catch and bycatch in the fishery and better address and manage bycatch issues in the future. The requirement for 100% NEFOP-level observer coverage was recommended to apply to the most active vessel in the herring fishery. Based on analyses in Amendment 5, vessels with Category A and B herring permits harvest greater than 98% of herring catch while vessels

with Limited Access Herring Incidental Catch Permits (Category C) harvest only a small percentage of the overall herring catch (0.6%). Because of the costs associated with industry-funded monitoring, Herring Amendment 5 recommended limiting industry-funded observer coverage to vessels with Category A and B permits. The recommendation to increase coverage just on vessels with Category A and B permits was intended to improve catch monitoring in the herring fishery, while minimizing the negative economic impacts associated with industry-funded observer coverage on fishery-related businesses and communities.

Support for 100% NEFOP-level observer coverage on Category A and B herring vessels in Amendment 5 was driven by a majority of fishing industry stakeholders (e.g., groundfish fishing industry, recreational fishery participants, environmental advocates). Those stakeholders, as well as some members of the herring industry, believed that 100% NEFOP-level observer coverage on the most active vessels was important to either confirm or disprove the claims that have been made by many regarding bycatch in the herring fishery.

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

2.2.2.2 Herring Alternative 2.2: At-Sea Monitor Coverage on Category A and B Vessels

Council would select one ASM coverage target (25%, 50%, 75%, or 100%) for all Category A and B vessels regardless of gear type.

Herring Alternative 2.2 would require vessels with Category A and B herring permits to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS. Vessels would be selected to carry an at-sea monitor by NMFS to meet the at-sea monitor coverage target (25%, 50%, 75%, or 100%) specified in this action.

Prior to any trip declared into the herring fishery, representatives for vessels with Category A and B herring permits would be required to provide notice to NMFS and request an at-sea monitor through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not an at-sea monitor must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that at-sea monitoring coverage is necessary, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for an at-sea monitor to carry on its next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring without carrying an at-sea monitor on its next trip. If NMFS informs the vessel representative that at-sea monitoring coverage is not necessary on its next trip, NMFS would issue the vessel an at-sea monitoring coverage waiver.

At-sea monitors would collect the following information on herring trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Length data, along with whole specimens and photos to verify species identification, on retained and discarded catch;
- Information on and biological samples from interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Currently, the primary biological data that at-sea monitors would collect are length data on retained and discarded catch. However, to verify species identification, at-sea monitors may also collect whole specimens or photos. In the future, the Council may recommend that at-sea monitors collect additional biological information upon request. Revising the duties for an at-sea monitor, such that additional biological information would be collected, could be done in a future framework action. The Council may also recommend that at-sea monitors collect additional biological information by considering the issue at a public meeting, where public comment is taken, and asking NMFS to publish a notice or rulemaking modifying the duties for at-sea monitors.

Initially, the Council recommended that at-sea monitors only collect data from discarded and not retained catch. The Council recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the herring fishery. However, the herring fishery only discards a small percentage of it catch, so there was only a minimal gain in information when at-sea monitors only collected data on discarded catch. In April 2016, to increase the data utility of information collected by at-sea monitors, the Council recommended that at-sea monitors collect information on both retained and discarded catch.

The ASM coverage target (25%, 50%, 75%, or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded at-sea monitor on the same trip.

The realized observer coverage level for this alternative in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities.

The realized observer coverage level would fall anywhere between SBRM coverage and the specified at-sea monitoring coverage level on vessels with Category A and B herring permits.

Herring Alternative 2.2 would require all vessels with Category A and B permits to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS. If an at-sea monitor was not available to cover a specific herring trip (either due to logistics or a lack of funding), NMFS would issue the vessel an at-sea monitoring coverage waiver for that trip.

Under Herring Alternative 2.2, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with Category A and B herring permits.

Rationale: In contrast to NEFOP-level observers, at-sea monitors would not collect whole specimens, photos, or biological samples (other than length data) from catch or sighting data on protected species. The Council recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the herring fishery. (See Appendix 4 for additional details.)

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (25%, 50%, 75%, or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

2.2.2.3 Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet

Category A and B Vessels

Council would select one ASM coverage target (25%, 50%, 75%, or 100%) for all Category A and B vessels using either purse seine or bottom trawl gear.

Herring Alternative 2.3 would require vessels with Category A and B herring permits using purse seine and small mesh bottom trawl gear to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS. Vessels would be selected to carry an at-sea monitor by NMFS to meet the at-sea monitor coverage target (25%, 50%, 75%, or 100%) specified in this action.

Prior to any trip declared into the herring fishery, representatives for vessels with Category A or B permits using purse seine or small mesh bottom trawl gear would be required to provide notice to NMFS and request an at-sea monitor through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not an at-sea monitor must be procured through an industry-funded monitoring service provider. If NMFS informs vessel representative that

they needed at-sea monitoring coverage, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for an at-sea monitor to carry on its next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring without carrying an at-sea monitor on its next trip. If NMFS informs the vessel representative that at-sea monitoring coverage is not needed on its next trip, NMFS would issue the vessel an at-sea monitoring coverage waiver.

At-sea monitors would collect the following information on herring trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Length data, along with whole specimens and photos to verify species identification, on retained and discarded catch;
- Information on and biological samples from interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Currently, the primary biological data that at-sea monitors would collect are length data on retained and discarded catch. However, to verify species identification, at-sea monitors may also collect whole specimens or photos. In the future, the Council may recommend that at-sea monitors collect additional biological information upon request. Revising the duties for an at-sea monitor, such that additional biological information would be collected, could be done in a future framework action. The Council may also recommend that at-sea monitors collect additional biological information by considering the issue at a public meeting, where public comment is taken, and asking NMFS to publish a notice or rulemaking modifying the duties for at-sea monitors.

The ASM coverage target (25%, 50%, 75%, or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded at-sea monitor on the same trip.

Herring Alternative 2.3 would require all vessels with Category A and B permits using purse seine or small mesh bottom trawl gear to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS. If an at-sea monitor was not available to cover a specific herring trip (either due to logistics or a lack of funding), NMFS would issue the vessel an at-sea monitoring coverage waiver for that trip.

Under Herring Alternative 2.3, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with Category A and B herring permits with ASM coverage.

Rationale: In contrast to NEFOP-level observers, at-sea monitors would not collect whole specimens, photos, or biological samples (other than length data) from catch or sighting data on protected species. The Council recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the herring fishery. (See Appendix 4 for additional details.*)*

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (25%, 50%, 75%, or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

Midwater Trawl Fleet

Council would select one electronic monitoring (EM)/portside sampling coverage target (50% or 100%) for all vessels using midwater trawl gear.

Herring Alternative 2.3 would also require midwater trawl vessels to carry an operating EM system on every trip declared into the herring fishery and portside sampling of catch on declared herring trips selected for coverage by NMFS. The intention of the Council would be that all declared herring trips by midwater trawl vessels would have some percentage of EM footage sampled (50% or 100%) and that same percentage of trips sampled portside (50% or 100%). However, factors such as where catch is landed, ability to access the offload, and infrastructure limitations at certain landing ports, may prevent the program from achieving 100% coverage, even if funding is not limiting.

Prior to any trip declared into the herring fishery, representatives for vessels using midwater trawl gear would be required to have an operational EM system installed aboard their vessel and provide notice to NMFS and request a portside sampler through the pre-trip notification system.

NMFS would notify the vessel representative whether or not portside sampling coverage must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that they needed portside sampling coverage, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for a portside sampler for its next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring without portside sampling of its offload on its next trip. If NMFS informs the vessel representative that portside sampling coverage is not needed on its next trip, NMFS would issue the vessel a portside sampling coverage waiver.

The EM footage and portside sampling coverage target (50% or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer on the same trip that would be sampled portside.

Electronic Monitoring

Under Herring Alternative 2.3, owners or operators of vessels issued a herring permit and using midwater trawl gear would be required to install EM equipment and maintain the equipment on board for the duration of the fishing year. Though the system would have to be installed for the duration of the fishing year, it would only need to be turned on and recording video footage during declared herring trips using midwater trawl gear.

Video footage would be used to confirm retention of catch on midwater trawl trips to ensure that all catch is available to be sampled portside for a given trip. Video footage would be recorded either throughout the duration of the trip or just around haulback. For analysis purposes, haulback would be defined as the time gear sensors document the start of gear retrieval to some set amount of time after the time gear sensors sense the end of gear retrieval, in order to ensure that all catch has been transferred into the hold or discarded. In addition, one wide angle camera may remain on for the duration of the trip to monitor for discard compliance.

While video footage was intended to only initially be used to verify retention of catch for portside sampling, the Council also recommended that EM would be used to verify compliance with slippage restrictions, reporting requirements, and a requirement to move 15 nautical miles following any slippage event. Footage would not initially be used to identify species, nor estimate the amount of catch released if a haul were slipped. The Council may expand the uses of video footage to include species identification or quantification of released catch in the future, if footage proves useful for these purposes. Such an expansion would be done via a framework adjustment or amendment, as appropriate.

In 2016 and 2017, GARFO and NEFSC, in cooperation with Saltwater Inc., evaluated the utility of EM aboard midwater trawl vessel participating in the herring and mackerel fisheries. The purpose of the program is to:

- Analyze the utility of EM in monitoring fisheries as a means of informing future EM programs.
- Deploy and test an EM program in an operational setting, allowing analysis and adjustment of EM program requirements.
- Evaluate the range of information that can be gathered with EM systems, such as: Verify slippage events; categorize the types of slippage events; verify other discard

sources; and determine if EM can help estimate the amount of catch retained (if not all catch is retained).
- Refine EM cost estimates for NMFS and the fishing industry.

Equipment

The EM system, installed by a NMFS-approved contractor, would be comprised of video camera(s), recording equipment, and other related equipment with the following components and capabilities:

- Video cameras. Video cameras would need to be mounted so to provide clear, unobstructed, and well illuminated views of the area(s) where the midwater trawl gear is retrieved prior to being placed in the hold. There would need to be a sufficient number of cameras with sufficient resolution for NMFS, the US Coast Guard, and other authorized officers/designees to determine that all catch was brought aboard the vessel during haulback. The EM system must be capable of initiating video recording at the time gear retrieval starts, and record all periods of time when the gear is being retrieved and until catch is placed in the hold or discarded.
- Global Positioning System (GPS) receiver. A GPS receiver would be required to document coordinates, velocity, and heading data.
- Hydraulic and drum rotation sensors. Hydraulic sensors would be required to continuously monitor the hydraulic pressure. Drum rotation sensor would be required to continuously monitor drum rotations.
- EM control box. The system would need to include a control box that receives and stores the raw data provided by the sensors and cameras. The control box would need to contain removable hard drives and sufficient storage system capability to record data for the full duration of a trip (i.e., the longest expected trip length for the vessel).
- EM systems monitor. A wheelhouse monitor would be necessary to provide a graphical user interface for the vessel operator to monitor: 1) The state and performance of the control box, 2) information on the current date and time synchronized via GPS, 3) GPS coordinates, 4) current hydraulic pressure reading, 5) presence of a data disk, 6) percentage used of the data disk, and 7) video recording status.

NMFS would announce specifics about this equipment list, as well as any additional design requirements for the EM system, during the rulemaking and implementation process. Industry will be responsible for contracting with a NMFS-approved provider for technical and maintenance services.

Data Transfer

After completing a fishing trip, a vessel representative would be required to mail or transmit the removable EM system hard drive(s) containing all data to NMFS or a NMFS-approved contractor, according to instructions provided by NMFS. The method of transfer

that would be allowed under the EM program will be developed during implementation and included in individual vessel monitoring plans, as described below. Prior to departing on a subsequent trip, a vessel representative would be required to install a replacement EM system hard drive(s) to enable data collection and video recording. A vessel representative would be responsible for contacting NMFS or a NMFS-approved contractor if they have requested but not received a replacement hard drive(s) and for informing NMFS or NMFS-approved contractor of any lapse in the hard drive management procedures described in the vessel monitoring plan.

Retention Requirements

Initially, Herring Alternative 2.3 would maintain the existing retention requirements for the midwater trawl fleet. Vessels would continue to operate under the regulations and possession limits for any fisheries for which they possess permits. There are also some statutory measures under the ESA and MMPA that may dictate retention of protected species.

Review of EM Video Footage

Video footage would be sampled at a predetermined percent of review (50% or 100%) and then could be compared to released catch affidavits, VMS reports describing discard events, and/or observer data on slippage. The sampling of video footage would evaluate whether or not catch was discarded. To use the optimum and most cost-effective rate to achieve the goal for this action, the rate of review may be adjusted by the Council via a future framework or specification action, if appropriate.

Compliance Measures

In the future, the Council may consider modifications to the rates of video footage recording and/or sampling rates to ensure compliance with slippage measures. For example, if a vessel is found to have undocumented discarding events on more than a specified number of trips during a fishing year, then the Council may adjust the rates of video footage recording and/or sampling.

Vessel Monitoring Plans

Individual Vessel Monitoring Plans (VMPs) would serve as a comprehensive plan for discard documentation, installation and maintenance, protocols for data storage and transfer, and other important information regarding a vessel's specific EM system. Each vessel operator or owner would be responsible for working with NMFS or a NMFS-approved contractor to develop a VMP, and would be required to keep the VMP aboard the vessel at all times. NMFS would specify VMP requirements in the regulations. VMPs may include, but are not limited to, information on the locations of EM system components, contact information for technical support, instructions on how to conduct a pre-trip system test, instructions on how to verify proper system functions, location(s) on deck where fish retrieval should occur to remain in view of the cameras, procedures for how to manage EM

system hard drives, catch handling procedures, periodic checks of the monitor during the retrieval of gear to verify proper functioning, and reporting procedures. The VMP should minimize, as much as possible, any impact on the current operating procedures of the vessel, and should help ensure the safety of the crew. NMFS or a NMFS-approved contractor would review VMPs biennially prior to the start of the upcoming fishing year.

Portside Sampling

Under Herring Alternative 2.3, vessels with herring permits using midwater trawl gear would be subject to portside sampling requirements for declared herring trips selected for coverage by NMFS. Portside sampling would be used to verify the amount and species composition of catch in the herring fishery and help track catch against catch caps for haddock and river herring and shad. Portside samplers would also collect age and length data.

Sampling Design

The sampling design for portside sampling alternatives would be based on existing portside sampling programs for the herring fishery, administered by the Massachusetts Division on Marine Fisheries and Maine Department of Marine Resources, and consistent with NEFOP sampling methodology. Midwater trawl vessels returning from a declared herring trip would be sampled portside during the offload. Initially, the level of sampling for midwater trawl trips would be approximately 50% or 100%. However, the sampling rate may be adjusted by the Council, in a future framework or specification action, to use the optimum and most cost effective rate to achieve management goals. Such factors as where catch is landed, ability to access the offload, and infrastructure limitations at certain landing ports, may prevent the program from achieving 100% coverage, even if funding is not limiting.

Basket samples would be collected from the vessel's dewatering box at specified intervals throughout the duration of the offload. Basket samples would be sorted and weighed by species and extrapolated based on vessel hail weight to represent the total trip. Actual weights could be verified against the vessel trip report and/or dealer data. Age and length data would be collected consistent with NEFOP sampling methodology.

Landing Ports

Midwater trawl vessels returning from declared herring trips would be required to land catch in specific ports. In past years, the midwater trawl fleet has landed catch in Maine (Portland, Rockland, Vinalhaven, Prospect Harbor, Jonesport), New Hampshire (Newington), Massachusetts (Boston, Gloucester, New Bedford), Rhode Island (Point Judith, North Kingston), and New Jersey (Cape May).

Approximately 95% of midwater trawl landings are made in ports currently sampled by the state programs. However, if certain ports are not suitable for portside sampling, then vessels may not be able to land in those ports on trips that are selected for portside

sampling. Some vessels only land in a single port and that port is not currently sampled. Some vessels land in both sampled and unsampled ports, but changing past practices to land only in sampled ports may not be easy. Without a predictive model, the analysis of requiring vessels to land in specified ports will be qualitative. Additionally, data confidentiality will limit a quantitative analysis. If the Council selects Herring Alternative 2.3 as a preferred alternative, NMFS would further evaluate how to enable portside sampling in midwater trawl landing ports during implementation of this amendment.

Vessel Responsibilities

Midwater trawl vessels would be responsible for offloading catch consistent with offloading requirements and contracting a service provider to arrange a portside sampler to sample catch from declared herring trips.

Herring Alternative 2.3 would require midwater trawl vessels to carry an operating EM system on every trip declared into the herring fishery and portside sampling of catch on every declared herring trip selected for coverage by NMFS. If an operating EM system or portside sampler was not available to cover a specific herring trip (either due to logistics or lack of funding), NMFS would issue the vessel a coverage waiver for that trip.

As recommended by the Council, Herring Alternative 2.3 would have a pre-implementation plan to help the industry understand any new EM and portside monitoring requirements and become compliant with sampling equipment, notification, sampling, and reporting requirements.

Under Herring Alternative 2.3, all slippage restrictions and reporting requirements would apply to all midwater trawl vessels with limited access herring permits. Additionally, on trips selected by NMFS to be sampled portside, a requirement to move 15 nautical miles following any slippage event would apply to all midwater trawl vessels with Category A and B herring permits.

Rationale: Because the midwater trawl fleet discards only a small percentage of its catch at sea, EM and portside sampling have the potential to be a cost effective way to address monitoring goals for the midwater trawl fleet harvesting herring. EM would be used to verify retention of catch on the midwater trawl fleet and portside sampling would be used to verify amount and species composition of landed catch.

The implementation of EM in the herring fishery would be informed by NMFS's evaluation of EM aboard midwater trawl vessels participating in the herring fishery as well as the exempted fishing permit program for the West Coast whiting fishery. The implementation of portside sampling in the herring fishery would be informed by the existing portside sampling programs operated by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources.

Slippage restrictions, reporting requirements, a requirement to move 15 nautical miles following any slippage event are intended to improve catch monitoring by minimizing

discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (50% or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

2.2.2.4 Herring Alternative 2.4: Electronic Monitoring and Portside Sampling on the Midwater Trawl Fleet

Council would select one EM/Portside sampling coverage target (50% or 100%) for all vessels using midwater trawl gear.

Herring Alternative 2.4 would require midwater trawl vessels to carry an operating EM system on every trip declared into the herring fishery and portside sampling of their catch on declared herring trip selected for coverage by NMFS. The intention of the Council would be that all declared herring trips by midwater trawl vessels would have some percentage of EM footage sampled (50% or 100%) and that same percentage of trips sampled portside (50% or 100%). However, factors such as where catch is landed, ability to access the offload, and infrastructure limitations at certain landing ports, may prevent the program from achieving 100% coverage, even if funding is not limiting. For complete details of EM and portside sampling, see the description of Herring Alternative 2.3

Herring Alternative 2.4, similar to Herring Alternative 2.3, would require midwater trawl vessels to carry an operating EM system on every trip declared into the herring fishery and portside sampling of their catch on every declared herring trip selected for coverage by NMFS. If an operative EM system or portside sampler was not available to cover a specific herring trip (either due to logistics or a lack of funding), NMFS would issue the vessel a coverage waiver for that trip.

The EM footage and portside sampling coverage target (50% or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer on the same trip that would be sampled portside.

As recommended by the Council, Herring Alternative 2.4 would have a pre-implementation plan to help the industry understand any new EM and portside monitoring requirements and become compliant with sampling equipment, notification, sampling, and reporting requirements.

Under Herring Alternative 2.4, all slippage restrictions and reporting requirements would apply to all midwater trawl vessels with limited access herring permits. Additionally, on a trips selected by NMFS to be sampled portside, a requirement to move 15 nautical miles following any slippage event would apply to all midwater trawl vessels with Category A and B herring permits.

Rationale: Because the midwater trawl fleet discards only a small percentage of its catch at sea, EM and portside sampling have the potential to be a cost effective way to address monitoring goals for the midwater trawl fleet harvesting herring. EM would be used to verify retention of catch on the midwater trawl fleet and portside sampling would be used to verify amount and species composition of landed catch.

The implementation of EM in the herring fishery would be informed by NMFS's evaluation of EM aboard midwater trawl vessels participating in the herring fishery as well as the exempted fishing permit program for the West Coast whiting fishery. The implementation of portside sampling in the herring fishery would be informed by the existing portside sampling programs operated by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources.

Slippage restrictions, reporting requirements, a requirement to move 15 nautical miles following any slippage event are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (50% or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

2.2.2.5 Herring Alternative 2.5 (Preferred Alternative): 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas

Council selected 100% NEFOP-Level coverage for all vessels using midwater trawl gear and fishing in Groundfish Closed Areas as a preferred alternative. Sub-Options do not apply to this preferred alternative.

Herring Alternative 2.5 would maintain the existing requirement that midwater trawl vessels fishing in the Groundfish Closed Areas to carry a NEFOP-level observer, but would allow vessels to pay for coverage to access the Groundfish Closed Areas. The sub-options (i.e., waiver allowed, wing vessel exemption, 2-year sunset, 2-year evaluation, and 25 mt or 50 mt exemption thresholds) described under Herring Alternative 2 would not apply to Herring Alternative 2.5.

Initially, the Groundfish Closed Areas included: Closed Area I, Closed Area II, Nantucket Lightship Closed Area, Cashes Ledge Closure Area, and Western Gulf of Maine Closure Area. Based on Amendment 5, if the Groundfish Closed Areas are modified or eliminated in the future, coverage requirements for midwater trawl vessels will be reconsidered at that time.

In January 2018, NMFS partially approved Omnibus Essential Fish Habitat Amendment 2 (Habitat Amendment), including changes to Closed Area I, Nantucket Lightship Closed Area, and the Western Gulf of Maine Closure Area. Consistent with Council intent regarding observer coverage, the final rule for the Habitat Amendment (83 FR 15240, April 9, 2018) maintained the 100% observer requirement for midwater trawl vessels fishing in Closed Area I North (February 1 – April 15), Closed Area II, Cashes Ledge Closure Area, and the Western Gulf of Maine Closure Area. Because the Habitat Amendment removed the

Nantucket Lightship Closed Area from the list of Groundfish Closed Areas, the 100% observer coverage requirement no longer applies to midwater trawl vessels fishing in the area previously known as the Nantucket Lightship Closed Area.

Prior to any Groundfish Closed Area trip declared into the herring fishery, representatives for vessels with midwater trawl gear would be required to provide notice to NMFS and request a NEFOP-level observer through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative that NEFOP-level observer coverage must be procured through an industry-funded at-sea monitoring service provider. The vessel representative would then be required to contact an industry-funded monitoring service provider to obtain and pay for a NEFOP-level observer to carry on its next fishing trip within a Groundfish Closed Area. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring on any trip within a Groundfish Closed Area without carrying a NEFOP-level observer for that trip.

NEFOP-level observers would collect the following information on herring trips in Groundfish Closed Areas:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Whole specimens, photos, length information, and biological samples (i.e., scales, otoliths, and/or vertebrae from fish, invertebrates, and incidental takes);
- Information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

The 100% NEFOP-level observer coverage for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded observer on the same trip.

Herring Alternative 2.5 would maintain the existing requirement that vessels fishing with midwater trawl gear in the Groundfish Closed Areas to carry a NEFOP-level observer. If a NEFOP-level observer was not available to cover a specific herring trip inside a Groundfish Closed Area (either due to logistics or a lack of funding), that vessel would be prohibited from fishing inside a Groundfish Closed Area on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of the midwater trawl fleet to participate in the herring fishery inside the Groundfish Closed Areas.

Under Herring Alternative 2.5, slippage restrictions and reporting requirements would apply to all midwater trawl vessels with limited access herring permits fishing in Groundfish Closed Areas and slippage consequences would apply to all midwater trawl vessels with Category A and B herring permits fishing in Groundfish Closed Areas.

The Council selected NEFOP-level observer coverage (Herring Alternative 2.5) and ASM and EM/Portside sampling coverage (Herring Alternative 2.7) as preferred monitoring types for the herring fishery. If available Federal funding is insufficient to cover NMFS costs responsibilities associated with administering multiple monitoring programs for the herring fishery, the Council recommended that funding be prioritized to ASM and EM/Portside coverage on Category A and B vessels and then to support NEFOP-level observer coverage on midwater trawl vessels fishing in Groundfish Closed Areas. This recommendation is intended to prioritize coverage aboard Category A and B vessels because they harvest the majority of the herring and then to facilitate midwater trawl access to Groundfish Closed Areas.

Rationale: The requirement that midwater trawl vessels fishing in the Groundfish Closed Areas carry a NEFOP-level observer was established in Herring Amendment 5. Analyses in Amendment 5 suggest that midwater trawl vessels are not catching significant amounts of groundfish either inside or outside the Groundfish Closed Areas. Additionally, the majority of groundfish catch by midwater trawl vessels is haddock, and the catch of haddock by midwater trawl vessels is already managed through a haddock catch cap for the herring fishery. However, the rationale in Amendment 5 described the importance of determining the extent and nature of catch and bycatch in the herring fishery. This alternative would still allow the herring midwater trawl fishery to operate in the Groundfish Closed Areas, but it would ensure that opportunities for sampling are maximized.

Revisions to the SBRM in April 2015 affected how funding is used to allocate observer coverage, such that SBRM funding must first be used to provide SBRM coverage. SBRM coverage is used to estimate amount of fish discarded at sea. Since midwater trawl vessels generally discard only a small percentage of catch at sea, SBRM coverage allocated to midwater trawl vessels is relative low compared to coverage allocated to other gear types that have higher discard rates. Thus, the realized coverage level of midwater trawl vessels fishing in Groundfish Closed Areas will only be equivalent to SBRM coverage aboard midwater trawl vessels, likely less than 100% observer coverage. This alternative is intended to increase observer coverage on midwater trawl vessels and allow those vessels access to the Groundfish Closed Areas with industry-funded monitoring.

If the Groundfish Closed Areas are modified or eliminated in the future, coverage requirements for midwater trawl vessels will be reconsidered at that time.

2.2.2.6 Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas

If the Council had selected Herring Alternative 2.2, 2.3, 2.4, or 2.7 as the preferred alternative, then the monitoring type and coverage target associated with that alternative would apply to vessels using midwater trawl gear and fishing in Groundfish Closed Areas.

Herring Alternative 2.6 would require vessels fishing with midwater trawl gear in the Groundfish Closed Areas to comply with any ASM or EM and portside monitoring requirements specified for the herring fishery in this amendment.

Prior to any Groundfish Closed Area trip declared into the herring fishery, representatives for vessels with midwater trawl gear would be required to provide notice to NMFS and request the appropriate type of industry-funded monitoring coverage through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative that industry-funded monitoring coverage must be procured through an industry-funded at-sea monitoring service provider. The vessel representative would then be required to contact an industry-funded monitoring service provider to obtain and pay the appropriate type of industry-funded monitoring coverage to carry on its next fishing trip within a Groundfish Closed Area. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring on any trip within a Groundfish Closed Area without the appropriate type of monitoring coverage for that trip.

The coverage target under this alternative would be calculated by combining SBRM and industry-funded monitoring coverage. NMFS would calculate the coverage target. If the Groundfish Closed Areas are modified or eliminated in the future, coverage requirements for midwater trawl vessels will be reconsidered at that time.

Herring Alternative 2.6 would require vessels fishing with midwater trawl gear in the Groundfish Closed Areas to comply with any ASM or EM and portside monitoring requirements specified for the herring fishery in this amendment. If the appropriate type of monitoring coverage was not available to cover a specific herring trip inside a Groundfish Closed Area (either due to logistics or a lack of funding), NMFS would issue the vessel a monitoring coverage waiver for that trip.

Under Herring Alternative 2.6, slippage restrictions and reporting requirements would apply to midwater trawl vessels with limited access herring permits fishing in Groundfish Closed Areas and slippage consequences would apply to midwater trawl vessels with Category A and B herring permits fishing in Groundfish Closed Areas.

Rationale: This alternative was recommended by the Council to balance stakeholder interest in additional catch monitoring on midwater trawl vessels with the ability of the herring fishery to operate within the Groundfish Closed Areas and the economic impacts of paying for monitoring on trips within the Groundfish Closed Areas.

Revisions to the SBRM in April 2015 affected how funding is used to allocate observer coverage, such that SBRM funding must first be used to provide SBRM coverage. SBRM coverage is used to estimate amount of fish discarded at sea. Since midwater trawl vessels generally discard only a small percentage of catch at sea, SBRM coverage allocated to midwater trawl vessels is relative low compared to coverage allocated to other gear types that have higher discard rates. Thus, SBRM coverage allocated to midwater trawl vessels would likely be less than 100% observer coverage.

This alternative is intended to increase monitoring on midwater trawl vessels and allow those vessels access to the Groundfish Closed Areas with industry-funded monitoring.

2.2.2.7 Herring Alternative 2.7 (Preferred Alternative): At-Sea Monitoring Coverage on Category A and B Vessels, Then Eventually Vessels May Choose Either At-Sea Monitoring Coverage or Electronic Monitoring and Portside Sampling Coverage

Council selected a 50% coverage target for all Category A and B vessels as a preferred alternative. Different coverage targets (25%, 50%, 75%, or 100%) were analyzed for each gear type (midwater trawl, purse seine, bottom trawl), but the Council selected a 50% coverage target for all gear types.

Initially, vessels would be required to carry an at-sea monitor, then eventually, once EM was approved by the Council and NMFS, specific gear types would be able choose between ASM or EM/portside coverage.

This amendment would establish a general process for NMFS to consult with the Council to approve EM coverage for the herring fishery. EM may be used in place of ASM in the herring fishery if the technology is deemed sufficient by the Council. The Regional Administrator, in consultation with the Council, may approve the use of EM systems for the herring fishery in a manner consistent with the Administrative Procedure Act, with final measures published in the *Federal Register*. A vessel electing to use EM in lieu of ASM must develop a vessel monitoring plan to implement EM requirements that is satisfactory to, and approved by, NMFS for monitoring catch, discards and slippage events. The vessel monitoring plan must meet the EM operational standards. The EM program shall be reviewed and approved by the Regional Administrator as part of a vessel's monitoring plan on a yearly basis in a manner consistent with the Administrative Procedure Act.

In 2016 and 2017, GARFO and NEFSC, in cooperation with Saltwater Inc., evaluated the utility of EM aboard midwater trawl vessel participating in the herring and mackerel fisheries. The purpose of the program is to:

- Analyze the utility of EM in monitoring fisheries as a means of informing future EM programs.
- Deploy and test an EM program in an operational setting, allowing analysis and adjustment of EM program requirements.

- Evaluate the range of information that can be gathered with EM systems, such as: Verify slippage events; categorize the types of slippage events; verify other discard sources; and determine if EM can help estimate the amount of catch retained (if not all catch is retained).
- Refine EM cost estimates for NMFS and the fishing industry.

At its April 2018 meeting, the Council determined that electronic monitoring, used in conjunction with portside sampling coverage, is an adequate substitute for at-sea monitoring coverage aboard vessels using midwater trawl gear, but did not recommend requiring electronic monitoring and portside sampling as part of this amendment. Instead, the Council recommended NMFS use an exempted fishing permit (EFP) to further evaluate how to best permanently administer an electronic monitoring and portside sampling program. The EFP would exempt midwater vessels from the proposed requirement for industry-funded at-sea monitoring coverage and would allow midwater trawl vessels to use electronic monitoring and portside sampling coverage to comply with the Council-recommended 50% coverage target. An EFP would enable NMFS to further evaluate how to best permanently administer an electronic monitoring and portside sampling program. The Council previously recommended reconsidering herring industry-funded monitoring requirements two years after implementation. Using the results of the EFP, the Council would consider establishing electronic monitoring and portside sampling program requirements into regulation via a framework adjustment at that time.

In 2018, the Council only evaluated if EM/Portside is an adequate substitute for ASM coverage aboard Category A and B vessels using midwater trawl gear. Midwater trawl would be required to: (1) Choose one monitoring type per fishing year; and (2) declare their preferred monitoring type six months in advance of the fishing year. In the future, the Council may determine that EM/Portside sampling is an adequate substitute for ASM coverage aboard purse seine or bottom trawl vessels. If so, then the ability of Category A and B vessels using purse seine or bottom trawl gear to choose whether to use ASM or EM/Portside sampling coverage would be considered in a future framework.

The Council selected NEFOP-level observer coverage (Herring Alternative 2.5) and ASM and EM/Portside sampling coverage (Herring Alternative 2.7) as preferred monitoring types for the herring fishery. If available Federal funding is insufficient to cover NMFS costs responsibilities associated with administering multiple monitoring programs for the herring fishery, the Council recommended that funding be prioritized to ASM and EM/Portside coverage on Category A and B vessels and then to support NEFOP-level observer coverage on midwater trawl vessels fishing in Groundfish Closed Areas. This recommendation is intended to prioritize coverage aboard Category A and B vessels because they harvest the majority of the herring and then to facilitate midwater trawl access to Groundfish Closed Areas.

ASM Coverage

Herring Alternative 2.7 would require vessels with Category A and B herring permits to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS.

Vessels would be selected to carry an at-sea monitor by NMFS to meet the 50% coverage target recommended by the Council.

Prior to any trip declared into the herring fishery, representatives for vessels with Category A or B permits would be required to provide notice to NMFS and request an at-sea monitor through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not an at-sea monitor must be procured through an industry-funded monitoring service provider. If NMFS informs vessel representative that they needed at-sea monitoring coverage, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for an at-sea monitor to carry on its next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any herring without carrying an at-sea monitor on its next trip. If NMFS informs the vessel representative that at-sea monitoring coverage is not needed on its next trip, NMFS would issue the vessel an at-sea monitoring coverage waiver.

At-sea monitors would collect the following information on herring trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Length data, along with whole specimens and photos to verify species identification, on retained and discarded catch;
- Information on and biological samples from interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Currently, the primary biological data that at-sea monitors would collect are length data on retained and discarded catch. However, to verify species identification, at-sea monitors may also collect whole specimens or photos. In the future, the Council may recommend that at-sea monitors collect additional biological information upon request. Revising the duties for an at-sea monitor, such that additional biological information would be collected, could be done in a future framework action. The Council may also recommend that at-sea monitors collect additional biological information by considering the issue at a public meeting, where public comment is taken, and asking NMFS to publish a notice or rulemaking modifying the duties for at-sea monitors.

The ASM coverage target (50%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage

target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded at-sea monitor on the same trip.

Herring Alternative 2.7 would require all vessels with Category A and B permits to carry an at-sea monitor on every declared herring trip selected for coverage by NMFS. If an at-sea monitor was not available to cover a specific herring trip (either due to logistics or a lack of funding), NMFS would issue the vessel an at-sea monitoring coverage waiver for that trip.

Under Herring Alternative 2.7, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with Category A and B herring permits with ASM coverage.

EM/Portside Coverage

Requirements for EM/Portside sampling coverage would not be specified in the amendment. Instead, the Council recommended NMFS use an exempted fishing permit EFP to further evaluate how to best permanently administer an EM/Portside sampling program. See Herring Alternative 2.3, for a general description of EM/Portside sampling.

The EFP would exempt midwater vessels from ASM coverage and the details of the EFP would be development concurrently with the rulemaking for this amendment. If the proposed herring measures are approved, then midwater trawl vessels issued EFPs would be allowed to use EM/Portside sampling coverage to comply with the 50% coverage target.

Rationale: To ensure an equitable monitoring burden across Category A and B vessels, the Council recommended Category A and B vessels be able to choose between ASM and EM/Portside monitoring coverage for a given fishing year.

In contrast to NEFOP-level observers, at-sea monitors would not collect whole specimens, photos, or biological samples (other than length data) from catch or sighting data on protected species. The Council recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the herring fishery. (See Appendix 4 for additional details.*)*

EM and portside sampling have the potential to be a cost effective way to address monitoring goals for vessels harvesting herring. EM would be used to verify retention of catch and portside sampling would be used to verify amount and species composition of landed catch.

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the 50% coverage target is intended to reduce the costs associated with industry-funded monitoring coverage.

2.2.3 CONSIDERED BUT REJECTED HERRING ALTERNATIVES

The alternative specifying NEFOP-level observer coverage on the midwater trawl fleet to obtain a 30% CV (coefficient of variation) on river herring and shad catch was considered but rejected by the Council.

The monitoring of the river herring and shad catch in the herring fishery was identified as a Herring FMP need in Amendment 5. This alternative was developed from an analysis that evaluated catch of river herring and shad in the herring and mackerel fisheries and was designed to complement SBRM coverage.

This alternative would have focused observer coverage on the midwater trawl fleet because that fleet had caught the majority of river herring and shad (57%) during 2010 to 2013. Additionally, consistent with the need identified in Amendment 5 to monitor all catch in the herring fishery, this alternative would have focused coverage on the fleet that catches the majority of the herring harvest (73%) and on the vessels with Category A and B permits that harvest the majority of the herring harvest (83%) based on analyses in Amendment 5. Based on 2013 data, the percent coverage to achieve a 30% CV on river herring and shad catch by the midwater trawl fleet would have been up to 61%.

The Council recommended this alternative be considered but rejected because it was not considered consistent with the goals of Herring Amendment 5 and it could not be revised to apply only to vessels with Category A and B herring permits.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The purpose of this action is to consider measures that would allow the Council to implement IFM coverage in New England FMPs. This amendment would allow industry funding to be used in conjunction with available Federal funding to pay for additional monitoring to meet FMP-specific coverage targets.

This section will provide specific information on the FMPs subject to this amendment and summarize the relevant environmental features at a broader scale that crosses all subject FMPs and their constituent fisheries.

Data in this section is through 2014. Those are the data that informed the impacts discussion in Section 4.0 of this document that was used by the New England Council when it selected preferred alternatives. NMFS did not add additional years of data after the Council selected its preferred alternatives because additional data would not have altered the impacts of the preferred alternatives.

Because the omnibus portion of this amendment is concerned with the process to create and prioritize IFM programs across FMPs, the scope of the "environment" affected by this amendment is atypical for an FMP amendment. As the focus of the omnibus portions of the process to creating and prioritizing IFM programs for available Federal funds, the impacts of the omnibus alternatives are administrative in nature. Therefore, a detailed description of the environmental components including the biological resources, physical environment, and socio-economic structure that could be affected by the alternatives under consideration is not necessary. Instead, this section of the amendment will include a brief overview of the areas in which the fishing activities affected by the subject FMPs occur, a brief overview of the primary ports engaged in the subject fishing activities, and a brief overview of the fishery and non-fishery living marine resources most frequently encountered by the subject fishing activities. This section will also include references for more detailed information on these topics, should any reader wish to become more familiar with the features of the environment in which the subject fisheries occur.
The herring alternatives in this amendment are consistent with typical FMP amendments. The potential increases in monitoring for the herring fishery may directly impact fishing vessel operations and the ways in which herring fishing activities directly or indirectly interact with living marine resources, marine habitat, and the socio-economic constructs of the human environment. Thus, where necessary, as in the "Affected Environment" section for a standard FMP amendment, detailed information is included regarding the herring resource, non-target and protected species encountered in these fisheries, the habitats of these species, and the fishing businesses and communities expected to be directly or indirectly affected by the proposed action.

3.1.1 TARGET SPECIES

The fishery resources under management by the Council include a variety of managed and non-managed species that are caught and landed by commercial and recreational fishermen operating in the region (Table 26). These fishery resources include many species of both demersal and pelagic finfish, several species of crustaceans, mollusks, and other invertebrates. These species occupy broad ranges within the Greater Atlantic Region (Table 26) and a wide variety of habitats from the pelagic waters of the open ocean to sand, mud, gravel, and rock beds in coastal waters.

All of the FMP summaries below incorporate data from the seafood dealer purchase report database, from 2010-2014, inclusive. For some FMPs, the fishing year is offset from the calendar year, and starts on March 1 (Sea Scallops and Deep-Sea Red Crab) or May 1 (Northeast Multispecies and Skates). For ease of analysis and consistency of presentation, the landings data for these FMPs are summarized based on calendar year, not fishing year.

TABLE 11. LIST OF EXAMPLE BIOLOGICAL RESOURCES AND THE GEOGRAPHIC REGIONS WHERE THE RESOURCES ARE MOST COMMONLY FOUND.

	Species	Gulf of Maine	Georges Bank	Middle Atlantic Bight
Fishery Resources	American lobster	X	X	X
	American plaice	X		
	Atlantic bluefish	X		X
	Atlantic cod	X	X	
	Atlantic croaker			X
	Atlantic halibut	X		
	Atlantic herring	X	X	X
	Atlantic mackerel	X	X	X
	Atlantic sea scallop		X	X
	Atlantic surfclam	X	X	X
	Atlantic wolffish	X	X	
	Black sea bass		X	X
	Blue crab			X
	Butterfish		X	X
	Clearnose skate			X
	Deep-sea red crab	X	X	X
	Golden tilefish			X
	Haddock	X	X	
	Hagfish	X	X	X
	Horseshoe crab	X	X	X
	Jonah crab	X	X	
	King whiting			X
	Little skate		X	X
	Longfin squid		X	X
	Menhaden	X	X	X
	Monkfish	X	X	X
	Ocean pout	X	X	X
	Ocean quahog	X	X	X
	Offshore hake		X	X
	Pandalid shrimp	X		
	Pollock	X	X	
	Red hake	X	X	X
	Redfish	X		
	Rock crab	X	X	X
	Rosette skate			X
	Scup			X
	Shortfin squid	X	X	X
	Silver hake	X	X	X
	Smooth dogfish		X	X
	Spiny dogfish	X	X	X
	Spot			X
	Striped bass	X	X	X
	Summer flounder		X	X
	Whelks	X	X	X
	White hake	X	X	X
	Windowpane		X	X
	Winter flounder	X	X	X
	Winter skate	X	X	X
	Witch flounder	X		
	Yellowtail flounder	X	X	X

	Species	Gulf of Maine	Georges Bank	Middle Atlantic Bight
Other Non-fishery Resources	Amphipods (spp.)	X	X	X
	Annelid worm (spp.)	X	X	X
	Barndoor skate		X	
	Brittle star (spp.)	X	X	X
	Coral (spp.)	X	X	X
	Greater shearwater	X		
	Grenadier (spp.)	X	X	X
	Hermit crab (spp.)	X	X	X
	Jellyfish (spp.)	X	X	X
	Kelp (spp.)	X	X	X
	Lumpfish	X	X	X
	Northern gannet	X	X	X
	Northern stone crab	X	X	X
	Sand dollar (spp.)	X	X	X
	Sand lance (spp.)	X	X	X
	Sculpin (spp.)	X	X	X
	Sea anemone (spp.)	X	X	X
	Sea cucumber (spp.)	X		X
	Sea raven	X	X	X
	Sea robin (spp.)	X	X	X
	Sea squirt (spp.)	X	X	X
	Snail (spp.)	X	X	X
	Spider crab (spp.)	X		X
	Sponge (spp.)	X	X	X
	Spotted hake		X	X
	Starfish (spp.)	X	X	X
	Thorny skate	X	X	
	Zooplankton (spp.)	X	X	X

3.1.1.1 Atlantic Herring FMP

Atlantic herring are dispersed along the Atlantic coast from North Carolina to the Canadian Maritime provinces. Schooling, or the formation of large aggregations for feeding and migration, is characteristic of herring species. This behavior begins as early as the onset of metamorphosis during larval development. Although herring schools are sometimes visible at the water's surface during the day, they typically undertake diurnal vertical migrations, sinking to the seafloor during the day and rising to the surface after dusk. Schools of adult herring make extensive migrations to areas where they feed, spawn, and overwinter.

Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August-September) than in the southwestern GOM (early to mid-October in the Jeffreys Ledge area) and GB (as late as November-December; Reid et al. 1999). In general, GOM herring migrate from summer feeding grounds along the Maine coast and on GB to SNE/MA areas during winter, with larger individuals tending to migrate farther distances. Presently, herring from the GOM (inshore) and GB (offshore) stock components are combined for assessment purposes into a single coastal stock complex.

Atlantic sea herring stocks were first managed in 1972 through the International Commission for the Northwest Atlantic Fisheries (ICNAF),[3] which regulated the high-seas international fishery. Upon implementation of the original Magnuson Fishery Conservation and Management Act in 1976, the NEFMC developed an FMP for herring. This FMP was implemented in late 1978; however, the FMP was withdrawn in 1982 due to concerns over the lack of enforcement of state waters quotas. In 1996, the Council began development of a new FMP for herring that was intended to closely coordinate Federal management with that of the ASMFC. This FMP was implemented in 2000.

The Atlantic Herring FMP established total allowable catches (TACs) for each of four management areas in the Gulf of Maine and Georges Bank. This FMP established requirements for vessel, dealer, and processor permits, as well as reporting requirements and restrictions on the size of vessels that can catch herring. Amendment 1 to the FMP was completed in 2006 and implemented a limited access qualification program, changes to management areas, and improved monitoring of catch. Amendment 2 to the FMP was part of the 2007 SBRM Omnibus Amendment. In 2011, Amendment 4 implemented a process for establishing ACLs and AMs in the herring fishery and brought the Herring FMP into compliance with the recently reauthorized Magnuson-Stevens Act.

Although some herring are caught incidentally in recreational fisheries for Atlantic mackerel and silver hake, this is limited to coastal New Jersey, and almost all herring are caught for commercial purposes. There are two primary uses of commercially-caught herring: As bait (in either the tuna fishery or the lobster fishery) or as a food fish. Other than tuna vessels catching their own herring to use as bait, almost all herring is caught with either midwater trawls (single and paired) or purse seines. The majority of herring landings are made with midwater trawls; purse seines accounted for approximately one-fifth to one-fourth of landings from 2008-2014. Herring is also targeted by small-mesh bottom trawl vessels.

While herring is caught over a wide range, there are seasonal patterns to the fishery. During the winter months (December-March), the fishery is most active in the coastal waters south of New England, as adult herring move into this area. The fishery generally moves offshore and into the Gulf of Maine as spring approaches, and by late summer or

[3] ICNAF formerly coordinated management of many fisheries off the east coast of North America. ICNAF lasted until 1979, when it was partly replaced by Northwest Atlantic Fisheries Organization (NAFO).

early fall, the fishery concentrates on the coastal waters of Maine, New Hampshire, and Massachusetts as herring move into these areas prior to spawning. The Georges Bank fishery is most active in summer and early fall. Table 29 lists recent landings, and Table 30 identifies the major herring ports.

TABLE 12. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF ATLANTIC HERRING.

	Commercial Landings (lb)	Ex-vessel Value
2010	144,977,070	$18,367,932
2011	177,107,581	$23,274,094
2012	193,505,848	$26,508,368
2013	208,029,532	$29,867,601
2014	207,142,256	$29,043,286

TABLE 13. PRIMARY PORTS ASSOCIATED WITH THE ATLANTIC HERRING FISHERY (VALUES ARE AVERAGED FOR 2010-2014).

Primary Ports	Commercial Landings	Ex-vessel Value of Landings
PORTLAND, ME	44,303,973	$6,702,608
GLOUCESTER, MA	39,013,924	$5,198,761
NEW BEDFORD, MA	32,145,797	$2,816,966
ROCKLAND, ME	30,422,155	$4,683,919
POINT JUDITH, RI	8,690,315	$922,628

3.1.1.2 Atlantic Salmon FMP

Atlantic salmon are a migratory anadromous fish with a complex life history, going through several distinct phases marked by changes in physiology and behavior. Spawning and juvenile development of Atlantic salmon occur in fresh water New England streams, with adults undergoing a highly migratory life on the open ocean and returning to fresh water to reproduce. North American origin Atlantic salmon are either from migratory stocks, undergoing long ocean migrations, or resident stocks, with more limited ocean migrations. Northern Canadian stocks are residential, while New England stocks tend to be migratory, traveling vast distances across open ocean to feeding grounds off the coast of southwestern Greenland and later returning to their New England spawning grounds. Although rivers from Maine to Connecticut once supported healthy populations of Atlantic salmon, native Atlantic salmon have since become extirpated in all but a portion of Maine supporting the remaining Gulf of Maine Distinct Population Segment.

The NEFMC developed an FMP for Atlantic salmon that was implemented by NMFS in 1988. The FMP established explicit U.S. management authority over all Atlantic salmon of U.S. origin. The plan was intended to complement state management programs in coastal and

inland waters and Federal management authority on the high seas (conferred to the U.S. as a signatory nation to the North Atlantic Salmon Conservation Organization).

The FMP prohibits possession of Atlantic salmon and any directed or incidental (bycatch) commercial fishery for Atlantic salmon in Federal waters. The Council's Atlantic salmon plan strengthens the efforts of local groups, such as the Connecticut River Atlantic Salmon Commission, that are working towards the restoration of salmon stocks in New England river systems. The first change to the Atlantic Salmon FMP, Amendment 1, was implemented in 1999 to designate essential fish habitat and provide for a framework adjustment mechanism related to aquaculture. Amendment 2 to this FMP was the 2007 SBRM Omnibus Amendment.

The Atlantic salmon fishery expanded during the late 1800s from a reported 183 weirs and nets capturing 7,320 salmon in 1867, to 230 weirs and 36 gillnets capturing over 10,016 salmon in 1880. The catch peaked in 1889 with over 17,000 salmon and began a steady decline during the 20th century, with landings falling to as low as 40 salmon in 1947 (Collette and Klein-MacPhee 2002). Because no reporting requirements were established for the fishery, landings data are incomplete. In 1989, all state and Federal commercial salmon fisheries in New England were closed by law. Recreational fishing for sea-run Atlantic salmon is currently prohibited in all New England States. A small local fishery is ongoing for captive reared domestic Atlantic salmon released into select rivers in Connecticut and New Hampshire; these fisheries are individually regulated by each State. In spite of the decline of wild salmon populations, Atlantic salmon remains an important fishery resource in New England through the development of fish farming efforts (aquaculture and mariculture). Salmon mariculture is especially important in Maine, where harvest of farmed Atlantic salmon typically averages between 10 to 12 million pounds and reached almost 25 million pounds in 2010.

3.1.1.3 Atlantic Sea Scallop FMP

The Atlantic sea scallop is a bivalve mollusk that is highly valued for the meat in the large adductor muscle that holds the top and bottom portions of the shell together. Sea scallops are semi-mobile, bottom dwelling organisms. They are most abundant on coarse sand, gravel, and cobble. Mature females are highly fecund and produce millions of eggs during the late summer and autumn months. The Atlantic sea scallop is managed as a single unit throughout its range in United States waters. Five stock components are recognized: The Gulf of Maine; eastern Georges Bank; the Great South Channel; the New York Bight; and the waters adjacent to Delaware, Maryland, and Virginia.

The Atlantic Sea Scallop FMP, prepared by the NEFMC, was implemented in 1982 to restore adult scallop stocks and reduce year-to-year fluctuations in stock abundance caused by variation in recruitment. Amendments 4 and 7 significantly reduced fishing effort by limiting access to the resource, instituting day-at-sea (DAS) allocations (limiting the number of days a vessel is allowed to fish for scallops each year), implementing gear restrictions to improve escapement of small scallops and finfish, and limiting crew size. Area closures in New England and the Mid-Atlantic and above-average recruitment have

resulted in increased scallop biomass both within and outside of the Groundfish Closed Areas.

One of the foundations of the Scallop FMP is its area rotational management programs, established in 2004 under Amendment 10. Under this program, areas are defined and closed and reopened to fishing on a rotational basis, depending on the condition and size of the scallop resource in the areas. As a result of Amendment 10, controls on scallop effort differ depending on whether a fishing trip occurs in an access area or in an open area. Vessels either fish in access areas under allocated trips, or in open areas under DAS. Amendment 12 was the 2007 SBRM Omnibus Amendment, and Amendment 13 permanently re-activated the industry-funded observer program in the same year. Amendment 11, implemented in 2008, included measures to control capacity and mortality in the general category scallop fishery. Primary measures included a limited entry program for general category vessels, as well as other permit provisions including an individual fishing quota program (IFQ). The most recent amendment, Amendment 15, introduced annual catch limits and accountability measures to the Scallop FMP in 2011, as required by the Magnuson-Stevens Act. Various frameworks have set annual or biennial scallop specifications and have included a variety of other management measures aimed at improving the effectiveness of the various aspects of scallop fishery management.

Under current regulations, the scallop fleet can be differentiated by vessel permit category: Limited access vessels that are subject to area-specific DAS controls and trip allocations; and limited access general category vessels that are not subject to DAS controls, but are subject to a possession limit per fishing trip. There are three types of limited access general category permits: IFQ permits with a possession limit of 600 lb per trip; Northern Gulf of Maine permits with a possession limit of 200 lb per trip; and incidental permits with a possession limit of 40 lb. per trip. The limited access and limited access general category scallop fleets receives a total allocation of 94.5 percent and 5 percent, respectively, of the scallop fishery's ACL, with the remaining 0.5 percent allocated to IFQ permits on vessels that have both limited access general category IFQ and limited access scallop permits. There are no open access permits in this fishery.

Another unique aspect of the Scallop FMP is its industry-funded observer program. Every year, 1 percent of the ACL allocated to the scallop fishery is set-aside to be used as compensation for limited access or limited access general category IFQ vessels that are assigned an observer in open or access areas. If a limited access vessel is assigned an observer while fishing on an open area DAS trip, it will accrue DAS at a reduced rate for the trip. For limited access vessels on access area trips, and IFQ vessels on any trip, vessels receive additional scallop catch above the possession limit on observed trips in order to pay for the observer. If the set-aside is exhausted in a given fishing year, vessel owners must continue to pay for observers assigned to their vessel without receiving any compensation. NMFS sets the compensation rates (i.e., the appropriate scallop lb/trip for each observed trip) at the start of each fishing year based on that year's observer set-aside allocation and closely monitors the set-aside usage each year to avoid fully harvesting it whenever possible.

Scallops are harvested primarily through the use of scallop dredges and trawls. In recent years (2007-2011), almost 98 percent of all scallop landings are by dredge vessels. During the 2007-2011 fishing years, trawl vessels landed another 1-2 percent, with other gear types contributing only trace amounts of scallop landings.

The Atlantic sea scallop fishery is rebuilt to sustainable levels, following declines in fishing mortality from effort reductions, gear restrictions, and closed areas, combined with above average recruitment in some areas and in multiple years since 1999. Revenues from commercial scallop landings for New England and Mid-Atlantic states in the year 2000 were estimated at $161 million. Increased landings since the early 2000's were made possible by an increase in scallop biomass and favorable recruitment. In recent years, total commercial landings have remained relatively constant while revenue has increased by over 50 percent (Table 31). The majority of limited access vessels are based in Massachusetts, Virginia, New Jersey, and North Carolina, and the primary scallop ports are located in New Bedford, MA, Cape May, NJ, and Newport News, VA (Table 32).

TABLE 14. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF ATLANTIC SEA SCALLOPS.

	Commercial Landings (lb)	Ex-vessel Value
2010	57,060,115	$450,801,783
2011	58,900,068	$582,252,024
2012	57,131,552	$559,565,071
2013	41,203,699	$466,710,023
2014	33,895,977	$424,489,183

TABLE 15. PRIMARY PORTS ASSOCIATED WITH THE SEA SCALLOP FISHERY (VALUES ARE AVERAGED FOR 2010-2014). *DATA EXCLUDED FOR CONFIDENTIALITY.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
NEW BEDFORD, MA	27,888,156	$285,450,065
CAPE MAY, NJ	5,913,650	$55,983,038
NEWPORT NEWS, VA	3,187,051	$28,824,513
BARNEGAT LIGHT/LONG BEACH, NJ	2,019,534	$20,801,691
SEAFORD, VA	*	*

3.1.1.4 Deep-Sea Red Crab FMP

The deep-sea red crab is a deep-water brachyuran crab that occurs in a patchy distribution on the continental shelf and slope from Nova Scotia to Florida. Though the species is found

primarily within a 200-1800 meter depth band along the continental shelf and slope, red crabs have also been located in some deep-water canyons along the shelf and can also be found in the Gulf of Maine. Preferred depth depends, in part, on the characteristics of individual crabs. Young crabs dwell in considerably deeper water than adults and males are typically found deeper than females. The red crab is a slow-growing species that may not spawn annually. It is long-lived, with some individuals surviving for up to 15 years. These characteristics make it particularly susceptible to depletion by overfishing.

There has been a small directed fishery off the coast of New England and in the Mid-Atlantic for deep-sea red crab since the early 1970s. Though the size and intensity of this fishery has fluctuated, it has remained consistently small relative to more prominent New England fisheries such as groundfish, sea scallops, and lobster. Landings increased substantially after 1994, when implementation of Amendment 5 to the Northeast Multispecies FMP may have led some fishing effort to redirect onto "under-exploited" fishery resources such as red crab.

In 1999, at the request of members of the red crab fishing industry, the NEFMC began development of an FMP to prevent overfishing of the red crab resource and address a threat of overcapitalization of the red crab fishery. A control date was established in 2000 to discourage "speculative entry," or rapid entry of new vessels into the fishery and, in 2001, NMFS implemented emergency regulations to prevent overfishing of the resource during the time the FMP was being developed. The FMP was implemented in 2002. The primary management control was to establish a limited access permit program for qualifying vessels with documented history in the fishery. Other measures implemented under the FMP included DAS limits, trip limits, gear restrictions, and limits on processing crabs at sea. Framework Adjustment 1 provided for a 3-year, rather than annual, specification-setting process. Amendment 3 was implemented in 2011 to bring the FMP into compliance with the revised Magnuson-Stevens Act by implementing annual catch limits and accountability measures. Amendment 3 also revised the management measures, by eliminating DAS and the vessel trip limit. The directed, limited access red crab fishery is a male-only fishery, that is currently managed with a "hard" quota (i.e., the fishery is closed when the quota is reached), gear restrictions, and limits on processing crabs at sea.

Although there is an open access permit category, the small possession limit of 500 lb per trip has kept this sector of the fishery very small. The directed red crab fishery is limited to using parlor-less crab pots, and is considered to have little, if any, incidental catch of other species. There is no known recreational fishery for deep-sea red crab. Landings of red crab varied somewhat before the implementation of the FMP, but have stabilized since (see Table 16). All vessels with limited access permits now fish out of Fall River, MA.

TABLE 16. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF DEEP-SEA RED CRABS. *DATA EXCLUDED FOR CONFIDENTIALITY.

	Commercial Landings (lb)	Ex-vessel Value
2010	3,124,311	$3,060,452
2011	3,607,148	$3,492,893
2012	*	*
2013	*	*
2014	*	*

3.1.1.5 Mackerel, Squid, and Butterfish FMP

Atlantic mackerel, *Illex* and longfin squid, and butterfish are all schooling pelagic species that range from at least the Gulf of St. Lawrence south to at least Cape Lookout, NC.[4] Butterfish and the two squids are fast-growing, short-lived species, while Atlantic mackerel grows more slowly and lives several years longer. All four species are most abundant from Georges Bank to Cape Hatteras, NC, and follow seasonal migration patterns based largely on water temperature. Longfin inshore squid was previously referred to as *Loligo* squid. Due to a recent change in the scientific name of longfin inshore squid from *Loligo pealeii* to *Doryteuthis (Amerigo) pealeii*, the common name ''longfin squid'' is now used in all official documents to avoid confusion.

The FMP was developed by the Mid-Atlantic Council and was implemented in 1983. Early amendments to the FMP changed permit and reporting requirements, the fishing year, quota adjustment mechanisms, foreign fishing and joint venture provisions, and implemented limited access systems for butterfish and the two squid fisheries. In recent years, amendments have been implemented to rebuild the butterfish stock and address bycatch in the longfin squid fishery (Amendment 10, in 2010), limit access in the mackerel fishery (Amendment 11, in 2011), and establish ACLs and AMs for the mackerel and butterfish fisheries (Amendment 13, in 2012). Amendment 12 to this FMP was the 2007 SBRM Omnibus Amendment. Amendment 14, in 2014, improved monitoring in the mackerel, squid, and butterfish fisheries and developed measures to reduce river herring and shad bycatch. Amendment 15 was intended to add river herring and shad as stocks in the Mackerel, Squid, and Butterfish FMP, but the Council determined not to pursue this action. Other amendments are currently under development to address interactions with deep-sea corals (Amendment 16), and to address latent effort in the squid fishery.

[4] Atlantic mackerel ranges from the Gulf of St. Lawrence to Cape Lookout, NC; *Loligo* squid ranges from Newfoundland to the Gulf of Venezuela; *Illex* squid ranges from the Labrador Sea to the Florida Straits; and butterfish range from the Gulf of St. Lawrence to the coast of Florida.

The mackerel, squid, and butterfish fisheries are all managed by directly controlling harvest. The directed mackerel fishery can be closed when landings are projected to reach 95 percent of the total domestic harvest. The mackerel incidental catch fishery can be closed when landings are projected to reach 100 percent of the total domestic harvest. The directed longfin squid fishery is managed via trimester quota allocations and the directed fishery is closed when 90 percent of the trimester quota allocations or 95 percent of the total domestic harvest is projected to be landed. There is also a cap on butterfish discards in the longfin squid fishery that is allocated by trimester, and closes the longfin squid fishery to directed harvest once it has been exceeded. The directed *Illex* fishery closes when 95 percent of the total domestic harvest is projected to be landed. Finally, the butterfish possession limit is reduced when annual landings have reached a limit that is 1,411 mt less than the total domestic harvest, and the fishery is closed when the total domestic harvest has been landed. During closures of the directed longfin squid, *Illex*, or butterfish fisheries, incidental catch fisheries for these species are permitted.

Although 1.5 percent of butterfish landed from 2007-2011 were reported as caught with gillnets, and trace amount of these species were reported as caught with a variety of fishing gears, more than 98 percent of reported landings of all four species during this period were caught with otter trawls (midwater and bottom). Management measures implemented under this FMP restrict only the commercial fishing sectors, although there is a recreational fishery for Atlantic mackerel.

Fishing for Atlantic mackerel occurs year-round, although most fishing activity occurs from January through April. The *Illex* squid fishery occurs largely from June through October, although this can vary somewhat from year to year. In some years, the longfin squid fishery remains relatively consistent throughout the year, but in most years, landings peak during October through April. Butterfish are landed year-round, with no apparent seasonal patterns. Table 17 and Table 18 identify the recent landings, ex-vessel value, and primary ports for these fisheries.

TABLE 17. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES IN THE ATLANTIC MACKEREL, BUTTERFISH, AND SQUID FISHERIES.

	Atlantic mackerel		Butterfish		*Illex* squid		Longfin squid	
	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)	Commercial Landings (1,000 lb)	Ex-vessel Value ($1,000)
2010	21,775	3,808	1,270	836	34,887	11,459	14,878	15,811
2011	1,170	401	1,463	1,141	41,440	18,976	21,049	24,872
2012	11,756	3,879	1,410	1,034	25,813	10,630	28,222	31,339
2013	9,119	1,773	2,382	1,621	8,359	2,343	24,667	26,434
2014	13,178	2,991	6,923	4,596	19,332	5,856	26,564	25,954

TABLE 18. PRIMARY PORTS ASSOCIATED WITH THE ATLANTIC MACKEREL, BUTTERFISH, AND SQUID FISHERIES (VALUES ARE AVERAGED FOR 2010-2014). *DATA EXCLUDED FOR CONFIDENTIALITY

Atlantic mackerel		Butterfish		*Illex* squid		Longfin squid	
Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value
NEW BEDFORD, MA	$487,918	NORTH KINGSTOWN, RI	$715,128	CAPE MAY, NJ	$4,467,948	POINT JUDITH, RI	$9,441,237
GLOUCESTER, MA	$486,364	POINT JUDITH, RI	$381,804	NORTH KINGSTOWN, RI	*	CAPE MAY, NJ	$2,885,825
NORTH KINGSTOWN, RI	*	MONTAUK, NY	$293,912	HAMPTON, VA	*	MONTAUK, NY	$3,575,063
CAPE MAY, NJ	$168,671	NEW BEDFORD, MA	$83,127	WANCHESE, NC	$114,807	NORTH KINGSTOWN, RI	$2,177,443
PORTLAND, ME	$118,672	STONINGTON, CT	$42,241	POINT JUDITH, RI	$163,069	HAMPTON BAYS, NY	$2,081,842

3.1.1.6 Monkfish FMP

The monkfish (also known as goosefish) is a member of the anglerfish family Lophiidae, fishes distinguished by an appendage on the head known as the illicium which has a fleshy end (esca) that acts as a lure to attract prey to within range of its large mouth. Monkfish have a large, bony head and are harvested for their livers and the tender meat in their tails. The species is distributed widely throughout the Northwest Atlantic, from the northern Gulf of St. Lawrence to Cape Hatteras, NC, and is known to inhabit waters from the tide-line to depths as great at 840 meters across a wide range of temperatures.

Adults have been found on a variety of substrate types including hard sand, gravel, broken shell, and soft mud. Spawning occurs in May and June from Cape Hatteras to southern New England. Mature females, which are slightly larger than males, produce a non-adhesive, mucoid egg raft or veil which can reach 20-40 feet in length and ½-5 feet in width. During spawning, this large mass of eggs can account for up to 50 percent of a female's body mass. Monkfish are managed as two stocks, a northern stock from Maine to Cape Cod, MA, and a southern stock from Cape Cod to North Carolina.

During the early 1990s, fishermen and dealers in the monkfish fishery addressed both the New England and MAFMCs with concerns about the increasing amount of small fish being landed, the increasing frequency of gear conflicts between monkfish vessels and those in other fisheries, and the expanding directed trawl fishery. In response, the Councils developed a joint FMP that was implemented in 1999. The FMP was designed to stop overfishing and rebuild the stocks through a number of measures, including: Limiting the number of vessels with access to the fishery and allocating DAS to those vessels; setting trip limits for vessels fishing for monkfish; minimum fish size limits; gear restrictions; mandatory time out of the fishery during the spawning season; and a framework adjustment process.

Reported landings of monkfish increased dramatically from the late 1970s until the mid-1990s and have remained high (Table 19). Burgeoning markets for monkfish tails and livers in the 1980s allowed fishermen to fish profitably for monkfish, landing increasingly smaller monkfish as the stocks became depleted. Since the implementation of the FMP, however, vessels are more commonly landing large, whole monkfish for export to Asian markets. Revenues have generally increased since the mid-1980s and the relative value of monkfish is currently at its highest point since 1996 (Table 19 and Table 20).

TABLE 19. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF MONKFISH.

	Commercial Landings (lb)	Ex-vessel Value
2010	8,840,157	$19,210,647
2011	10,647,111	$26,589,688
2012	11,505,017	$27,133,777
2013	9,844,989	$18,708,988
2014	9,549,031	$19,047,301

TABLE 20. PRIMARY PORTS ASSOCIATED WITH THE MONKFISH FISHERY (VALUES ARE AVERAGED FOR 2010-2014).

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
NEW BEDFORD, MA	1,874,329	$4,697,797
GLOUCESTER, MA	1,053,099	$3,127,155
BARNEGAT LIGHT/LONG BEACH, NJ	1,004,247	$1,951,212
POINT JUDITH, RI	900,255	$2,028,754
BOSTON, MA	591,428	$1,802,295
CHATHAM, MA	544,087	$925,923
MONTAUK, NY	541,351	$939,915
LITTLE COMPTON, RI	530,971	$796,790
NEW LONDON, CT	431,321	$707,725

The majority of commercial landings are made using gillnets (67 percent) with another 26 percent landed by otter trawls (according to the VTR database, 2007-2011). Scallop dredges also catch monkfish, but in much smaller amounts (7 percent of reported landings, 2007-2011). No other gear types account for more than trace landings of monkfish. There is no recreational component to this fishery.

The Monkfish FMP has been modified by three amendments and 7 framework adjustment actions since 1999. Amendments have implemented more substantial changes to the FMP, while framework adjustments implement less substantive revisions to existing measures, or specify annual catch levels. Amendment 1 implemented the Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act in 1999. Amendment 2, implemented in 2005, included restrictions on otter trawls in certain areas, made the minimum fish size consistent in all areas, closed two offshore canyons to monkfish fishing, created a monkfish research DAS set-aside program, and created new permit categories for fishing in designated areas, among other measures. Amendment 3 was the 2007 SBRM Omnibus Amendment. In 2011, Amendment 5 implemented a process to establish acceptable biological catch amounts and annual catch limits, along with accountability measures to prevent overfishing if such catch limits are exceeded, to bring the FMP into

compliance with the Magnuson-Stevens Reauthorization Act. Framework adjustments have generally specified appropriate fishing measures (DAS and trip limits) for each management area to achieve, but not exceed annual catch targets.

3.1.1.7 Northeast Multispecies FMP

Sixteen species of groundfish are managed under this FMP. Thirteen species are managed as part of the large-mesh complex, based on fish size and type of gear used to harvest the fish, and five species are managed under a separate small-mesh multispecies FMP. While these eighteen groundfish species exhibit unique body types, behaviors, and habitat preferences, all are demersal, living near the bottom and feeding on benthic organisms. Groundfish are found throughout New England waters, from the Gulf of Maine to southern New England.

In 1977, the Council's first groundfish FMP, including only cod, haddock, and yellowtail flounder, was implemented. This plan was primarily developed by NMFS and its individual species quotas were a continuation of the International Commission for the Northwest Atlantic quota-based management system. Although the quotas did reduce the catch of these species, the system had a number of serious flaws. Because there was no limit on the number of participants, the number of vessels increased dramatically as the stocks improved between 1977 and 1980. The increasing number of vessels caught the quota in less time causing the fishery to be closed more frequently and for longer periods of time. The quotas forced vessels to catch fish as fast as possible to get the largest possible share before the fishery was closed (known as a "derby" fishery). In 1977, the Gulf of Maine cod quota was taken in 5 months and the Georges Bank quota was caught in 6 months.

The Council implemented a system of individual vessel trip limits that helped to prevent long closures that disrupted market supplies. This action was also intended to mitigate the derby fishery, which caused safety concerns, and to give small boats a greater chance to catch a share of fish proportional to their traditional participation levels. Limits were set for each species and stock area for each of three vessel categories. Because of problems associated with data reliability, enforcement, and equity among the vessel sectors, the Council eliminated the quota-based management system when it adopted the Interim Groundfish FMP in 1982. This plan replaced the catch quotas with minimum fish size and codend mesh size regulations for Georges Bank and the Gulf of Maine. It also allowed small-mesh fishing to continue throughout the Gulf of Maine. Closed areas intended to protect spawning haddock were left in place.

What we now consider the Northeast Multispecies FMP was implemented in 1986. It was the first plan in the world to set biological targets in terms of maximum spawning potential. This mechanism allows the Council to meet its biological objectives either by increasing the age-at-first capture (size of fish caught) or by controlling fishing mortality. The plan also greatly expanded the number of species included in the management unit. In its first year, the plan set minimum fish sizes

for some species and changed minimum fish sizes for others. The plan also enlarged one of the haddock spawning closed areas, Area I, and established a large closed area off of southern New England to protect spawning yellowtail and to help reduce fishing mortality. The Exempted Fisheries Program substantially reduced the area and time period available for small-mesh fishing in the Gulf of Maine.

In 1987, the Council adopted Amendment 1 to the FMP, which decreased the area for the silver hake exempted fishery, increased the large-mesh area to include some important yellowtail flounder grounds to the south, and tightened existing mesh size regulations and regulations for the southern New England yellowtail flounder area. Amendment 2 eliminated a scheduled increase in codend mesh size, and implemented the following measures: (1) Trip bycatch limits and stricter non-reporting penalties in the Exempted Fisheries Program; (2) increased some minimum fish sizes; (3) established a seasonal large-mesh area on Nantucket Shoals to protect cod; (4) applied mesh size regulations to the whole nets rather than only to the codend; (5) set all recreational minimum sizes to be consistent with commercial minimum sizes; and (6) excluded trawlers from Closed Area II during the closure to improve enforcement of the closure.

Amendment 3, implemented in 1989, established the Flexible Area Action System. Its purpose was to enable the Council and NMFS to respond quickly to protect large concentrations of juvenile, sub-legal (smaller than the minimum legal size) and spawning fish. Amendment 4 was implemented in 1991 and added more restrictions to the Exempted Fisheries Program; established a procedure for the Council to make recommendations for modifying northern shrimp gear to reduce the bycatch of groundfish; expanded the management unit to include silver hake, ocean pout, and red hake; established management measures for the Cultivator Shoals silver hake fishery; further tightened restrictions on the carrying of small mesh while fishing in the Regulated Mesh Area; and established a minimum mesh size in the southern New England yellowtail flounder area.

Amendment 5 was implemented in 1994 to address the overfishing of principal groundfish stocks that occurred in the late 1980s and early 1990s and reflected a significant turning point in the management of the Northeast multispecies fishery. Amendment 5 established a moratorium on new vessel permits during the rebuilding period (creating the current limited access permit system based on history in the fishery), implemented a DAS effort reduction program (the first of its kind), added additional mesh size restrictions, and also included interim gillnet regulations to reduce harbor porpoise bycatch, a mandatory vessel trip reporting system for landings, a prohibition on pair-trawling, a requirement for a finfish excluder device for shrimp fishery, changed some minimum fish sizes, and expanded the size of Closed Area II. Amendment 6 followed shortly after to implement additional haddock conservation measures.

Amendment 7, implemented in 1996, accelerated the DAS effort reduction program established in Amendment 5, eliminated significant exemptions from the current

effort control program, provided incentives to fish exclusively with mesh larger than the minimum required, broadened the area closures to protect juvenile and spawning fish, and increased the haddock possession limit. It established a rebuilding program for Georges Bank and Southern New England yellowtail flounder, Georges Bank and Gulf of Maine cod, and Georges Bank haddock based primarily on DAS controls, area closures, and minimum mesh size. Additionally, the amendment changed existing permit categories and initiated several new ones, including an open access multispecies permit for limited access sea scallop vessels. Amendment 7 also created a program for reviewing the management measures annually and making changes to the regulations through the framework adjustment process to insure that plan goals would be met.

Amendment 8 was implemented to address gear conflict issues between the mobile gear participants of the groundfish and scallop fisheries and the fixed gear participants of the lobster fishery. Amendment 9 established new status determination criteria (overfishing definitions) and set optimum yield for twelve groundfish species to bring the plan into compliance with the Sustainable Fisheries Act. Amendment 9 also added Atlantic halibut to the FMP's management unit. Amendment 10, known as the "consistency amendment," was developed to make the vessel upgrading and replacement provisions consistent across all New England and MAFMC FMPs. Amendment 11 addressed the Sustainable Fisheries Act EFH requirements. Amendment 12 addressed the Sustainable Fisheries Act requirements for silver hake, red hake, and offshore hake through a separate small-mesh multispecies management program implemented in 2000.

In addition to the amendments implemented prior to Amendment 13, the FMP was modified through a number of framework adjustments designed to achieve the Amendment 7 fishing mortality targets or to fulfill the requirement for annual adjustments to management measures. Several joint frameworks with the Sea Scallop FMP were implemented to provide scallop vessels access to the groundfish closed areas. Frameworks 32, 35, 37, and 38 instituted additional changes to management of the small-mesh fishery, including several new small-mesh gear exemption areas and elimination of default rebuilding measures.

The Council began work on Amendment 13 in February 1999. The purpose for this amendment included a need to develop rebuilding programs to meet the Amendment 9 status determination criteria and to address problems identified with the effort control program (DAS). After this amendment was begun, the Council submitted Framework 33 to meet the Amendment 7 requirement for an annual adjustment to the FMP. This framework was implemented May 1, 2000. On May 19, 2000, a coalition of conservation organizations challenged Framework 33 alleging that it failed to implement programs necessary to rebuild groundfish stocks to the Amendment 9 targets and did not meet bycatch requirements of the Magnuson-Stevens Act (*Conservation Law Foundation et al*. v. *Evans et al*.). The Court found in favor of the plaintiffs on December 28, 2001. After a series of negotiations among various parties, interim measures were adopted by the Court in 2002 and NMFS was

instructed to submit a management plan that complied with the Magnuson-Stevens Act. Amendment 13–already in development–was recognized as the most appropriate vehicle to meet the Court's requirement.

Amendment 13 was implemented in 2004, and included several new management features. The amendment classified multispecies DAS into three categories (unrestricted A DAS, restricted use B DAS, and C DAS, which cannot be used at this time); enables the Council to create/allow "special access programs" (SAPs)[5] for healthy stocks, such as Georges Bank haddock; allows sectors of the groundfish fishing industry to develop their own sector allocation plan; includes an adaptive approach for rebuilding groundfish stocks that requires biennial adjustments to management measures; and implements several provisions of the U.S./Canada Resource Sharing Understanding.[6] Since Amendment 13 was implemented, several framework adjustments have been developed to modify, fully implement, and/or comply with various provisions of Amendment 13. Several environmental groups challenged Amendment 13, claiming that the rebuilding programs did not comply with the Magnuson-Stevens Act, the management measures would be ineffective, an SBRM was not included, and the amendment did not consider a sufficiently broad range of alternatives. The Court upheld the amendment with the exception of the reference to the SBRM.

Amendment 16 was implemented May 1, 2010, and provided major changes in the realm of groundfish management. Notably, it greatly expanded the sector program and implemented Annual Catch Limits in compliance with 2006 revisions to the Magnuson-Stevens Act. As a result of this amendment, about 95 percent of the fishery chose to operate in a form of cooperative referred to as a sector, subject to strict limits on catch. These vessels are not subject to trip limit or days-at-sea controls. This management system drastically changed the way the fishery operates. At the time of its implementation, Amendment 16 was expected to reduce bycatch as it reduces regulatory discards. Possession of some species was prohibited to reduce catches (ocean pout, windowpane flounder, wolffish, SNE/MA winter flounder). The amendment also included a host of mortality reduction

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[5] There are three SAPs currently in place: The Closed Area I Hook Gear Haddock SAP is open to NE multispecies DAS vessels fishing with hook gear in a portion of Closed Area I; the Eastern U.S./Canada Haddock SAP Pilot Program is open to NE multispecies DAS vessels using a haddock "separator" trawl in portions of the Eastern U.S./Canada Area and Closed Area II; and the Closed Area II Yellowtail Flounder SAP is open to NE multispecies DAS vessels fishing for yellowtail flounder in the southern portion of Closed Area II.

[6] The U.S./Canada Resource Sharing Understanding (Understanding) was reached between the United States and Canada regarding the management of Georges Bank cod, Georges Bank haddock, and Georges Bank yellowtail flounder resources found within the waters of both countries in an area known as the U.S./Canada Management Area. Amendment 13 implements certain measures consistent with the Understanding, including a requirement to use VMS, an area declaration requirement, and specific gear requirements (flatfish net or haddock separator trawl).

measures for "common pool" (i.e., non-sector) vessels and the recreational component of the fishery.

The Council developed Amendment 19 with the initial goal of bringing the small-mesh multispecies portion of the NE Multispecies FMP into compliance with the ACL and AM requirements of the reauthorized Magnuson-Stevens Act. However, development of Amendment 19 was delayed for several reasons, so NMFS implemented ACLs and AMs for the small-mesh multispecies in 2012 through a Secretarial Amendment. The Council continued development of Amendment 19 in order to adopt the ACL framework used by the Secretarial Amendment, as well as to modify other management measures for the small-mesh multispecies fishery. The management measures in the Secretarial Amendment and Amendment 19 include an incidental trip limit trigger to prevent the ACL from being exceeded, a year-round trip limit for red hake, and the potential to implement a quarterly quota system in the southern area, should landings increase rapidly. Because these species are caught incidentally in many fisheries, landings are never prohibited if a quota is projected to be reached, just reduced to an incidental limit to discourage directed fishing. In general, the small-mesh multispecies portion of the fishery is managed using mesh-size dependent trip limits for whiting (silver and offshore hake, combined), area restrictions on small-mesh, and a new year-round trip limit for red hake.

The NE Multispecies FMP has been modified through a number of framework adjustments designed to achieve fishing mortality targets or to fulfill the requirement for annual adjustments to management measures. Several joint frameworks with the Atlantic Scallop FMP were implemented to provide scallop vessels access to the groundfish closed areas. Frameworks 32, 35, 37, and 38 each instituted additional changes to management of the small-mesh fishery, including several new small-mesh gear exemption areas and elimination of default rebuilding measures.

There are a variety of fishing gears used in the commercial groundfish fishery. Otter trawls are the primary gear type used for all species in both the large-mesh and small-mesh complexes and flatfish and silver hake are caught almost exclusively with otter trawls. Based on VTR data for 2007-2011, gillnets contribute substantial amounts of Atlantic cod, pollock, redfish, and white hake. Other gears identified in the FVTR data associated with landings of groundfish include handlines, longlines, and fish pots. Recreational fishing for groundfish is focused primarily Atlantic cod, pollock, haddock, red hake, and winter flounder. Recreational fishing is conducted by shore-based anglers and anglers with private boats, as well as by anglers aboard party/charter vessels. See below for recent commercial landings of large-mesh (Table 38) and small-mesh (Table 40) multispecies, aggregated across the complexes. Table 39 and Table 41 identify the primary ports associated with the large-mesh and small-mesh multispecies complexes, respectively, along with the average recent landings and ex-vessel values for each of the primary ports.

TABLE 21. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF LARGE-MESH MULTISPECIES (AGGREGATED).

	Commercial Landings (lb)	Ex-vessel Value
2010	62,165,855	$85,239,958
2011	63,161,506	$91,237,378
2012	55,095,497	$82,169,154
2013	44,894,643	$63,362,159
2014	48,139,099	$65,853,590

TABLE 22. PRIMARY PORTS ASSOCIATED WITH THE LARGE-MESH MULTISPECIES FISHERY (VALUES ARE AGGREGATED AND AVERAGED FOR 2010-2014).

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
GLOUCESTER, MA	17,615,768	$24,212,104
NEW BEDFORD, MA	17,037,387	$24,821,492
BOSTON, MA	8,903,765	$11,379,312
PORTLAND, ME	3,679,354	$5,199,408
POINT JUDITH, RI	1,148,478	$1,946,519

TABLE 23. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF SMALL-MESH MULTISPECIES (AGGREGATED).

	Commercial Landings (lb)	Ex-vessel Value
2010	19,072,767	$11,550,525
2011	18,347,731	$11,584,240
2012	17,674,293	$11,329,843
2013	14,872,507	$9,318,464
2014	17,495,471	$12,030,911

TABLE 24. PRIMARY PORTS ASSOCIATED WITH THE SMALL-MESH MULTISPECIES FISHERY (VALUES ARE AGGREGATED AND AVERAGED FOR 2010-2014).

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
NEW BEDFORD, MA	6,263,913	$3,816,393
POINT JUDITH, RI	3,092,415	$1,600,930
MONTAUK, NY	2,710,013	$2,055,788
NEW LONDON, CT	1,376,807	$1,079,459
GLOUCESTER, MA	1,082,682	$742,413

3.1.1.8 Northeast Skate FMP

There are seven species included in the Northeast skate complex: Barndoor skate, clearnose skate, little skate, rosette skate, smooth skate, thorny skate, and winter skate. The Northeast skate complex is distributed along the coast of the northeastern United States from near the tide line to depths exceeding 700 meters. Within the complex, the ranges of the individual species vary. The center of distribution for little and winter skates is Georges Bank and southern New England. Barndoor skate is most common in the offshore Gulf of Maine, on Georges Bank, and in southern New England. Thorny and smooth skates are commonly found in the Gulf of Maine. Clearnose and rosette skates have a more southern distribution, and are found in southern New England and the Chesapeake Bight. Skates are not known to undertake large-scale migrations, but they do move seasonally in response to changes in water temperature, moving offshore in summer and early autumn and returning inshore during winter and spring.

A Northeast Skate Complex FMP was developed by the Council and was implemented in 2003. The regulations implementing the FMP require the Council to monitor the status of the subject skates and the fishery on an annual basis. The initial regulations under the FMP included the following: Permit requirements for vessels possessing skates and dealers purchasing skates; reporting requirements; a possession limit for skate wings; an exemption from the wing possession limit for vessels fishing only for skates for the bait market; and prohibitions on the possession of smooth skates from or in the Gulf of Maine, and barndoor and thorny skates throughout their range. The original FMP also incorporated a baseline of management measures implemented under other FMPs (Northeast Multispecies, Sea Scallops, and Monkfish) that directly or indirectly control fishing effort on skates. Any proposed changes to these FMPs that could result in an increase in fishing effort on skates were required to first undergo a "skate baseline review" to determine whether, and to what degree, the change may have an impact on skate conservation. The FMP was developed, in part, to collect more complete and accurate information on the catch and disposition of skates in Northeast fisheries, at the species level. Stock assessments and efforts to manage fishing mortality have been hampered by a lack of species-specific catch information. The first amendment to the Skate FMP was the 2007 SBRM Omnibus Amendment.

Amendment 3 to the Skate FMP was implemented in 2010, to establish ACLs and AMs for the skate complex as required by the re-authorized Magnuson-Stevens Act, and to implement measures to rebuild overfished skate stocks. Amendment 3 implemented a stock complex ACL for skates, but created separate landing quotas for the skate wing and bait fisheries, and reduced the skate wing and bait possession limits. The skate bait fishery annual total allowable landings were divided into three separate seasonal quotas to maintain year-round supply of bait. AMs would be triggered if the total allowable landings or ACL were exceeded. Amendment 3 also replaced the skate baseline review with annual review and specification procedures. Framework Adjustment 1 to the Skate FMP was subsequently

implemented in 2011, to further reduce the skate wing possession limits, and adjust the in-season trigger of the incidental possession limit. Skates are harvested for two very different commercial markets—one market supplies whole skates to be used as bait in the lobster fishery, and one market supplies skate wings for human consumption. The skate bait fishery is a directed fishery and is more traditional, involving vessels primarily from southern New England ports that target a combination of little skates (>90 percent) and, to a much lesser extent, juvenile winter skates (<10 percent). The vessels supplying skates for the bait market tend to make dedicated trips targeting skates and land large quantities of skates per trip.

The skate wing fishery developed in the 1990s when skates were promoted as "underutilized species," and fishermen shifted effort from groundfish and other fisheries to skates and spiny dogfish. The wing fishery is largely an incidental catch fishery that involves vessels that also participate in the groundfish and/or monkfish fisheries. Although some vessels will make trips specifically targeting winter skates for the wing market, most skates caught for this market are retained by vessels engaged in other fisheries. Most skates are caught using an otter trawl (according to the VTR) database for 2007-2011, almost 65 percent of landings were from an otter trawl), although gillnets are also used (the remaining 35 percent of 2007-2011 landings were from gillnets). Small amounts of landings are associated with hook and line gear and scallop dredges.

Even though skates are now managed under a Federal FMP, reported landings remain incomplete at the species level. Although some skates are caught by recreational fishermen, recreational landings of skates are negligible both in the context of all recreational fisheries and in the context of the overall skate fisheries. Thus, Table 42 reports recent commercial landings and the ex-vessel value of skates aggregated across all species. Table 43 identifies the primary ports associated with the skate fishery.

TABLE 25. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF SKATES (AGGREGATED).

	Commercial Landings (lb)	Ex-vessel Value
2010	24,581,085	$7,624,482
2011	22,345,312	$8,425,052
2012	22,968,345	$7,937,143
2013	20,377,800	$7,303,131
2014	21,394,736	$9,623,271

TABLE 26. PRIMARY PORTS ASSOCIATED WITH THE SKATE FISHERY (2010-2014 VALUES ARE AVERAGED). *DATA EXCLUDED FOR CONFIDENTIALITY.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
POINT JUDITH, RI	7,382,750	$1,415,613
NEW BEDFORD, MA	3,050,385	$1,642,701
CHATHAM, MA	2,822,778	$1,634,998
NEWPORT, RI	2,440,504	$497,633
FALL RIVER, MA	*	*

3.1.1.9 Spiny Dogfish FMP

Spiny dogfish are the most abundant sharks in the western North Atlantic, and range from Labrador to Florida, although they are most abundant from Nova Scotia to Cape Hatteras, North Carolina. Spiny dogfish are highly migratory, often traveling in large troops, and they move northward in the spring and summer and southward in the fall and winter. Spiny dogfish are known to be opportunistic predators, consuming whatever prey are readily abundant in their environment, including pelagic and benthic invertebrates and fishes. Although dogfish have a varied diet, most of what they eat are invertebrates (ctenophores in particular) and a recent study of 40,000 stomachs found that less than 1 percent of their diet was composed of principal groundfish species (Link et al. 2002).

In spite of their large numbers and opportunistic feeding, spiny dogfish, like many elasmobranches, suffer from several reproductive constraints. Females may take 7-12 years to reach maturity, growing more than one-third larger than their mature male counterparts before becoming sexually mature. Fertilization and egg development are internal, and gestation takes roughly 2 years, resulting in litters that usually average 6-7 dogfish "pups." As a result of these factors (long time to maturity, long gestation periods, and low fecundity), spiny dogfish are vulnerable to overfishing, particularly if fishing activities focus on the largest individuals, which are almost all mature females.

As a result of increased fishing pressure, spiny dogfish were classified as overfished in 1998. The Mid-Atlantic and NEFMCs jointly developed an FMP for spiny dogfish. This plan was partially approved in 1999 and implemented in 2000 and the management measures included an overall commercial quota, allocated into two semiannual periods; restrictive trip limits; a prohibition on finning; an annual quota adjustment process; and permit and reporting requirements. The Atlantic States Marine Fisheries Commission implements complementary management measures for spiny dogfish in state waters. The most significant effect of the original FMP

measures was the elimination of the directed dogfish fishery in Federal waters.[7] Framework Adjustment 1 to the FMP, implemented in 2006, provided for a multi-year, rather than annual, specification-setting process. Framework Adjustment 2, implemented in 2009, adjusted the FMP to allow for more efficient implementation of new scientific information on stock status and biological reference points. The spiny dogfish stock was officially declared to be rebuilt in 2010, and commercial quotas have been significantly increased in recent years. Amendment 1 to the Spiny Dogfish FMP was the 2007 SBRM Omnibus Amendment. Amendment 2 was implemented in 2011 to bring the FMP into compliance with the revised Magnuson-Stevens Act by implementing annual catch limits and accountability measures.

By far most spiny dogfish landings are the result of commercial fishing activities, as reported recreational landings comprise less than 2 percent of the total catch. Sink gillnets, bottom longlines, and bottom otter trawls are the primary commercial fishing gears that catch spiny dogfish and these three gear types accounted for 97 percent of all dogfish landed in 2007-2011. Over the last several years, commercial landings ranged from 6.6 million lb in 2007 up to as 20.9 million lb in 2011 (see Table 44). For fishing years 2007-2011 combined, the Massachusetts ports had the most commercial landings (42.5 percent), with another 19 percent made in Virginia, and 10 percent in New Hampshire. Table 45 identifies the primary ports of spiny dogfish landings from 2007 to 2011.

TABLE 27. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES OF SPINY DOGFISH.

	Commercial Landings (lb)	Ex-vessel Value
2010	12,141,697	$2,499,603
2011	20,901,761	$4,549,273
2012	23,335,350	$5,005,201
2013	16,023,231	$2,399,488
2014	23,711,400	$4,080,792

[7] Directed fishing for spiny dogfish continued in state waters until 2004, by which time the states had followed suit to implement restrictive trip limits and eliminate the directed dogfish fishery.

TABLE 28. PRIMARY PORTS ASSOCIATED WITH THE SPINY DOGFISH FISHERY (VALUES AVERAGED FOR 2010-2014). *DATA EXCLUDED FOR CONFIDENTIALITY.

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
CHATHAM, MA	3,708,318	$699,407
GLOUCESTER, MA	2,060,339	$442,056
HATTERAS, NC	1,733,815	$207,335
VIRGINIA BEACH/LYNNHAVEN, VA	*	*
SCITUATE, MA	918,516	$192,327

3.1.1.10 Summer Flounder, Scup, and Black Sea Bass FMP

Summer flounder, scup, and black sea bass are three demersal finfish species that occur primarily in the Middle Atlantic Bight from Cape Cod, MA, to Cape Hatteras, NC.[8] All three species exhibit seasonal movement or migration patterns. Summer flounder move inshore to shallow coastal and estuarine waters during warmer months and move offshore during colder months. Scup is a schooling species that undertakes extensive migrations between the coastal waters in the summer and outer continental shelf waters in the winter. Black sea bass are most often found in association with structured habitats, and they migrate offshore and to the south as waters cool in the fall, returning north and inshore to coastal areas and bays as waters warm in the spring.

The FMP was developed by the MAFMC, initially just for summer flounder, and approved by the Secretary of Commerce in 1988. This original Summer Flounder FMP was based largely on the ASMFC plan. The first major amendment, Amendment 2, was implemented in 1993 and it established much of the current management regime, including a commercial quota allocated to the states, a recreational harvest limit, minimum size limits, gear restrictions, permit and reporting requirements, and an annual review process to establish specifications for the coming fishing year. Amendments 4 through 7 made relatively minor adjustments to the management program.

Although initially intended to be separate FMPs, work on the development of the Scup FMP and the Black Sea Bass FMP was folded into the Summer Flounder FMP, which was broadened to incorporate management measures for scup and black sea bass through Amendments 8 and 9, respectively. These amendments included management measures for scup and black sea bass such as commercial quotas and quota periods, commercial fishing gear requirements, minimum fish size limits,

[8] Summer flounder range from Nova Scotia to Florida; scup range from the Bay of Fundy to Florida; and black sea bass range from southern Nova Scotia to southern Florida and into the Gulf of Mexico.

recreational harvest limits, and permit and reporting requirements. Both amendments were implemented in 1996. Amendments 10 and 11 made relatively minor changes to the management systems for these fisheries, including removing the sunset provisions related to the limited access (moratorium) permits, gear requirements, and to achieve consistency among all Mid-Atlantic and NEFMC FMPs regarding vessel replacement and upgrade provisions.

Amendment 12 was developed to bring the FMP into compliance with the provisions of the Sustainable Fisheries Act. This amendment included revised overfishing definitions for all three species, established rebuilding programs, addressed bycatch and habitat issues, and established a framework adjustment procedure for the FMP to allow relatively minor changes to management measures to be implemented through a streamlined process. Amendment 12 was implemented in 1999, although not all of the elements of the amendment were approved by NMFS. In particular, the EFH provisions for all three species and the rebuilding program for scup were not approved.

Implemented in 2003, Amendment 13 focused primarily on the commercial black sea bass fishery, although it also served to bring the FMP into compliance with the Sustainable Fisheries Act regarding the EFH requirements for all three species. The most significant change to the commercial black sea bass fishery eliminated the quarterly quota system, replaced with an annual coastwide quota. This change provided a framework for the ASMFC to allocate the annual quota on a state-by-state basis.

Amendment 14 to the FMP, implemented in 2007, addressed the requirement to establish a rebuilding program for scup, which was declared in 2005 to be overfished. Scup was declared rebuilt as of 2009, and is no longer under a rebuilding plan. An upcoming amendment (Amendment 18) is planned to address a wide range of issues associated with the management of scup (including the commercial/recreational split and the allocation of commercial scup quota among the three quota periods, among other issues). Amendment 17 has been initiated, but not yet completed, to discuss the potential for the black sea bass recreational fishery to be managed using conservation equivalency.

In order to come into compliance with the revised Magnuson-Stevens Act, the MAFMC developed an omnibus amendment for all of its FMPs. The ACL/AM Omnibus Amendment (Amendment 15 to the Summer Flounder, Scup, and Black Sea Bass FMP) implemented ACLs and AMs for these three fisheries. Amendment 16 to the FMP was the 2007 SBRM Omnibus Amendment.

For each of these three species, an annual acceptable biological catch (ABC) is established by the Council. The ABC is then divided, using percentages identified in

the FMP[9], into a commercial ACL and a recreational ACL. The Council then sets corresponding annual catch targets (ACT) for each fishing sector. The commercial quota and recreational harvest limit are the amount of landings remaining after deducting discards from the respective ACTs. The commercial fisheries for all three species are managed through a combination of limited access (moratorium) fishing vessel permits, annual quotas that result in closures of the fisheries upon reaching the quota, gear restrictions, and minimum fish sizes. The summer flounder and black sea bass commercial quotas are managed on an annual basis, but the scup commercial quota is sub-divided into three quota periods (Winter I, Summer, and Winter II); although the black sea bass and scup quotas are managed on a coastwide basis, the summer flounder quota is managed on a state-by-state basis.[10] The annual specifications for these three fisheries may be set each year or for up to 3 years in advance.

The recreational fisheries are not subject to a "hard" quota, but instead are subject to a set of management measures designed to constrain catch to a target level. Management measures used include minimum fish sizes, bag (possession) limits, and fishing seasons. AMs for the recreational fisheries include a pound-for-pound payback of any overage of the ACL.[11] Party/charter vessels operating in Federal waters are required to obtain Federal permits. Coastwide management measures are established for the black sea bass and scup recreational fisheries operating in Federal waters, but for summer flounder, the states have the option to develop state-by-state measures that, in sum, would achieve the equivalent level of conservation as would the coastwide measures. All decisions regarding annual quotas and management measures for these commercial and recreational fisheries are made in conjunction with the ASMFC.

All three of these species support significant recreational as well as commercial fisheries. On average, commercial landings over the last several years accounted for slightly more than half to two-thirds of the total landings of summer flounder and scup, while black sea bass recreational landings typically exceed commercial landings. The primary gears used in the commercial fisheries for these species vary. Based on fishing vessel trip report data from 2007-2011, summer flounder are caught almost exclusively (95 percent) with bottom otter trawls; scup are caught

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[9] The summer flounder TAL is allocated 60 percent to the commercial fishery and 40 percent to the recreational. The scup TAL is allocated 78 percent to the commercial fishery, while 22 percent is allocated to the recreational fishery. The black sea bass TAL is allocated 49 percent to the commercial fishery, with 51 percent allocated to the recreational fishery.

[10] Similar to the percentage allocation of the TAL to the commercial and recreational fisheries, the FMP allocates the commercial summer flounder quota among the states from North Carolina to Maine according to specific percentage shares.

[11] An Omnibus Amendment (Amendment 19 to the Summer Flounder, Scup, and Black Sea Bass FMP) is under development that may revise the AMs for the Mid-Atlantic Council's recreational fisheries.

primarily (92 percent) with bottom otter trawls, but handlines/rod and reel combined with pots, traps, and weirs accounted for another 6 percent; and black sea bass are caught in roughly equal amounts by bottom otter trawls (47 percent), and pots and traps (46 percent), and to a much lesser extent by handlines/rod and reel (5 percent). Recreational fishing for these species is enjoyed by shore-based anglers, private recreational boat anglers, and anglers on party and charter vessels. Table 46 and Table 47 identify the recent commercial landings as well as the primary ports and ex-vessel value of the commercial fishery.

TABLE 29. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES IN THE SUMMER FLOUNDER, SCUP, AND BLACK SEA BASS FISHERIES.

	Summer Flounder		Scup		Black Sea Bass	
	Commercial Landings (lb)	Ex-vessel Value	Commercial Landings (lb)	Ex-vessel Value	Commercial Landings (lb)	Ex-vessel Value
2010	13,400,584	$26,980,011	10,437,483	$6,912,378	1,734,077	$5,367,706
2011	16,567,658	$30,184,226	15,017,382	$8,362,455	1,688,258	$5,508,102
2012	13,049,845	$30,254,138	14,885,859	$10,438,115	1,724,548	$5,747,616
2013	12,441,067	$29,051,149	17,869,273	$9,791,416	2,262,330	$7,381,708
2014	10,999,319	$30,206,753	15,964,207	$9,526,277	2,621,123	$8,383,370

TABLE 30. PRIMARY PORTS ASSOCIATED WITH THE SUMMER FLOUNDER, SCUP, AND BLACK SEA BASS COMMERCIAL FISHERIES (VALUES ARE AVERAGED FOR 2010-2014).

Summer Flounder		Scup		Black Sea Bass	
Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value	Primary Ports	Ex-vessel Value
POINT JUDITH, RI	$5,645,826	POINT JUDITH, RI	$2,853,004	OCEAN CITY, MD	$563,564
NEWPORT NEWS, VA	$2,896,245	MONTAUK, NY	$1,852,083	POINT PLEASANT, NJ	$624,918
HAMPTON, VA	$2,440,962	POINT PLEASANT, NJ	$547,945	POINT JUDITH, RI	$569,412
POINT PLEASANT, NJ	$2,243,934	NEW BEDFORD, MA	$529,606	CAPE MAY, NJ	$433,635
CHINCOTEAGUE, VA	$1,289,621	LITTLE COMPTON, RI	$312,836	HAMPTON, VA	$422,115
WANCHESE, NC	$1,172,201	CAPE MAY, NJ	$232,319	CHINCOTEAGUE, VA	$413,046

3.1.1.11 Surfclam and Ocean Quahog FMP

The Atlantic surfclam and ocean quahog are both bivalve mollusks that are found in continental shelf waters from Cape Hatteras, NC, north to the Gulf of St. Lawrence/Newfoundland. Major concentrations of surfclams are found on Georges Bank, south of Cape Cod, off Long Island, southern New Jersey, and the Delmarva Peninsula. The greatest concentrations of ocean quahogs are fished in offshore waters south of Nantucket to the Delmarva Peninsula. In general, surfclams are found in water shallower than that in which ocean quahogs are found.

The MAFMC developed the FMP in the mid 1970's (it was the first FMP the Council developed) and the FMP was implemented in 1977. Initially, the FMP instituted a moratorium on participation in the surfclam fishery, while a more detailed limited entry system could be developed, and established quarterly quotas for surfclams and an annual quota for ocean quahogs. The first several amendments dealt mostly with the duration of the management measures and permit moratorium (made indefinite in Amendment 3), reporting requirements, management areas (Amendment 2 divided the surfclam portion of the management unit into the New England and Mid-Atlantic areas) minimum size limits, cage tags, and quota period issues.

Amendment 8 to the FMP, implemented in 1990, established an individual transferable quota (ITQ) system for the fisheries. The fishing vessel owners that received allocation under the ITQ system were those whose vessels had reported landings under the mandatory logbook requirement in place since 1978. The initial allocation was based on the vessel's average historical catch and vessel size, calculated as a percentage of historical quota allocations. Quota shareholders are allowed to purchase, sell, or lease quota to and from other shareholders. This amendment also merged the Mid-Atlantic and New England management areas back into a single management area.

Amendment 9 revised the overfishing definitions, and Amendment 10 incorporated management measures for the Maine "mahogany clam."[12] Amendment 11 represented the "consistency amendment" to bring all New England and MAFMC FMPs into consistency in regards to vessel replacement and upgrade provisions. Amendment 12 was intended to bring the FMP into compliance with the provisions of the Sustainable Fisheries Act, and included revisions to overfishing definitions, the designation of EFH, a provision allowing framework adjustments to the FMP, and a requirement for an operator permit. Amendment 13 rectified aspects of Amendment 12 that were not approved (surfclam overfishing definition and an analysis of the impacts of fishing on EFH), and included provision for multiple year quota setting. A framework adjustment in 2007 implemented a requirement to use VMS for all vessels participating in the surfclam or ocean quahog

[12] The Maine mahogany clam is the same species as the ocean quahog, but is found in the inshore waters of the State of Maine and supports a small artisanal fishery. This fishery had been operating on an experimental basis since 1990, but was beginning to move offshore into Federal waters.

fisheries. Amendment 14 to this FMP was the 2007 SBRM Omnibus Amendment, and Amendment 16 was the 2011 ACL/AM Omnibus Amendment.

Both species live in the sediment and are not vulnerable to most types of fishing gears. Almost 100 percent of landings are associated with the hydraulic clam dredge, although the relatively small Maine fishery uses the so-called "dry" dredge. Landings of surfclams and ocean quahogs from recreational fishing are negligible. Table 48 identifies the recent commercial landings and ex-vessel value of both species, and Table 49 identifies the primary ports of landings for both species.

Waters of the Gulf of Maine and Georges Bank are subject to intermittent harmful algal blooms, or "red tide," caused by the dinoflagellate *Alexandrium fundyense*, which produces a toxin known to cause paralytic shellfish poisoning (PSP) in people consuming contaminated clams. Because of a history of harmful algal blooms and limited testing in the area, eastern Georges Bank has been closed to the harvest of clams since 1990. In 2013 a portion of Georges Bank was opened for the harvest of surfclams and ocean quahog by vessels using a new PSP testing protocol. Other areas in the Gulf of Maine and western Georges Bank have been closed since 2005 due to an outbreak of *A. fundyense* in these areas.

TABLE 31. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUES IN THE SURFCLAM AND OCEAN QUAHOG FISHERIES.

	Atlantic Surfclam		Ocean Quahog	
	Commercial Landings (lb)	Ex-vessel Value	Commercial Landings (lb)	Ex-vessel Value
2010	44,049,455	$30,336,346	36,071,850	$23,184,691
2011	43,885,111	$30,086,829	31,771,210	$22,094,549
2012	45,131,331	$32,436,365	35,119,940	$25,867,115
2013	44,062,576	$31,483,011	32,267,010	$23,654,062
2014	43,254,654	$30,979,326	31,391,827	$23,839,278

TABLE 32. PRIMARY PORTS ASSOCIATED WITH THE SURFCLAM AND OCEAN QUAHOG COMMERCIAL FISHERIES (VALUES ARE AVERAGED FOR 2010-2014). *DATA EXCLUDED FOR CONFIDENTIALITY.

Atlantic Surfclam			Ocean Quahog		
Primary Ports	Landings (lb)	Ex-vessel Value	Primary Ports	Landings (lb)	Ex-vessel Value
ATLANTIC CITY, NJ	20,032,756	$12,451,256	NEW BEDFORD, MA	*	*
NEW BEDFORD, MA	10,680,503	$8,465,441	POINT PLEASANT, NJ	*	*
OTHER BARNSTABLE, MA	2,390,581	$2,274,196	ATLANTIC CITY, NJ	7,572,472	$6,289,987
POINT PLEASANT, NJ	2,154,607	$1,039,619	OCEAN CITY, MD	1,413,696	$1,193,949
OCEAN CITY, MD	2,146,733	$1,371,187	WARREN, RI	*	*

3.1.1.12 Tilefish FMP

The golden tilefish is the largest and longest lived of all the tilefish species, and in U.S. waters ranges from Georges Bank to Key West, FL, and throughout the Gulf of Mexico. Golden tilefish occupy a fairly restrictive band along the outer continental shelf and are most abundant in depths of 100-240 meters. Temperature may also constrain their range, as they are most abundant near the 15° C isotherm. Although this species occupies a variety of habitats, it is somewhat unique in that they create and modify existing vertical burrows in the sediment as their dominant habitat in U.S. waters.

The Tilefish FMP was developed by the MAFMC to implement management measures for the tilefish fishery north of the Virginia/North Carolina border intended to address the overfished status of the species.[13] The FMP was implemented in 2001, and in the FMP's short existence it has been the subject of two legal challenges. *Natural Resources Defense Council* v. *Evans* (2001) challenged the essential fish habitat provisions of the FMP, and *Hadaja* v. *Evans* (2001) challenged the ban on trawl gear and the permit category designations. The latter temporarily voided the limited access permit categories in the FMP.

Amendment 1 to the Tilefish FMP, implemented in 2009, eliminated the limited access permit categories and adopted an IFQ program. Initially, thirteen allocation holders received quota share based primarily on historical participation in the fishery. Any vessel

[13] The tilefish fishery south of the Virginia/North Carolina border is currently managed as part of the Snapper-Grouper Complex FMP developed by the South Atlantic Fishery Management Council.

is required to have an open access permit in order to land tilefish. The open access permit alone authorizes a vessel to land tilefish under a 500 lb per trip incidental possession limit. If the vessel is authorized to land under tilefish an IFQ allocation permit, it is exempt from the possession limit. Each year, 95 percent of the total allowable landings are allocated to the IFQ fishery. The remaining 5 percent is allocated to the incidental fishery. If landings in the incidental fishery reach or exceed the amount allocated, the incidental fishery would be shut down for the remainder of the fishing year. Amendment 2 was the 2007 SBRM Omnibus Amendment, and Amendment 3 was the 2011 ACL/AM Omnibus Amendment.

The commercial tilefish fishery is relatively small, with only a dozen vessels participating in the IFQ fishery. Tilefish are primarily caught with bottom longlines (98 percent of landings reported in the fishing vessel trip report database from 2007-2011), and approximately 1.8 percent of landings are associated with bottom otter trawls. There is a minimal recreational fishery for this species, with less than 8,300 lb landed annually for the last 30 years and in only two years since 2000 does the MRIP database report trips with tilefish as the primary target species. Table 50 and Table 51 identify the recent commercial landings as well as the primary ports and ex-vessel value of the commercial fishery.

TABLE 33. RECENT COMMERCIAL LANDINGS AND EX-VESSEL VALUE OF GOLDEN TILEFISH.

	Commercial Landings (lb)	Ex-vessel Value
2010	1,866,799	$5,185,807
2011	1,750,152	$5,633,296
2012	1,686,401	$5,466,872
2013	1,710,344	$5,877,742
2014	1,649,080	$5,689,066

TABLE 34. PRIMARY PORTS ASSOCIATED WITH THE GOLDEN TILEFISH FISHERY (VALUES ARE AVERAGED FOR 2010-2014).

Primary Ports	Commercial Landings (lb)	Ex-vessel Value of Landings
MONTAUK, NY	1,129,561	$3,628,707
BARNEGAT LIGHT/LONG BEACH, NJ	344,015	$1,128,285
HAMPTON BAYS, NY	214,551	$701,704
POINT JUDITH, RI	17,141	$34,112

3.1.2 NON-TARGET AND BYCATCH SPECIES

Various species are caught incidentally by the Atlantic herring fishery. For non-target species that are managed under their own FMP, incidental catch/discards are considered as part of the management of that fishery. These species will be impacted to some degree by the prosecution of the herring fishery. The primary non-target species of current

concern for the herring fishery are river herring (alewife and blueback herring) and shad (American shad and hickory shad), so additional information is provided below. Haddock is also a primary non-target species.

River Herring

In the recent Atlantic States Marine Fisheries Commission river herring stock assessment (ASMFC 2012), of the 24 river herring stocks for which sufficient data are available to make a conclusion, 23 were depleted relative to historic levels and one was increasing. The status of 28 additional stocks could not be determined because the time-series of available data was too short. Estimates of coastwide abundance and fishing mortality could not be developed because of the lack of adequate data. The "depleted" determination was used instead of "overfished" because of the many factors that have contributed to the declining abundance of river herring, which include not just directed and incidental fishing, but likely also habitat issues (including dam passage, water quality, and water quantity), predation, and climate change. There are no coastwide reference points. The NEFSC trawl survey, which is the only coastwide fisheries-independent survey, showed increasing trends in relative abundance beginning in 2008 (ASMFC 2012).

As part of a recent river herring status review under the Endangered Species Act, NMFS completed an extinction risk analysis (http://www.greateratlantic.fisheries.noaa.gov/protected/pcp/soc/river_herring.html). This analysis investigated trends in river herring relative abundance for each species range-wide as well as for each identified stock complex. This analysis found that "the abundance of alewife range-wide significantly increased over time (mid 1970s-2012), but the increase in blueback herring abundance was not significant (page 7 and Figures 8 and 9 of the referenced document). These range-wide analyses incorporated data from fishery independent surveys with the widest geographic extent, specifically the Northeast Fisheries Science Center spring and fall bottom trawl surveys and Canada's Department of Fisheries and Oceans (DFO) Scotian Shelf survey. Stock-specific analyses incorporated run count data and stock-specific fishery-independent surveys. Stock-specific analyses indicated that the abundance of the Canadian alewife stock complex was significantly increasing, the abundance of the mid-Atlantic blueback herring stock complex was significantly decreasing, and all other analyzed stock complexes were not significantly increasing or decreasing in abundance. The status review concluded that the species did not currently warrant listing under the ESA.

NMFS and the ASMFC are engaged in a proactive conservation strategy for river herring and the Council is also involved in the endeavor. This strategy is described at http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/index.html, and will bring a variety of management partners and stakeholders together to address river herring threats and plan conservation and data gathering activities.

Shad

The recent American shad stock assessment report (ASMFC 2007) identified that American shad stocks are highly depressed from historical levels. Of the 24 stocks of American shad for which sufficient information was available, 11 were depleted relative to historic levels, 2 were increasing, and 11 were stable (but still below historic levels). The status of 8 additional stocks could not be determined because the time-series of data was too short or analyses indicated conflicting trends. Taken in total, American shad stocks do not appear to be recovering. The assessment concluded that current restoration actions need to be reviewed and new ones need to be identified and applied. These include fishing rates, dam passage, stocking, and habitat restoration. There are no coastwide reference points for American shad. There is no stock assessment available for hickory shad.

3.1.3 PHYSICAL ENVIRONMENT

The fishing activities affected by the FMPs subject to this amendment occur off the Atlantic coast of the U.S., primarily from Cape Hatteras, NC, to the U.S./Canada border. This area of the Northwest Atlantic Ocean is also known as the Northeast U.S. Continental Shelf Large Marine Ecosystem (Sherman et al. 1996) and includes the subsystems known as the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight. For more information about the physical characteristics of the environment described below, reference NEFMC (2004a); NEFMC (2004b); Sherman et al. (1996); and Stevenson et al. (2004). See Figure 1 for a map of the Greater Atlantic Region with the three major subsystems identified.

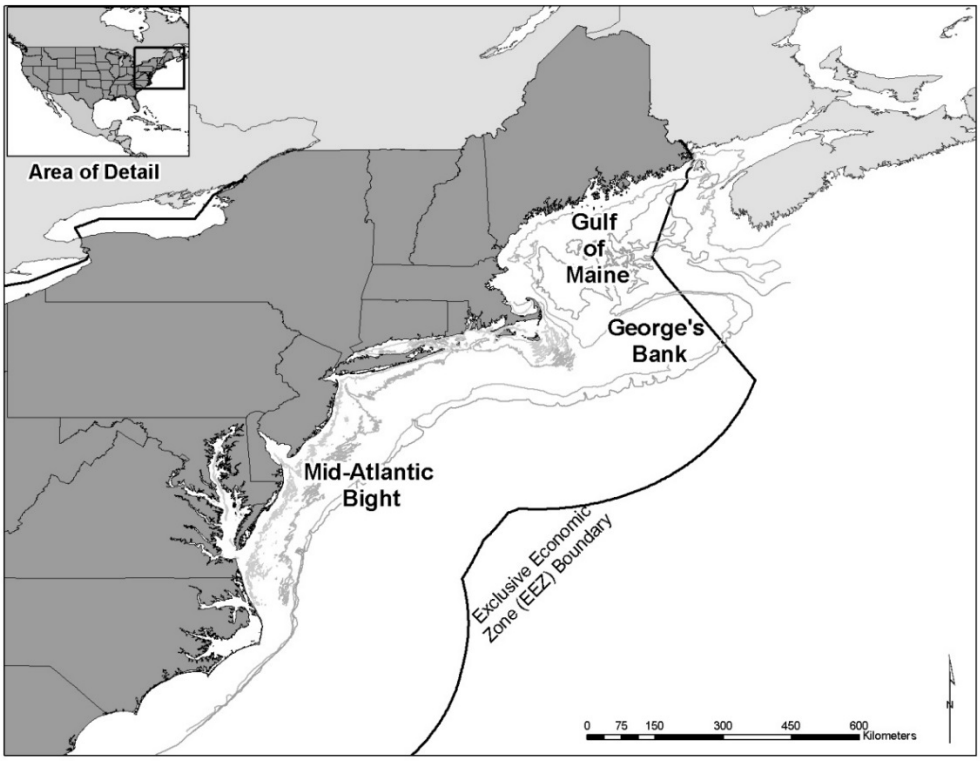


FIGURE 1. MAP OF THE GULF OF MAINE, GEORGES BANK, AND MID-ATLANTIC BIGHT.

Gulf of Maine

The Gulf of Maine is an enclosed coastal sea characterized by relatively cold waters and deep basins. The Gulf of Maine is bounded on the east by Browns Bank, on the north by Maine and Nova Scotia, on the west by Maine, New Hampshire, and Massachusetts, and on the south by Cape Cod and Georges Bank. Retreating glaciers (18,000-14,000 years ago) formed a complex system of deep basins, moraines, and rocky protrusions, leaving behind a variety of sediment types including silt, sand, clay, gravel, and boulders. These sediments are patchily distributed throughout the Gulf of Maine, and are largely related to the topography of the bottom.

Water patterns in the Gulf of Maine exhibit a general counterclockwise current, influenced primarily by cold water masses moving in from the Scotian Shelf and offshore. Although large-scale water patterns are generally counterclockwise around the Gulf, many small gyres and minor currents do occur. Freshwater runoff from the many rivers along the coast of the Gulf of Maine influences coastal circulation, as well. These water movements feed into and affect the circulation patterns on Georges Bank and in Southern New England, both of which are discussed below.

Georges Bank

Georges Bank is a shallow, elongate extension of the northeastern U.S. continental shelf, and it is characterized by a steep slope on its northern edge and a broad, flat, and gently sloping southern flank. The Gulf of Maine lies to the north of Georges Bank, the Northeast Channel (between Georges Bank and Browns Bank) is to the east, the continental slope lies to the south, and the Great South Channel separates Georges Bank and Southern New England to the west. Although the top of Georges Bank is predominantly sandy sediment, glacial retreat during the late Pleistocene era resulted in deposits of gravel along the northern edge of the Bank, and some patches of silt and clay can be found.

The most dominant oceanographic features of Georges Bank include a weak but persistent clockwise gyre that circulates over the whole of the Bank, strong tidal flows (predominantly northwest and southeast), and strong but intermittent storm-induced currents. The strong tidal currents result in waters over the Bank that are well-mixed vertically. The clockwise Georges Bank gyre is in part driven by the southwestern flow of shelf and slope water that forms a countervailing current to the Gulf Stream.

Mid-Atlantic Bight and Southern New England

The Mid-Atlantic Bight includes the continental shelf and slope waters from Georges Bank to Cape Hatteras, North Carolina. Occasionally discussed separately, most texts consider

Southern New England a sub-region within the Mid-Atlantic Bight.[14] The basic morphology and sediments of the Mid-Atlantic Bight were shaped during the retreat of the last ice sheet. The continental shelf south of New England is broad and flat, dominated by fine grained sediments (sand and silt). Patches of gravel can be found in places, such as on the western flank of the Great South Channel.

The shelf slopes gently away from the shore out to 100-200 km offshore, where it transforms into the continental slope at the shelf break (at water depths of 100-200 m). Along the shelf break, numerous deep-water canyons incise the slope and into the shelf. The sediments and topography of the canyons are much more heterogeneous than the predominantly sandy top of the shelf, with steep walls and outcroppings of bedrock and deposits of clay.

The southwestern flow of cold shelf water feeding out of the Gulf of Maine and off Georges Bank dominates the circulatory patterns in this area. The countervailing Gulf Stream provides a source of warmer water along the coast as warm-core rings and meanders break off from the Gulf Stream and move shoreward, mixing with the colder shelf and slope water. As the shelf plain narrows to the south (the extent of the continental shelf is narrowest at Cape Hatteras), the warmer Gulf Stream waters run closer to shore.

3.1.4 ENDANGERED AND OTHER PROTECTED SPECIES

3.1.4.1 Omnibus discussion of endangered and other protected species

There are many protected species inhabiting the Northeast Continental Shelf Large Marine Ecosystem. These include Atlantic salmon, two species of listed sturgeon, several species of endangered and threatened sea turtles, and several species of whales, small cetaceans, and pinnipeds. Although there may be many species that occur in this area, this section will not provide a detailed description of protected species in the affected environment as the omnibus potion of this amendment focuses on the process of creating and allocating Federal funds to IFM programs and therefore, any impacts are procedural in nature and will not cause any direct or indirect effects to protected species. As a result, a detailed description of these species that could be affected by omnibus alternatives in this amendment is not warranted.

3.1.4.2 Herring Fishery discussion of endangered and protected species interactions

The herring coverage target alternatives in this amendment are consistent with typical FMP amendments. The potential changes in monitoring for the herring fishery may directly or indirectly impact fishing vessel operations (by modifying where, when, and/or how fishing may take place), and the ways in which herring fishing activities directly or

[14] Southern New England is generally considered to be the area of the continental shelf off the coasts of Massachusetts, Rhode Island, and Long Island, New York, from the Great South Channel to Hudson Canyon.

indirectly interact with living marine resources, including protected species. As a result, this section will provide information on protected species that may be affected by the action alternatives in the herring section of the amendment. Specifically, protected species may be caught in or otherwise interact with one or more of the fishing gears utilized in a fishery addressed in this amendment (i.e., midwater trawl, bottom trawl, and purse seine). Therefore, information on protected species gear interaction risks with specific gear types used in the herring fishery will be provided.

Most of the following information is adapted from Framework Adjustment 4 to the Atlantic Herring FMP (NEFMC 2015). Data on endangered and protected species is generally collected, analyzed, and presented by gear type. The Atlantic herring fishery uses midwater and bottom trawls, purse seines, stop seines, and weirs. However, midwater trawls and purse seines are the primary gear type used to prosecute this fishery (followed by bottom trawl gear) and therefore, will also be the gear types addressed in this section.

There are numerous species of fish, marine mammals, and sea turtles which inhabit the management unit of the Atlantic Herring FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act (MMPA) of 1972 (Table 52). Detailed information on the range-wide status of marine mammal and sea turtle species that occur in the area can be found in a number of published documents. These include sea turtle status reviews, biological reports, and recovery plans (Conant et al. 2009; NMFS and USFWS 1991, 1992, 1995, 1998a, 1998b, 2007a, 2007b, 2008, 2013, 2015; Hirth 1997; Turtle Expert Working Group (TEWG) 1998, 2000, 2007, 2009; Seminoff et al. 2015; NMFS et al. 2011). For marine mammals this includes marine mammal stock assessment reports and recovery plans (e.g., Waring et al. 2016; Hayes et al. 2017, NMFS 1991, 2005, 2010, 2011, 2012). Additional background information on the Gulf of Maine Distinct Population Segment of Atlantic salmon and the five distinct population segments of Atlantic sturgeon can be found in the respective status reviews (Fay et al. 2006; ASSRT 2007) and listing determinations for Atlantic salmon (74 FR 29344; June 19, 2009) and Atlantic sturgeon (77 FR 5880 and 77 FR 5914; February 3, 2012). Additional information on the species provided in the table below (e.g., life history, distribution, stock status) can also be found at the following sites: http://www.greateratlantic.fisheries.noaa.gov/Protected/ and http://www.nmfs.noaa.gov/pr/sars/region.htm.

TABLE 35. SPECIES PROTECTED UNDER THE ESA AND/OR MMPA THAT MAY OCCUR IN THE AFFECTED ENVIRONMENT OF THE ATLANTIC HERRING FMP.

Species	Status[2]	*Potential to interact with Atlantic herring fishing gear?*
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***No***
Humpback whale, West Indies DPS, (*Megaptera novaeangliae*)	Protected (MMPA)	Yes
Fin whale (Balaenoptera physalus)	***Endangered***	***Yes***
Sei whale (Balaenoptera borealis)	***Endangered***	***Yes***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter macrocephalus	***Endangered***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (Globicephala spp.)[3]	***Protected (MMPA)***	***Yes***
Pygmy sperm whale (*Kogia breviceps*)	Protected (MMPA)	No
Dwarf sperm whale (*Kogia sima*)	Protected (MMPA)	No
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes
Short Beaked Common dolphin (*Delphinus delphis*)	Protected (MMPA)	Yes
Atlantic Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Striped dolphin (*Stenella coeruleoalba*)	Protected (MMPA)	No
Beaked whales (*Ziphius and Mesoplodon spp*)[4]	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[5]	***Protected (MMPA)***	***Yes***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	Yes
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	No
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle, North Atlantic DPS (*Chelonia mydas*)	Threatened	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic Ocean DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Atlantic salmon	Endangered	Yes
Atlantic sturgeon *(Acipenser oxyrinchus)*		

Species	Status[2]	*Potential to interact with Atlantic herring fishing gear?*
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk *(Brosme brosme)*	Candidate	Yes
Alewife (*Alosa pseudoharengus*)	Candidate	Yes
Blueback herring (*Alosa aestivalis*)	Candidate	Yes
Critical Habitat		
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No
North Atlantic Right Whale Critical Habitat	ESA (Protected)	No

Notes:

[1] A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).

[2] Status is defined by whether the species is listed under the ESA as endangered (i.e. at risk of extinction) or threatened (i.e. at risk of endangerment), or protected under the MMPA. Marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species for which ESA listing may be warranted.

[3] There are 2 species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often referred to as *Globicephala spp*.

[4] There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier's (*Ziphius cavirostris*), blainville's (*Mesoplodon densirostris*), gervais' (*Mesoplodon europaeus*), sowerbys' (*Mesoplodon bidens*), and trues' (*Mesoplodon mirus*) beaked whales. Species of *Mesoplodon* are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.

[5] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.[1] Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters).

In Table 35, please note that cusk, alewife, and blueback herring are NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register. If a species is proposed for listing the conference provisions under Section 7 of the ESA apply (see 50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. As a result, these species will not be discussed further in this and the following sections; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate

species from any proposed action. Additional information on cusk, alewife, and blueback herring can be found at: http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm.

Protected Species and Critical Habitat Not Likely to be Affected by the Proposed Action

In Table 35, protected species or critical habitat that are not likely to be affected by the proposed action are provided. This determination has been made because either the occurrence of the protected species is not known to overlap with the herring fishery and/or there have never been documented interactions between the species and the fishery (NMFS NEFSC FSB 2014, 2015, 2016, 2017; See: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html, and http://www.nmfs.noaa.gov/pr/sars/region.htm). In the case of critical habitat, this determination has been made because the herring fishery will not affect the essential physical or biological features of North Atlantic right whale or loggerhead (NWA DPS) critical habitat, and therefore, will not result in the destruction or adverse modification of either species critical habitat (NMFS 2014; NMFS 2015).

Protected Species Potentially Affected by the Proposed Action

Large Whales

Large whales, such as humpback, fin, sei, and minke whales, are found throughout the waters of the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; Hayes et al. 2017; NMFS 1991, 2010, 2011; 2012). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., humpback whales), some portion of the population remains in higher latitudes throughout the winter (Clapham et al. 1993;Swingle et al. 1993; Vu et al. 2012; Hayes et al. 2017). Although further research is needed to provide a clearer understanding of large whale movements and distribution in winter, the distribution and movements of large whales to foraging ground in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Payne *et al*.1986, 1990; Schilling *et al.* 1992; Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017). For additional information on the biology, status, and range wide distribution of each whale species please refer to: Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; NMFS 1991, 2010, 2011. For additional information on the biology, status, and range wide distribution of each whale species please refer to: Hayes et al. 2017; NMFS 1991, 2010, 2011.

Small Cetaceans

Numerous small cetacean species (dolphins, pilot whales, harbor porpoise) occur within the area from Cape Hatteras through the Gulf of Maine. Seasonal shifts in abundance and distribution of each species in Mid-Atlantic, Georges Bank, and/or Gulf of Maine waters varies with respect to life history characteristics. Some species primarily occupy continental shelf waters (e.g., white sided dolphins, bottlenose dolphin, harbor porpoise), while others are found primarily in continental shelf edge and slope waters (e.g., Risso's and short beaked common dolphin). For additional information on the biology and range wide distribution of all small cetacean species identified in Table 52, please refer to Waring et al. 2014 and Waring et a. 2015.

Pinnipeds

Of the four species of seals expected to occur in the area, harbor and gray are the most common seal species in EEZ waters of the United States. Gray and harbor seals are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals, gray seals) may be extending their range seasonally into Mid-Atlantic waters as far south as the Cape Hatteras, North Carolina (35°N) (Hayes et al. 2017). Harp and hooded seals are less commonly observed in EEZ waters; however, individuals of both species are also known to travel south into EEZ waters and sightings, as well as strandings of each species have been recorded for both New England and Mid-Atlantic waters (Waring et al. 2007; Waring et al. 2015). For additional information on the biology and range wide distribution of gray, harbor, harp, and hooded seals, please refer to marine mammal stock assessment reports provided at http://www.nmfs.noaa.gov/pr/sars/region.htm..

Sea Turtles

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida to Cape Cod, MA, although their presence varies with the seasons due to changes in water temperature (Braun-McNeill et al. 2008; Braun & Epperly 1996; Epperly et al. 1995a,b; Mitchell et al. 2003; Shoop & Kenney 1992; TEWG 2009; Blumenthal et al. 2006; Braun-McNeill & Epperly 2004; Griffin et al. 2013; Hawkes et al. 2006; Hawkes et al. 2011; Mansfield et al. 2009; McClellan & Read 2007; Mitchell et al. 2003; Morreal & Standora 2005). As coastal water temperatures warm in the spring, hard-shelled sea turtles begin to migrate north up the Atlantic Coast from southeastern waters, occurring in Virginia foraging areas as early as late April and on the most northern foraging ground in the GOM in June (Braun-McNeill & Epperly 2004; Epperly et al. 1995a,b,c; Griffin et al. 2013; Morreale & Standora 2005; Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool, with a large majority leaving the GOM by September, and some remaining in Mid-Atlantic and Northeast areas until late fall (i.e., November). By December, sea turtles have migrated south to waters offshore of North Carolina, particularly south of Cape Hatteras, and further south (Epperly et al. 1995b; Griffin et al.

2013; Hawkes et al. 2011; Shoop & Kenney 1992).[15] Leatherback sea turtles also engage in routine migrations between northern temperate and tropical waters (Dodge et al. 2014; James et al. 2005; James et al. 2006; NMFS & USFWS 1992).

Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf and to have a greater tolerance for colder water than hard-shelled sea turtles (James *et al.* 2005; Eckert *et al.* 2006; Murphy *et al.* 2006; NMFS and USFWS 2013; Dodge *et al.* 2014). Leatherback sea turtles engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014).

Atlantic Sturgeon

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range (ASSRT 2007; Dovel and Berggren 1983; Dadswell et al. 1984; Kynard et al. 2000; Stein et al. 2004a; Dadswell 2006; Laney et al. 2007; Dunton et al. 2010; Dunton et al. 2012; Dunton et al. 2015;Erickson et al. 2011; Wirgin et al. 2012, 2015a,b; Waldman et al. 2013; O'Leary et al. 2014;). Based on fishery-independent and –dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein et al. 2004a,b; Erickson et al. 2011; Dunton et al. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein et al. 2004a, b; Dunton et al 2010; Erickson et al. 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that Atlantic sturgeon may undertake seasonal movements along the coast (Dunton et al. 2010; Erickson et al. 2011; Wipplehauser 2012). However, there is no evidence to date that all Atlantic sturgeon make these seasonal movements and therefore, they may be present throughout the marine environment throughout the year. For additional information on the biology, status, and range wide distribution of each distinct population segment of Atlantic sturgeon please refer to 77 FR 5880 and 77 FR 5914 (finalized February 6, 2012), as well as the Atlantic Sturgeon Status Review Team's (ASSRT) 2007 status review of the Atlantic sturgeon (ASSRT 2007).

Atlantic Salmon

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, while the marine range of the GOM DPS extends from

[15] Hard-shelled sea turtles can occur year-round in waters off Cape Hatteras and waters south of this area.

the GOM (primarily northern portion of the GOM), to the coast of Greenland (NMFS and USFWS 2005, 2016; Fay et al. 2006). In general, smolts, post-smolts, and adult Atlantic salmon may be present in the GOM and coastal waters of Maine in the spring (beginning in April), and adults may be present throughout the summer and fall months (Baum 1997; Fay et al. 2006; USASAC 2004; Hyvarinen et al. 2006; Lacroix & McCurdy 1996; Lacroix et al. 2004, 2005; Reddin 1985; Reddin & Short 1991; Reddin & Friedland 1993; Sheehan et al. 2012; NMFS and USFWS 2005,2016; Fay et al. 2006). For additional information on the biology, status, and range wide distribution of the GOM DPS of Atlantic salmon please refer to NMFS and USFWS 2005, 2016; Fay et al. 2006.

Protected Species Interactions with Commercial Trawl Gear and Purse Seines

The Atlantic herring fishery is prosecuted primarily with midwater trawls and purse seines, but bottom trawls are also used to some extent. In addition, weirs and stop seines are used, but are responsible for only a small fraction of herring landings. Since weirs and stop seines operate exclusively within State waters and are not regulated by the Federal Atlantic Herring FMP, they will not be discussed further in this document relative to protected species. A subset of protected species of fish, marine mammals, and sea turtles (see Table 52) are known to be vulnerable to interactions with midwater trawl, bottom trawl, and purse seines. In the following sections, available information on protected species interactions with these gear types will be provided. Please note, these sections are not a comprehensive review of all fishing gear types know to interact with a given species; emphasis is only being placed on those gear types primarily used to prosecute the Atlantic herring fishery.

Marine Mammals

Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annual, classifying U.S. commercial fisheries into one of the three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions; 82 FR 3655 (January 12, 2017)). The categorization in the LOF determines whether participants in that fishery are subject to certain provisions of the MMPA such as registration, observer coverage, and take reduction plan requirements. Individuals fishing in Category I or II fisheries must comply with requirements of any applicable take reduction plan. Table 36 provides fishing gear types considered in the herring fishery and the prescribed LOF fishery Category for commercial fisheries in the (Northwestern) Atlantic Ocean.

TABLE 36. LOF FISHERIES LIKELY TO OCCUR IN THE AFFECTED ENVIRONMENT OF THE HERRING FISHERY.

Fishery	Category
Mid-Atlantic Midwater Trawl (Including Pair Trawl)	II
Northeast Midwater Trawl (Including Pair Trawl)	II
Northeast Bottom Trawl	II
Mid-Atlantic Bottom Trawl	II
Purse Seine (GOM Atlantic Herring)	III

Large Whales

Trawl (Bottom and Midwater) Gear

With the exception of one species (minke whales), there have been no observed interactions with large whales and trawl (bottom or mid-water) gear. Minke whales have been observed seriously injured and killed in both types of trawl gear. Specifically, over the past 10 years, there have been two (2) observed minke whales incidentally taken in mid-water trawl gear. These occurred in 2009 and 2013, with the 2009 incident resulting from entanglement in NOAA research mid-water trawl gear (whale released alive, but seriously injured), and the 2013 incident resulting from entanglement in a Northeast mid-water trawl (including pair trawl) fishery (whale was dead, moderately decomposed) (see http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Waring *et al*. 2016; Henry *et al*. 2015). Based on the latter incident, as provided in Waring *et al*. (2016), the estimated annual average minke whale mortality and serious injury from the Northeast mid-water trawl (including pair trawl) fishery from 2009 to 2013 is 0.2; Hayes *et al*. (2017) provided the same estimated annual average minke whale mortality and serious injury from the Northeast mid-water trawl (including pair trawl) fishery from 2010 to 2014.

In bottom trawl gear, to date, interactions have only been observed in the northeast bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008 and zero minke whales from 2009-2012; no serious injuries were reported during this time (Waring *et al*. 2015). Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (CV=0.69) whales (Waring *et al*. 2015). Lyssikatos (2015) estimated that from 2008-2013, mean annual serious injuries and mortalities from the northeast bottom trawl fishery were 1.40 (CV=0.58) minke whales. Serious injury and mortality records for minke whales in U.S. waters from 2010-2014 showed zero interactions with bottom trawl (northeast or Mid-Atlantic) gear (Henry *et al*. 2016; Hayes *et al*. 2017).

Based on above information, trawl gear is likely to pose a low interaction risk to any large whale species. Should an interaction occur, serious injury or mortality to any large whale is possible; however, relative to other gear types discussed below (i.e., fixed gear), trawl gear represents a low source serious injury or mortality to any large whale.

Purse Seine Gear

Since 2008, three (3) humpback whales and one (1) unidentified (fin or sei) whale have been documented as interacting with purse seines, specifically those operating in the GOM targeting Atlantic herring (see: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). All interactions; however, resulted in the animals being released from the nets unharmed (Waring et al. 2016; Hayes et al. 2017; Henry et al. 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). Based on this information, although interactions are possible with large whales, purse seines are not expected to pose a serious injury or mortality risk to these species.

Small Cetaceans and Pinnipeds

Trawl (Bottom and Midwater) Gear

Small cetaceans and pinnipeds are vulnerable to interactions with trawl (bottom or midwater) gear (Table 37). Based on the 2017 MMPA LOF and the most recent five years of observer data (2010-2014), Table 54 provides a list of species that have been observed (incidentally) seriously injured and/or killed by List of Fisheries Category II trawl fisheries that operate in the affected environment of the Atlantic herring fishery (Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)).

TABLE 37. SMALL CETACEAN AND PINNIPED SPECIES OBSERVED SERIOUSLY INJURED AND/OR KILLED BY TRAWL FISHERIES IN THE AFFECTED ENVIRONMENT OF THE AMENDMENT.

Fishery	Category	Species Reported Injured/Killed
Mid-Atlantic Mid-Water Trawl (Including Pair Trawl)	II	White-sided dolphin
		Gray seal
		Harbor seal
Northeast Mid-Water Trawl (Including Pair Trawl)	II	Short-beaked common dolphin
		Long-finned pilot whales
		Gray seal
		Harbor seal
Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Long-finned pilot whales
		Short-beaked common dolphin
		White-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin
Mid-Atlantic Bottom Trawl	II	White-sided dolphin

Fishery	Category	Species Reported Injured/Killed
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
Sources: Hayes et al. 2017; MMPA LOF 82 FR 3655 (January 12, 2017)		

Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). In 2006, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened to address the incidental mortality and serious injury of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), common dolphins (*Delphinus delphis*), and white sided dolphins (*Lagenorhynchus acutus*) incidental to bottom and midwater trawl fisheries operating in both the Northeast and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock," nor do they currently interact with a Category I fishery, it was determined at the time that development of a take reduction plan was not necessary.[16]

In lieu of a take reduction plan, the ATGTRT agreed to develop an ATGTRS. The ATGTRS identifies informational and research tasks, as well as educational and outreach needs the ATGTRT believes are necessary, to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero mortality and serious injury rates. The ATGTRS also identifies several potential voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals. For additional details on the ATGTRS, please visit: http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/.

Purse Seine Gear

There have been no observed small cetacean interactions with purse seines used to prosecute any of the Council fisheries (primarily GOM Atlantic herring). As a result, this gear type is not expected to pose an interaction risk with small cetacean species, and therefore, is not expected to be source of serious injury or mortality to any small cetacean.

However, purse seines - specifically those operating in the Gulf of Maine targeting Atlantic herring - are known to interact with pinniped species. Since 2004, pinniped species have been observed in purse seine gear; however, none of these interactions have resulted in

[16] A strategic stock is defined under the MMPA as a marine mammal stock: for which the level of direct human-caused mortality exceeds the potential biological removal level; which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or which is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA.

mortality or confirmed serious injury to the seal (Table 55; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Waring et al. 2014b,Hayes et al. 2017). As a result, although interactions are possible with seals, purse seines are not expected to pose a significant serious injury or mortality risk to these species. This conclusion is further supported by the fact that the MMPA LOF has identified the Gulf of Maine Atlantic herring purse seine fishery as a Category III fishery; a fishery that has a remote to no likelihood of causing serious injury or mortality to marine mammals .

TABLE 38. 2004-2014 OBSERVED GRAY AND HARBOR SEAL INTERACTION WITH THE GOM ATLANTIC HERRING PURSE SEINE FISHERY

Seal Species	Number of Observed Interactions	Released Alive (No Serious Injury or Mortality)
Unknown	16	Yes
Harbor Seal	21	Yes
Gray Seal	114	Yes

Sea Turtles

Bottom Trawl Gear

Bottom trawl gear poses an interaction risk to sea turtles. Sea turtle interactions with bottom trawl gear have been observed on Georges Bank, and in the Mid-Atlantic; however, most of the observed interactions have occurred in the Mid-Atlantic (Warden 2011a,b; Murray 2015). As no sea turtle interactions with bottom trawl gear have been observed in the Gulf of Maine, and few sea turtle interactions have been observed on Georges Bank, there is insufficient data available to conduct a robust model-based analysis on sea turtle interactions with bottom trawl gear in these regions or produce a bycatch estimate for these regions. As a result, the following bycatch estimates are based on observed sea turtle interactions in bottom trawl gear in the Mid-Atlantic.

Bottom trawl gear poses an injury and mortality risk to sea turtles, specifically due to forced submergence (Sasso and Epperly 2006). Green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles have been documented interacting (e.g., bycaught) with bottom trawl gear. However, estimates are available only for loggerhead sea turtles. Warden (2011a,b) estimated that from 2005-2008, the average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic[17] was 292 (CV=0.13, 95% CI=221-369), with an additional 61 loggerheads (CV=0.17, 95% CI=41-83) interacting with trawls,

[17] Warden (2011a) defined the Mid-Atlantic as south of Cape Cod, Massachusetts, to approximately the North Carolina/South Carolina border.

but released through a Turtle Excluder Device (TED).[18] The 292 average annual observable loggerhead interactions equates to approximately 44 adult equivalents (Warden 2011a,b). Most recently, Murray (2015) estimated that from 2009-2013, the total average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic[19] was 231 (CV=0.13, 95% CI=182-298); this equates to approximately 33 adult equivalents (Murray 2015). Bycatch estimates provided in Warden (2011a) and Murray (2015) are a decrease from the average annual loggerhead bycatch in bottom otter trawls during 1996-2004, which Murray (2008) estimated at 616 sea turtles (CV=0.23, 95% CI over the nine-year period: 367-890). This decrease is likely due to decreased fishing effort in high-interaction areas (Warden 2011a, b).

Midwater Trawl Gear

NEFOP and ASM observer data from 1989-2016 have recorded five sea turtle interactions with midwater trawl gear; the primary species landed during these interactions was tuna (NMFS NEFS FSB 2015, 2016, 2017). These takes were in the early 1990s in an experimental Highly Migratory Species fishery that no longer operates. No takes have been documents in other midwater trawl fisheries operating in the Greater Atlantic Region. Based on the best available information, sea turtle interactions in midwater trawl gear are expected to be rare.

Purse Seine Gear

Sea turtle interactions with this gear type are possible; however, based on available information (NMFS NEFSC FSB 2015, 2016, 2017), the risk of a sea turtle interacting with purse seine is low (i.e., only several sea turtle interactions observed since 1989). Sea turtle may be capture in the net and could become entangled in the mesh. Captured turtles can be released alive if they are quickly retrieved and removed from the net.

Atlantic Sturgeon

Bottom Trawl Gear

Atlantic sturgeon interactions (i.e., bycatch) with bottom trawl gear have been observed since 1989; these interactions have the potential to result in the injury or mortality of Atlantic sturgeon (NMFS NEFSC FSB 2015, 2016, 2017). Three documents, covering three time periods, that use data collected by the Northeast Fisheries Observer Program to describe bycatch of Atlantic sturgeon in bottom trawl gear: Stein et al. (2004b) for 1989-2000; ASMFC (2007) for 2001-2006; and Miller and Shepard (2011) for 2006-2010; none

[18] TEDs allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net. Approved TEDs are required in the shrimp and summer trawl fishery. For further information on TEDs see 50 CFR 223.206 and 68 FR 8456 (February 21, 2003).

[19] Murray 2015b defined the Mid-Atlantic as the boundaries of the Mid-Atlantic Ecological Production; roughly waters west of 71°W to the North Carolina/South Carolina border)

of these documents provide estimates of Atlantic sturgeon bycatch by Distinct Population Segment. Miller and Shepard (2011), the most recent of the three documents, analyzed fishery observer data and VTR data in order to estimate the average annual number of Atlantic sturgeon interactions in otter trawl in the Northeast Atlantic that occurred from 2006 to 2010. This timeframe included the most recent, complete data and as a result, Miller and Shepard (2011) is considered to represent the most accurate predictor of annual Atlantic sturgeon interactions in the Northeast bottom trawl fisheries (NMFS 2013).

Based on the findings of Miller and Shepard (2011), NMFS (2013) estimated that the annual bycatch of Atlantic sturgeon in bottom trawl gear to be 1,342 sturgeon. Miller and Shepard (2011) reported observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes and concluded that, based on NEFOP observed sturgeon mortalities, relative to gillnet gear, bottom trawl gear posed less risk of mortality to Atlantic sturgeon. Estimated mortality rates in gillnet gear were 20.0%, while those in otter trawl gear were 5.0% (Miller and Shepard 2011; NMFS 2013). Similar conclusions were reached in Stein *et al*. (2004b) and ASMFC (2007) reports; after review of observer data from 1989-2000 and 2001-2006, both studies concluded that observed mortality is much higher in gillnet gear than in trawl gear. However, an important consideration to these findings is that observed mortality is considered a minimum of what actually occurs and therefore, the conclusions reached by Stein *et al*. (2004b), ASMFC (2007), and Miller and Shepard (2011) are not reflective of the total mortality associated with either gear type. To date, total Atlantic sturgeon mortality associated with gillnet or trawl gear remains uncertain.

Midwater Trawl Gear

To date, there have been no observed/documented interactions with Atlantic sturgeon with midwater trawl gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on this information, midwater trawl gear is not expected to pose a significant interaction risk to any Atlantic sturgeon and therefore, is not expected to be a source of serious injury or mortality to this species.

Purse Seine Gear

Capture of sturgeon in purse seine gear type is possible; however, interactions have been extremely rare over the past 27 years. NEFOP and ASM observer data from 1989-2016 have recorded two Atlantic sturgeon interactions with purse seine gear targeting Atlantic herring in the GOM (NMFS NEFSC FSB 2015, 2016, 2017). These interactions were recorded in 2004 and 2005, prior to the listing of Atlantic sturgeon under the ESA. Based on this information, although Atlantic sturgeon interactions with purse seine gear are possible, the risk of an interaction is expected to be low.

Atlantic Salmon

Bottom Trawl Gear

According to the Biological Opinion issued by NMFS Greater Atlantic Regional Fisheries Office on December 16, 2013, NMFS NEFSC NEFOP and ASM program documented a total of 15 individual salmon incidentally caught on over 60,000 observed commercial fishing trips from 1989 through August 2013 (NMFS 2013; Kocik et al. 2014). Four out of the 15 individuals were observed bycaught in bottom otter trawl gear, the remainder were observed in gillnet gear (Kocik NEFSC, pers. comm (February 11, 2013) in NMFS 2013). This information suggests that interactions with Atlantic salmon are rare events (NMFS 2013; Kocik et al. 2014). Since 2013, no additional Atlantic salmon have been observed in gillnet or bottom trawl (NMFS NEFSC FSB 2015, 2016, 2017). Based on the above information, interactions with Atlantic salmon are likely rare (NMFS 2013; Kocik *et al*. 2014).

Midwater Trawl and Purse Seine Gear

To date, there have been no observed/documented interactions with Atlantic salmon and midwater trawl or purse seine gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on this information, midwater trawl and purse seine gear are not expected to pose an interaction risk to any Atlantic salmon and therefore, are not expected to be source of serious injury or mortality to this species.

3.1.5 HUMAN COMMUNITIES

3.1.5.1 ATLANTIC HERRING FISHERY INFORMATION

The following information is adapted from Framework Adjustment 4 to the Atlantic Herring FMP (NEFSC, 2015). Additional description of the herring fishery is included in section 3.1.1.2 of this document.

The herring resource is managed as one stock complex, but this stock is thought to be composed of inshore and offshore components that segregate during spawning. In recognition of the spatial structure of the herring resource, the herring annual catch limit (ACL) is divided into sub-ACLs and assigned to four herring management areas. Area 1 is the Gulf of Maine (GOM) divided into an inshore (Area 1A) and offshore section (Area 1B); Area 2 is located in the coastal waters between MA and NC, and Area 3 is on Georges Bank (GB) (Figure 2).

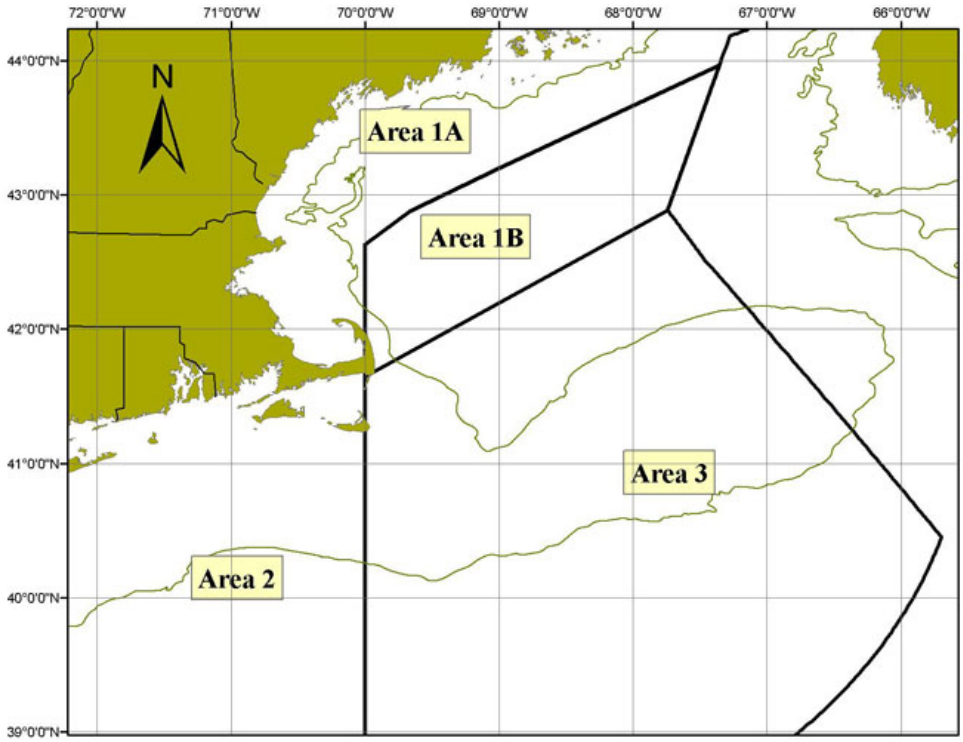


FIGURE 2. ATLANTIC HERRING MANAGEMENT AREAS.

The Atlantic herring fishery is generally prosecuted south of New England in Area 2 during the winter (January-April), and oftentimes as part of the directed mackerel fishery. There is overlap between the herring and mackerel fisheries in Area 2 and in Area 3 during the winter months, although catches in Area 3 tend to be relatively low. The herring summer fishery (May-August) is generally prosecuted throughout the GOM in Areas 1A, 1B and in Area 3 (GB) as fish are available. Restrictions in Area 1A have pushed the fishery in the inshore GOM to later months (late summer). The midwater trawl (single and paired) fleet is restricted from fishing in Area 1A in the months of January through September because of the Area 1A sub-ACL split (0% January-May) and the purse seine-fixed gear only area (all of Area 1A) that is effective June-September. A sub-ACL split for Area 1B (0% January-April, 100% May-December) is effective for all vessels during the 2014 and 2015 fishing years.

Fall fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A inshore Gulf of Maine sub-ACL is always fully utilized, and the fishery usually closes sometime around November. Once the 1A and 1B quotas are taken, larger vessels become increasingly dependent on offshore fishing opportunities (Georges Bank, Area 3).

Businesses related to the Atlantic herring fishery include fishing vessel owners and employees (captains/crew) and herring dealers and processors. Refer to the Herring

Amendment 5 FEIS (Section 4.5) for information in addition to that provided in the following subsections.

The 2013-2015 Atlantic herring fishery specifications were approved by NMFS concurrently with Framework 2 to the Herring FMP, which allows the Council to split sub-ACLs seasonally (by month) and establishes provisions for the carryover of some un-utilized sub-ACL during the specifications process. The specifications summarized below in Table 39 are effective for the 2013-2015 fishing years (initial allocations, not including overage deductions, carryovers, or set-aside deductions).

TABLE 39. 2016-2018 ATLANTIC HERRING FISHERY SPECIFICATIONS (INITIAL ALLOCATIONS).

	2016-2018
Overfishing Limit	138,000 – 2016 117,000 – 2017 111,000 – 2018
Acceptable Biological Catch (ABC)	111,000
Optimum Yield/ACL	104,800*
Domestic Annual Harvest (DAH)	104,800
Border Transfer	4,000
Domestic Annual Processing (DAP)	100,800
U.S. At-Sea Processing (USAP)	0
Area 1A Sub-ACL	30,300*
Area 1B Sub-ACL	4,500
Area 2 Sub-ACL	29,100
Area 3 Sub-ACL	40,900
Fixed Gear Set-Aside	295
Research Set-Aside	3 percent of each sub-ACL
* If New Brunswick weir fishery catch harvested through October 1 is less than 4,000 mt, then 1,000 mt will be subtracted from the management uncertainty buffer and added to the ACL and Area 1A Sub-ACL.	

Atlantic Herring Catch

The Atlantic herring ACL and management area sub-ACLs are tracked/ monitored based on the total catch – landings and discards – which are provided and required by herring permitted vessels through daily VMS and weekly VTRs as well as through Federal/state dealer data. Herring harvesters are required to report discards in addition to landed catch through these independent methods.

NMFS' catch estimation methods for the Atlantic herring fishery are described in detail in both Framework Adjustment 2 and Framework Adjustment 3 to the Atlantic Herring FMP (see Section 3.6.1 of Framework 3, NEFMC 2014).

Table 40 summarizes recent Atlantic herring catch estimates by year and management area from 2004-2014. The following bullets describe how these estimates were derived:

- 2004-2006 herring catch estimates are provided from quota management implemented by NMFS through the Atlantic Herring FMP and are based on interactive voice reporting (IVR) data from the call-in system used to monitor TACs. Reported herring discards are included in the totals.
- 2007-2009 herring catch estimates are based on IVR data supplemented with dealer data. Reported discards are included in the totals.
- 2010-2014 Atlantic herring catch estimates are based on a comprehensive methodology developed by NMFS in response to Amendment 4 provisions and the need to better monitor sub-ACLs. The methodology for estimating catch is based on landings data obtained from dealer reports (Federal and State) supplemented with VTRs (Federal and State of Maine) and VMS catch reports with the addition of discard data from extrapolated observer data.

TABLE 40. ATLANTIC HERRING CATCH BY YEAR AND MANAGEMENT AREA, 2004-2014

Year	Area (sub-ACL)	Catch (mt)	Quota (mt)	Percent of quota caught
2004	1A	60,095	60,000	100%
	1B	9,044	10,000	90%
	2	12,992	50,000	26%
	3	11,074	60,000	18%
2005	1A	61,102	60,000	102%
	1B	7,873	10,000	79%
	2	14,203	30,000	47%
	3	12,938	50,000	26%
2006	1A	59,989	60,000	100%
	1B	13,010	10,000	130%
	2	21,270	30,000	71%
	3	4,445	50,000	9%
2007	1A	49,992	50,000	100%
	1B	7,323	10,000	73%
	2	17,268	30,000	58%
	3	11,236	55,000	20%
2008	1A	42,257	43,650	97%
	1B	8,671	9,700	89%
	2	20,881	30,000	70%

Year	Area (sub-ACL)	Catch (mt)	Quota (mt)	Percent of quota caught
	3	11,431	60,000	19%
2009	1A	44,088	43,650	101%
	1B	1,799	9,700	19%
	2	28,032	30,000	93%
	3	30,024	60,000	50%
2010	1A	28,424	26,546	107%
	1B	6,001	4,362	138%
	2	20,831	22,146	94%
	3	17,596	38,146	46%
2011	1A	30,676	29,251	105%
	1B	3,530	4,362	81%
	2	15,001	22,146	68%
	3	37,038	38,146	97%
2012	1A	24,302	27,668	88%
	1B	4,307	2,723	158%
	2	22,482	22,146	102%
	3	39,471	38,146	103%
2013	1A	29,820	29,775	100%
	1B	2,458	4,600	53%
	2	27,569	30,000	92%
	3	37,833	42,000	90%
2014	1A	32,898	33,031	100%
	1B	4,399	2,878	153%
	2	19,626	28,764	68%
	3	36,323	39,415	92%

Source: NMFS

Table 41 summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2014 based on NMFS catch estimation methods. Atlantic herring catch has been somewhat consistent over the time period (and in previous years), averaging about 91,500 mt, with the highest catch of the time series observed in 2009 and lowest in 2008. However, the quota allocated to the fishery (stockwide ACL/OY) has decreased 50% over the ten-year period. The herring fishery has therefore become more fully utilized in recent years and utilized 100% of the total ACL in 2012. The 2013-2015 Atlantic herring fishery specifications increased the stockwide Atlantic herring ACL available to the fishery by more than 15,000 mt; an additional 7,000 mt was caught under the higher quota in 2013, and overall, the fishery utilized 92% of the stockwide herring ACL.

TABLE 41. TOTAL ANNUAL ATLANTIC HERRING CATCH 2003-2014

Year	Total Herring Catch (mt)	Total quota allocated (mt)	Percent of total quota caught
2003	101,607	180,000	57%
2004	93,205	180,000	52%
2005	96,116	150,000	64%
2006	98,714	150,000	66%
2007	85,819	145,000	59%
2008	83,240	143,350	58%
2009	103,943	143,350	73%
2010	72,852	91,200	80%
2011	86,245	93,905	92%
2012	90,561	90,683	100%
2013	97,680	106,375	92%
2014	93,247	104,088	90%

Source: NMFS

Atlantic Herring Vessels

This section provides summary information regarding the vessels participating in the Atlantic herring fishery from 2008-2014. Additional information can be found in the FEIS for Amendment 5 to the Herring FMP. In this section, a herring trip is defined broadly as any trip in which at least one pound of Atlantic herring is retained.

Atlantic Herring Permits

Atlantic herring vessel permit categories are: Category A limited access all management areas; Category B limited access Areas 2 and 3 only; Category C limited access incidental catch of 55,000 lb per trip; Category D open access incidental catch of 6,600 lb per trip; and Category E limited access mackerel vessels that did not qualify for a limited access herring permit with a 20,000 lb herring possession limit in Areas 2/3. At this time, Category A and B vessels comprise the majority of the directed herring fishery. Many of the Category A, B, and C (limited access) vessels are also active in the Atlantic mackerel fishery (managed by the MAFMC). Approximately 50 vessels generally own a Category E permit.

Aside from a small increase in 2013, the number of vessels with either a limited access or an open access Atlantic herring permit has decreased annually since 2008 (Table 59). This includes a general annual decrease in limited access directed fishery vessels (Categories A and B), with a low of 40 vessels permitted in 2012. One cause could have been the substantial cuts in herring catch limits from prior levels beginning with the 2010-2012 specifications.

In 2014, 28 of the 43 (65%) Category A and B vessels were active (defined broadly as landing at least one pound of Atlantic herring during the fishing year). For the Category C

vessels, 9 of 42 (23%) were active. Just 55 of the 1,842 (3%) Category D vessels were active. Although there have been far fewer active limited access versus open access vessels, data presented in the remainder of this section show that the limited access fishery comprises over 99% of the fishery in terms of revenues.

TABLE 42. FISHING VESSELS WITH FEDERAL ATLANTIC HERRING PERMITS, 2009-2014

Permit Category		A	B,C	C	Total LA	D
2009	All	44	4	51	99	2,373
	Active	29	3	15	47	78
2010	All	42	4	49	95	2,277
	Active	29	3	19	51	99
2011	All	38	4	44	86	1,991
	Active	29	2	10	41	84
2012	All	36	4	41	81	1869
	Active	24	3	13	40	80
2013	All	40	4	44	88	1,909
	Active	25	3	15	43	76
2014	All	39	4	42	85	1,842
	Active	26	2	9	37	55

Source: NMFS Permit database and VTR database
Notes: Active vessels are defined as having landed at least one pound of Atlantic herring. This includes pair trawl vessels whose partner vessels landed the catch. Permit data for 2009-2011 are as of November 2012. Permit data for 2012-2013 are as of August 23, 2013.

Atlantic Herring Fishing Gear

Atlantic herring vessels primarily use purse seines, single midwater trawls or midwater pair trawls for fishing gear, with the combined single and pair midwater trawl fleet harvesting the majority of landings from 2008 to 2014 (70%; Tables 60 and 61). Some vessels use multiple fishing areas. The midwater trawl fleet uses all management areas, while the purse seine fishery focuses in Area 1A. Small mesh bottom otter trawls comprise about 5% of the fishery, and other gear types (e.g., pots, traps, shrimp trawls, handlines) comprise less than 1% of the herring fishery.

Table 60, 61 and 62 show the distribution of Atlantic herring landings by gear type, permit category, and management area. The data indicate that the vast majority of midwater trawl vessels are Category A permit holders. All pair trawl vessels possess Category A permits, and a small number of single midwater trawl vessels have both Category B and C herring permits.

TABLE 43. FISHING GEAR DISTRIBUTION OF TOTAL HERRING LANDINGS FROM ATLANTIC HERRING MANAGEMENT AREAS (2008-2011)

Gear Type	Area 1A (mt)	Area 1B (mt)	Area 2 (mt)	Area 3 (mt)	Total
Single Midwater Trawl	6,340 (5%)	3,246 (17%)	4,886 (5%)	12,830 (14%)	**27,302 (8%)**
Midwater Pair Trawl	56,769 (43%)	12,612 (64%)	68,336 (76%)	78,518 (86%)	**216,235 (65%)**
Purse Seine	69,074 (52%)	3,696 (19%)	2,221 (2%)	0 (0%)	**74,991 (22%)**
Small Mesh Bottom Trawl	463 (0.3%)	* (0%)	14,288 (16%)	117 (0.1%)	**14,869 (4%)**
Other	817 (0.6%)	0 (0%)	17 (0%)	* (0%)	**834 (0.2%)**
Total	**133,463 (100%)**	**19,555 (100%)**	**89,748 (100%)**	**91,466 (100%)**	**334,231 (100%)**

**Data Confidentiality Concern*
Source: VTR database. Data are updated as of September, 2012.

TABLE 44. FISHING GEAR DISTRIBUTION OF TOTAL HERRING LANDINGS FROM ATLANTIC HERRING MANAGEMENT AREAS (2012-2014)

Gear Type	Area 1A (mt)	Area 1B (mt)	Area 2 (mt)	Area 3 (mt)	Total
Single and Pair Midwater Trawl	14,677 (18%)	9,068 (34%)	44,746 (100%)	110,227 (100%)	**178,718 (67%)**
Purse Seine	68,409 (82%)	310 (1%)	0 (0%)	0 (0%)	**68,719 (26%)**
Small Mesh Bottom Trawl	534 (1%)	16,967 (64%)	0 (0%)	267 (0%)	**17,768 (7%)**
Other	3 (0%)	0 (0%)	3 (0%)	0 (0%)	**6 (0%)**
Total	**83,623 (100%)**	**26,345 (100%)**	**44,749 (100%)**	**110,494 (100%)**	**265,211 (100%)**

Source: VTR database. Data are updated as of August 2015.

TABLE 45. FISHING GEAR DISTRIBUTION OF HERRING LANDINGS BY PERMIT CATEGORY (2008-2011)

Gear Type	Category A (mt)	Category B/C (mt)	Category C (mt)	Category D (mt)	Total
Single Midwater Trawl	26,915 (8%)	383 (9%)	0 (0.0%)	5 (0%)	27,302 (8%)
Midwater Pair Trawl	216,235 (66%)	0 (0%)	0 (0.0%)	0 (0%)	216,235 (65%)
Purse Seine	73,261 (22%)	0 (0%)	1,350 (62%)	514 (41%)	74,991 (22%)
Small Mesh Bottom Trawl	9,922 (3%)	3,990 (91%)	538 (25%)	418 (34%)	14,869 (4%)
Other	249 (0%)	0 (0%)	278 (13%)	307 (25%)	834 (0%)
Total	326,583 (100%)	4,373 (100%)	2,166 (100%)	1,244 (100%)	334,365 (100%)

Atlantic Herring Prices

Average Atlantic herring prices have increased from approximately $221/mt in 2009 to approximately $300/mt in 2012. For January-June 2013, herring prices averaged $306/mt. Figure 3 plots the monthly average nominal prices for Atlantic herring, omitting December of 2011 and 2012 (prices were quite high during these months, but quantities were very low, and these months are not representative of normal operating conditions for the directed herring fishery).

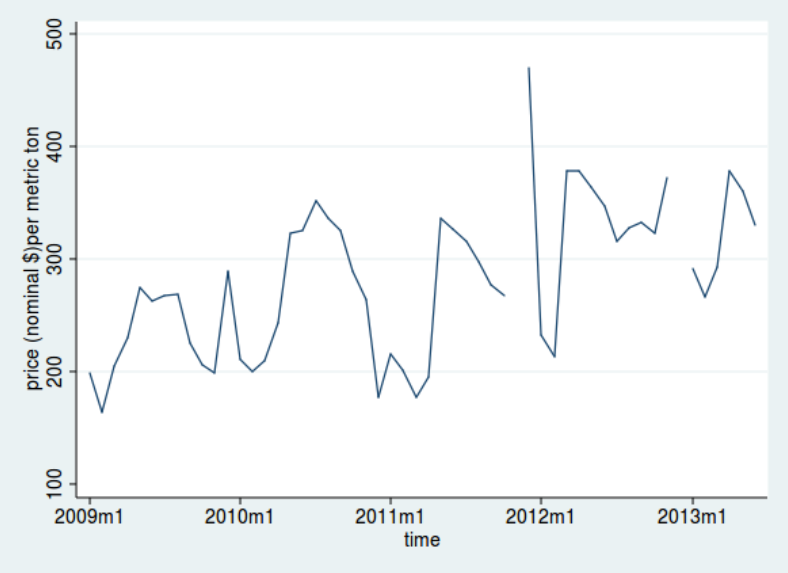


FIGURE 3. MONTHLY AVERAGE PRICE PER METRIC TON FOR ATLANTIC HERRING.

Atlantic Herring Fishing Communities

In this document, for the purposes of gaining a better perspective on the nature of the Atlantic herring fishery and the character of the affected human environment, a broader interpretation of fishing community has been applied to include almost all communities with a substantial involvement in or dependence on the Atlantic herring fishery. In terms of National Standard 8 (NS 8), some of the communities identified in this section may not fit the strict interpretation of the criteria for substantial dependence on fishing. The fishing communities that meet the legal definition (as promulgated through NS 8) are likely to be considered a subset of the broader group of communities of interest that are engaged in the herring fishery and identified in this document. A description concerning NS 8 is seen below.

In the 1996 amendments to the MSA, Congress added provisions directly related to social and economic factors for consideration by Councils and NMFS. NS 8 of the MSA states that:

Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

NS 8 requires the consideration of impacts on fishing communities. Section 316 of MSA defines a fishing community as:

"A community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community."

Because herring is widely used as bait for the lobster fishery, especially in Maine, it is not practical to identify every community with substantial involvement in the lobster fishery (and consequently some level of dependence on the herring fishery) for assessment in this document. However, some of the communities of interest were selected, in part, because of their involvement in or dependence on the lobster fishery. Assessment of the impacts of the Amendment 1 measures on these communities should provide enough context to understand the potential impacts on any community with substantial involvement in the lobster fishery. Parallels can be drawn between the communities that are identified in this section and other similar communities engaged in the lobster fishery.

NS 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. "Sustained participation" is interpreted as continued access to the fishery within the constraints of the condition of the resource.

Atlantic Herring Communities of Interest

The following five criteria were used in Amendments 1 and 5 to the Herring FMP to define *Communities of Interest* for the Atlantic herring fishery, which must meet at least one criterion:

1. Atlantic herring landings of at least 10M pounds (4,536 mt) per year from 1997-2008, or anticipated landings above this level based on interviews and documented fishery-related developments.
2. Infrastructure dependent in part or whole on Atlantic herring.
3. Dependence on herring as lobster and/or tuna bait.
4. Geographic isolation in combination with some level of dependence on the Atlantic herring fishery.
5. Utilization of Atlantic herring for value-added production.

Based on the above criteria, there are 11 *Communities of Interest* for the Atlantic herring fishery, identified below and further evaluated in Amendment 5 to the FMP for Atlantic Herring (Section 4.5.3). Also, community profiles of each are available from the NEFSC Social Sciences Branch website (Clay et al. 2007). Since Amendment 1, this list has changed slightly with changes in harvesting and processing sectors.

1. Portland, Maine
2. Rockland, Maine
3. Stonington/Deer Isle, Maine
4. Vinalhaven, Maine
5. Lubec/Eastport, Maine
6. Sebasco Estates, Maine
7. NH Seacoast (Newington, Portsmouth, Hampton/Seabrook)
8. Gloucester, Massachusetts
9. New Bedford, Massachusetts
10. Southern Rhode Island (Point Judith, Newport, North Kingstown)
11. Cape May, New Jersey

Atlantic Herring Home Ports

Of the Atlantic herring *Communities of Interest*, Gloucester, New Bedford, Southern RI, and Cape May are homeports with largest concentrations of vessels that have Atlantic Herring Category A or B limited access permits (Table 63). Mid-Coast ME, Portland ME, and Seacoast NH also are home to a few of these permit holders. Beyond the communities of interest, a few Category A and B permit holders have homeports in Bath, Cundys Harbor, Hampden, Owls Head, and West Rockport ME; Boston and Woods Hole MA; and Wanchese NC. For the most part, these vessels use a community of interest as a landing port (NMFS 2012).

The communities of interest also reflect concentrated locations of other stakeholders who rely on herring as a secondary resource. Examples include lobster fishing industry members who use herring for bait, and tuna fishermen and whale watch companies that rely on herring as forage to attract their target species.

TABLE 46. DISTRIBUTION OF 2012 ATLANTIC HERRING PERMIT HOLDERS THAT HAVE AN ATLANTIC HERRING COMMUNITY OF INTEREST AS A HOMEPORT

Homeport		Permit Category				
		A	B,C	C	D	Total
Maine	Portland	2	0	1	36	39
	Rockland	1	0	0	3	4
	Stonington/Deer Isle	1	0	0	0	1
	Vinalhaven	0	0	0	2	2
	Lubec/Eastport	0	0	0	2	2
	Sebasco Estates	0	0	0	3	3
	Maine, other	5	0	5	180	190
New Hampshire	Seacoast	2	0	4	90	96
Massachusetts	Gloucester	5	0	2	155	162
	New Bedford	5	0	2	195	202
	Massachusetts, other	5	1	1	356	363
Rhode Island	Southern	3	3	7	115	128
New Jersey	Cape May	6	0	8	85	99
	New Jersey, other	0	0	0	184	184
Other States		1	0	11	463	475

Source: NMFS

Atlantic Herring Landing Ports

Atlantic herring harvested from Areas 1A and 1B are landed in fishing communities in Maine, New Hampshire, and Massachusetts, whereas herring from Areas 2 and 3 are landed in a wider range of ports (Table 64). Communities in Rhode Island and New Jersey fish for herring almost exclusively in Area 2. Portland, Rockland, Gloucester, and New Bedford are ports with the most herring landings in recent years. Within New Jersey, Cape May is the most active landing port.

TABLE 47. ATLANTIC HERRING LANDING DISTRIBUTION BY PORT AND MANAGEMENT AREA

Landing Port		Area 1A	Area 1B	Area 2	Area 3
Maine	Portland	25%	20%	0%	26%
	Rockland	27%	14%	0%	11%
	Stonington/Deer Isle	8%	12%	0%	0%
	Vinalhaven	1.7%	3.9%	0%	2.3%

Landing Port		Area 1A	Area 1B	Area 2	Area 3
	Lubec/Eastport	0%	0%	0%	0%
	Sebasco Estates	0%	0%	0%	0%
	Maine, other	6.1%	1.1%	0%	4%
New Hampshire	Seacoast	2.5%	0.7%	0.1%	0.9%
Massachusetts	Gloucester	22%	45%	10%	44%
	New Bedford	6.9%	4.4%	53%	12%
	Massachusetts, other	1.1%	0.1%	3.6%	0%
Rhode Island	Southern	0%	0%	22%	0.1%
New Jersey	Cape May	0%	0%	12%	0%
	New Jersey, other	0%	0%	0%	0%
Other States		0%	0%	0.1%	0%
Total		163,269 (100%)	23,289 (100%)	101,542 (100%)	133,368 (100%)

Source: NMFS

Atlantic Herring Community Descriptions

1. Portland, Maine

Portland is the largest city in Maine, with a population of 66,194 (Bureau 2010). Of the civilian employed population 16 years and older, 0.3% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (29.3%) is the largest industry sector (Bureau 2011). Portland's waterfront provides most of the community's fishing industry infrastructure (e.g., Portland Fish Exchange) alongside other industries including recreation, tourism, light industry, transportation, cargo, and marine-related research. Portland's landings come primarily from the large mesh groundfish species and from lobster. Herring brings in about 8.6% of the dollar value of landings in Portland. Portland ranked third in herring landings in the region, taking a six-year (2005-2010) average (13.5K mt). Taking a four-year average (2007-2010), Portland ranked fourth among ports with herring revenue ($3.1M) (Dealer and VTR data).

2. Rockland, Maine

Rockland has a total population of 7,297 (Bureau 2010). Of the civilian employed population 16 years and older, 3.1% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (18.3%) is the largest industry sector (Bureau 2011). Other than fishing and boat building/repair, other stabilizing businesses include furniture and playground equipment manufacturing, biotechnology industries, wholesale distribution, marine-related businesses, seaweed processing, metal fabricating, and food related industries.

Rockland's landings consist primarily of lobster and herring. Herring brings in about 36% of the dollar value of landings in Rockland. Rockland ranked fourth in herring landings in the region, with a six-year (2005-2010) average (12.5K mt). Taking a four-year average (2007-2010), Rockland ranked second among ports with herring revenue ($3.4M), though 2009 and 2010 revenues were noticeably lower (Dealer and VTR data).

3. Stonington/Deer Isle, Maine

Stonington and Deer Isle have a total population of 3,018 (Bureau 2010). Of the civilian employed population 16 years and older, 29% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). This is the largest industry sector (Bureau 2011). Deer Isle is home to the Commercial Fisheries News, the widely-read monthly fishing industry newspaper for the Atlantic coast. Stonington is one of the few Maine fishing communities that have secured waterfront access for commercial fishing, because property values have remained stable relative to other coastal cities. Stonington's landings come primarily from lobster. Herring brings in about 0.10% of the dollar value of landings in Stonington and Deer Isle. Stonington and Deer Isle landed 3.9K mt of herring on average over six years (2005-2010). Taking a four-year average (2007-2010), Stonington ranked fifth among ports with herring revenue ($1.0M), though 2009 and 2010 revenues were noticeably lower (Dealer and VTR data). Stonington and Deer Isle are involved in the Atlantic herring fishery primarily through their dependence on herring for lobster bait.

4. Vinalhaven, Maine

The island town of Vinalhaven has a total population of 1,165 (Bureau 2010). Of the civilian employed population 16 years and older, 32.4% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). This is the largest industry sector (Bureau 2011). Vinalhaven is intimately involved with the Atlantic herring fishery because of its dependence on lobster bait. Many of the year-round residents are participants in the lobster fishery. Several lobster bait dealers, including floating stations and a co-op, are located in Vinalhaven. Vinalhaven has several packaging and wholesale companies (including Vinalhaven Lobster Co., Vinalhaven Fishermen's Co-op, Inland Seafood, and Alfred Osgood) that ship lobster to Portland and other mainland locations for processing and distribution. Bait dealers on Vinalhaven pay a higher price for bait than dealers on the mainland. This is due to the limited bait storage capacity on the island and insufficient space bait transshipments on the ferry that transports goods and people from the mainland during the height of the lobster season. Herring brings in about 2.7% of the dollar value of landings in Vinalhaven. Vinalhaven ranked ninth in herring landings in 2004 (2,674 mt) and tenth cumulatively from 1995-2004 (24,779 mt).

5. Lubec/Eastport, Maine

Lubec and Eastport have a total population of 2,690 (Bureau 2010). Of the civilian employed population 16 years and older, 5.4% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (31%) is the largest industry sector (Bureau 2011). Lubec and

Eastport have a diversity of employment, including medical centers, schools, an apparel company, and an Atlantic salmon aquaculture facility. Eastport also has the only nori seaweed processing plant in the USA. Eastport and Lubec are involved in a diversity of fisheries, including lobster, scallops, urchins, clams, and sea cucumbers. No herring landings were reported in Lubec/Eastport in 2004. Lubec and Eastport are representative of geographically isolated small ports that depend on herring for lobster bait.

6. Sebasco Estates, Maine

Sebasco Estates is a small village within the town of Phippsburg, which has a total population of 2,216 (Bureau 2010). Of the civilian employed population of Phippsburg 16 years and older, 5.2% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (22.6%) is the largest industry sector (Bureau 2011). Herring brings in about 0.076% of the dollar value of landings in Sebasco Estates. Several lobster bait dealers, large and small, are located in this area. Sebasco Estates is involved in the Atlantic herring fishery primarily due to its dependence on herring for lobster bait, and is representative of small ports that depend on herring for lobster bait.

7. NH Seacoast – Newington, Portsmouth, Hampton/Seabrook

Newington has a total population of 753 (Bureau 2010). Of the civilian employed population of Newington 16 years and older, 1.0% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (15.8%) is the largest industry sector (Bureau 2011). Major employers in Newington include Fox Run Mall (retail) and Neslab (light manufacturing lab equipment). Herring brings in about 4.8% of the dollar value of landings in Newington. Newington ranked fifth in herring landings in 2004 (5,660 mt) and 12th cumulatively from 1995-2004 (16,805 mt), with herring landings increasing in more recent years. Newington is primarily dependent on the herring fishery because of the bait it provides for lobster operations based in Great Bay estuary. Commercial fisheries in the Great Bay estuary include herring, alewives, mummichogs (*Fundulus sp.*) and tomcod, eels, and smelt. Newington has several large and small herring bait dealers, and freezer facilities to store lobster bait. The Little Bay Lobster Company and the Shafmaster Fleet Services both harvest and deliver lobster nationally and internationally. The Newington fishing industry also competes with other water-dependent industries, including tallow, steel scrap, and wood chip export industries.

Portsmouth has a total population of 20,779 (Bureau 2010). Of the civilian employed population of Portsmouth 16 years and older, 0.7% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (25.5%) is the largest industry sector (Bureau 2011). Portsmouth is somewhat involved in the herring fishery, primarily through its dependence on herring for lobster and tuna bait. Herring brings in about 1.2% of the dollar value of landings in Portsmouth. The port is centrally-located with good transportation

infrastructure and provides other fishing related services. Portsmouth ranked 13th in herring landings in 2004 (800 mt) and 11th cumulatively from 1995-2004 (18,060 mt).

Hampton and Seabrook have a total population of 24,123 (Bureau 2010). Of the civilian employed population 16 years and older, 0.5% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (21.5%) and retail trade (21.8%) are the largest industry sectors, in Hampton and Seabrook, respectively (Bureau 2011). Hampton and Seabrook are somewhat involved in the herring fishery through their dependence on herring for lobster and tuna bait. Herring brings in about 0.2% of the dollar value of landings in Hampton and Seabrook. Only 2 mt of herring were reported to have been landed in Hampton in 2004. Seabrook ranked 17th in herring landings in 2004 (96 mt).

8. Gloucester, Massachusetts

Gloucester has a total population of 28,789 (Bureau 2010). Of the civilian employed population of Gloucester 16 years and older, 2.2% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (25.5%) is the largest industry sector (Bureau 2011). Herring brings in about 11% of the dollar value of landings in Gloucester. Gloucester was the top-ranked port for herring landings in 2004 (26,891 mt) and cumulatively from 1995-2004 (227,579 mt). Taking a four-year average (2007-2010), Gloucester ranked first among ports with herring revenue ($6.4M) (Dealer and VTR data). Gloucester lobster fishermen depend on the harvested herring as bait for their traps and tuna fishermen use herring as bait for their lines. Several lobster bait dealers and a pumping station for offloading herring are located in Gloucester. In addition, Cape Seafoods, one of the largest processors of herring for frozen export, is located at the State Pier and owns several dedicated pelagic fishing vessels.

9. New Bedford, Massachusetts

New Bedford has a total population of 95,072 (Bureau 2010). Of the civilian employed population of New Bedford 16 years and older, 1.2% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (26.1%) is the largest industry sector (Bureau 2011). New Bedford contains approximately 44 fish wholesale companies, 75 seafood processors and 200 shore side industries (Hall-Arber et. al. 2001). Maritime International, which has one of the largest U.S. Department of Agriculture-approved cold treatment centers on the East Coast, is also located in New Bedford. Herring brings in about 0.7% of the dollar value of landings in New Bedford. New Bedford ranked fourth in herring landings in 2004 (7,791 mt) and seventh cumulatively from 1995-2004 (31,089 mt). Taking a four-year average (2007-2010), New Bedford ranked third among ports with herring revenue ($6.4M) (Dealer and VTR data).

10. Southern Rhode Island – Point Judith, Newport, North Kingstown

Census data are not available for Point Judith itself, but are available for the county subdivision "Narragansett Pier CDP" which includes Point Judith. Narragansett Pier CDP has a total population of 3,409 (Bureau 2010). Of the civilian employed population of Narragansett Pier CDP 16 years and older, 0.5% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (27.7%) is the largest industry sector (Bureau 2011). Several lobster bait dealers are located in Point Judith, and some herring is trucked from there to Maine for processing. Landings of herring in Point Judith were much higher in the early 1990s, possibly due to increased participation in the Atlantic mackerel fishery. Today, herring brings in about 1.2% of the dollar value of landings in Point Judith. Point Judith ranked 10th in herring landings in 2004 (2,129 mt) and fourth cumulatively from 1995-2004 (71,289 mt). Taking a four-year average (2007-2010), Point Judith ranked seventh among ports with herring revenue ($469K) (Dealer and VTR data).

Newport has a total population of 24,672 (Bureau 2010). Of the civilian employed population of Newport 16 years and older, less than 0.01% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (25.1%) is the largest industry sector (Bureau 2011). Herring brings in less than 0.01% of the dollar value of landings in Newport. Newport is marginally involved in the Atlantic herring fishery, and ranked 15th in herring landings in 2004 (313 mt) and 17th cumulatively from 1995-2004 (3,757 mt). Aquidneck Lobster Co., Dry Dock Seafood, International Marine Industries Inc., Long Wharf Seafood, Neptune Trading Group Ltd., Parascandolo and Sons Inc., and Omega Sea are wholesalers and retailers of seafood in Newport.

North Kingstown has a total population of 26,486 (Bureau 2010). Of the civilian employed population of North Kingstown 16 years and older, 1.1% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Educational services and health care and social assistance (25.4%) is the largest industry sector (Bureau 2011). Herring brings in about 6.9% of the dollar value of landings in North Kingstown, which is involved in the herring fishery primarily through its involvement in the bait market. North Kingstown ranked 12th in herring landings in 2004 (1,065 mt) and fifth cumulatively from 1995-2004 (69,094 mt). Several lobster bait dealers and freezer facilities are located in North Kingstown, and some herring is trucked from there to Maine for processing. North Kingston's Sea Freeze, Ltd. is the largest producer of sea-frozen fish on the U.S. east coast. It supplies sea-frozen and land-frozen fish to domestic and international markets including bait products to long-line fleets. Sea Freeze owns two freezer trawlers that provide *Illex* and *Loligo* squid, mackerel and herring to the Sea Freeze facilities. Although herring is among the least financially valuable species that Sea Freeze harvests and processes, it is nevertheless important to the business due to its year round availability.

11. Cape May, New Jersey

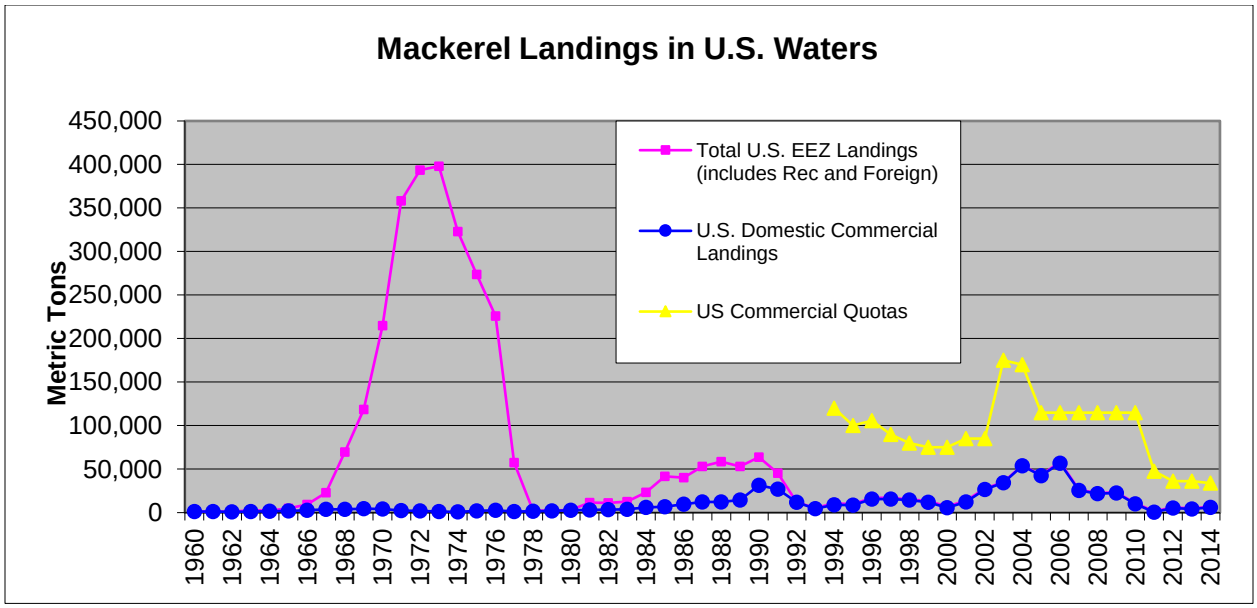
Cape May has a total population of 3,607 (Bureau 2010). Of the civilian employed population of Cape May 16 years and older, less than 0.01% are employed in the agriculture, forestry, fishing, hunting, or mining sectors (2007-2011 average). Arts, entertainment, recreation, accommodation and food services (19.3%) is the largest industry sector (Bureau 2011). Herring brings in about 0.6% of the dollar value of landings in Cape May. Only 8 mt of herring were reported to have been landed in Cape May in 2004. A pumping station for offloading herring and Lund's Fisheries, a processor of herring and mackerel, are located in Cape May. Lund's' also owns a number of dedicated pelagic fishing vessels, and is a member of the Garden State Seafood Association. There are two other exporters of seafood in Cape May. These include the Atlantic Cape Fisheries Inc., which exports marine fish and shellfish, oysters, scallops, clams and squid, and the Axelsson and Johnson Fish Company Inc., which exports shad, marine fish, conch, American lobster, lobster tails, scallops and whole squid.

3.1.5.2 ATLANTIC MACKEREL FISHERY INFORMATION

The following information is adapted from 2015-2017 Specifications and Management Measures for the Atlantic Mackerel, Squid, and Butterfish FMP (MAFMC, 2014). Additional description of the mackerel fishery is included in Section 3.1.1.6 of this document.

Historical Atlantic Mackerel Commercial Fishery

The modern northwest mackerel fishery began with the arrival of the European distant-water fleets in the early 1960's. Total international commercial landings (Northwest Atlantic Fisheries Organization Subareas 2-6,) peaked at 437,000 mt in 1973 and then declined sharply to 77,000 by 1977 (Overholtz 1989). The MSA established control of the portion of the mackerel fishery occurring in US waters (Northwest Atlantic Fisheries Organization Subareas 5-6) under the auspices of the Council. Reported foreign landings in US waters declined from an unregulated level of 385,000 mt in 1972 to less than 400 mt from 1978-1980 under the MSA (the foreign mackerel fishery was restricted by NOAA Foreign Fishing regulations to certain areas or "windows"). Under the MSB FMP foreign mackerel catches were permitted to increase gradually to 15,000 mt in 1984 and then to a peak of almost 43,000 mt in 1988 before being phased out again.

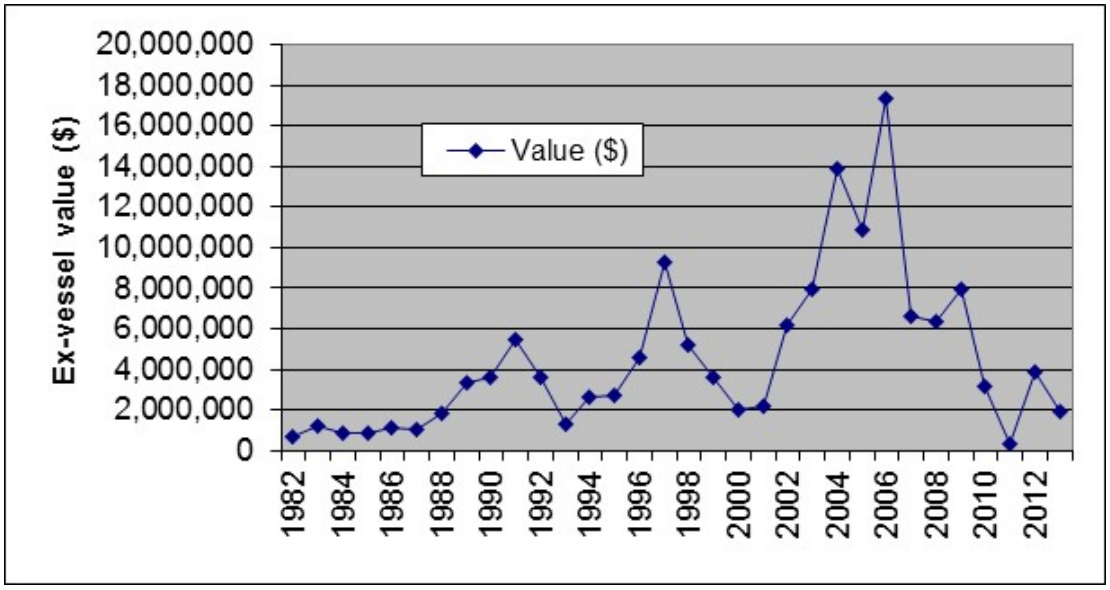


Source: TRAC 2010, unpublished NEFSC dealer reports

FIGURE 4. HISTORICAL ATLANTIC MACKEREL LANDINGS IN THE U.S. EEZ.

US commercial landings of mackerel increased steadily from roughly 3000 mt in the early 1980s to greater than 31,000 mt by 1990. US mackerel landings declined to relatively low levels 1992-2000 before increasing in the early 2000's. The most recent years have seen a significant drop-off in harvest. In 2014, 6,726 mt of mackerel was landed.

Nominally ex-vessel price has generally varied between about $200-$700 per mt but when inflation is taken into account there was erosion in the ex-vessel per-pound value of mackerel from 1982-2010. 2011 and 2012 prices increased substantially (near $700/mt), which is likely at least partially related to the low levels of mackerel landed. 2014 ex-vessel prices were about $491/mt. Total ex-vessel value tracks both price and the quantity of fish landed (see Fishery Information Document at http://www.mafmc.org/ssc-meetings/2013/april-may for details). 2014 landings totaled 5,490 mt and generated $2.9 million in ex-vessel revenues.



Source: unpublished NEFSC dealer reports

FIGURE 5. MACKEREL NOMINAL EX-VESSEL REVENUES 1982-2013.

Atlantic Mackerel Fishery Performance

Weekly dealer data triggers in-season management actions that institute relatively low trip limits when 90% of the commercial DAH is landed. Table 65 lists the performance of the mackerel fishery (commercial and recreational together) compared to the effective quota from 2005-2014. There have been no quota overages over this period, and the fisheries have not approached the quotas. Since 2012 any ABC overages must be repaid pound for pound. Discard information is not available since 2011, but it does not appear that mackerel would have approached anywhere near its ABC since discards are usually quite low according to the most recent assessment (TRAC 2010). The 2013 and 2014 ABC was 43,781 mt.

TABLE 48. ATLANTIC MACKEREL QUOTA PERFORMANCE

Year	Harvest (mt) (Commercial and Recreational)	Quota (mt) (Rec+Com)	Percent of Quota Landed
2005	43,275	115,000	38%
2006	58,352	115,000	51%
2007	26,142	115,000	23%
2008	22,498	115,000	20%
2009	23,235	115,000	20%
2010	10,739	115,000	9%
2011	1,478	47,395	3%
2012	6,015	36,264	17%
2013	5,029	36,264	14%
2014	6,726	33,821	20%

Source: Unpublished NMFS dealer reports and MRIP data

Participation in the fishery was low in 2014 related to the low availability of mackerel. The tables and figures below and on the following pages describe vessel participation, vessel dependency, distribution of landings by state/month/gear/port, dealer participation, and the general at-sea location of recent mackerel landings/catches.

TABLE 49. 2014 DATA FOR PERMITTED AND ACTIVE ATLANTIC MACKEREL VESSELS

Landings (lb)	1,000,000	100,000-1,000,000	50,000-100,000	10,000-50,000
No. of Vessels (All States)	6	5	1	14

Source: Unpublished NMFS dealer reports and permit data. Data confidentiality rules do not allow state by state breakdowns.

The mackerel fishery became a limited access fishery in 2013 except for open-access incidental catch permits. The current numbers of permits are approximately 31 Tier 1 permits, 24 Tier 2 permits, and 80 Tier 3 permits. When the directed fishery is open, there are no trip limits for Tier 1, Tier 2 has a 135,000 pound trip limit and Tier 3 has a 100,000 pound trip limit. Tier 3's trip limit is reduced to 20,000 pounds if it catches 7% of the commercial quota. Open access incidental permits have a 20,000 pound per trip limit. Only a few vessels accounted for most mackerel landings in 2014 (Table 66).

TABLE 50. 2014 VESSEL DEPENDENCE ON MACKEREL (REVENUE-BASED)

Dependence on Mackerel	Number of Vessels in Each Dependency Category
1%-%5	10
5%-25%	12
25%-50%	3
More than 50%	1

Source: Unpublished NMFS dealer reports – not at state level due to data confidentiality issues

TABLE 51. RECENT LANDINGS BY STATE (MT)

Year	CT	MA	ME	NJ	NY	RI	Other
2012	4	1,874	19	915	25	2,493	2
2013	9	3,302	465	21	9	324	5
2014	9	4,924	622	13	57	245	71

Source: Unpublished NMFS dealer reports

TABLE 52. RECENT LANDINGS BY MONTH (MT)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	668	3,576	948	19	48	4	5	1	35	18	5	4
2013	109	2,075	1,149	148	26	9	29	28	21	23	33	485
2014	109	2,560	936	67	21	13	29	33	42	61	1,958	111

Source: Unpublished NMFS dealer reports

TABLE 53. RECENT LANDINGS BY GEAR (MT)

Year	Gill Nets	Bottom Trawl	Single Mid-Water Trawl	Pair Mid-Water Trawl	Trap/Pots/Pound Nets/Weir	Other/Unknown
2012	4	3,059	576	1,488	24	181
2013	6	749	166	2,338	15	861
2014	33	1,126	1,299	1,484	16	1,981

Source: Unpublished NMFS dealer reports

Because of data confidentiality issues, details for port revenues from mackerel cannot be provided. Ports that had at least $100,000 in ex-vessel revenues from mackerel over 2011-2014 (combined) included (from more mackerel dollars to less): North Kingstown, RI; Gloucester, MA; New Bedford, MA; Portland, ME; Cape May, NJ; Marshfield, MA; Provincetown, MA; and Point Judith, RI. (Source: Unpublished NMFS dealer reports.). Descriptions of these communities are provided in Section 3.1.5.1.

Permit data is public, and the tables below provide the homeport and principal landing port for the 57 mackerel vessels with Tier 1 and Tier 2 permits, which land almost all of the mackerel in a given year and would be the most likely to be affected by this action. While more principal ports are listed in the permit data, the majority of mackerel would be expected to be landed in the above listed ports with recent substantial landings even if mackerel became more available and landings increased substantially.

TABLE 54. TIER 1/2 HOMEPORTS

Home Port State	Home Port City	Total
MA	Boston	4
	Gloucester	4
	New Bedford	8
	Woods Hole	1
MA Total		17
	Bath	1
	Cundys Harbor	1
	Portland	1
	Rockland	1
ME Total		4
NC	Wanchese	1
NC Total		1
NH	Newington	2
NH Total		2
NJ	Cape May	21
NJ Total		21
NY	Greenport	1
	Montauk	2
NY Total		3
PA	Philidelphia	2
PA Total		2
RI	Davisville	1
	Narragansett	1
	Point Judith	4
	Tiverton	1
RI Total		7
Grand Total		57

TABLE 55. TIER 1/2 PRINCIPAL PORTS

PRINCIPAL PORT STATE	PRINCIPAL PORT CITY	Total
⊟MA	FAIRHAVEN	1
	GLOUCESTER	4
	NEW BEDFORD	7
	WOODS HOLE	1
MA Total		13
⊟ME	PORTLAND	3
	ROCKLAND	1
	VINALHAVEN	1
ME Total		5
⊟NH	NEWINGTON	2
NH Total		2
⊟NJ	CAPE MAY	22
	WILDWOOD	1
NJ Total		23
⊟NY	GREENPORT	1
	MONTAUK	2
NY Total		3
⊟RI	DAVISVILLE	2
	NARRAGANSETT	2
	POINT JUDITH	5
	TIVERTON	1
RI Total		10
⊟VA	HAMPTON	1
VA Total		1
Grand Total		57

Source: NMFS

TABLE 56. RECENT NUMBERS OF ACTIVE DEALERS

	Number of dealers buying at least $10,000 Mackerel	Number of dealers buying at least $100,000 Mackerel
2012	5	5
2013	16	4
2014	18	5

Source: Unpublished NMFS dealer reports

TABLE 57. KEPT CATCH (MT) IN STATISTICAL AREAS WITH AT LEAST 1,000 MT OF MACKEREL CAUGHT IN AT LEAST ONE RECENT YEAR

YEAR	_612	_521	_616	_522
2011	4	.	100	13
2012	2,393	38	1,527	45
2013	15	2,010	.	1,511

Source: Unpublished NMFS vessel trip reports

Data confidentiality concerns preclude listing mackerel catch by statistical area, but statistical areas with more than 1,000 mt of mackerel catch combined over 2012-2014 include (in descending order of catch amounts) 522, 612, 521, 616, and 514.

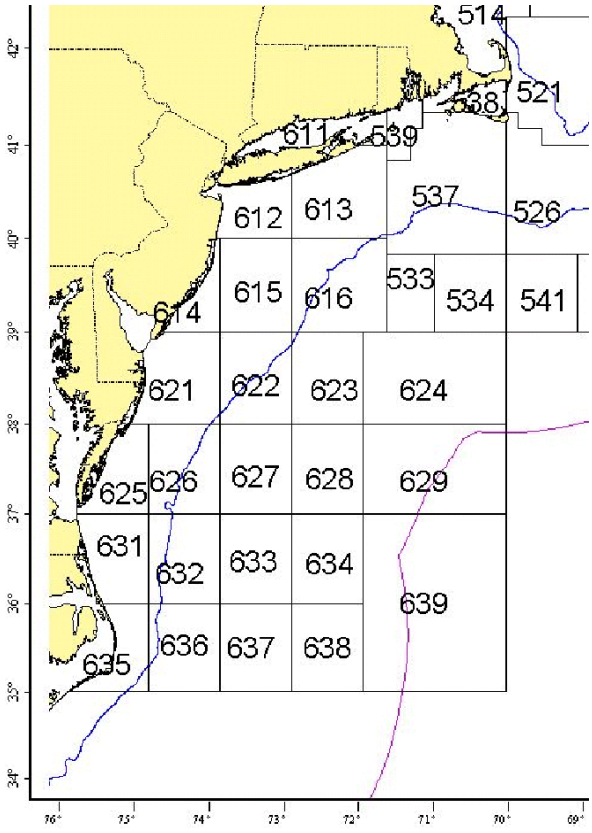
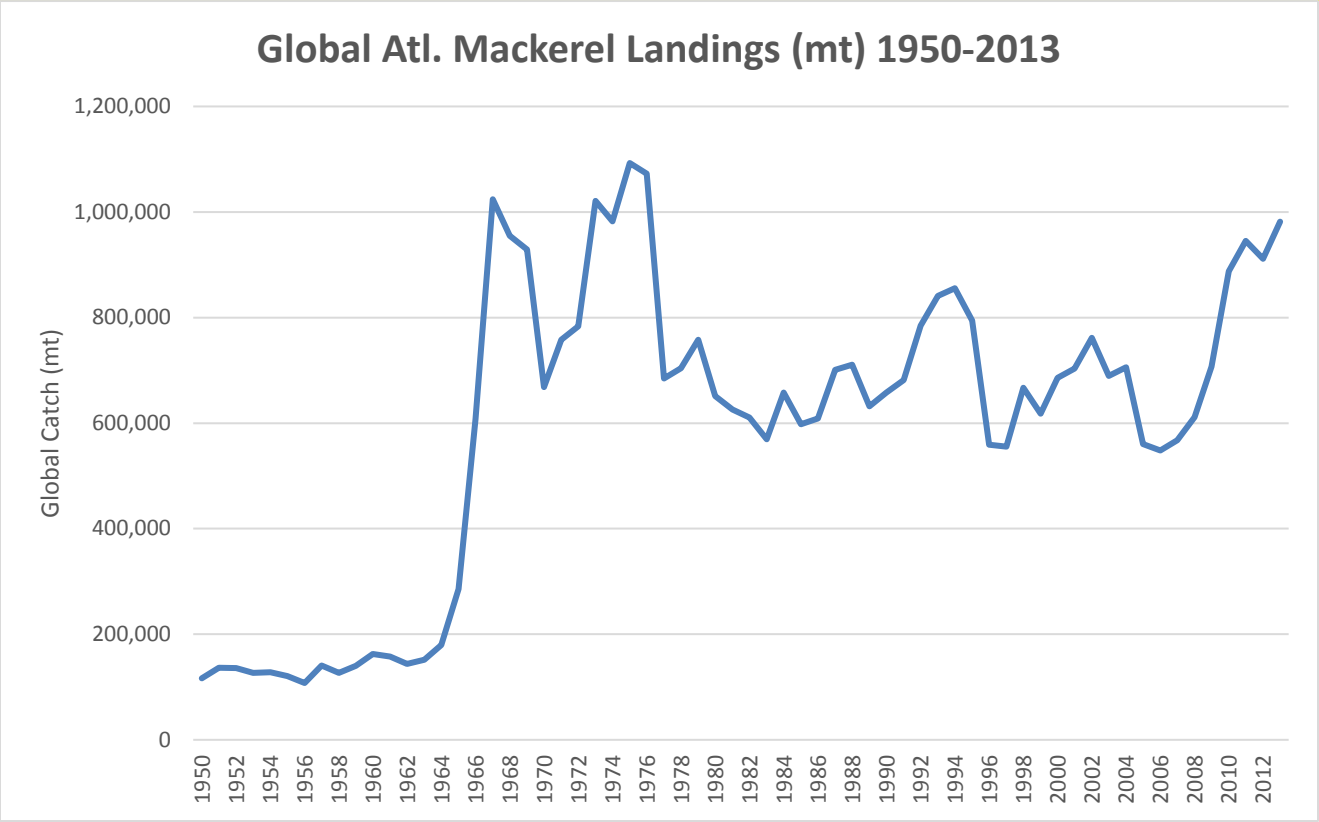


FIGURE 6. NMFS STATISTICAL AREAS

Current Market Overview for Mackerel and World Production (Required by FMP)

U.S. mackerel (western Atlantic) are a substitute for European mackerel (eastern Atlantic), which are caught in much larger quantities. It is unclear how demand for U.S. mackerel may be impacted by European catches, but the MSB advisory panel has indicated that the demand for mackerel is high enough to support catches near the quotas if the product is of high quality.



Source: http://www.fao.org/fishery/statistics/

FIGURE 7. WORLD PRODUCTION OF MACKEREL, 1950-2013.

Recreational Atlantic Mackerel Fishery

Mackerel can be seasonally important to the recreational fisheries of the Mid-Atlantic and New England regions. They may be available to recreational anglers in the Mid-Atlantic primarily during the winter and spring, depending on annual conditions. Mackerel are caught in New England in the summer and fall and are often targeted for purposes of collecting live bait, especially for large striped bass. 2005-2014 recreational landings of mackerel, as estimated from the Marine Recreational Information Program ("MRIP"), are given in Table 75. Most mackerel are caught in the private/rental mode but some are caught in the party/charter and shore modes as well. Approximately 20% of all mackerel caught (by number) are released (2013-2014 combined). Compared to other recreationally-important species, estimates for mackerel recreational harvest have low precisions due to low encounter rates. Earlier years (1980s-1991) had higher catches (consistently in the 1,000-4,000 mt range) but recent years have been below 1,000 mt.

TABLE 58. RECREATIONAL HARVEST (ROUNDED TO NEAREST MT) OF MACKEREL, 2005-2014.

Year	Harvest (MT)
2005	1,005
2006	1,491
2007	596
2008	755
2009	600
2010	845
2011	947
2012	683
2013	888
2014	792

Source: Personal Communication from NMFS Fisheries Statistics Division.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The National Environmental Policy Act requires that an EA briefly describe the probable environmental impacts of the proposed action and alternatives to the proposed action considered by the action agency (NEPA, section 102(2)(E)). The following sections address the reasonably foreseeable direct, indirect, and cumulative effects of the alternatives considered in this amendment.

4.1 OMNIBUS ALTERATIVE IMPACTS

This amendment includes a set of Omnibus Alternatives that would modify all the FMPs managed by the Council to allow standardized development of future FMP-specific IFM programs.

The Council finalized its selection of preferred alternatives at its April 18-20, 2017, meeting.

Omnibus Alternatives	Preferred Alternatives
Alternative 1 (No Standardized Structure for IFM Programs)	No
Alternative 2 (Standardized Structure for IFM Programs)	Yes
Alternative 2.1 (NMFS-Led Prioritization Process)	No
Alternative 2.2 (Council-Led Prioritization Process)	Yes
Alternative 2.3 (Proportional Prioritization Process)	No
Alternative 2.4 (Lowest Ratio-Based Prioritization Process)	No
Alternative 2.5 (Highest Ratio-Based Prioritization Process)	No
Alternative 2.6 (Monitoring Set-Aside)	Yes

Omnibus Alternative 1 (No Action) – No standardized structure for IFM programs. Programs developed on an FMP-by-FMP basis.

- No standard definition of cost responsibilities for NMFS or industry;
- No standard amendment process to implement IFM programs and no standard framework adjustment process to revise IFM programs;

- No standardized service provider requirements;
- No process for prioritizing available Federal funding to support IFM programs across all New England FMPs; and
- No standardized framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternative 2 (**Preferred Alternative**) – Standardized structure for IFM programs and option for monitoring set-aside provision.

- Standard definition for cost responsibilities for NMFS or industry;
- Standard amendment process to implement IFM programs and standard framework adjustment process to revise IFM programs;
- Standard service provider requirements;
- Process for prioritizing available Federal funding to support IFM programs across all New England FMP; and
- Option for standard framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternatives 2.1-2.5 are variations on the prioritization process in Omnibus Alternative 2, and consider specific options for what to do when Federal funding is not sufficient to cover NMFS cost responsibilities to support the Council's desired level of IFM for a given FMP.

- Omnibus Alternative 2.1 – NMFS-led prioritization process. NMFS prepares analysis and prioritization in consultation with the Council.
- Omnibus Alternative 2.2 (**Preferred Alternative**) – Council-led prioritization process. Council prepares analysis and recommends priorities to NMFS. Council recommended an equal weighting approach that would be adjusted on an as-needed basis.
- Omnibus Alternative 2.3 – Proportional prioritization process. Available Federal funding would be allocated proportionally among all IFM programs.
- Omnibus Alternative 2.4 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP relative to the extra coverage needed and total fleet activity. Alternative 2.4 would favor coverage for the FMPs that need little additional monitoring to meet coverage targets and have the most active fleets.
- Omnibus Alternative 2.5 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP relative to the extra coverage needed and total fleet activity. Alternative 2.5 would favor coverage for the FMPs that need more additional monitoring to meet coverage targets and have the least active fleets.

Omnibus Alternative 2.6 (**Preferred Alternative**) (Monitoring Set-Aside) would provide a structure to develop future monitoring set-aside programs to help offset vessel/non-governmental cost responsibilities associated with IFM coverage targets. No monitoring set-aside programs would be established in this amendment.

4.1.1 IMPACTS SUMMARY FOR PREFERRED OMNIBUS ALTERNATIVES

In general, there are no direct impacts on biological resources (target, non-target, and protected species), the physical environment, or fishery-related businesses and human communities associated with the Council's preferred alternatives, Omnibus Alternatives 2, 2.2, and 2.6.

If approved and implemented by NMFS, these preferred alternatives would become tools for the Council to use when developing future IFM programs. Because these alternatives would not directly affect the level of fishing, fishing operations, amount of fish harvested, or area fished, they do not have direct impacts on biological resources or the physical environment. Additionally, these alternatives do not have any direct economic impacts on fishery-related business or human communities because they do not require the development of IFM programs nor do they directly impose any costs.

In the future, if the Council developed an IFM program for a particular FMP, there would be direct negative economic impacts to fishing vessels resulting from the standardized cost responsibilities included in Omnibus Alternative 2, provided there was available Federal funding to support that IFM program and vessels were required to pay for increased monitoring. However, any direct negative economic impacts to fishing vessels resulting from a future IMF program would be evaluated in the amendment to establish that IFM program and are not considered in this amendment.

Preferred Omnibus Alternatives 2 and 2.2 would have an indirect low positive impact on biological resources. Standard monitoring service provider requirements have the potential to help improve data collections for IFM programs. A process to prioritize available Federal funding across New England FMPs allows IFM programs to align with Council monitoring priorities.

There would also likely be indirect low positive economic impacts associated with the Council's preferred alternatives, Omnibus Alternatives 2 and 2.2. These indirect impacts would result from standardized cost responsibilities, standardized service provider requirements, and a process to prioritize available Federal funding. Standardized cost responsibilities and service provider requirements may allow the fishing industry to negotiate contracts with service providers and increase the efficiency of administering IFM programs, thereby, potentially reducing future sampling costs for the industry.

The impacts (biological, physical, socioeconomic) of preferred Omnibus Alternative 2.6 would be negligible because the alternative details the mechanism to develop and implement future monitoring set-aside programs. Any impacts that may be associated with actually implementing a monitoring set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

4.1.2 OMNIBUS ALTERNATIVE IMPACTS TO BIOLOGICAL RESOURCES

In general, there are no direct impacts on biological resources (target, non-target, and protected species) associated with either Omnibus Alternative 1 or Omnibus Alternative 2. These alternatives specify the process to develop future IFM programs and, thus, do not directly affect the level of fishing, fishing operations, amount of fish harvested, or area fished.

Standardized cost responsibilities and a standardized process for implementing and revising future IFM programs in Omnibus Alternative 2 have a negligible impact on biological resources. These aspects of Omnibus Alternative 2 detail the process of standardizing future IFM programs, but do not directly affect the level of fishing, fishing operations, amount of fish harvested, or area fished. As there are negligible biological impacts associated with standardizing cost responsibilities and the process to develop new IFM programs, there are no differences in the impacts of these aspects of Omnibus Alternatives 1 and 2.

Under Omnibus Alternative 2, there is the potential for an indirect low positive impact on biological resources related to establishing standardized IFM service provider requirements. Standardized service provider requirements may lead to greater consistency in the information collected about target, non-target, and protected species through IFM programs, provided that individual FMPs do not drastically alter the service provider requirements when establishing monitoring programs. Improved catch information resulting from greater consistency in how information is collected may lead to better management of biological resources. In contrast, under Omnibus Alternative 1, there is the potential for an indirect low negative impact on biological resources because IFM service provider requirements would need to be established separately for each FMP, which could delay the implementation of new monitoring programs and may provide less consistent data.

Under Omnibus Alternative 2, if adequate Federal funding was available to cover NMFS cost responsibilities associated with IFM coverage targets after SBRM coverage requirements were met, those IFM programs would operate at the target coverage levels established through each individual FMP. If there is some Federal funding available after SBRM coverage requirements are met, but not enough to cover all of the IFM programs, a prioritization process would be used to allocate available Federal funding across FMPs. If no Federal funding was available after SBRM coverage requirements were met, then, similar to Omnibus Alternative 1, there would be no IFM in addition to SBRM requirements.

Under the Omnibus Alternative 1, there is no specified process to prioritize available Federal funding between IFM programs, so funding is allocated on a case-by-case basis. There is the potential for a low negative impact on biological resources under Omnibus Alternative 1 if IFM programs gathering important catch information go unfunded because there is no mechanism to use available Federal funding in a timely manner. Without the funding to gather important catch information, there could be indirect low negative

impacts on biological resources if limited information prevents appropriate management or the implementation of measures to conserve a species.

In contrast, Omnibus Alternative 2 may provide an indirect low positive impact on biological resources, compared to Omnibus Alternative 1, because the prioritization process would allow Federal funding to support IFM when funding was available.

The magnitude of potential indirect impacts of the prioritization process on biological resources varies by prioritization process. The impacts discussed below apply when there is some Federal funding available to support NMFS cost responsibilities associated with IFM coverage targets, after SBRM coverage requirements are met, but not enough to support all the IFM coverage targets.

The discretionary prioritization alternatives (Omnibus Alternatives 2.1 and 2.2) have the greatest potential for indirect low positive impacts to biological resources, compared to Omnibus Alternative 1 and the formulaic prioritization alternatives (Alternatives 2.3-2.5), because they allow for the evaluation of program need and design when assigning funding priorities. This means that, in years where there is Federal funding available to support IFM programs, the discretionary prioritization alternatives allow the potential to direct funding towards monitoring programs that improve information about specific target, non-target, and protected species. For example, if IFM programs were developed to address concerns with the precision of bycatch of target, non-target, or protected species the discretionary prioritization alternatives (Omnibus Alternatives 2.1 and 2.2) would allow for NMFS or the Council to prioritize funding to those programs rather than other IFM programs that do not address the same biological concerns. When funding is prioritized to specific IFM programs, those programs are better able to gather data and provide increased information on biological resources.

Omnibus Alternatives 2.1 and 2.2 would use a weighting approach to prioritize available Federal funding. Omnibus Alternative 2.1 specifies a criteria-based weighting approach, while the Council recommended an equal weighting approach, adjusted on an as-need basis, for Omnibus Alternative 2.2. The equal weighting approach is an effective and administratively simple tool to prioritize funding when the number of IFM programs are limited. If the number of IFM programs across New England FMPs increases, the Council may want to consider another type of weighting approach, similar to the criteria-based approach, to help ensure that available Federal funding is prioritized consistent with Council monitoring priorities.

The formulaic prioritization alternatives (Omnibus Alternative 2.3-2.5) all provide an indirect low positive impact on biological resources, compared to Omnibus Alternative 1, because the formulaic prioritization alternatives would consider all New England IFM programs when allocating Federal funds, rather than considering IFM programs on a case-by-case basis. Omnibus Alternative 2.3 would allocate available Federal funding proportionally to IFM programs. So that during years when funding was available, all New England IFM programs would receive some additional monitoring, which may have indirect low positive impacts on biological resources resulting from information collection.

Omnibus Alternative 2.4 would allocate funding to those IFM programs that need limited IFM coverage to meet cover targets and involve the most active fisheries, while Omnibus Alternative 2.5 would allocate funding to those IFM programs that need more IFM coverage to meet cover targets and involve the least active fisheries. Even though Omnibus Alternatives 2.4 and 2.5 do not evaluate program need and design and may result in some IFM programs not receiving funding, there is still some potential for indirect low positive impacts on biological resources by using a funding prioritization process, rather than allocating funding on a case-by-case basis as in Omnibus Alternative 1. The efficiency of allocating Federal funding under Alternatives 2.3-2.5 would indirectly benefit biological resources by helping ensure funding is available in a timely manner to gather information which could improve catch monitoring or fishery management.

Because Omnibus Alternative 2.6 details the mechanism to develop and implement future monitoring set-aside programs, to help offset industry/non-government cost responsibilities associated with IFM programs, there are no direct or indirect impacts on any biological resources anticipated for this alternative. Any impacts that may be associated with actually implementing a monitoring set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

The Council's selection of Omnibus Alternatives 2 and 2.2 as preferred alternatives will likely have potential downstream impacts (e.g., subsequent management measures to address issues discovered by increased monitoring) but these impacts are too remote and speculative to be appropriate for consideration in this amendment.

First, while the omnibus alternatives consider expanding monitoring coverage above the level required under SBRM, implementation of this amendment does not, by itself, automatically allow for increased monitoring in New England FMPs. While increases in monitoring coverage targets for some fisheries may be expected to improve data quality, actual improvements in data quality are contingent upon sufficient funding to expand coverage beyond SBRM.

Second, there is no way to predict the impact that improvements in data quality would have for managing the affected fisheries. Increased monitoring should allow for improvements in data quality, which may then give assessment scientists and fishery managers more confidence in the data. However, there is no way to predict outcomes from increased monitoring because but any resulting data trends are unknown at this time.

Third, the type of management measures implemented in response to improvements in data quality cannot be predicted. Depending on the fishery, species, time, area, and type to the concern, different types of management measures would be appropriate. Therefore, there is no way to speculate as to what the most likely impacts resulting from those management measures may entail.

4.1.3 OMNIBUS ALTERNATIVE IMPACTS TO PHYSICAL ENVIRONMENT

Neither Omnibus Alternative 1 nor Omnibus Alternative 2 would directly impose or likely result in any changes in fishing effort or behavior, fishing gears used, or areas fished. Similarly, Omnibus Alternatives 2.1 – 2.5 would not result in any changes in fishing behavior or areas fished. Therefore, there are no potential impacts (direct or indirect) on the physical environment (including essential fish habitat) associated with the omnibus alternatives in this amendment. Because there are no potential impacts to the physical environment associated with the omnibus alternatives, there are no differences in impacts between omnibus alternatives.

Omnibus Alternative 2.6 details the mechanism to develop and implement future monitoring set-aside programs. Accordingly, there are no direct or indirect impacts on the physical environment (including essential fish habitat) anticipated for this alternative. Any impacts that may be associated with implementing a future monitoring set-aside program through a framework adjustment to an FMP would be fully analyzed in the document supporting the action.

4.1.4 OMNIBUS ALTERNATIVE IMPACTS TO HUMAN COMMUNITIES

In general, there are no direct impacts on fishery-related businesses or communities associated with either Omnibus Alternative 1 or Omnibus Alternative 2. These alternatives specify the process to develop future IFM programs, but do not require the development of IFM programs nor do they directly impose any cost responsibilities.

In the future, if the Council developed an IFM program for a particular FMP, there would be direct negative economic impacts to fishing vessels resulting from the standardized cost responsibilities included in Omnibus Alternative 2, provided there was available Federal funding to support that IFM program and vessels were required to pay for increased monitoring. However, any direct negative economic impacts to fishing vessels resulting from a future IMF program would be evaluated in the amendment to establish that IFM program and are not considered in this amendment.

Omnibus Alternative 1 would have an indirect low negative impact if, in the absence of additional monitoring, continued uncertainty about catch led to overly cautious management. Standardizing a process to develop new IFM programs and a process to prioritize funding for those new IFM programs in Omnibus Alternative 2 may have indirect low positive impacts on fishery-related businesses and communities associated with the potential for additional monitoring and improved management. The indirect low positive impacts associated with Omnibus Alternative 2 may not be realized under Omnibus Alternative 1.

Similar to Omnibus Alternative 1, establishing an amendment process to allow for the future establishment of IFM programs and a framework process to revise IFM programs in Omnibus Alternative 2 has a negligible impact on fishery-related businesses and human

communities. This aspect of Omnibus Alternative 2 specifies the process to establish and revise IFM programs, and thus does not affect fishing vessels, fleets, or ports. As there are no impacts to fishery-related businesses and communities associated with these process aspects of the Omnibus Alternative 2, operationally there are no differences in impacts between Omnibus Alternatives 1 and 2.

Under Omnibus Alternative 2, there is a potential for indirect low positive impacts on fishery-related businesses and communities associated with the establishment of standardized IFM service provider requirements. The service provider requirements generally match the existing service provider requirements codified for other New England IFM programs, such as Northeast multispecies and Atlantic scallop. Standardized service provider requirements may allow for efficiencies in the administration of IFM programs (e.g., process for service provider approval, data requirements, training requirements for observers and at-sea monitors) compared to Omnibus Alternative 1, which could ultimately reduce the dollar amount associated with industry cost responsibilities. In addition, standardized service provider requirements could lead to greater consistency in the information collected by IFM programs, provided that individual FMPs do not drastically alter the service provider requirements when establishing monitoring programs. Improved catch information that results from greater consistency in information collection may lead to better management of biological resources, which may eventually lead to higher harvest levels. In contrast, under Omnibus Alternative 1,IFM service provider requirements would be established separately for each FMP and would likely lack any economic benefits associated with standardized those requirements.

Establishing standardized cost responsibility definitions in Omnibus Alternative 2 could have low positive impacts compared to Omnibus Alternative 1. While industry cost responsibilities are not codified in this action, categorizing and characterizing industry cost responsibilities in this action could provide the industry with information to better understand and plan for their IFM cost responsibilities as well negotiate better contracts with IFM service providers, which may ultimately reduce the dollar amount associated with industry cost responsibilities.

In conjunction with Omnibus Alternative 2, the Council recommended that existing service provider requirements be revised to allow observers or at-sea monitors to be deployed on the same vessel for more than two consecutive multi-day trips or more than twice in a given month. This is less restrictive than existing deployment requirements, prohibiting multiple deployments on the same vessel, under Omnibus Alternative 1. Omnibus Alternative 2 may have indirect low positive economic impacts on fishing vessels, compared to Omnibus Alternative 1, if relaxing deployment restrictions helps reduce the dollar amount associated with industry cost responsibilities.

Under Omnibus Alternative 2, if adequate Federal funding was available to cover NMFS cost responsibilities associated with IFM coverage targets after SBRM coverage requirements were met, those IFM programs would operate at the target coverage levels established through each individual FMP. If there is some Federal funding available after SBRM coverage requirements are met, but not enough to cover all of the IFM programs, a

prioritization process would be used to allocate available Federal funding across FMPs. If no Federal funding was available after SBRM coverage requirements were met, then, similar to Omnibus Alternative 1, there would be no IFM in addition to SBRM requirements.

Under the Omnibus Alternative 1, there is no specified process to prioritize available Federal funding between IFM programs, so funding is allocated on a case-by-case basis. There is the potential for a low negative impact on fishery-related business and communities under Omnibus Alternative 1 if IFM programs gathering important catch information go unfunded because there is no mechanism to use available Federal funding in a timely manner. Without the funding to gather important catch information, there could be indirect low negative impacts on fishery-related business and communities if limited information prevents appropriate management or results in overly cautious management.

In contrast, Omnibus Alternative 2 may provide an indirect low positive impact on fishery-related businesses and communities, compared to Omnibus Alternative 1, because the prioritization process would allow Federal funding to support IFM when funding was available.

The magnitude of potential indirect impacts of the prioritization process on business and communities varies by prioritization process. The impacts discussed below apply when there is some Federal funding available to support NMFS cost responsibilities associated with IFM coverage targets, after SBRM coverage requirements are met, but not enough to support all the IFM coverage targets.

The discretionary prioritization alternatives (Omnibus Alternatives 2.1 and 2.2) have the greatest potential for indirect low positive impacts to businesses and communities, compared to Omnibus Alternative 1 and the formulaic prioritization alternatives (Alternatives 2.3-2.5), because they could help align available funding with the Council's monitoring priorities. This means that, in years where there is Federal funding available to support IFM programs, the discretionary prioritization alternatives allow the potential to direct funding towards monitoring programs with specific characteristics. These alternatives could allow the Council or NMFS to choose to support IFM programs for species with high economic value, programs where the industry can better afford the cost of additional monitoring, or programs that gather information about species with special ecosystem importance (e.g., overfished species or forage species). Improved catch information that results from the opportunity to align funding with the most critical IFM programs may lead to better management of biological resources, which may eventually lead to higher harvest levels.

Omnibus Alternatives 2.1 and 2.2 would use a weighting approach to prioritize available Federal funding. Omnibus Alternative 2.1 specifies a criteria-based weighting approach, while the Council recommend an equal weighting approach, adjusted on an as-need basis, for Omnibus Alternative 2.2. The equal weighting approach is an effective and administratively simple tool to prioritize funding when the number of IFM programs are limited. If the number of IFM programs across New England FMPs increases, the Council

may want to consider another type of weighting approach, similar to the criteria-based approach, to help ensure that available Federal funding is prioritized consistent with Council monitoring priorities.

The formulaic prioritization alternatives (Omnibus Alternative 2.3-2.5) all provide an indirect low positive impact on business and communities, compared to Omnibus Alternative 1, because the formulaic prioritization alternatives would consider all New England IFM programs when allocating Federal funds, rather than considering IFM programs on a case-by-case basis. Omnibus Alternative 2.3 would allocate available Federal funding proportionally to IFM programs. So that during years when funding was available, all New England IFM programs would receive some additional monitoring, which may have indirect low positive impacts on businesses and communities resulting from information collection.

Omnibus Alternative 2.4 would allocate funding to those IFM programs that need limited IFM coverage to meet cover targets and involve the most active fisheries, while Omnibus Alternative 2.5 would allocate funding to those IFM programs that need more IFM coverage to meet cover targets and involve the least active fisheries. Even though Omnibus Alternatives 2.4 and 2.5 do not evaluate program need and design and may result in some IFM programs not receiving funding, there is still some potential for indirect low positive impacts on businesses and communities by using a funding prioritization process, rather than allocating funding on a case-by-case basis as in Omnibus Alternative 1. The efficiency of allocating Federal funding under Alternatives 2.3-2.5 would indirectly benefit businesses and communities by helping ensure funding is available in a timely manner to gather information which could improve fishery management.

Because Omnibus Alternative 2.6 details the mechanism to develop and implement future monitoring set-aside programs, to help offset industry/non-government cost responsibilities associated with IFM programs, there are no direct or indirect impacts on businesses or communities anticipated for this alternative, similar to Omnibus Alternative 1. Any impacts that may be associated with actually implementing a monitoring set-aside program through a framework adjustment to an FMP would be fully analyzed in the documents supporting the action.

4.1.5 IMPACTS SUMMARY FOR OMNIBUS ALTERNATIVES

TABLE 59. SUMMARY OF THE INDIRECT IMPACTS OF OMNIBUS ALTERNATIVES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 1: No Standardized Industry-Funded Monitoring Programs (No Action)	Low negative impact related to allocating funding to IFM programs on a case-by-case basis, rather than evaluating funding across FMPs	Low negative impact related to continued uncertainty about catch rates that may lead to overly cautious management

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 2: Standardized Industry-Funded Monitoring Programs (Action Alternative)	**Negligible impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**	**Low positive impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**
Alternative 2.1: NMFS-Led Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.2: Council-Led Prioritization Process	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**
Alternative 2.3: Proportional Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.4 and 2.5: Coverage Ratio-Based Prioritization Processes	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.6 Monitoring Set-Aside	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**
Impacts to physical environment are not described in this table because they are negligible. These alternatives will not alter fishing behavior or directly impact fishing regulations (gears used or areas fished).		

4.2 ATLANTIC HERRING ALTERNATIVE IMPACTS

The Council recommended that increased monitoring in the herring fishery address the following goals: (1) Accurate estimates of catch (retained and discarded), (2) accurate catch estimates for incidental species for which catch caps apply, and (3) affordable monitoring for the herring fishery.

This section considers the potential impacts of alternatives considered by the Council to specify IFM coverage targets for the herring fishery on valued ecosystem components (VEC), including target species, non-target species, protected species, physical environment, and human communities.

For each VEC, the impacts associated with Herring Alternatives 1 and 2 will be discussed, followed by a discussion of impacts associated with Herring Alternatives 2.1-2.7.

The Council finalized its selection of preferred alternatives at its April 18-20, 2017, meeting. The Council selected the following preferred alternatives:

- Herring Alternative 2, including Sub-Options 1 (Waiver Allowed), 2 (Wing Vessel Exemption), 4 (2-Year Re-Evaluation), and 5 (50 mt Exemption Threshold);
- Herring Alternative 2.5 (100% NEFOP-Level Coverage on Midwater Trawl Fleet in Groundfish Closed Areas); and
- Herring Alternative 2.7 (ASM Coverage on Category A and B Vessels, then Eventually Vessels may choose either ASM or EM/Portside Coverage).

TABLE 60. RANGE OF INDUSTRY-FUNDED MONITORING HERRING COVERAGE TARGET ALTERNATIVES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Gear Type	Midwater Trawl	Purse Seine	Small Mesh Bottom Trawl
Herring Alternative 1: No Coverage Target for IFM Program (No Action)	SBRM		
Herring Alternative 2: Coverage Targets for IFM Program	Includes Sub-Options: 1) **Wavier Allowed**, 2) **Wing Vessel Exemption**, 3) 2-Year Sunset, 4) **2-Year Re-evaluation**, and 5) 25 mt or **50 mt Exemption Threshold**		
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	100% NEFOP-Level Observer		
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	25%, 50%, 75% or 100% ASM		
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	50% or 100% EM/Portside	25%, 50%, 75% or 100% ASM	
Herring Alternative 2.4: EM and Portside Coverage on Midwater Trawl Fleet	50% or 100% EM/Portside	SBRM (No Action)	

Gear Type	Midwater Trawl	Purse Seine	Small Mesh Bottom Trawl
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet in Groundfish Closed Areas*	**100% NEFOP-Level Coverage**	**SBRM (No Action)**	
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet in Groundfish Closed Areas	Coverage would match selected alternative 2.1-2.4	SBRM (No Action)	
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**50% ASM or EM/Portside**	**50% ASM**	**50% ASM**
* Sub-Options do not apply to Herring Alternative 2.5.			

4.2.1 IMPACTS SUMMARY FOR PREFERRED HERRING ALTERNATIVES

The impacts of preferred Herring Alternatives on biological resources (herring resource, non-target species, and protected species) are indirect because they affect levels of monitoring rather than harvest specifications.

Indirect low positive impacts to biological resources are possible if the increased monitoring associated with Herring Alternatives 2.5 and 2.7 can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management. However, these preferred Herring Alternatives may lead to direct positive impacts on biological resources if herring fishing effort is limited, by increased information on catch tracked against catch limits, leading to increased reproductive potential of the herring resource and non-target species and reduced interactions between the herring fishery and protected species.

Because additional monitoring under Herring Alternative 2.5 is confined to the Groundfish Closed Areas, a low positive biological impact is likely because the area with 100% observer coverage is limited. The 50% coverage associated with Herring Alternative 2.7 is expected to have low positive impacts on the herring resource and non-target species (haddock and river herring and shad) if the uncertainty around catch track against catch caps is reduced.

Sub-Options 1 and 2 have the potential for low negative impacts on biological resources if additional coverage is waived. Sub-Option 5 also has the potential for a low negative impact on the herring resource and non-target species. A low negative impact is possible if the disconnect between vessels with additional monitoring (trips greater than 50 mt of herring) and trips subject to fishery catch caps (trips greater than either 1 lb of herring or 6,600 lb of herring) if it biases data used to track catch against catch caps.

The impacts of these preferred Herring Alternatives on biological resources are not significant because they would not cause any biological resource to become overfished, would not result in overfishing, and/or would not cause a change in population status.

The impacts of preferred Herring Alternatives on the physical environment are expected to be negligible. The impact of the herring fishery on the physical environment is thought to be minimal and temporary. Therefore, the expected impact on the physical environment of increased monitoring in the herring fishery is expected to be negligible under Herring Alternatives 2.5 and 2.7.

If fishing effort is limited, by increased information on catch tracked against catch limits, and there are few interactions between fishing gear and the physical environment, there is the potential for a positive impact on the physical environment associated with the preferred Herring Alternatives. However, the magnitude of any potential positive impact is low because the herring fishery has only minimal and temporary impacts on the environment.

The impacts of preferred Herring Alternatives on fishery-related businesses and human communities are negative and result from reductions in returns-to-owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue and was used rather than net revenues to more accurately reflect income from fishing trips. Reductions in RTO are related to paying for monitoring coverage. Under Herring Alternative 2.7, the potential reduction in RTO may be up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring in conjunction with portside sampling. Annual RTO for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. The total annual cost to the herring fishery is up to $294,999 for Herring Alternative 2.7 and $75,000 for Herring Alternative 2.5.

Because midwater trawl vessels average more sea days than other gear types, midwater trawl vessels have a greater negative economic impact associated with paying for monitoring coverage, followed by purse seine vessels, and small mesh bottom trawl vessels.

Sub-Options 1 and 2 have the potential to reduce monitoring costs for herring vessels if coverage is waived. Sub-Option 5 would eliminate monitoring costs for vessels that always land less than 50 mt of herring on a trip. Additionally, Sub-Option 5 may reduce monitoring costs for vessels than often land less than 50 mt of herring on a trip. There benefits will vary with gear type. Small mesh bottom trawl vessels and single midwater trawl vessels take the most trips that land less than 50 mt of herring, 81% and 60%, respectively, followed by purse seine vessels (33% of trips) and paired midwater trawl vessels (13% of trips). The potential reduction in RTO associated with at sea-monitoring coverage in combination with Sub-Option 5 is up to 16% for paired midwater trawl vessels, up to 4% for single midwater trawl vessels, and up to 3% for purse seine and small mesh bottom trawl vessels.

Indirect positive economic impacts on herring vessels associated with preferred Herring Alternatives may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs.

Conversely, indirect negative economic impacts on herring vessels associated with preferred Herring Alternatives may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, such that vessels would be less likely be less likely to be able to fully harvest herring sub-ACLs because they were constrained by catch caps.

4.2.2 BACKGROUND ON BIOLOGICAL IMPACTS OF HERRING ALTERNATIVES

When evaluating IFM for the herring fishery, one major consideration is whether a monitoring alternative provides the type and quality of data necessary to meet the Council's information collection goals for the herring fishery.

Type of Information Collected

Different types of monitoring can provide different kinds of information with varying levels of verification (Table 61).

Currently, vessel trip reports (VTRs) provide information on fishing effort, retained catch, and discarded catch. Dealer reports provide information on retained catch and vessel monitoring systems (VMS) provided information on fishing location and behavior. Affidavits of slippage events and discard reports can provide details of why slippage and/or discard events occur.

Under the industry-funded herring coverage target alternatives, NEFOP-level observers and at-sea monitors would both provide information on fishing effort. NEFOP-level observers and at-sea monitors would be collecting species composition data on retained and discarded catch, while portside samplers would be collecting species composition data on retained catch. NEFOP-level observers and portside samplers would be collecting age and length data, while at-sea monitors would be collecting length data. EM would be used to confirm retention of catch.

TABLE 61. COMPARISON OF INFORMATION COLLECTED ACROSS HERRING COVERAGE TARGET ALTERNATIVES

Herring Data Interests	Current Information Collections That Would Continue Under Any Alternative	HER Alt 1	HER Alt 2.1	HER Alt 2.2	HER Alts 2.3 & 2.7	HER Alt 2.4	HER Alt 2.5
		Ability to meet data interest: ☐ High ☐ Medium ■ Low					
		No Action (NEFOP coverage for SBRM only)	100% NEFOP on Category A and B Vessels	ASM (25, 50, 75, or 100%) on Category A and B Vessels	ASM and/or EM/Portside (25, 50, 75, or 100%) on Category A and B vessels and/or MWT vessels	EM/Portside (50 or 100%) on MWT vessels	100% NEFOP On MWT Vessels Fishing in Groundfish Closed Areas
Retained Catch	• Vessel trip reports • Dealer reports • VMS catch reports	Information on effort, area, gear, and economics Species composition data	Information on effort, area, gear, and economics Species composition data	Information on effort, area, gear, and economics Species composition data	ASM - Information on effort, area, gear, economics; species composition data EM/Portside - Confirms retention; species composition data	Confirms retention Species composition data	Information on effort, area, gear, and economics Species composition data
Discarded Catch	• Vessel trip reports • VMS catch reports	Discard estimate Species composition data	Discard estimate Species composition data	Discard estimate Species composition data	ASM - Discard estimate; species composition data EM - Flags discarding	Flags discarding	Discard estimate Species composition of discarded catch
Catch Cap Monitoring	• Vessel trip reports • Dealer reports • VMS catch reports • Affidavits	Species composition of retained catch Discard estimate and species composition of discarded catch	Species composition of retained catch Discard estimate and species composition of discarded catch	Species composition of retained catch Discard estimate and species composition of discarded catch	ASM - Discard estimate; species composition data on catch EM/Portside - Confirms retention; species composition data on retained catch	Confirms retention Species composition of retained catch	Species composition of retained catch Species composition of discarded catch
Stock Assess-ments	• Vessel trip reports	Age and length data on catch	Age and length data on catch	Length data on catch	ASM - Length data on catch EM/Portside - Age and length data on retained catch	Age and length data on retained catch	Age and length data on catch
Data collected under HER Alt 2.6 would be consistent with the data collected by ASM (25, 50, 75, or 100%) or EM/PRT (25, 50, 75, 100%) on MWT vessels fishing in Groundfish Closed Areas.							

Amount of Coverage

The amount of coverage can affect the uncertainty around catch estimates. The table below describes NEFOP coverage by gear type. Revisions to the SBRM in April 2015 affected how funding is used to allocate observer coverage. Therefore, the level of observer coverage during 2015 may be more indicative of future observer coverage levels than observer coverage levels from previous years.

TABLE 62. 2015 MIDWATER TRAWL[1], PURSE SEINE[2], AND SMALL MESH BOTTOM TRAWL[3] OBSERVER COVERAGE RATES

Gear	Observer Coverage[4]
Midwater Trawl	4.7%
Purse Seine	2.5%
Small Mesh Bottom Trawl	9.1%

Source: DMIS and ODBS databases as of 2016-05-21

[1]Midwater Trawl: Includes both single and paired midwater trawl gears

[2]Purse Seine: Includes all purse seine gears (including tuna)

[3]Small Mesh Bottom Trawl: Includes bottom trawl gear w/codend mesh size less than 5.5" excluding bottom otter twin trawl,
scallop and shrimp trawl trips

[4]Includes observer trips w/at least 1 observed haul divided by VTR trips reporting kept catch

Monitoring Catch Caps in the Herring Fishery

The monitoring coverage levels for the herring fishery described in Herring Alternatives 2.1 and 2.2 were evaluated with regard to their impact on haddock and river herring/shad catch estimate precision. Only fishing years (FYs) when catch caps were in effect were included in the analysis. The haddock catch cap analysis includes 2011-2015 and the river herring/shad catch cap analysis includes 2014-2015. Herring discards were not evaluated. Herring discards are generally a small component of the overall herring catch. Herring discards are estimated by extrapolating discards from NEFOP observed hauls only. In recent years, herring discards have accounted for well less than 1% of the total herring catch.

The herring fishery currently has six catch caps: (1) Haddock: Georges Bank (GB) Midwater Trawl, (2) Haddock: Gulf of Maine (GOM) Midwater Trawl, (3) River Herring/Shad (RHS): Cape Cod (CC) Midwater Trawl, (4) RHS: GOM Midwater Trawl, (5) RHS: Southern New England (SNE) Bottom Trawl, and (6) SNE Midwater Trawl.

The GB and GOM Haddock Catch Caps were implemented through NE Multispecies Framework 46 in 2011, which separated the previous existing haddock catch cap into GB and GOM stock areas and adjusted the estimation methodology to the current extrapolation method. Herring Framework Adjustment 3 implemented RHS Catch Caps for 2014-2015;

caps were effective on December 4, 2014. The haddock catch caps operate on a May-April Fishing Year, while the river herring/shad catch caps operate on a January-December Fishing Year. For river herring/shad catch caps, trips landing greater than 6,600 pounds of herring are counted against an individual catch cap, depending on the gear and area of the trip. For haddock catch caps, all midwater trawl trips in GB and GOM are counted against the catch caps.

Catch cap estimates in the herring fishery are comprised of both incidental kept and discard components. Current quota monitoring methodology for these catch caps employs the cumulative method to extrapolate incidental catch (kept and discard) to the fleet based on a ratio estimator (incidental catch divided by total catch) derived from NEFOP data. Only observed trips are used to derive the ratio estimator. Fleet kept all (KALL) is obtained from VTRs and dealer data, which provides effort information (gear and area) and landings information respectively. Actual observed incidental catch amounts are used in lieu of estimated incidental catch amounts whenever possible.

This analysis uses the same data sources as quota monitoring. However, this analysis focuses strictly on the precision of the incidental catch ratio estimator in each catch cap, and does not incorporate the replacement of actual observed values for estimated incidental catch based on the ratio estimator (described above). Furthermore, this analysis is constrained to trips that count towards a specific catch cap (e.g., river herring/shad cap trips must land >6,600 pounds of herring regardless of gear). Trips that would not be count against a catch cap are not included in the analysis.

The coefficient of variation (CV), defined for this analysis as the ratio of the standard error of total catch (incidental kept and discards) to was used to quantify the precision of the estimated catch. The CV is sensitive to sample size. In a finite population, the CV will converge to zero as the sample size approaches the population size. The total fishing trips within a stratum is considered finite, therefore, as sampling coverage approaches 100%, the CV will converge to zero for that stratum. The CV analysis follows the guidelines detailed by the SBRM and uses the trip as the sampling unit. Only observed trips (trips with at least one observed haul) and trips reporting kept catch on their VTR were used in the CV analysis. This distinction is important to understand when interpreting observer coverage rates (referred to below as "realized" observer coverage) because in the paired midwater trawl fishery it is not uncommon for wing vessels to carry observers and but not carry any catch. These trips would not be reflected in the observer coverage rates described in this analysis. Furthermore, trips that did not yield any observed hauls are excluded from this analysis.

At-sea monitors would collect both retained and discarded catch composition in a manner consistent with existing NEFOP protocols. Therefore it is assumed that there will be no difference in the catch composition data collected by NEFOP observers and at-sea monitors under Herring Alternatives 2.1 and 2.2. This analysis uses NEFOP data as a proxy for potential future ASM coverage estimate simulations. Also, observer and ASM coverage targets proposed in the IFM Amendment are additive, so simulated CV estimates based on

proposed coverage targets assume both SBRM and IFM coverage will contribute to the target.

Monitoring Catch Caps Under Herring Alternative 1

Table 63 and Figure 8 summarize the CV calculated according to SBRM methodology as well as the realized observer coverage for each catch cap during the years when catch caps were in place. For each year and catch cap, the CV and the realized observer coverage in italics are shown in Table 63.

Although there is no defined CV target, a 30% CV was provided for context. The GB Haddock Catch Cap remained below a CV of 30% for all years except for 2015, while the GOM haddock had a CV of 0% for all years because no GOM haddock catch was observed. The river herring/shad catch cap CVs are more variable, but it is difficult to infer a trend based on the limited data.

Table 63 and Figure 8 characterize the history of catch cap estimate precision produced from NEFOP coverage (Herring Alternative 1). It must be noted that due to the implementation of river herring/shad catch caps in late 2014, most of the 2014 effort was not subject to the river herring/shad catch caps. Furthermore, the 2015 GB Haddock Catch Cap was closed in October, effectively truncating the May-April fishing year

TABLE 63. HERRING CATCH CAP CV AND OBSERVER COVERAGE, 2011-2015

	Fishing Year[1]: CV (Observer Coverage)				
Catch Cap Fishery	**2011**	**2012**	**2013**	**2014**	**2015**
Haddock: GB MW Trawl	17.6% *(41.7%)*	12.3% *(62.9%)*	21.3% (35.6%)	20.5% *(27.2%)*	61.4% *(4.9%)***
Haddock: GOM MW Trawl	0.0% *(30.4%)*	0.0% *(29.2%)*	0.0% (34.8%)	0.0% *(46.3%)*	0.0% *(8.6%)*
RHS: CC MW Trawl				36.2% *(48.0%)**	81.4% *(10.1%)*
RHS: GOM MW Trawl				37.3% *(50.0%)**	94.8% *(8.7%)*
RHS: SNE Bottom Trawl				28.4% *(17.4%)**	24.5% *(15.0%)*
RHS: SNE MW Trawl				70.2% *(3.4%)**	11.8% *(2.3%)*

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April
*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

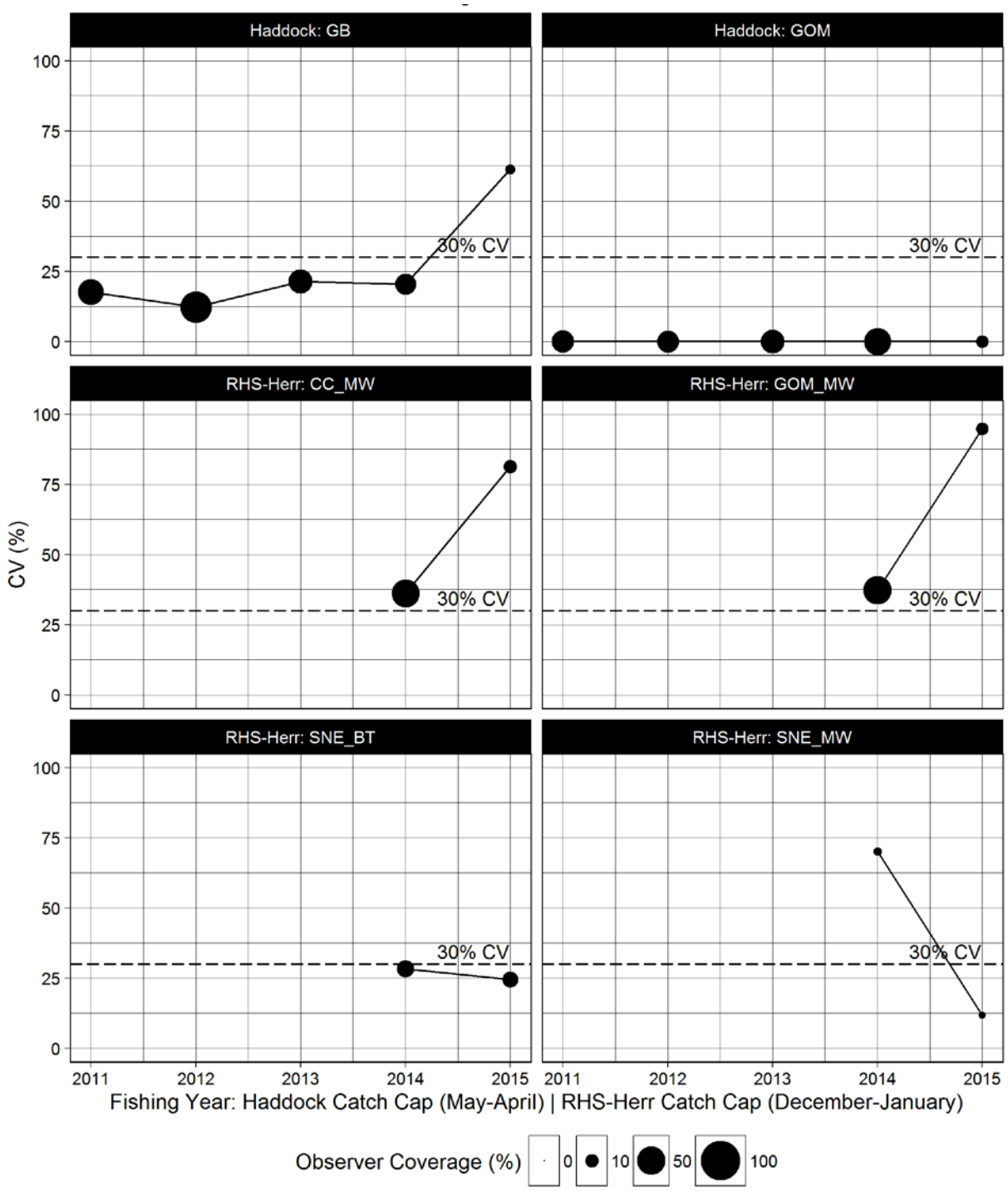


FIGURE 8. HERRING CATCH CAP CV AND OBSERVER COVERAGE (DOT SIZE) IN RELATION TO A 30% CV.

Figure 9 details CV curves calculated according to SBRM methodology across varying coverage levels in relation to a 30% CV. These curves are solely based on observer data within each catch cap and year and are estimated on those data and how observer coverage was assigned for that particular year.

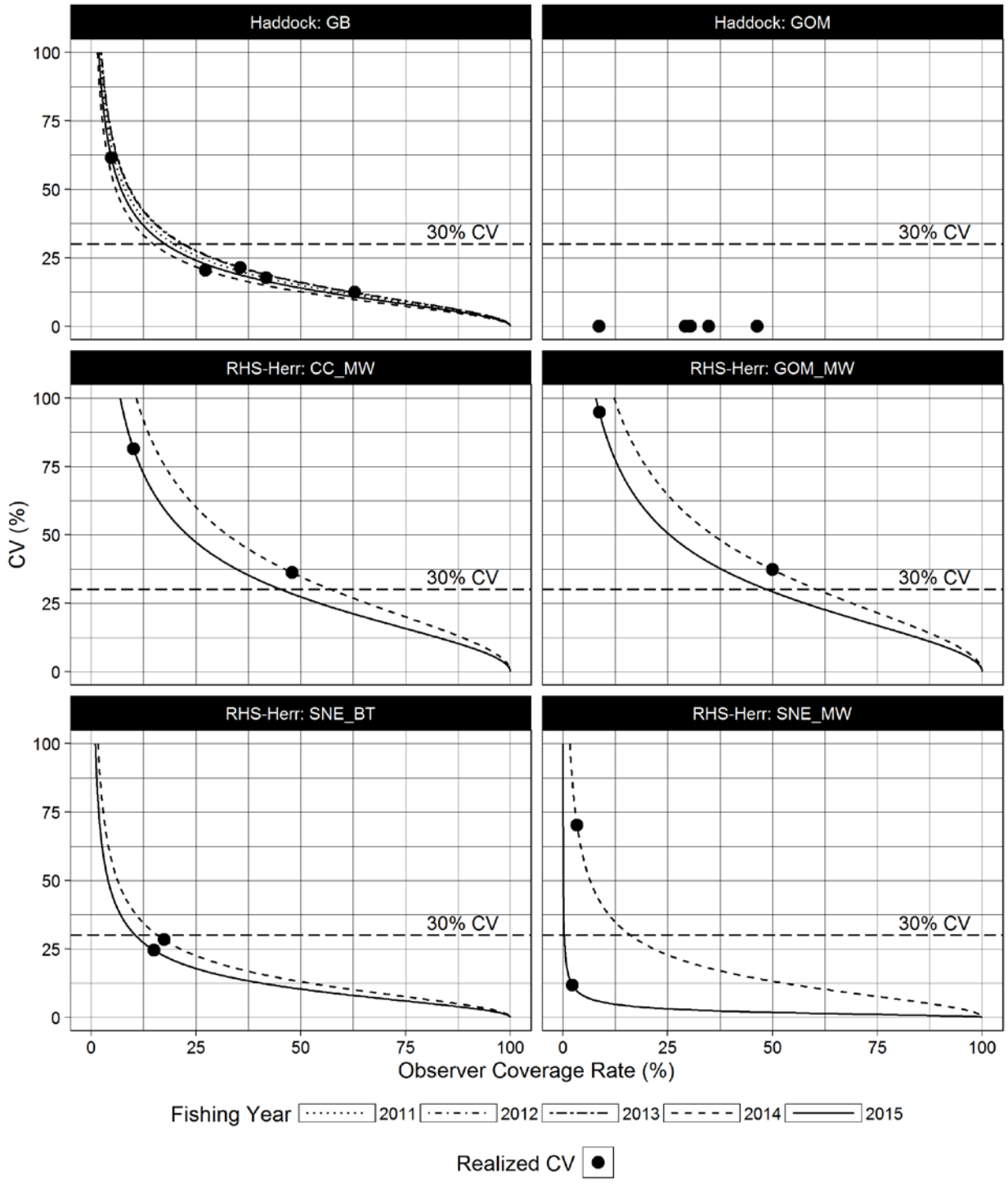


FIGURE 9. 2011-2015 DERIVED CV CURVE FOR EACH CATCH CAP BASED ON SBRM SAMPLE SIZE ANALYSIS METHODOLOGY, WITH REALIZED CV FOR EACH CATCH CAP YEAR (BLACK DOT).

Monitoring Catch Caps Under Herring Alternatives 2.1 and 2.2

Due to the structure of Herring Alternatives 2.1 and 2.2, and how coverage is being selectively assigned based on gear, permit, category, and 25 mt and 50 mt landing thresholds, estimated CVs based on proposed coverage levels could not be estimated formulaically according to SBRM. Simulation based on resampling of observed trips was required instead.

Simulations were performed for each catch cap and year and based on NEFOP observer data. Proposed coverage levels were simulated by resampling the required amount of observer trips to obtain the target coverage level based on the effort profile for a particular catch cap and year. Herring Alternatives 2.1 and 2.2 focus coverage on Category A and B herring vessels. Due to this, simulated increasing coverage was confined to Category A and B vessel trips until 100% of those trips were simulated as observed. Observed non-category A and B herring vessel trips were assumed to be SBRM coverage and were fully resampled in each simulation without increasing coverage. Within each simulation, a CV was calculated for the catch cap based on the specified coverage level. This process was repeated 1,000 times for each proposed coverage level, which yielded a distribution of simulated CVs. Table 64 summarizes the mean CV from those distributions for each proposed coverage level. Table 65 provides the simulated results if a 25 mt trip exemption existed, and Table 66 provides the simulated results if 50mt trip exemption existed. This process was repeated for each catch cap and year.

Due to the amount of observer data available within each catch cap, different approaches were taken in order to obtain a minimum sampling pool. Haddock catch cap strata yielded higher numbers of observed trips within each year allowing for simulation of observed trips within each fishing year; observer data from multiple fishing years were not grouped. The GB Haddock accountability measure closure in 2015 resulted in a small number ($n<10$) of observed trips to be simulated. The river herring/shad catch cap strata yielded smaller amounts of observed trips and needed to be combined across 2014 and 2015 into a single resampling group that was used to simulate 2014 and 2015 based on their respective effort profiles (total trips in strata for each year). Even after grouping 2014 and 2015, the RHS SNE Midwater Trawl Catch Cap had a small number ($n<10$) of trips to simulate. The RHS SNE Bottom Trawl Catch Cap also experienced a small number of observed trips to simulate from when the 25 mt and 50 mt trip exemptions were applied (this was not the case when the 25 mt and 50 mt trip exemptions were removed).

For catch caps where all of the effort is comprised of Category A and B herring vessels, the CV should converge to zero in 100% coverage scenarios. This was the case for all catch caps confined to midwater trawl trips except for RHS SNE Midwater Trawl, which includes non-Category A and B vessels. The effect of mixed permit categories in RHS SNE Midwater Trawl Catch Cap is that proposed coverage will not cover all trips in that catch cap at 100% coverage of Category A and B vessels and results in the CV not converging to zero. The effect is more pronounced in the RHS SNE Bottom Trawl Catch Cap, where on average 38% of 2014-2015 trips were by non-Category A and B vessels.

The 25 mt and 50 mt trip exemptions allow for a certain number of trips within each catch cap to go unobserved and therefore impact the simulated CV. Generally, the exemptions cause the CV to increase when compared to simulations without the exemption. The effect becomes more pronounced at higher coverage levels. This results in CVs that do not converge to zero at 100% coverage levels, even in catch caps with 100% Category A and B vessels because not all trips will be covered. Tables 65 and 66 describe the CV effects for all catch caps. The GOM Haddock Catch Cap is not impacted because the CV is always zero due to no observed incidental haddock catch. The effect is very small in the GB Haddock Catch Cap where trips tend to be consistently above 25 mt and/or 50 mt compared to the RHS catch caps where catches are small or more variable. Both the 25 mt and 50 mt exemptions exert the same general effect on CV performance, which gets amplified as the exemption threshold increases. Thus, the 50 mt exemption yields the highest simulated CVs in catch caps that are sensitive to exemptions.

TABLE 64. ALTERNATIVE 2.2: SIMULATED MEAN CV AT 25%, 50%, 75% AND 100% ASM COVERAGE

	Simulated Mean CV (%)				
Catch Cap	**Fishing Year[1]**	**25% Coverage**	**50% Coverage**	**75% Coverage**	**100% Coverage**
Haddock: GB Midwater Trawl	2011	25.8%	14.8%	8.6%	0.0%
	2012	24.2%	14.9%	8.8%	0.0%
	2013	26.4%	15.5%	9.1%	0.0%
	2014	21.7%	12.5%	7.2%	0.0%
	2015**	22.7%	13.1%	7.5%	0.0%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015**	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	63.2%	39.5%	22.7%	0.0%
	2015	62.4%	41.8%	24.9%	0.0%
Herring-RHS: GOM Midwater Trawl	2014*	64.3%	39.1%	22.8%	0.0%
	2015[3]	61.1%	35.3%	20.8%	0.0%
Herring-RHS: SNE Bottom Trawl	2014*	24.1%	17.3%	13.2%	9.8%
	2015	28.0%	18.6%	13.3%	9.2%
Herring-RHS: SNE Midwater Trawl	2014*	23.0%	13.6%	8.5%	3.9%
	2015	22.7%	13.1%	7.5%	0.0%

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

TABLE 65. ALTERNATIVE 2.2: SIMULATED MEAN CV AT 25%, 50%, 75% AND 100% ASM COVERAGE WITH 25 MT TRIP EXEMPTION

		Simulated Mean CV (%)			
Catch Cap	**Fishing**	**25%**	**50%**	**75%**	**100%**
Haddock: GB Midwater Trawl	2011	25.4%	15.0%	8.9%	2.4%
	2012	24.8%	15.4%	9.7%	4.0%
	2013	26.1%	15.5%	9.3%	2.2%
	2014	22.2%	12.9%	7.6%	2.2%
	2015**	23.1%	13.5%	8.1%	2.7%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015**	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	61.9%	39.7%	23.4%	4.5%
	2015	63.7%	42.0%	24.2%	5.0%
Herring-RHS: GOM Midwater Trawl	2014*	62.8%	41.8%	25.8%	11.5%
	2015	63.6%	39.8%	25.0%	13.4%
Herring-RHS: SNE Bottom Trawl	2014*	24.2%	17.5%	14.1%	11.5%
	2015	24.8%	19.3%	15.4%	12.6%
Herring-RHS: SNE Midwater Trawl	2014*	32.5%	21.7%	16.2%	12.4%
	2015	34.3%	22.1%	15.9%	11.5%

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December 4, 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

Table 66. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage with 50 mt trip exemption

	Simulated Mean CV (%)				
Catch Cap	**Fishing**	**25%**	**50%**	**75%**	**100%**
Haddock: GB Midwater Trawl	2011	25.1%	15.1%	9.4%	4.1%
	2012	22.8%	14.9%	9.6%	4.1%
	2013	25.1%	15.4%	9.3%	3.2%
	2014	22.9%	13.5%	8.6%	4.4%
	2015**	26.0%	15.9%	10.3%	5.5%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015**	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	63.5%	41.3%	25.0%	9.0%
	2015	64.5%	45.8%	30.4%	16.5%
Herring-RHS: GOM Midwater Trawl	2014*	66.4%	46.3%	31.2%	18.9%
	2015	62.0%	39.3%	25.7%	14.0%
Herring-RHS: SNE Bottom Trawl	2014*	24.5%	20.6%	17.7%	15.7%
	2015	28.3%	24.9%	21.7%	19.4%
Herring-RHS: SNE Midwater Trawl	2014*	41.0%	28.2%	22.2%	18.0%
	2015	41.2%	27.4%	20.5%	16.1%

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April
*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December 4, 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

Figures 10, 11, 12, and 13 detail the simulation results by year and catch cap. The dotted line represents the mean simulated CV based on increasing Category A and B vessel coverage, while the solid line indicates the same simulation with the 25 mt and 50 mt trip exemptions applied. The grey area around the solid and dashed lines represents the two standard error envelope around the mean simulated CV. It is important to understand that these are simulated CVs, therefore by their nature there is a range of resulting CVs for each coverage rate. The variability of the simulated CV (expressed by the standard error) is related to the variability of the underlying incidental catch data. The overlap (black dots on Figures) between the realized CV for these catch caps and the range of simulated CVs is a good indicator of that variability. All realized CVs fell within +/- 2 standard errors of the mean simulated CV, which implies the simulation is reasonable within that margin of error. For catch caps, the realized CV does not closely track the mean simulated CV. This effect is

likely due to underlying variability in incidental catch data and/or small numbers of observed trips. The simulated GOM Haddock CV Catch Cap was not shown because no haddock catch was observed from 2011-2015.

Overall, the GB Haddock Catch Cap, RHS SNE Bottom Trawl, and RHS SNE Midwater Trawl catch caps yielded a mean simulated CV < 30% for all simulated years at or below a 25% coverage rate. RHS CC Midwater Trawl and RHS GOM Midwater Trawl Catch Caps were the only catch caps that clearly did not reduce below 30% at a 25% observer coverage rate. Given the broad range in the simulated CV for these caps (wide standard error envelope) it is difficult to draw strong conclusions from these results. Furthermore, the relatively short (2 years) worth of data available from the river herring/shad catch caps adds to this difficulty.

The performance was nearly identical under the 25 mt trip exemption option with the exception of RHS SNE Midwater Trawl Catch Cap, which shows the simulated mean CV slightly increase above 30% at a 25% coverage rate. The 50 mt exemption option has more pronounced effects than the 25 mt option. These effects can be seen in the RHS catch caps where the 50 mt exemption simulated CVs diverge from the non-exemption CV more strongly and at lower coverage levels (Figure 13).

The simulated CV results must be interpreted as an estimate of what may happen in the future based on existing information. The simulations were based on past fishing behavior and observed incidental catch from within the catch caps. Therefore, they may not hold if either factor changes in the future.

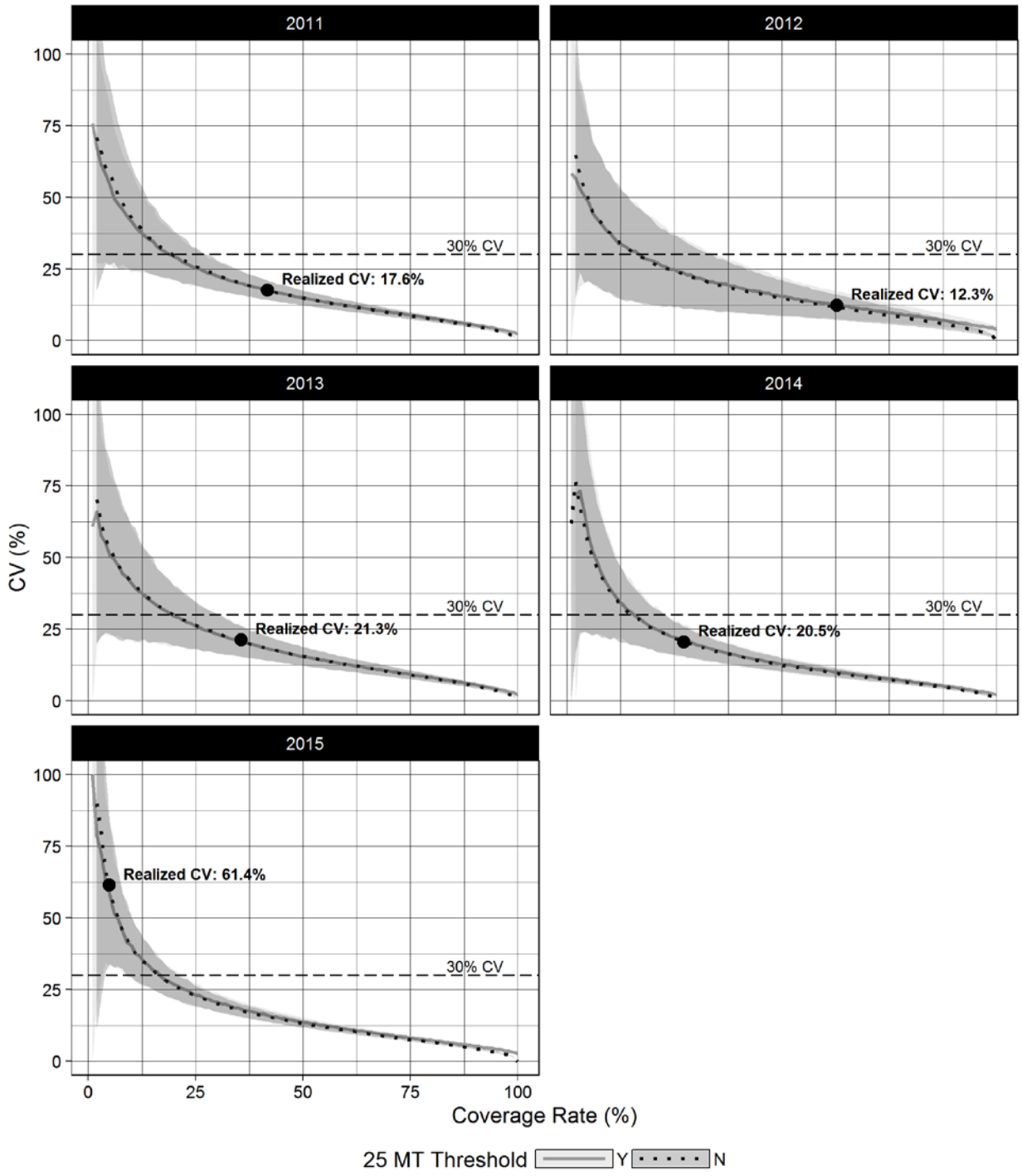


FIGURE 10. 2011-2015 SIMULATED GB HADDOCK CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.

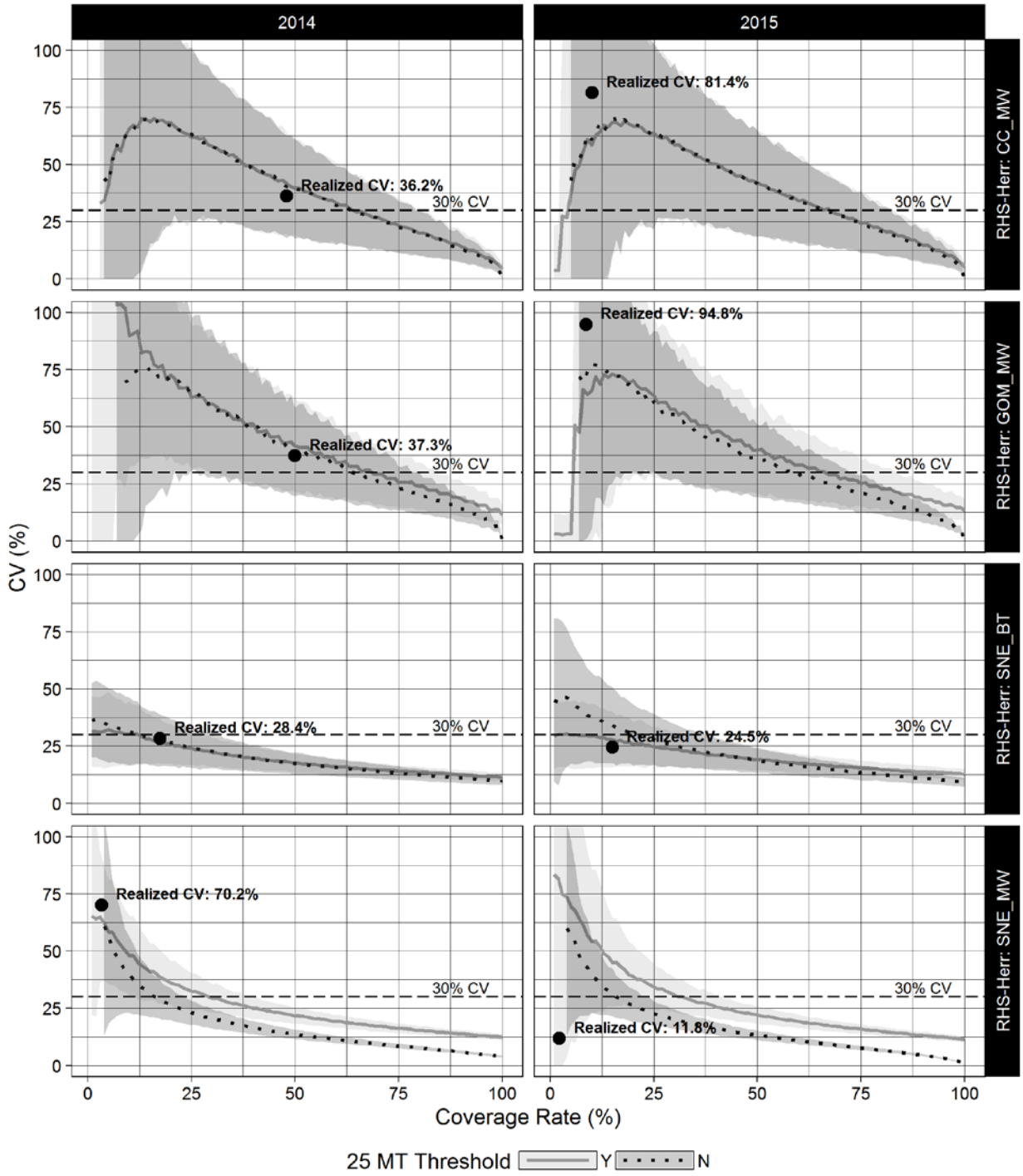


FIGURE 11. 2014-2015 SIMULATED RHS CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.

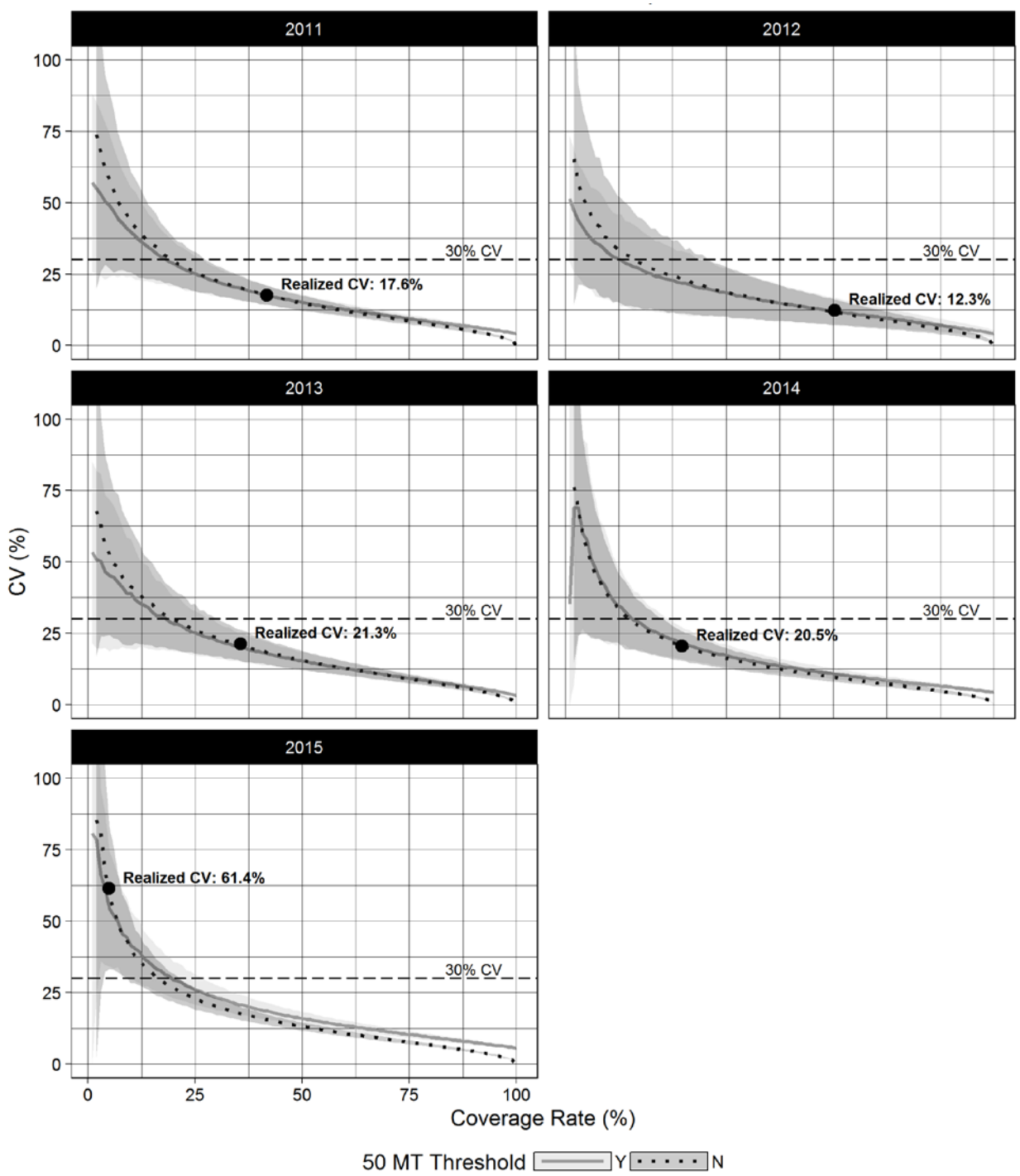


FIGURE 12. 2011-2015 SIMULATED GB HADDOCK CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 50 MT TRIP EXEMPTION OPTION.

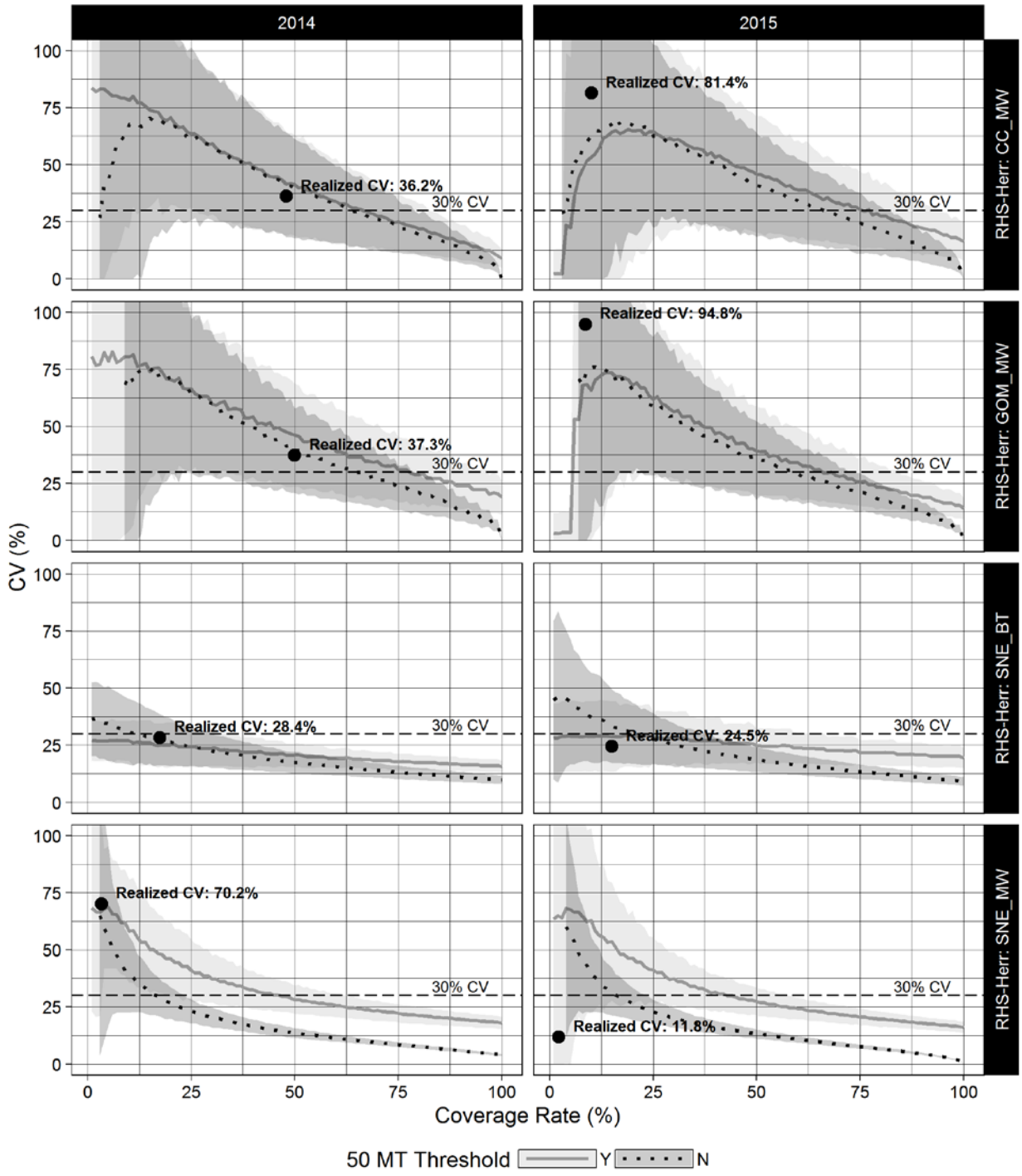


FIGURE 13. 2014-2015 SIMULATED RHS CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 50 MT TRIP EXEMPTION OPTION.

How Coverage is Allocated

The allocation of monitoring, or the basis of selecting a vessel for monitoring coverage, affects how the resulting data can be used for management.

Under SBRM, vessels are selected for observer coverage by fishing fleet (based on gear, mesh and area), not based on FMP or permit category. Valid estimates of catch or bycatch (and their variances) rely on formulas that are consistent with the underlying sampling design. Estimates that are inconsistent with the sampling design may be biased, which may impact the utility of the data.

Observed trips that were selected for coverage based on permit category, and not fleet, may be treated separately by the NEFSC in catch and bycatch analyses. These data may not be used in stock assessments or total catch estimation because the vessel selection for observer coverage is no longer done in a randomized way and is inconsistent with SBRM's sampling design. Data collected by permit category could be used to track catch against annual catch limits (ACLs) or fishery catch caps that are specific to the permits that are being targeted for coverage because the data collection and catch estimation method would match. However, the utility of data collected by permit category would likely be limited as compared to data that were collected by fishing fleet because the catch estimate method does not match SBRM's sampling design.

To summarize, the decision to allocate observer coverage by FMP (i.e., permits) or fishing fleet depends on the objectives of the additional coverage and how the data will subsequently be used. If one of the objectives of additional coverage is to improve catch estimates for use in stock assessments, and not just solely for monitoring harvest, then monitoring coverage should be allocated by fishing fleet and not FMP, fishery, or permit category.

TABLE 67. PROS AND CONS OF ALLOCATING MONITORING COVERAGE BY FLEET VERSUS PERMIT CATEGORY

	Pros	Cons
Permit-Based Coverage Target Alternatives	Councils manage fisheries by FMP and vessel permit	Not consistent with how SBRM allocates observers
	Can be used to monitor FMP-specific quotas and catch caps	Resulting data may be biased and not used for stock assessment and/or total removals
	Can be used to monitor FMP-specific quotas and catch caps	Difficult to design, deploy and analyze results because vessels typically don't structure trips by permit category

	Pros	Cons
Fleet-Based Coverage Target Alternatives	Consistent with how SBRM allocates observer coverage	Typically extends across FMPs
	Resulting data may be combined with SBRM data for stock assessments and/or total removals	Not consistent with how Councils manage fisheries by FMP and vessel permit

4.2.3 IMPACTS OF HERRING ALTERNATIVES ON TARGET SPECIES

4.2.3.1 Impacts of Herring Alternatives 1 and 2 on the Herring Resource

In general, the impacts of Herring Alternatives 1 and 2 on the herring resource are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to the herring resources are possible if increased monitoring can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments. However, Herring Alternatives 1 and 2 may lead to direct positive impacts on the herring resource if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, and that increases the reproductive potential of the herring resource.

Herring Alternative 1 would not specify a coverage target for an IFM program in the Herring FMP. Monitoring for herring vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis.

In recent years, observer coverage for the herring fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-specific basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under one or more FMPs, the SBRM is designed around "fishing modes" defined by the type of fishing gear used and the area from which the vessels depart.

There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine. The SBRM is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through a FMP developed by either the New England or Mid-Atlantic Fishery Management Council. Current observer coverage allocated to the herring fishery through SBRM is described in Table 67.

Under SBRM, the Atlantic herring fishery will receive at-sea observer coverage under the following 6 fleets: New England and Mid-Atlantic small mesh otter trawl; New England and Mid-Atlantic purse seine; and New England and Mid-Atlantic paired and single midwater trawl. The table below describes the sea days proposed for April 2016 through March 2017. The sea days listed below for small mesh otter trawl cover all FMPs that use this gear type, so only a portion would cover trips targeting herring. The purse seine and midwater trawl fleets are largely comprised of vessels targeting herring, so a majority of these sea days in these categories will be used to observe trips targeting herring.

TABLE 68. PROPOSED AND OBSERVED SEA DAYS FOR FLEETS THAT TARGET HERRING

Fleet	Region	Proposed sea days for April 2016 to March 2017	Observed sea days, July 2014 to June 2015	VTR sea days, July 2014 to June 2015	Observed trips, July 2014 to June 2015	VTR trips, July 2014 to June 2015
Small Mesh Bottom Trawl	MA	1,171	997	6,761	360	3,088
Small Mesh Bottom Trawl	NE	798	933	8,847	319	3,381
Purse seine	MA	6	0	174	0	172
Purse seine	NE	19	29	661	13	315
Midwater Trawl (Pair and Single)	MA	30	8	134	1	26
Midwater Trawl (Pair and Single)	NE	440	160	1,189	43	363

Source: 2016 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States; Wigley et al., 2016.

The herring fishery is managed through a stock-wide ACL (reduced from the overfishing limit and acceptable biological catch to address scientific uncertainty and management

uncertainty) and sub-ACLs (allocated by herring management area) that are designed to prevent overfishing on individual stock components. Currently, the herring resource is not overfished, and overfishing is not occurring. Additionally, in recent years, the fleet has had the ability to fully harvest the stock-wide ACL and the sub-ACLs. Selection of Herring Alternative 1 will not likely affect the setting of herring harvest specifications but it may affect the ability of the herring fishery to fully harvest the ACLs if less monitoring (when compared to herring Alternative 2) results in catch caps for haddock and river herring/shad limiting effort in the herring fishery.

The Council selected Herring Alternative 2 as a preferred alternative. Under Herring Alternative 2, the Council would specify the details of an IFM program for the Herring FMP. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the IFM program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified IFM programs.

Herring Alternative 2 is intended to allow for additional monitoring in the herring fishery by specifying coverage targets, above SBRM (Herring Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM and the specified coverage target. If Federal funding is available to cover NMFS cost responsibilities associated with IFM in the herring fishery, Herring Alternative 2 may have a positive impact on the herring resource by increasing monitoring in the herring fishery. While the benefits to the herring resource may be difficult to quantify under Herring Alternative 2, they may not be realized under Herring Alternative 1.

Under Alternative 2, benefits to the herring resource would depend on the type of additional monitoring and specified coverage targets for the herring fishery, but could result from increased monitoring to verify retained and discarded catch. As catch information increases, the uncertainty around catch estimates in the herring fishery may be reduced, potentially improving the tracking of harvest against ACLs and allowing for discard estimates to be incorporated into future herring stock assessments. These benefits may not be realized under Herring Alternative 1.

Similar to Herring Alternative 1, the selection of Herring Alternative 2 will not likely affect the setting of herring harvest specifications. However, similar to Herring Alternative 1, the selection of Herring Alternative 2 may affect the ability of the herring fishery to fully harvest ACLs. Under Herring Alternative 2, if fishing effort is limited by the availability of monitoring coverage or increased monitoring results in catch caps for haddock and river herring/shad limiting effort in the herring fishery, then the herring fishery may not be able to fully harvest the ACLs.

Impacts under Herring Alternative 2 assume that the future behavior of fishery participants will be similar to that in past years, when in reality fishery participants are likely to engage in a range of mitigation behaviors to reduce the economic impact associated with industry-funded monitoring. For example, vessels that have historically participated in many fisheries may stop fishing for herring and only participate in fisheries that do not have industry-funded monitoring requirements. However, it is unlikely that those effort shifts would have biological impacts on other fisheries, especially when those fisheries are managed by catch limits. At this time, it is not possible to predict what, if any, mitigation behaviors may be used by herring fishery participants.

Herring Alternative 2 would allow several sub-options to apply to the IFM alternatives.

Sub-Option 1 (Preferred Alternative) would allow vessels to be issued waivers to exempt them from IFM requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Sub-Option 2 (Preferred Alternative) would exempt a wing vessel pair trawling with another vessel from IFM requirements, provided the vessel does not carry any fish. Sub-Option 3 would require that IFM requirements expire two years after implementation. Sub-Option 4 (Preferred Alternative) would require the Council to examine the results of any increased coverage in herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via specifications, a framework adjustment, or an amendment to the Herring FMP, as appropriate. Lastly, Sub-Option 5 would exempt trips that land less than 25 mt or 50 mt (Preferred Alternative) of herring from IFM requirements.

If the increased monitoring associated with Herring Alternative 2 is reduced or minimized by selection of any of the sub-options, the benefits of additional monitoring to the herring resource may be reduced and/or be similar to impacts under Herring Alternative 1.

Because the Council selected Sub-Options 1 and 2 as preferred alternatives, the additional coverage associated with Herring Alternative 2 may be waived if additional monitoring is unavailable or a wing vessel is pair trawling with another vessel. If additional coverage is waived under Sub-Options 1 and 2, then any benefits associated with the additional coverage may be reduced, similar to Herring Alternative 1.

A positive impact is associated with Sub-Option 1 not being selected, if fishing effort is limited, either due to funding or logistics, and that increases the reproductive potential of herring. Selection of Sub-Option 1 preserves the Council's intent to increase monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available. Had the Council not select Sub-Option 1, then any IFM requirements established in this amendment would have the potential to reduce effort in the herring fishery. However, reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.

Sub-Option 3 (2-year sunset of coverage targets) and Sub-Option 4 (2-year re-evaluation of coverage targets and preferred alternative) are both administrative and would not impact the herring resource, thus both alternatives should have a negligible difference on impacts between Herring Alternatives 1 and 2.

The Council's selection of Sub-Option 5 as a preferred alternative means that the threshold for additional coverage (50 mt of herring) and the threshold for which trips count against catch caps for haddock (1 lb of herring) and river herring and shad (6,600 lb of herring) would differ. The data generated by the selection of Sub-Option 5 has the potential to bias (either higher or lower) the catch tracked against catch caps when compared to not selecting Sub-Option 5. Additionally, the Council's selection of the 50 mt threshold as a preferred alternative would result in fewer trips with additional coverage, thereby reducing the benefits of additional coverage under Herring Alternative 2, but the additional coverage would still be higher than under Herring Alternative 1.

Both Herring Alternative 1 and Herring Alternative 2 would require compliance with slippage restrictions, reporting requirements, and consequence measures. These measures are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Because these measures apply similarly to both Herring Alternatives 1 and 2, the benefits of slippage restrictions and requirements to the herring resource would be similar under both alternatives.

Coverage Target Alternatives

Herring Alternative 2 would specify a level and type of IFM for the herring fishery. The types of IFM considered by the Council for the herring fishery include: NEFOP-level observers, at-sea monitors, and electronic monitoring (EM), and portside sampling. Monitoring alternatives allocate coverage by fleet or permit category. Monitoring requirements could apply across all herring management areas or to just midwater trawl vessels fishing in the Groundfish Closed Areas.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. How coverage targets are calculated would not impact the herring resource, but any benefits associated with additional monitoring would be greater under Herring Alternative 2 than under Herring Alternative 1.

Under Herring Alternative 2, the amount and quality of information collected as part of an IFM program would vary with the type of coverage target alternative specified for the herring fishery. Impacts on the herring resource associated with specific coverage target alternatives (Herring Alternatives 2.1-2.7) are discussed in a subsequent section.

Monitoring and Service Provider Requirements

Herring Alternative 2 would specify that requirements for industry-funded observers and at-sea monitors include a HVF certification for the herring fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in Herring Amendment 5.

NEFOP determined that data quality in the herring fishery was sub-optimal when collected by observers without specialized training, potentially resulting in data loss. In addition, the high variety of deck configurations, fish handling practices and fast-paced operations proved more demanding for observers. Having an additional training to identify these practices allowed for improved decision-making while at sea, which, ultimately, improved data accuracy and maximized data collection.

Observers in the herring fishery are currently required to possess a HVF certification under Herring Alternative 1 and both observers and at-sea monitors would be required to possess a HVF certification under Herring Alternative 2. Therefore, the impacts of a HVF certification requirement under Herring Alternative 2 on the herring resource would be similar to the impacts under Herring Alternative 1.

Under Herring Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

To the extent that increased information on herring catch benefits the herring resource under Herring Alternative 2, those benefits may not be realized under Herring Alternative 1.

4.2.3.2 Impacts of Herring Coverage Target Alternatives 2.1- 2.7 on the Herring Resource

The Council selected Herring Alternatives 2.5 and 2.7 as preferred alternatives.

Herring Alternatives 2.1-2.7 are intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM, for industry-funded monitoring. If Federal funding is available to cover NMFS cost responsibilities associated with IFM in the herring fishery, the increased monitoring associated with Herring Alternatives 2.1-2.7 may have a positive impact on the herring resource. That positive impact would result from reducing the uncertainty around catch and bycatch estimates of herring and potentially increasing the amount of information available for use in the herring stock assessment. While the benefits to the herring resource may be difficult to quantify under Herring Alternatives 2.1-2.7, they may not be realized under Herring Alternative 1.

The magnitude of positive impacts to the herring resource associated with additional catch information is expected to vary with the monitoring coverage target specified and the realized coverage level in that year. The realized coverage level in a given year would be largely driven by the amount of funding available to cover NMFS cost responsibilities in a given year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM (Herring Alternative 1) and the specified monitoring coverage target (Herring Alternatives 2.1-2.7).

Herring Alternatives 2.1-2.7 differ by (1) the type of information collected, (2) the specified amount of coverage, and (3) how coverage is allocated.

Type of Information Collected

Currently, vessel and dealer data are used to track retained herring catch and SBRM observer data are used to track discarded herring catch. Additionally, vessel (i.e., catch and effort) and portside sampler (i.e., age and length) data are used in herring stock assessments.

Herring Alternatives 2.1and 2.5 would specify NEFOP-level observer coverage, Herring Alternative 2.2 would specify ASM coverage, Herring Alternatives 2.3, 2.6, and 2.7 would specify ASM coverage and/or EM and portside sampling coverage, and Herring Alternative 2.4 would specify EM and portside sampling coverage.

Both NEFOP-level observer coverage and at-sea monitoring coverage would provide species composition data on retained and discarded catch, while portside sampling coverage would provide species composition data on retained catch. NEFOP-level observers and at-sea monitors can estimate amounts of discarded catch. While EM cannot estimate the amount of discarded catch, it can verify retention of catch. Because discarding in the herring fishery is minimal, alternatives that increase the amount of information on retained and discarded catch (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely have the same potential to benefit the herring resource as alternatives that increase the amount of information on retained catch (Herring Alternative 2.4).

Because discarding in the herring fishery is minimal, alternatives that increase the amount of information on retained and discarded catch (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely have the same likelihood of affecting the data tracked against catch caps than alternatives that increase the amount of information on just retained catch (Herring Alternative 2.4). Increased monitoring of haddock and river herring and shad catch may help reduce uncertainty in estimates of catch that is tracked against catch caps, when that uncertainty may have otherwise led to effort restrictions in the herring fishery. Conversely, additional monitoring may illustrate higher than expected catch of haddock and river herring and shad, resulting in catch caps that are fully harvested earlier than expected and reduced opportunities to harvest herring. Increased information to help track catch against catch caps may help allow the herring fishery to fully harvest the ACLs or it may curtail the harvest of herring by the herring fishery.

Both NEFOP-level observers and portside samplers would collect age and length on herring, while at-sea monitors would collect length data on herring. Currently, age and length data collected portside by Maine Department of Marine Resources are used in the herring stock assessment. Because Herring Alternatives 2.1, 2.3 (portside sampling), 2.4, 2.5, 2.6, and 2.7 (portside sampling) would collect both age and length data on herring, those alternatives have the potential to benefit the herring resource more than Herring Alternatives 2.2 that would just collect length data on herring.

Amount of Coverage

Herring Alternatives 2.1 and 2.5 specify monitoring coverage at 100%, while Herring Alternatives 2.2-2.4 and 2.7 allow monitoring coverage to range between 25% and 100%.

One monitoring objective for the herring coverage targets are accurate estimates of herring catch. While high levels of monitoring are not always necessary to address a monitoring goal, more monitoring could be more effective to meet monitoring goals than less monitoring. Therefore, across alternatives, choosing a higher coverage target has the potential to benefit the herring resource by improving management through better data.

The Council's preferred alternatives would require 100% coverage in Groundfish Closed Areas and 50% coverage on Category A and B vessels everywhere else. These coverage targets are high to moderate compared to other alternatives and have the potential to improve herring catch estimates and ultimately improve management.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage. But because SBRM coverage has the potential to vary year to year, the cost of monitoring paid by industry may also vary year to year and may be difficult to plan/budget.

How Coverage is Allocated

Herring Alternatives 2.1, 2.2, and 2.7 would allocate monitoring coverage by vessel permit category (i.e., Category A and B herring permits), Herring Alternative 2.4 would allocate monitoring coverage by fishing fleet (i.e., midwater trawl fleet), and Herring Alternative 2.3 would allocate monitoring coverage by permit category and fishing fleet.

The extent to which the allocation of industry-funded coverage is consistent with the SBRM fishing fleet will determine how the resulting data can be used. Data collected by vessel permit category can be used for catch limit and catch cap monitoring, while data collected by fleet can be used for catch monitoring and generating discard estimates for stock assessments. Therefore, a positive biological impact is expected when coverage is allocated by fleet and a low positive biological impact is expected when coverage is allocated by

vessel permit category. However, the only alternatives allocating coverage by fleet (Herring Alternatives 2.3 (portside sampling) and 2.4) would not be collecting an estimate of discards.

Vessels with Category A and B herring permits harvested approximately 98% of recent herring catch (2008-2011) and the midwater trawl fleet harvested approximately 73% of recent herring catch (2008-2012). Based on recent catch, allocating coverage by Category A and B herring permits (Herring Alternatives 2.1, 2.2, 2.3, and 2.7) would increase monitoring on vessels that harvest the majority of catch in the herring fishery as compared to allocating coverage to the midwater trawl fleet (Herring Alternative 2.4). Therefore, any benefit to herring associated with increased monitoring may be higher under Herring Alternatives 2.1-2.3 and 2.7 than under Herring Alternative 2.4.

Overall, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

Herring Alternative 2.5 specifies that midwater trawl vessels fishing in the Groundfish Closed Areas must carry a NEFOP-level observer while Herring Alternative 2.6 would specify that coverage for midwater trawl vessels fishing in Groundfish Closed Areas would match the coverage targets recommended by the Council for the rest of the fishery. Herring Alternative 2 Sub-Options would apply to Herring Alternative 2.6 but not to Herring Alternative 2.5. If increased monitoring associated with Herring Alternative 2.6 is reduced or minimized by the selection of any of the sub-options, the benefits of additional monitoring to the non-target species may be less than under Herring Alternative 2.6 than under Herring Alternative 2.5.

During 2005-2010, prior to any observer coverage requirements for midwater trawl vessels fishing in Groundfish Closed Areas, less than 12% of total catch by the midwater trawl fleet came from inside the Groundfish Closed Areas. Because a relatively small percentage of the midwater trawl fleet's herring harvest comes from inside Groundfish Closed Areas, any positive impact to the herring resource associated with additional catch information under Herring Alternatives 2.5 and 2.6 would be similar, but likely reduced, compared to impacts under Herring Alternatives 2.1-2.4 and 2.7.

Slippage Requirements

Herring Alternatives 2.1–2.7 would require compliance with slippage restrictions, reporting requirements, and consequence measures. Specifically, all existing slippage restrictions, reporting requirements, and consequence measures would apply on all trips with a NEFOP-level observer or at-sea monitor was aboard. Additionally, slippage restrictions, reporting requirements, and the 15-mile move requirement would apply on all trips selected for portside sampling.

Slippage requirements are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Any benefits to the herring resource from slippage requirements would likely be similar across Herring Alternatives 2.1-2.7.

Summary of Impacts to Herring Resource

The impacts of herring alternatives on the herring resource are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to herring are possible if increased monitoring can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments.

However, these alternatives may lead to direct positive impacts on herring if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, and that increases the reproductive potential of herring.

The impact of Herring Alternative 1 (No Action) on herring is likely low positive because monitoring coverage is allocated by SBRM, but there is no additional monitoring to reduce uncertainty around catch and bycatch estimates. The impact of Herring Alternative 2 on herring is generally positive because there would be additional monitoring to reduce the uncertainty around catch estimates, but the magnitude of the impact is dependent on the type of information collected, amount of coverage, and how coverage is allocated. The realized coverage in any given year will also largely depend on and amount of Federal funding available to cover NMFS cost responsibilities.

A positive biological impact on herring is expected if data are collected on both retained and discarded catch and a low positive impact if data are collected on just retained catch. But since discards are minimal in the herring fishery, a similar positive impact is likely if data are collected on just retained catch. Data collected by vessel permit category can be used for catch limit and catch cap monitoring, while data collected by fleet can be used for catch monitoring and generating discard estimates for stock assessments. Therefore, a positive biological impact is expected when coverage is allocated by fleet and a low positive biological impact is expected when coverage is allocated by vessel permit category. However, the only alternative solely allocating coverage by fleet (Herring Alternative 2.4) would not be collecting an estimate of discards. Additionally, vessels with Category A and B herring permits harvest approximately 98% of total herring catch, compared to the midwater trawl fleet that harvests approximately 73% of total herring catch. Therefore, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

If coverage is only allocated to Groundfish Closed Areas (Herring Alternatives 2.5 and 2.6), then a low positive biological impact is likely because the area of coverage is limited.

A positive impact is associated with Sub-Options 1 and 2 not being selected, if fishing effort is limited, either due to funding or logistics, and that increases the reproductive potential of herring. Sub-Option 5 would only require additional coverage on trips that land more than 25 mt or 50 mt mt of herring, so there is the potential for a low negative impact on herring associated with Sub-Option 5 if it biases data used to track catch against catch caps.

Given all these factors, the impact on the herring resource is likely low positive for Herring Alternatives 2.1-2.7. Additionally, the impacts of these herring alternatives on the herring

resource are not significant because they would not cause the herring resource to become overfished and would not result in overfishing.

TABLE 69. IMPACTS SUMMARY OF HERRING ALTERNATIVES ON HERRING RESOURCE (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Impacts on Herring Resource
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	• Low positive impact associated with observer coverage allocated by SBRM • Low negative impact associated with no additional monitoring to reduce uncertainty around catch estimates
Herring Alternative 2: Coverage Target Specified For IFM Programs	• **Positive impact associated with additional monitoring to reduce uncertainty around catch estimates** • **Low negative impact associated with no additional monitoring unless available Federal funding can cover NMFS cost responsibilities** • **Magnitude of impacts associated with additional monitoring would be primarily dependent on the type of information collected, amount of coverage, how coverage is allocated, and amount of available Federal funding** • **Positive impact associated with not selecting Sub-Option 1 if fishing effort is limited and that increases the reproductive potential of herring** • **Low negative impact associated with selecting Sub-Options 1 and 2 if additional monitoring is waived** • **Low negative impact associated with selecting Sub-Option 5 if it biases data used to track catch against catch caps**
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100% coverage on Category A and B vessels
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce around uncertainty around retained and discarded catch estimates associated with 100%-25% coverage on Category A and B vessels
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100%-25% coverage on Category A and B vessels • Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• **Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas** • **Negligible impact associated with Sub-Options**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100%-25% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas

Alternatives	Impacts on Herring Resource
Fishing in Groundfish Closed Areas	
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	• **Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 50% coverage on Category A and B vessels**

4.2.4 IMPACTS OF HERRING ALTERNATIVES ON NON-TARGET SPECIES

The non-target species of interest that are harvested by the herring fishery are haddock, river herring and shad, and mackerel.

Current management of the herring fishery specifies gear and area specific catch caps for non-target species of interest harvested in the herring fishery. River herring/shad catch (RHS) caps for vessels using midwater trawl gear exist for the Gulf of Maine (GOM), Cape Cod (CC), and Southern New England (SNE). River herring and shad catch caps for vessels using small mesh bottom trawl gear exist for Southern New England. The haddock catch cap in the herring fishery applies to vessels using midwater trawl gear in the GOM and Georges Bank (GB).

4.2.4.1 Impacts of Herring Alternatives 1 and 2 on Non-Target Species

In general, the impacts of Herring Alternatives 1 and 2 on non-target species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to non-target species are possible if increased monitoring can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments. However, Herring Alternatives 1 and 2 may lead to direct positive impacts on non-target species if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, and that increases the reproductive potential of non-target species.

Herring Alternative 1 would not specify a coverage target for an IFM program in the Herring FMP. Monitoring for herring vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis.

In recent years, observer coverage for the herring fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-specific basis, from the perspective of developing a bycatch reporting system, there is overlap among the

FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under one or more FMPs, the SBRM is designed around "fishing modes" defined by the type of fishing gear used and the area from which the vessels depart.

There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine. The SBRM is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through a FMP developed by either the MAFMC or NEFMC. Current observer coverage allocated to the herring fishery through SBRM is described in Table 84.

The catch of mackerel in the herring fishery is managed by the Mid-Atlantic Council in the mackerel fishery specifications and the catch of haddock in the herring fishery is managed by the Council in the Northeast multispecies specifications. The catch of haddock, river herring, and shad in the herring fishery is managed by fishery specific catch caps established by the Council. Selection of Herring Alternative 1 will not likely affect the setting of harvest specifications for mackerel or haddock, but less monitoring (when compared to Herring Alternative 2) may affect the setting of catch caps and tracking catch against those catch caps.

The Council selected Herring Alternative 2 as a preferred alternative. Under Herring Alternative 2, the Council would specify the details of an IFM program for the Herring FMP. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the IFM program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified IFM programs.

Herring Alternative 2 is intended to allow for additional monitoring in the herring fishery by specifying coverage targets, above SBRM (Herring Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year. The realized coverage for the fishery in a given year would fall somewhere between no additional

coverage above SBRM (Herring Alternative 1) and the specified coverage target (Herring Alternatives 2.1-2.7). If Federal funding is available to cover NMFS cost responsibilities associated with IFM in the herring fishery, Herring Alternative 2 may have a positive impact on non-target species by increasing monitoring in the herring fishery. While the benefits to non-target species may be difficult to quantify under Herring Alternative 2, they may not be realized under Herring Alternative 1.

Under Herring Alternative 2, benefits to non-target species would depend on the type of additional monitoring and specified coverage targets for the herring fishery, but could result from increased monitoring to verify retained and discarded catch. As catch information increases, the uncertainty around catch estimates in the herring fishery may be reduced, potentially improving the tracking of haddock, river herring, and shad catch against catch caps. Additionally, increased monitoring may result in higher or lower documented catch of haddock, river herring, and shad, potentially leading to changes to the basis for setting catch caps and/or fishery catch caps being fully harvested more often or less often than expected. These benefits may not be realized under Herring Alternative 1.

Impacts under Herring Alternative 2 assume that the future behavior of fishery participants will be similar to that in past years, when in reality fishery participants are likely to engage in a range of mitigation behaviors to reduce the economic impact associated with industry-funded monitoring. For example, vessels that have historically participated in many fisheries may stop fishing for herring and only participate in fisheries that do not have industry-funded monitoring requirements. However, it is unlikely that those effort shifts would have biological impacts on other fisheries or non-target species, especially when those fisheries are managed by catch limits. At this time, it is not possible to predict what, if any, mitigation behaviors may be used by herring fishery participants.

Herring Alternative 2 would allow several sub-options to apply to the IFM alternatives.

Sub-Option 1 (Preferred Alternative) would allow vessels to be issued waivers to exempt them from IFM requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Sub-Option 2 (Preferred Alternative) would exempt a wing vessel pair trawling with another vessel from IFM requirements, provided the vessel does not carry any fish. Sub-Option 3 would require that IFM requirements expire two years after implementation. Sub-Option 4 (Preferred Alternative) would require the Council to examine the results of any increased coverage in the herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via specifications, a framework adjustment, or an amendment to the Herring FMP, as appropriate. Lastly, Sub-Option 5 would exempt trips that land less than 25 mt or 50 mt (Preferred Alternative) of herring from IFM requirements.

If the increased monitoring associated with Herring Alternative 2 is reduced or minimized by selection of any of the sub-options, the benefits of additional monitoring to non-target species may be reduced and/or similar to impacts under Herring Alternative 1.

Because the Council selected Sub-Options 1 and 2 as preferred alternatives, the additional coverage associated with Herring Alternative 2 may be waived if additional monitoring is unavailable or a wing vessel is pair trawling with another vessel. If additional coverage is waived under Sub-Options 1 and 2, then any benefits associated with the additional coverage may be reduced, similar to Herring Alternative 1.

A positive impact is associated with Sub-Option 1 not being selected, if fishing effort is limited, either due to funding or logistics, and that increases the reproductive potential of non-target species. The positive impact would result from the increased reproductive potential of the individuals that are unharvested. However, larger numbers of spawning fish do not guarantee increased recruitment and high densities of fish may result in slow growth and poor condition. Selection of Sub-Option 1 preserves the Council's intent to increase monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available. Had the Council not select Sub-Option 1, then any IFM requirements established in this amendment would have the potential to reduce effort in the herring fishery. However, reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.

Sub-Option 3 (2-year sunset of coverage targets) and Sub-Option 4 (2-year re-evaluation of coverage targets and preferred alternative) are both administrative and would not impact non-target species, thus both alternatives should have a negligible difference on impacts between Herring Alternatives 1 and 2.

The Council's selection of Sub-Option 5 as a preferred alternative means that the threshold for additional coverage (50 mt of herring) and the threshold for which trips count against catch caps for haddock (1 lb of herring) and river herring and shad (6,600 lb of herring) would differ. The data generated by the selection of Sub-Option 5 has the potential to bias (either higher or lower) the catch tracked against catch caps when compared to not selecting Sub-Option 5. Additionally, the Council's selection of the 50 mt threshold as a preferred alternative would result in fewer trips with additional coverage, thereby reducing the benefits of additional coverage under Herring Alternative 2, but the additional coverage would still be higher than under Herring Alternative 1.

Both Herring Alternative 1 and Herring Alternative 2 would require compliance with slippage restrictions, reporting requirements, and consequence measures. These measures are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Because these measures apply similarly to both Herring Alternatives 1 and 2, the benefits of slippage restrictions and requirements to non-target species would be similar under both alternatives.

Coverage Target Alternatives

Herring Alternative 2 would specify a level and type of IFM for the herring fishery. The types of IFM considered by the Council for the herring fishery include: NEFOP-level

observers, at-sea monitors, and electronic monitoring and portside sampling. Monitoring alternatives allocate coverage by fleet or permit category. Monitoring requirements could apply across all herring management areas or to just midwater trawl vessels fishing in the Groundfish Closed Areas.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. How coverage targets are calculated would not impact non-target species, but any benefits associated with additional monitoring would be greater under Herring Alternative 2 than under Herring Alternative 1.

Under Herring Alternative 2, the amount and quality of information collected as part of an IFM would vary with the type of coverage target alternative specified for the herring fishery.

A CV analysis was used to simulate the precision associated with tracking catch against catch caps. Although there is no defined CV target, results are compared to a 30% CV for context. Under Herring Alternative 1, based on data from 2011-2015, CVs for the GB Haddock Catch Cap were generally less than 30%, except in 2015. Since there has not been any observed GOM haddock catch, the CV is zero. In comparison, under Herring Alternative 2, coverage targets of 25% and higher will generate CVs less than 30% for the GB Haddock Catch Cap. Results of the CV simulation are more varied for river herring/shad catch caps. Under Herring Alternative 1, CVs for SNE catch caps were less than 30%, while CVs for GOM and CC caps ranged from 61.4% to 94.8%. Under Herring Alternative 2, coverage targets of 25% and higher would generated CVs less than 30% for the SNE catch caps. Additionally, for the GOM and CC catch caps, coverage targets of 50% and higher would generate CVs around 30% and lower.

Additional impacts on non-target species associated with specific coverage target alternatives (Herring Alternatives 2.1-2.7) are discussed in a subsequent section.

Monitoring and Service Provider Requirements

Herring Alternative 2 would specify that requirements for industry-funded observers and at-sea monitors include a HVF certification for the herring fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in Herring Amendment 5.

NEFOP determined that data quality in the herring fishery was sub-optimal when collected by observers without specialized training, potentially resulting in data loss. In addition, the high variety of deck configurations, fish handling practices and fast-paced operations proved more demanding for observers. Having an additional training to identify these

practices allowed for improved decision-making while at sea, which, ultimately, improved data accuracy and maximized data collection.

Observers in the herring fishery are currently required to possess a HVF certification under Herring Alternative 1 and both observers and at-sea monitors would be required to possess a HVF certification under Herring Alternative 2. Therefore, the impacts of a HVF certification requirement under Herring Alternative 2 on non-target species would be similar to the impacts under Herring Alternative 1.

Under Herring Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

To the extent that increased information on non-target species catch benefits non-target species under Herring Alternative 2, those benefits may not be realized under Herring Alternative 1.

4.2.4.2 Impacts of Herring Coverage Target Alternatives 2.1- 2.7 on Non-Target Species

The Council selected Herring Alternatives 2.5 and 2.7 as preferred alternatives.

Herring Alternatives 2.1-2.7 are intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM, for industry-funded monitoring. If Federal funding is available to cover NMFS cost responsibilities associated with IFM in the herring fishery, the increased monitoring associated with Herring Alternatives 2.1-2.7 may have a positive impact on non-target species. That positive impact would result from reducing the uncertainty around catch and bycatch estimates of non-target species in the herring fishery and potentially increasing the amount of information available for use in stock assessments for non-target species. While the benefits to non-target species may be difficult to quantify under Herring Alternatives 2.1-2.7, they may not be realized under Herring Alternative 1.

The magnitude of positive impacts to non-target species associated with additional catch information is expected to vary with the monitoring coverage target specified and the realized coverage level in that year. The realized coverage level in a given year would be largely driven by the amount of funding available to cover NMFS cost responsibilities in a given year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM (Herring Alternative 1) and the specified monitoring coverage target (Herring Alternatives 2.1-2.7).

Herring Alternatives 2.1-2.7 differ by (1) the type of information collected, (2) the specified amount of coverage, and (3) how coverage is allocated.

Type of Information Collected

Currently, vessel and dealer data are used to track retained catch of mackerel and haddock while SBRM observer data are used to track retained and discarded catch of river herring and shad, as well as the discarded catch of mackerel and haddock. Additionally, SBRM observer (i.e., discard and length) and survey (i.e., age) data are used for stock assessments and to estimate total removals.

Herring Alternatives 2.1 and 2.5 would specify NEFOP-level observer coverage, Herring Alternatives 2.2 would specify ASM coverage, Herring Alternatives 2.3, 2.6, and 2.7 would specify ASM coverage and/or EM and portside sampling coverage, and Herring Alternative 2.4 would specify EM and portside sampling coverage.

Both NEFOP-level observer coverage and at-sea monitoring coverage would provide species composition data on retained and discarded catch, while portside sampling coverage would provide species composition data on retained catch. NEFOP-level observers and at-sea monitors can estimate amounts of discarded catch. While EM cannot estimate the amount of discarded catch, it can verify retention of catch. Because discarding in the herring fishery is minimal, alternatives that increase the amount of information on retained and discarded catch (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely have the same potential to benefit non-target species as alternatives that increase the amount of information on retained catch (Herring Alternative 2.4).

Because discarding in the herring fishery is minimal, alternatives that increase the amount of information on retained and discarded catch (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely have the same likelihood of affecting the data tracked against catch caps than alternatives that increase the amount of information on just retained catch (Herring Alternative 2.4). Increased monitoring of haddock and river herring and shad catch may help reduce uncertainty in estimates of catch that is tracked against catch caps and illustrate higher or lower than expected catch of haddock and river herring and shad.

Both NEFOP-level observers and portside samplers would collect age and length on non-target species, while at-sea monitors would collect length data on non-target species. Currently, length data collected by SBRM observers and age data collected during NMFS research surveys are considered in the stock assessments for haddock, mackerel, river herring, and shad. Because Herring Alternatives 2.1, 2.3 (portside sampling), 2.4, 2.5, 2.6, and 2.7 (portside sampling) would collect both age and length data on non-target species, those alternatives have the potential to benefit non-target species more than Herring Alternatives 2.2 that would collect just length data on non-target species.

Amount of Coverage

Herring Alternatives 2.1 and 2.5 specify monitoring coverage at 100% while Herring Alternatives 2.2-2.4 and 2.7 allow monitoring coverage to range between 25% and 100%.

The monitoring objectives for the herring coverage targets are accurate estimates of herring catch and the catch of haddock and river herring/shad to track against catch caps.

The Council's preferred alternatives would require 100% coverage in Groundfish Closed Areas and 50% coverage on Category A and B vessels. While high levels of monitoring are not always necessary to address a monitoring goal, more monitoring could be more effective to meet monitoring goals than less monitoring. Therefore, across alternatives, choosing a higher coverage target has the potential to benefit the non-target species by improving management through better data.

A CV analysis of Herring Alternatives 2.1 and 2.2 was used simulate the precision associated with tracking catch against catch caps. For the GB Haddock Catch Cap, coverage targets of 25% and higher would have generated CVs less than 30%. For the RHS SNE catch caps, coverage targets of 25% and higher would generated CVs less than 30%. For the RHS GOM and CC catch caps, coverage targets of 50% and higher would generate CVs around 30% and lower. Based on this analysis, coverage targets of 50%, and often times even 25%, would generate CVs on the catch tracked against catch caps of 30% or lower.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage. But because SBRM coverage has the potential to vary year to year, the cost of monitoring paid by industry may also vary year to year and may be difficult to plan/budget.

How Coverage is Allocated

Herring Alternatives primarily 2.1, 2.2, and 2.7 would allocate monitoring coverage by vessel permit category (i.e., Category A and B herring permits), Herring Alternative 2.4 would allocate monitoring coverage by fishing fleet (i.e., midwater trawl fleet), and Herring Alternative 2.3 would allocate monitoring coverage by permit category and fishing fleet.

The extent to which the allocation of industry-funded coverage is consistent with the SBRM fishing fleet will determine how the resulting data can be used. Data collected by vessel permit category can be used for catch limit and catch cap monitoring, while data collected by fleet can be used for catch monitoring and generating discard estimates for stock assessments. Therefore, a positive biological impact is expected when coverage is allocated by fleet and a low positive biological impact is expected when coverage is allocated by vessel permit category. However, the only alternatives allocating coverage by fleet (Herring Alternatives 2.3 (portside sampling) and 2.4) would not be collecting an estimate of discards.

Vessels with Category A and B herring permits harvested approximately 98% of recent herring catch (2008-2011) and the midwater trawl fleet harvested approximately 73% of

recent herring catch (2008-2012). Based on recent catch, allocating coverage by Category A and B herring permits (Herring Alternatives 2.1, 2.2, 2.3, and 2.7) would increase monitoring on vessels that harvest the majority of catch in the herring fishery as compared to allocating coverage to the midwater trawl fleet (Herring Alternative 2.4). Therefore, any benefit to non-target species associated with increased monitoring may be higher under Herring Alternatives 2.1-2.3 and 2.7 than under Herring Alternative 2.4

Overall, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

Herring Alternative 2.5 specifies that midwater trawl vessels fishing in the Groundfish Closed Areas must carry a NEFOP-level observer while Herring Alternative 2.6 would specify that coverage for midwater trawl vessels fishing in Groundfish Closed Areas would match the coverage targets recommended by the Council for the rest of the fishery. Herring Alternative 2 Sub-Options would apply to Herring Alternative 2.6 but not to Herring Alternative 2.5. If increased monitoring associated with Herring Alternative 2.6 is reduced or minimized by the selection of any of the sub-options, the benefits of additional monitoring to the non-target species may be less than under Herring Alternative 2.6 than under Herring Alternative 2.5.

Haddock is the only non-target species of interest that is typically harvested by midwater vessels inside the Groundfish Closed Areas. The catch of haddock by midwater trawl vessels inside Groundfish Closed Areas would be tracked against the haddock catch caps. Because a relatively small percentage of the midwater trawl fleet's harvest comes from inside Groundfish Closed Areas, any positive impact to haddock associated with additional catch information under Herring Alternatives 2.5 and 2.6 would be similar, but likely reduced, compared to impacts under Herring Alternatives 2.1-2.4 and 2.7.

Slippage Requirements

Herring Alternatives 2.1–2.7 would require compliance with slippage restrictions, reporting requirements, and consequence measures. Specifically, all existing slippage restrictions, reporting requirements, and consequence measures would apply on all trips with a NEFOP-level observer or at-sea monitor was aboard. Additionally, slippage restrictions, reporting requirements, and the 15-mile move requirement would apply on all trips selected for portside sampling.

Slippage requirements are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Any benefits to non-target species from slippage requirements would likely be similar across Herring Alternatives 2.1-2.7.

Summary of Impacts to Non-Target Species

The impacts of herring alternatives on non-target species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to non-target

species are possible if increased monitoring can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments.

However, these alternatives may lead to direct positive impacts on non-target species if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, and that increases the reproductive potential of non-target species.

The impact of Herring Alternative 1 (No Action) on non-target species is likely low positive because monitoring coverage is allocated by SBRM, but there is no additional monitoring to reduce uncertainty around catch and bycatch estimates. The impact of Herring Alternative 2 on non-target species is generally positive because there would be additional monitoring to reduce the uncertainty around catch estimates, but the magnitude of the impact is dependent on the type of information collected, amount of coverage, and how coverage is allocated. The realized coverage in any given year will also largely depend on and amount of Federal funding available to cover NMFS cost responsibilities.

A positive biological impact on non-target species is expected if data are collected on both retained and discarded catch and a low positive impact if data are collected on just retained catch. But since discards are minimal in the herring fishery, a similar positive impact is likely if data are collected on just retained catch. Data collected by vessel permit category can be used for catch limit and catch cap monitoring, while data collected by fleet can be used for catch monitoring and generating discard estimates for stock assessments. Therefore, a positive biological impact is expected when coverage is allocated by fleet and a low positive biological impact is expected when coverage is allocated by vessel permit category. However, the only alternative solely allocating coverage by fleet (Herring Alternative 2.4) would not be collecting an estimate of discards. Additionally, vessels with Category A and B herring permits harvest approximately 98% of total herring catch, compared to the midwater trawl fleet that harvests approximately 73% of total herring catch. Therefore, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

If coverage is only allocated to Groundfish Closed Areas (Herring Alternatives 2.5 and 2.6), then a low positive biological impact is likely because the area of coverage is limited.

A positive impact is associated with Sub-Options 1 and 2 not being selected, if fishing effort is limited, either due to funding or logistics, and that increases the reproductive potential of non-target species. Sub-Option 5 would only require additional coverage on trips that land more than 25 mt or 50 mt of herring, so there is the potential for a low negative impact on haddock and river herring and shad associated with Sub-Option 5 if it biases data used to track catch against catch caps.

Given all these factors, the impact on non-target species is likely low positive for Herring Alternatives 2.1-2.7. Additionally, the impacts of these herring alternatives on non-target species are not significant because they would not cause non-target species to become overfished, would not result in overfishing, and would not cause a change in population status.

TABLE 70. IMPACTS SUMMARY OF HERRING COVERAGE TARGET ALTERNATIVES ON NON-TARGET SPECIES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Impacts on Non-Target Species (Haddock, River Herring and Shad, Mackerel)
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	• Low positive impact associated with observer coverage allocated by SBRM • Low negative impact associated with no additional monitoring to reduce uncertainty around catch estimates
Herring Alternative 2: Coverage Target Specified For IFM Programs	• **Positive impact associated with additional monitoring to reduce uncertainty around catch estimates** • **Low negative impact associated with no additional monitoring unless available Federal funding can cover NMFS cost responsibilities** • **Magnitude of impacts associated with additional monitoring would be primarily dependent on the type of information collected, amount of coverage, how coverage is allocated, and amount of available Federal funding** • **Positive impact associated with not selecting Sub-Option 1 if fishing effort is limited and that increases the reproductive potential of non-target species** • **Low negative impact associated with selecting Sub-Options 1 and 2 if additional coverage is waived** • **Low negative impact associated with Sub-Option 5 if it biases data used to track catch against catch caps**
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100% coverage on Category A and B vessels to track against catch caps
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100%-25% coverage on Category A and B vessels to track catch against catch caps
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100%-25% coverage on Category A and B vessels to track catch against catch caps • Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet to track catch against catch caps
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet to track catch against catch caps
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• **Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 100% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas to track catch against catch caps** • **Negligible impact associated with Sub-Options**

Alternatives	Impacts on Non-Target Species (Haddock, River Herring and Shad, Mackerel)
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100%-25% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas to track catch against catch caps
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	• **Low positive impact associated with additional information to reduce uncertainty around retained and discarded catch estimates associated with 50% coverage on Category A and B vessels to track catch against catch caps**

4.2.5 IMPACTS OF HERRING ALTERNATIVES ON PROTECTED RESOURCES

Protected species include fish, turtles, and marine mammals listed under the ESA and marine mammals protected under the MMPA.

4.2.5.1 Impacts of Herring Alternatives 1 and 2 on Protected Species

In general, the impacts of Herring Alternatives 1 and 2 on protected species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to protected species are possible if increased monitoring can reduce uncertainty around interactions between protected species and the herring fishery and generate more information for stock assessments. However, Herring Alternatives 1 and 2 may lead to direct positive impacts on protected species if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, so that interactions between the herring fishery and protected species are reduced.

Herring Alternative 1 would not specify a coverage target for an industry-funded monitoring program in the Herring FMP. Monitoring for herring vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis.

In recent years, observer coverage for the herring fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-specific basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under

three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under one or more FMPs, the SBRM is designed around "fishing modes" defined by the type of fishing gear used and the area from which the vessels depart.

There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine. The SBRM is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through a FMP developed by either the MAFMC or NEFMC. Current observer coverage allocated to the herring fishery through SBRM is described in Table 84.

Selection of Herring Alternative 1 will not likely affect the setting of harvest specifications for herring, but less monitoring (when compared to Herring Alternative 2) may affect the setting of catch caps in the herring fishery and tracking catch against those catch caps.

The Council selected Herring Alternative 2 as a preferred alternative. Herring Alternative 2, the Council would specify the details of an industry-funded monitoring program for the Herring FMP. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified industry-funded monitoring programs.

Herring Alternative 2 is intended to allow for additional monitoring in the herring fishery by specifying coverage targets, above SBRM (Herring Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM and the specified coverage target. If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the herring fishery, Herring Alternative 2 may have a positive impact on protected species by increasing monitoring in the herring fishery. While the benefits to protected species may be difficult to quantify under Herring Alternative 2, they may not be realized under Herring Alternative 1.

Under Herring Alternative 2, benefits to protected species would depend on the type of additional monitoring and specified coverage targets for the herring fishery, but could result from increased monitoring to verify retained and discarded catch. As catch

information increases, the uncertainty around catch estimates in the herring fishery may be reduced, potentially improving protected species bycatch estimates to be incorporated into future stock assessments and improving the available information for protected species management decisions. These benefits may not be realized under Herring Alternative 1.

Herring Alternative 2 would allow several sub-options to apply to the industry-funded monitoring alternatives.

Sub-Option 1 (Preferred Alternative) would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Sub-Option 2 (Preferred Alternative) would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not carry any fish. Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation. Sub-Option 4 (Preferred Alternative) would require the Council to examine the results of any increased coverage in the herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via specifications, a framework adjustment, or an amendment to the Herring FMP, as appropriate. Lastly, Sub-Option 5 would exempt trips that land less than 25 mt or 50 mt (Preferred Alternative) of herring from industry-funded monitoring requirements.

If the increased monitoring associated with Herring Alternative 2 is reduced or minimized by selection of any of the sub-options, the benefits of improved catch estimates in stock assessments and improving the available information for protected species management decisions may be reduced and/or similar to impacts under Herring Alternative 1.

Because the Council selected Sub-Options 1 and 2 as preferred alternatives, the additional coverage associated with Herring Alternative 2 may be waived if additional monitoring is unavailable or a wing vessel is pair trawling with another vessel. If additional coverage is waived under Sub-Options 1 and 2, then any benefits associated with the additional coverage may be reduced, similar to Herring Alternative 1.

A positive impact is associated with Sub-Option 1 not being selected, if fishing effort is limited, either due to funding or logistics, and that reduces interactions between the herring fishery and protected species. The positive impact would result from reduced interactions between the herring fishery and protected species and the potential for reducing the fishing mortality of protected species. Selection of Sub-Option 1 preserves the Council's intent to increase monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available. Had the Council not select Sub-Option 1, then any industry-funded monitoring requirements established in this amendment would have the potential to reduce effort in the herring fishery. Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.

Sub-Option 3 (2-year sunset of coverage targets) and Sub-Option 4 (2-year re-evaluation of coverage targets and preferred alternative) are both administrative and would not impact protected species, thus both alternatives should have a negligible difference on impacts between Herring Alternatives 1 and 2.

The Council's selection of Sub-Option 5 as a preferred alternative means that the threshold for additional coverage (50 mt of herring) and the threshold for which trips count against catch caps for haddock (1 lb of herring) and river herring and shad (6,600 lb of herring) would differ. The data generated by the selection of Sub-Option 5 has the potential to bias (either higher or lower) the catch tracked against catch caps when compared to not selecting Sub-Option 5. Additionally, the Council's selection of the 50 mt threshold as a preferred alternative would result in fewer trips with additional coverage, thereby reducing the benefits of additional coverage under Herring Alternative 2, but the additional coverage would still be higher than under Herring Alternative 1.

Both Herring Alternative 1 and Herring Alternative 2 would require compliance with slippage restrictions, reporting requirements, and consequence measures. These measures are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Because these measures apply similarly to both Herring Alternatives 1 and 2, the benefits of slippage restrictions and requirements to protected species would be similar under both alternatives.

Coverage Target Alternatives

Herring Alternative 2 would specify a level and type of industry-funded monitoring for the herring fishery. The types of industry-funded monitoring considered by the Council for the herring fishery include: NEFOP-level observers, at-sea monitors, and electronic monitoring and portside sampling. Monitoring alternatives allocate coverage by fleet or permit category. Monitoring requirements could apply across all herring management areas or to just midwater trawl vessels fishing in the Groundfish Closed Areas.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. How coverage targets are calculated would not impact protected species, but any benefits associated with additional monitoring would be greater under Herring Alternative 2 than under Herring Alternative 1.

Under Herring Alternative 2, the amount and quality of information collected as part of an industry-funded monitoring would vary with the type of coverage target alternative specified for the herring fishery. Additional impacts on protected species associated with specific coverage target alternatives (Herring Alternatives 2.1-2.7) are discussed in a subsequent section.

Monitoring and Service Provider Requirements

Herring Alternative 2 would specify that requirements for industry-funded observers and at-sea monitors include a HVF certification for the herring fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in Herring Amendment 5.

NEFOP determined that data quality in the herring fishery was sub-optimal when collected by observers without specialized training, potentially resulting in data loss. In addition, the high variety of deck configurations, fish handling practices and fast-paced operations proved more demanding for observers. Having an additional training to identify these practices allowed for improved decision-making while at sea, which, ultimately, improved data accuracy and maximized data collection.

Observers in the herring fishery are currently required to possess a HVF certification under Herring Alternative 1 and both observers and at-sea monitors would be required to possess a HVF certification under Herring Alternative 2. Therefore, the impacts of a HVF certification requirement under Herring Alternative 2 on protected species would be similar to the impacts under Herring Alternative 1.

Under Herring Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

To the extent that increased information on protected species catch benefits protected species under Herring Alternative 2, those benefits may not be realized under Herring Alternative 1.

4.2.5.2 Impacts of Herring Coverage Target Alternatives 2.1- 2.7 on Protected Species

The Council selected Herring Alternatives 2.5 and 2.7 as preferred alternatives.

Herring Alternatives 2.1-2.7 are intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM, for industry-funded monitoring. If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the herring fishery, the increased monitoring associated with Herring Alternatives 2.1-2.7 may have a positive impact on protected species. That positive impact may result from reducing uncertainty around the bycatch of protected species in the herring fishery, thereby, potentially improving bycatch estimates to be incorporated into future stock assessments and improving the available information for protected species management decisions. While the benefits to protected species may be difficult to quantify under Herring Alternatives 2.1-2.7, they may not be realized under Herring Alternative 1.

The magnitude of positive impacts to protected species associated with additional catch information is expected to vary with the monitoring coverage target specified and the realized coverage level in that year. The realized coverage level in a given year would be largely driven by the amount of funding available to cover NMFS cost responsibilities in a given year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM (Herring Alternative 1) and the specified monitoring coverage target (Herring Alternatives 2.1-2.7).

Herring Alternatives 2.1-2.7 differ by (1) the type of information collected, (2) the specified amount of coverage, and (3) how coverage is allocated.

Type of Information Collected

Herring Alternatives 2.1 and 2.5 would specify NEFOP-level observer coverage, Herring Alternatives 2.2 would specify ASM coverage, Herring Alternatives 2.3, 2.6, and 2.7 would specify ASM coverage and/or EM and portside sampling coverage, and Herring Alternative 2.4 would specify EM and portside sampling coverage.

Both NEFOP-level observer coverage and at-sea monitoring coverage would provide species composition data on retained and discarded catch, while portside sampling coverage would provide species composition data on retained catch. NEFOP-level observers and at-sea monitors can estimate amounts of discarded catch. While EM cannot estimate the amount of discarded catch, it can verify retention of catch.

Because interactions between protected species and the herring fishery occur at sea, alternatives that increase the amount of information collected at sea (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely benefit protected species more than alternatives that only increase the amount of information collected portside (Herring Alternative 2.4).

NEFOP-level observers would collect data on interactions with protected species, such as sea turtles, marine mammals, and sea birds, as well as sighting data on protected species. In contrast, at-sea monitors would collect data on interactions with protected species, but not sighting data. While the purpose of EM is not to collect protected species information, EM has proven useful at documenting interactions with protected species and may be able to document protected species sightings. However, Herring Alternative 2.1 would likely generate more information on protected species and has the potential to benefit protected species more than Herring Alternatives 2.2-2.7.

Amount of Coverage

Herring Alternatives 2.1 and 2.5 specify monitoring coverage at 100% while Herring Alternatives 2.2-2.4 and 2.7 allow monitoring coverage to range between 25% and 100%.

The Council's preferred alternatives would require 100% coverage in Groundfish Closed Areas and 50% coverage on Category A and B vessels. While high levels of monitoring are not always necessary to generate information, more monitoring could be more effective at

generating information on the interactions between protected species and the herring fishery than less information. In general, interactions between ESA-listed species and the herring fishery occur infrequently, while interactions between marine mammals and the herring fishery are more frequent. Therefore, across alternatives, choosing a higher coverage target has the potential to benefit the protected species by improving management through better data.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage. But because SBRM coverage has the potential to vary year to year, the cost of monitoring paid by industry may also vary year to year and may be difficult to plan/budget.

How Coverage is Allocated

Herring Alternatives primarily 2.1, 2.2, and 2.7 would allocate monitoring coverage by vessel permit category (i.e., Category A and B herring permits), Herring Alternative 2.4 would allocate monitoring coverage by fishing fleet (i.e., midwater trawl fleet), and Herring Alternative 2.3 would allocate monitoring coverage by permit category and fishing fleet.

Vessels with Category A and B herring permits harvested approximately 98% of recent herring catch (2008-2011) and the midwater trawl fleet harvested approximately 73% of recent herring catch (2008-2012). Based on recent catch, allocating coverage by Category A and B herring permits (Herring Alternatives 2.1, 2.2, 2.3, and 2.7) would increase monitoring on vessels that harvest the majority of catch in the herring fishery as compared to allocating coverage to the midwater trawl fleet (Herring Alternative 2.4). Therefore, any benefit to protected species associated with increased monitoring may be higher under Herring Alternatives 2.1-2.3 and 2.7 than under Herring Alternative 2.4

Overall, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

Herring Alternative 2.5 specifies that midwater trawl vessels fishing in the Groundfish Closed Areas must carry a NEFOP-level observer while Herring Alternative 2.6 would specify that coverage for midwater trawl vessels fishing in Groundfish Closed Areas would match the coverage targets recommended by the Council for the rest of the fishery. Herring Alternative 2 Sub-Options would apply to Herring Alternative 2.6 but not to Herring Alternative 2.5. If increased monitoring associated with Herring Alternative 2.6 is reduced or minimized by the selection of any of the sub-options, the benefits of additional monitoring to the protected species may be less than under Herring Alternative 2.6 than under Herring Alternative 2.5.

Because only a relatively small percentage of the midwater trawl fleet's harvest comes from inside the Groundfish Closed Areas, any positive impact to protected species

associated with additional monitoring under Herring Alternatives 2.5 and 2.6 would be similar, but likely reduced, compared to impacts under Herring Alternatives 2.1-2.4 and 2.7.

Slippage Requirements

Herring Alternatives 2.1–2.7 would require compliance with slippage restrictions, reporting requirements, and consequence measures. Specifically, all existing slippage restrictions, reporting requirements, and consequence measures would apply on all trips with a NEFOP-level observer or at-sea monitor was aboard. Additionally, slippage restrictions, reporting requirements, and the 15-mile move requirement would apply on all trips selected for portside sampling.

Slippage requirements are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Any benefits to protected species from slippage requirements would likely be similar across Herring Alternatives 2.1-2.7.

Summary of Impacts to Protected Species

The impacts of herring alternatives on protected species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to protected species are possible if increased monitoring can reduce uncertainty around interactions between protected species and the herring fishery and generate more information for stock assessments.

However, these alternatives may lead to direct positive impacts on protected species if fishing effort is limited, either through monitoring availability or catch tracked against catch limits, so that interactions between the herring fishery and protected species are reduced.

The impact of Herring Alternative 1 (No Action) on protected species is likely low positive because monitoring coverage is allocated by SBRM, but there is no additional monitoring to reduce uncertainty around catch and bycatch estimates. The impact of Herring Alternative 2 on protected species is generally positive because there would be additional monitoring to reduce the uncertainty around bycatch estimates and generate more information for stock assessments, but the magnitude of the impact is dependent on the type of information collected, amount of coverage, and how coverage is allocated. The realized coverage in any given year will also largely depend on and amount of Federal funding available to cover NMFS cost responsibilities.

A positive biological impact on protected species is expected if data are collected at sea rather than just portside. However, EM has proven useful at documenting interactions with protected species and may be able to document protected species sightings.

Vessels with Category A and B herring permits harvest approximately 98% of total herring catch, compared to the midwater trawl fleet that harvests approximately 73% of total herring catch. Therefore, a similar low positive impact is likely if coverage is allocated by permit or by fleet.

If coverage is only allocated to Groundfish Closed Areas (Herring Alternatives 2.5 and 2.6), then a low positive biological impact is likely because the area of coverage is limited.

A positive impact is associated with Sub-Options 1 and 2 not being selected, if fishing effort is limited, either due to funding or logistics, and that reduces interactions between the herring fishery and protected species. Sub-Option 5 would only require additional coverage on trips that land more than 25 mt or 50 mt of herring, so there is the potential for a low negative impact on protected species if selecting Sub-Option 5 biases data used to track catch against catch caps and affects the overall amount of herring effort or harvest.

Given all these factors, the impact on protected species is likely low positive for Herring Alternatives 2.1-2.7. Additionally, the impacts of these herring alternatives on protected species are not significant because they would not cause a change in population status.

TABLE 71. IMPACTS SUMMARY OF HERRING ALTERNATIVES ON PROTECTED SPECIES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Impacts on Protected Species
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	• Low positive impact associated with observer coverage allocated by SBRM • Low negative impact associated with no additional monitoring to reduce uncertainty around bycatch estimates
Herring Alternative 2: Coverage Target Specified For IFM Programs	• **Positive impact associated with additional monitoring to reduce uncertainty around bycatch estimates** • **Low negative impact associated with no additional monitoring unless available Federal funding can cover NMFS cost responsibilities** • **Magnitude of impacts associated with additional monitoring would be primarily dependent on the type of information collected, how coverage is allocated, amount of coverage, and amount of available Federal funding** • **Positive impacts associated with not selecting Sub-Option 1 if fishing effort is limited and that reduces interactions between the herring fishery and protected species** • **Low negative impact associated with selecting Sub-Options 1 and 2 if additional monitoring is waived** • **Low negative impact associated with selecting Sub-Option 5 if it bias data used to track catch against catch caps**
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce uncertainty around bycatch estimates associated with 100% coverage on Category A and B vessels
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	• Low positive impact associated with additional information to reduce uncertainty around bycatch estimates associated with 100%-25% coverage on Category A and B vessels

Alternatives	Impacts on Protected Species
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around bycatch estimates associated with 100%-25% coverage on Category A and B vessels • Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	• Low positive impact associated with additional information to reduce uncertainty around retained catch estimates associated with 100% or 50% coverage on the midwater trawl fleet
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• **Low positive impact associated with additional to reduce uncertainty around** bycatch **estimates associated with 100% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas** • **Negligible impact associated with Sub-Options**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• Low positive impact associated with additional to reduce uncertainty of bycatch estimates associated with 100%-25% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	• **Low positive impact associated with additional information to reduce uncertainty of** bycatch **estimates associated with 50% coverage on Category A and B vessels**

4.2.6 IMPACTS OF HERRING ALTERNATIVES ON THE PHYSICAL ENVIRONMENT

4.2.6.1 Impacts of Herring Alternatives on the Physical Environment

In general, the impact of the herring fishery on the physical environment is expected to be minimal and temporary. Therefore, the expected impact on the physical environment of increased monitoring in the herring fishery is expected to be negligible under both Herring Alternatives 1 and 2.

Herring Alternative 1 would not specify a coverage target for an industry-funded monitoring program in the Herring FMP. Monitoring for herring vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis.

The Council selected Herring Alternative 2 as a preferred alternative. Under Herring Alternative 2, the Council would specify the details of an industry-funded monitoring program for the Herring FMP. These details may include, but are not limited to: (1) Level

and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified industry-funded monitoring programs.

Herring Alternative 2 is intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM (Herring Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM requirements (Herring Alternative 1) and the specified coverage target (Herring Alternatives 2.1-2.7).

The realized coverage level would be determined by the amount of funding available to cover NMFS cost responsibilities in a given year. If coverage is not available (either due to logistics or a lack of funding) for a specific trip, Herring Alternatives 2.1-2.7 specify that the vessel would be prohibited from participating in the herring fishery on that trip, unless Sub-Option 1 is selected.

The Council selected Sub-Option 1 as a preferred alternative. The selection Sub-Option 1 preserves the Council's intent to increase monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available.

A positive impact is associated with Sub-Option 1 not being selected, if fishing effort is limited, either due to funding or logistics, and there are few interactions between fishing gear and the physical environment. However, the magnitude of any potential positive impact is low because the herring fishery has only minimal and temporary impacts on the environment.

Vessels may switch gear modes to minimize economic impacts associated with gear-specific requirements. However changes to gear modes associated with Herring Alternatives 2.1-2.7 are not expected to affect the overall impact of the herring fishery on the physical environment. Therefore, impacts on the physical environment are expected to be similar under Herring Alternatives 1 and 2.

TABLE 72. SUMMARY OF PHYSICAL ENVIRONMENT IMPACTS OF HERRING ALTERNATIVES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Impacts on Physical Environment
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	• Negligible impact associated with minimal and temporary effects on the environment from herring fishery
Herring Alternative 2: Coverage Target Specified For IFM Programs	• **Negligible impact associated with minimal and temporary effects on the environment from herring fishery** • **Low positive impacts associated with not selecting Sub-Option 1 if fishing effort is limited and interactions between fishing gear and the physical environment are reduced** • **Negligible impact associated with switching gear modes**

4.2.7 BACKGROUND ON ECONOMIC IMPACTS OF HERRING ALTERNATIVES

When evaluating IFM for the herring fishery, another major consideration is the cost of the monitoring program. The requirement to pay for monitoring coverage increases operating costs for fishing vessels, which in turn reduces vessel revenue.

There are two primary approaches for minimizing the cost of monitoring paid by industry. The first approach is to select the most cost effective type of coverage to meet program goals. For example, it may be more cost effective to use electronic monitoring rather than observers to confirm retention of catch on herring vessels.

The second approach to limit costs to industry is to set coverage levels at the lowest level necessary to gather information to meet program goals. For example, it may be possible to increase precision around catch estimates for a certain species by setting a coverage target of 50%, rather than a coverage target of 100%.

Table 72 shows the range of costs associated with the different types of monitoring under consideration for the herring fishery. A detailed description of industry cost responsibilities associated with each of these types of monitoring can be found in Appendix 4.

TABLE 73. MONITORING COST ESTIMATES FOR THE HERRING FISHERY

Types of Monitoring	NMFS Cost	Vessel Cost
NEFOP-Level Observer	$479 per sea day	$818 per sea day
At-Sea Monitor	$530 per sea day	$710 per sea day
Electronic Monitoring[1]	Year 1: $36,000 startup plus $97 per sea day Year 2: $97 per sea day	Year 1: $15,000 startup plus $325-$172 per sea day (depending on coverage target) Year 2: $325-$172 per sea day (depending on coverage target)
Portside Sampling[2]	$479-$530 per sea day	$5.12[1] or $3.84[2] per mt

1 – EM cost assumptions: EM on every vessel, video collected throughout the duration of a trip (100%) or only around haulback (25%, 50%, or 75%), and 25%, 50%, 75% or 100% video review. Costs for coverage targets are: $325 for 100%, $202 for 75%, $187 for 50%, and $172 for 25%.
2 – Portside cost assumptions: $5.12 includes portside administration costs. $3.84 does not include portside administration. $5.12 mt would apply to 100% of trips, while $3.84 would apply to 25%, 50%, or 75% of trips.

Assumptions Used to Generate Estimates of Industry Cost Responsibilities

While the cost of a sea day can vary between service providers, the individual components of a sea day cost are necessary to successfully execute a monitoring program. Because each of these components is essential, in most cases, it is not appropriate to reduce industry's cost responsibilities by removing or adjusting components of the sea day cost.

NEFOP-Level Observer Cost Estimate

The $818 per sea day industry cost responsibility related to NEFOP-level observer coverage is based on sampling costs from October 2012 through May 2014 averaged across 3 service providers. The program elements and activities covered in this cost would include, but are not limited to, costs to the provider for deployments and sampling (e.g., travel and salary for observer deployments and debriefing), equipment, costs to the provider for observer time and travel to a scheduled deployment that does not sail and was not canceled by the vessel prior to the sail time, and provider overhead.

At-Sea Monitor Cost Estimate

The $710 per sea day industry cost responsibility related to a herring at-sea monitoring program is based on the current sea day rate for the groundfish at-sea monitoring program. In the absence of an estimate specific to the herring at-sea monitoring program, the PDT/FMAT determined that using the groundfish at-sea monitoring sea day rate was appropriate, but the actual cost of a herring at-sea monitor may be more or less.

TABLE 74. INDUSTRY COST RESPONSIBILITIES FOR NEFOP-LEVEL OBSERVER AND AT-SEA MONITORS

Industry Cost Responsibilities	NEFOP-level observer cost per sea day	At-sea monitor cost per sea day
Provider costs for deployments and sampling (e.g., travel and salary for observer deployments and debriefing)	Sea day charges paid to providers: $640 Travel: $71 Meals: $22 Other non-sea day charges: $12	Sea day charge paid to providers: $561 Travel: $67 Meals: $18 Other non-sea day charges: $14
Equipment, as specified by NMFS, to the extent not provided by NMFS	$11	
Provider costs for observer time and travel to a scheduled deployment that does not sail and was not canceled by the vessel prior to the sail time.	$1	
Provider overhead and project management costs not included in sea day charges above (e.g., per diem costs for trainees)	Training: $61	Training: $50
Provider costs to meet performance standards laid out by a fishery management plan	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery
Total (not including other costs)	$818	$710

Electronic Monitoring Cost Estimate

Because no Federal electronic monitoring program exists for the herring fishery, industry cost responsibilities associated with an electronic monitoring program were difficult to estimate. Electronic monitoring cost estimates include a one-time implementation cost, as well as ongoing annual operational program costs. Cost components include equipment, field services, data services, and program management. The implementation costs associated with EM are summarized in Table 91 and the ongoing costs associated with EM are summarized in Table 92. Costs for Year 1 of using EM include both the implementation and ongoing costs, while the cost for Year 2 of using EM only includes the ongoing costs. For these reasons, the industry cost responsibility of operating EM in Year 1 would be higher than during Year 2 or any subsequent year. Additional details on monitoring costs are available in Appendix 4.

TABLE 75. INDUSTRY COST RESPONSIBILITIES FOR ELECTRONIC MONITORING IMPLEMENTATION

Industry Cost Responsibilities	Electronic Monitoring Implementation Costs Per Vessel
Equipment, including initial purchase and installation of the cameras, associated sensors, integrated GPS, control box, and hard drives	$9,018
Field Services, including technician's labor and travel associated with the installation of equipment	$2,952
Program Management, including one-time labor, equipment, facilities, and administrative costs associated with getting the new EM program operational	$3,493
Total	$15,463

Initially, the sea day cost for EM was estimated at $325. The $325 cost estimate is likely high because it assumes video footage is collected for the duration of a trip and 100% of the video footage is reviewed. Subsequently, the PDT/FMAT generated cost estimates for other coverage targets (25%, 50%, and 75%) with the assumption that video footage is just collected around haulback and that the level of video footage review matches the coverage target. The breakdown of these costs is shown in Table 75.

TABLE 76. INDUSTRY COST RESPONSIBILITIES FOR ONGOING ELECTRONIC MONITORING COSTS PER SEA DAY

Industry Cost Responsibilities	100% Coverage	75% Coverage	50% Coverage	25% Coverage
Equipment, including annual equipment costs estimated here include spare parts to replace broken or aging equipment, as well as licenses for the use of proprietary software	$11	$11	$11	$11
Field Services, including labor, travel, and other costs associated with repairs, technical support, and retrieving hard drives from the vessels and shipping them to the service provider for analysis	$78	$47	$47	$47
Data Services, including the costs associated with review and analysis of the video, reporting to NMFS, and archiving of the data	$160	$67	$52	$37
Program Management, including costs of the day-to-day operations of the service provider for running the EM program	$77	$77	$77	$77
Total	$325	$202	$187	$172

Portside Sampling Cost Estimate

The analysis assumes the cost per amount of fish landed is the most accurate way to represent the potential industry costs for monitoring. Because no Federal portside sampling program exists for the herring fishery, industry cost responsibilities associated with a portside sampling program for the herring fishery were difficult to estimate.

The average cost per pound of groundfish landed for the Northeast Multispecies dockside monitoring program ranged from $0.01 - $0.12 per pound for all sectors. The average cost per pound landed per trip is inversely related to the average pounds landed – that is, trips that land larger amounts are less expensive to monitor than trips that land smaller amounts. Larger trips are less expensive to monitor because they typically land in principle ports with a dedicated monitor, therefore, there are no additional costs for monitors to travel to offload locations.

Initially, the industry cost responsibility associated with portside sampling was estimated to be as much as $5.12 per mt. This cost estimate was generated using information from the Massachusetts Division of Marine Fisheries portside sampling program for the herring fishery. The $5.12 per mt cost estimate is likely high as it includes program administration costs as well as sampling costs and was intended to apply to all trips for a target sampling rate of 100%.

Subsequently, the PDT/FMAT generated a revised cost estimate ($3.84 per mt) that does not include portside administration costs. This cost estimate may be closer to the actual industry cost responsibilities associated with portside sampling and would apply to 25%, 50%, or 75% of trips, consistent with the coverage target selected by the Council. The price per mt is the best estimate of the total industry cost responsibilities associated with portside sampling.

Under the Herring Alternatives 2.3, 2.4, and 2.7, midwater trawl vessels returning from declared herring trips would be required to land catch in specific ports for sampling. Table 76 describes the ports where midwater trawl vessel currently land catch and whether those ports are currently sampled by existing portside sampling program for the herring fishery operated by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources.

TABLE 77. LANDING PORTS FOR MWT VESSELS AND PORTSIDE SAMPLING ISSUES

Ports	Currently Sampled (Y/N)	Issues Affecting Sampling
Maine		
Portland	Y	None
Rockland	Y	None
Vinalhaven	N	Not cost effective; fish sold over the side of vessels
Prospect Harbor	Y	None
Jonesport	Y	None

Ports	Currently Sampled (Y/N)	Issues Affecting Sampling
Massachusetts		
Boston	N	Costly to sample; logistically challenging; unsafe area
Gloucester	Y	Only a few landings during the year
New Bedford	Y	Logistically challenging; safety issues
Rhode Island		
Point Judith	Y	None
North Kingstown	N	Only frozen product is landed
Newport	N	Safety issues
New Jersey		
Cape May	Y	None

Approximately 95% of midwater trawl landings are made in ports currently sampled by the state programs. However, if certain ports are not suitable for portside sampling, then vessels may not be able to land in those ports on trips that are selected for portside sampling. Some vessels only land in a single port and that port is not currently sampled. Some vessels land in both sampled and unsampled ports, but changing past practices to land only in sampled ports may not be easy.

Travel time and seller/buyer arrangements are likely to be most affected by requiring midwater trawl vessels to land in specified ports. Seasonal fishing conditions may make travel time to specified ports an issue of concern. But seller/buyer arrangements are likely the larger concern. A vessel may need to substantially revise its business plan if it must land in a port not previously used.

Without a predictive model, the analysis of requiring vessels to land in specified ports will be qualitative. Additionally, data confidentiality will limit a quantitative analysis. However, if certain ports are not suitable for portside sampling, then vessels may not be able to land in those ports on trips selected for portside sampling.

The Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources will continue their existing portside sampling programs in 2018. If the Council approves EM and portside sampling as a monitoring option for midwater trawl vessels, then midwater trawl vessels would continue to participate in the voluntary state portside sampling programs in 2018. Because midwater trawl vessels would be participating in the state portside sampling programs in 2018, they would not be paying for portside sampling coverage in 2018. In 2019 or 2020, a Federal portside sampling program would replace the portside sampling program administered by the Massachusetts Division of Marine Fisheries and midwater trawl vessels would be responsible for paying for portside sampling starting in 2019 or 2020. The Maine Department of Marine Resources will likely continue its portside sampling program at no cost to midwater trawl vessels.

Estimating Total Trip Costs

The previous analysis of economic impacts of herring coverage target alternatives on the herring industry was based on trip cost data collected by NEFOP and showed the economic impact of the alternatives on partial vessel net revenues (gross revenues less certain trip costs). Because NEFOP only collects a limited amount of cost data, industry participants expressed concern that an analysis of net revenues underestimated vessel costs. In response, Jason Didden, staff of the Mid-Atlantic Fishery Management Council, offered to coordinate a survey of herring and mackerel vessels to collect more detailed cost information.

The survey requested information from vessel owners on total trip costs in 2014. The cost survey collected information on variable costs; payments to crew; the cost of repairs, maintenance, upgrades; and fixed costs. These data were used to update the impact analyses. To profile vessels, data were averaged across vessel types, by vessel characteristics, and by primary species caught. The cost profiles of vessels, as adjusted by the estimated industry cost responsibilities of each herring coverage target alternative, were used to describe the economic impact on herring vessels. Economic impacts are described at an annual level. Surveys were sent to approximately 18 vessel owners (representing about 26 vessels) in the herring and/or mackerel fisheries. Surveys were sent in May 2015 and information was submitted for 16 of the 26 vessels. A copy of the survey is included in Appendix 9.

Analysis of the economic impact of industry-funded monitoring herring coverage target alternatives on fishery-related businesses compared industry cost responsibilities to 2014 herring vessel returns-to owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue (Table 77) and was used rather than net revenues to more accurately reflect income from fishing trips. RTO is similar to net income from a financial income statement. Other financial statement approaches, such as a balance sheet or a cash flow statement, are not used. These approaches consider other financial aspects of a business, such as total assets and liabilities and the ability to cover expenses within a particular time frame. Principal payments on loans, which matter from a balance sheet and cash flow perspective, are not typically used in the calculation of RTO/net income. Depreciation of capital assets is typically part of a RTO/net income calculation. In this analysis, depreciation of vessel improvements is included but the depreciation of the vessel is not included because that information was not collected in the survey.

TABLE 78. SUMMARY OF TOTAL TRIP COSTS FOR HERRING AND MACKEREL VESSELS IN 2014

Cost Category	Description	Average Percent of 2014 Gross Revenue for Herring and Mackerel Vessels	Average Percent of 2014 Gross Revenue for Squid Vessels
Variable Costs	Annual fuel, oil, food, water, ice, carrier vessel, communication, fishing supplies, crew supplies, and catch handling costs	25%	35%
Crew Share	Total annual payments to crew	28%	26%
Repair, Maintenance, Upgrades, Haulout (RMUH)	Annual cost of repairs to engines, deck equipment, machinery, hull, fishing gear, electronics, processing equipment, refrigeration, safety equipment, upgrades and haulout. Because these costs vary considerably from year to year and are typically spread out over several years, only a portion of these costs were applied to 2014 revenue	13%	11%
Fixed Costs	Annual mooring, dockage, permits and licenses, insurance, quota and DAS lease, crew benefits, vessel monitoring, workshop and storage, office, vehicle, travel, association, professional, interest, taxes, and non-crew labor costs Note: depreciation expense of the vessel is not included in fixed costs.	19%	21%
Return to Owner	Gross revenue less variable, crew share, RMUH, and fixed costs	15%	7%

The Council is considering four types of industry-funded monitoring for the herring fishery, including NEFOP-level observers, at-sea monitors, EM, and portside sampling coverage. NEFOP-level and at-sea monitoring coverage would function independently, but EM and portside are intended to be used together.

Prior to any trip declared into the herring fishery, vessel representatives would be required contact NMFS and request monitoring coverage. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether monitoring coverage must be procured through an industry-funded monitoring service provider. For the

purposes of this analysis, however, it is assumed that there would be no SBRM coverage of trips. Therefore, the economic impacts of industry-funded monitoring cost alternatives described in this section may be an overestimate of actual costs.

Declared Herring Trips That Do Not Land Herring

A trip must be a declared herring trip in order to land 1 lb or more of herring. The economic analysis focused on trips that landed 1 lb or more of herring because those are the trips that would be subject to industry-funded monitoring. However, industry participants also requested consideration of the economic impacts associated with declared herring trips that did not land any herring.

In 2014, there were 121 sea days for 22 trips that had no herring landings. If 100% NEFOP-level observer coverage was required on those trips, then $98,978 would have been spent monitoring those trips. If 100% at-sea monitoring coverage was required on those trips, then $85,910 would have been spent monitoring those trips. The breakdowns of these costs by gear type as well as other coverage levels and monitoring types are provided in Table 78.

TABLE 79. MONITORING COSTS ASSOCIATED WITH DECLARED HERRING TRIPS THAT DID NOT LAND HERRING IN 2014.

	Small Mesh Bottom Trawl	Single Midwater Trawl	Paired Midwater Trawl	Total
Permit Category	A	A	A	
Total Number of Days	111	6	4	121
Total NEFOP Cost – 100% Coverage	$90,586	$5,217	$3,212	$99,015
Total ASM Cost – 100% Coverage	$78,626	$4,528	$2,788	$85,943
Total ASM Cost – 75% Coverage	$58,970	$3,396	$2,091	$64,457
Total ASM Cost – 50% Coverage	$39,313	$2,264	$1,394	$42,971
Total ASM Cost – 25% Coverage	$19,657	$1,132	$697	$21,486
Total EM Cost, Year 2 – $325 per day	NA	$2,073	$1,276	$3,349
Total EM Cost, Year 2 – $187 per day	NA	$1,193	$734	$1,927

Declared Herring Trips That Land Less Than 50 mt of Herring

During 2012-2014, there were 32 vessels with Category A and B herring permits and those vessels made 2,329 trips.

TABLE 80. NUMBER OF CATEGORY A AND B HERRING VESSELS BY TRIP SIZE DURING 2012-2014.

Number of vessels with trips always under 25 mt of herring	Number of vessels with less than 50% of trips under 25 mt of herring	Number of vessels with trips always under 50 mt of herring	Number of vessels with less than 50% of trips under 50 mt of herring
5*	22	8*	20
* Four of these vessels made less than four trips during 2012-2014.			

Source: VTR Data

TABLE 81. TRIPS BY CATEGORY A AND B HERRING VESSELS BY SIZE AND GEAR TYPE DURING 2012-2014.

Gear Type	Percentage of trips under 25 mt of herring	Percentage of trips over 25 mt of herring	Percentage of trips under 50 mt of herring	Percentage of trips over 50 mt of herring
Small Mesh Bottom Trawl	45%	55%	81%	19%
Single Midwater Trawl	40%	60%	60%	40%
Paired Midwater Trawl	6%	94%	13%	87%
Purse Seine	16%	84%	33%	67%

Source: VTR Data

Under Sub-Option 5, the Council selected 50 mt of herring per trip as the threshold below which vessels would be exempt from IFM requirements. This preferred alternative would result in fewer trips with additional coverage, thereby reducing the costs of additional coverage.

4.2.8 IMPACTS OF HERRING ALTERNATIVES ON HUMAN COMMUNITIES

4.2.8.1 Impacts of Herring Alternatives 1 and 2 on Fishery-Related Businesses

In general, Herring Alternatives 1 and 2 would have direct negative economic impacts and potentially indirect positive and negative economic impacts on fishery-related businesses and communities.

Herring Alternative 1 would not specify a coverage target for an industry-funded monitoring program in the Herring FMP. Monitoring for herring vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the herring fishery would be evaluated on a case-by-case basis. Under Herring Alternative 1, additional costs to vessels participating in the herring fishery associated with monitoring coverage, if there were any, would be evaluated on a case-by-case basis.

In recent years, observer coverage for the herring fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-by-FMP basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

Currently, the herring resource is not overfished, and overfishing is not occurring. Additionally, in recent years, the fleet has had the ability to fully harvest the stock-wide ACL and the sub-ACLs. Selection of Herring Alternative 1 would not likely affect the setting of herring harvest specifications, but it may affect the ability of the herring fishery to fully harvest the ACLs if less monitoring (when compared to Herring Alternative 2) results in catch caps for haddock and river herring/shad limiting effort in the herring fishery.

The Council selected Herring Alternative 2 as a preferred alternative. Under Herring Alternative 2, the Council would specify the details of an industry-funded monitoring program for the Herring FMP. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified industry-funded monitoring programs.

Herring Alternative 2 is intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM (Herring Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year and would fall somewhere between no additional coverage above SBRM (Herring Alternative 1) and the specified coverage target.

If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the herring fishery, Herring Alternative 2 may have both positive and negative economic impacts on vessels participating in the herring fishery.

Indirect positive impacts on herring vessels associated with Herring Alternative 2 may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates in the herring fishery leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs.

Direct negative impacts on herring vessels associated with Herring Alternative 2 would likely result from reduced RTO after paying for monitoring coverage. The magnitude of the economic impact associated with paying for monitoring coverage would vary with herring coverage target alternative (Herring Alternatives 2.1-2.7). If increased monitoring results in fishery catch caps being harvested more often than expected, an indirect negative impact on herring vessels may result if vessels are not able to fully harvest herring sub-ACLs. While the full extent of positive and negative impacts to herring vessels may be difficult to quantify under Herring Alternative 2, the impacts may not be realized under Herring Alternative 1.

If Federal funding is not available to cover NMFS cost responsibilities associated with industry-funded monitoring in the herring fishery, fishing effort may be reduced under Herring Alternative 2 to match available levels of monitoring coverage, unless Sub-Option 1 is selected. If fishing effort is reduced to match available monitoring levels, herring vessels may not be able to fully harvest herring sub-ACLs. This direct negative economic impact associated with Herring Alternative 2 would be less likely to be realized under Herring Alternative 1.

Herring Alternative 2 would allow several sub-options to apply to the IFM alternatives.

Sub-Option 1 (Preferred Alternative) would allow vessels to be issued waivers to exempt them from IFM requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Sub-Option 2 (Preferred Alternative) would exempt a wing vessel pair trawling with another vessel from IFM requirements, provided the vessel does not carry any fish. Sub-Option 3 would require that IFM requirements expire two years after implementation. Sub-Option 4 (Preferred Alternative) would require the Council to examine the results of any increased coverage in herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted.

Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via specifications, a framework adjustment, or an amendment to the Herring FMP, as appropriate. Lastly, Sub-Option 5 would exempt trips that land less than 25 mt or 50 mt (Preferred Alternative) of herring from IFM requirements.

If selection of the sub-options under Herring Alternative 2 minimizes the likelihood of positive or negative economic impacts on herring vessels, then the economic impacts associated with the sub-options may be reduced and/or similar to impacts under Herring Alternative 1.

Because the Council selected Sub-Options 1 and 2 as preferred alternatives, the additional coverage associated with Herring Alternative 2 may be waived if additional monitoring is unavailable or a wing vessel is pair trawling with another vessel.

Had the Council not selected Sub-Option 1, then any industry-funded monitoring requirements established in this amendment would have the potential to reduce effort in the herring fishery to match monitoring availability. However, reducing fishing effort to match available monitoring availability may lack sufficient justification and be inconsistent with National Standards.

Because the Council selected Sub-Option 2 as a preferred alternative, the negative economic impacts on pair trawl vessels associated with paying for additional monitoring would be reduced if one of the vessels acted as a wing vessel and did not carry fish.

If additional coverage is waived under Sub-Options 1 and 2, then any indirect benefits associated with the additional coverage may be reduced, similar to Herring Alternative 1.

Sub-Option 3 (2-year sunset of coverage targets) and Sub-Option 4 (2-year re-evaluation of coverage targets and preferred alternative) are both administrative and would not impact fishery-related business and communities, thus both alternatives should have a negligible difference on impacts between Herring Alternatives 1 and 2.

Under Sub-Option 5, the Council selected 50 mt of herring per trip as the threshold below which vessels would be exempt from IFM requirements. This preferred alternative would result in fewer trips with additional coverage, thereby reducing the costs of additional coverage under Herring Alternative 2. Small mesh bottom trawl and single midwater trawl vessels have the greatest potential to benefit from Sub-Option 5 because greater than 50% of their trips typically land under 50 mt of herring. Additionally, 8 Category A and B vessels almost always make trips than land under 50 mt of herring. Despite the selection of Sub-Option 5, the indirect benefits of additional monitoring associated with Herring Alternative 2 would still be higher than under Herring Alternative 1.

The Council's selection of Sub-Option 5 as a preferred alternative means that the threshold for additional monitoring (50 mt of herring) and the threshold for which trips count against catch caps for haddock (1 lb of herring) and river herring and shad (6,600 lb of herring) would differ. The data generated by the selection of Sub-Option 5 has the

potential to bias (either higher or lower) the catch tracked against catch caps when compared to not selecting Sub-Option 5.

Both Herring Alternative 1 and Herring Alternative 2 would require compliance with slippage restrictions, reporting requirements, and consequence measures. These measures are intended to improve catch monitoring by minimizing discarding. Because these measures apply to both Herring Alternatives 1 and 2, the cost of complying with these requirements may be similar under Herring Alternatives 1 and 2, unless monitoring coverage is substantially higher under Herring Alternative 2. In that case, the cost of complying with these requirements may be higher under Herring Alternative 2.

Impacts under Herring Alternative 2 assume that the future behavior of fishery participants will be similar to that in past years, when in reality fishery participants are likely to engage in a range of mitigation behaviors to reduce the economic impact associated with industry-funded monitoring. For example, vessels that have historically participated in many fisheries may stop fishing for herring and only participate in fisheries that do not have industry-funded monitoring requirements. However, if a vessel does not have the ability to participate in other fisheries, it may not be able to mitigate the impacts of industry-funded monitoring in that way. At this time, it is not possible to predict what, if any, mitigation behaviors may be used by herring fishery participants.

Coverage Target Alternatives

Herring Alternative 2 would specify a level and type of industry-funded monitoring for the herring fishery. The types of industry-funded monitoring considered by the Council for the herring fishery include: NEFOP-level observers, at-sea monitors, and electronic monitoring and portside sampling. Monitoring alternatives allocate coverage by fleet or permit category. Monitoring requirements could apply across all herring management areas or to just midwater trawl vessels fishing in the Groundfish Closed Areas.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. SBRM coverage varies across gear types and years. For this reason, the economic analysis of the coverage targets assumed that there would be no SBRM coverage on trips. Therefore, the estimated costs and economic impacts of industry-funded monitoring cost alternatives described in this section are likely an overestimate of actual costs.

Under Herring Alternative 2, the amount, quality, and cost of information collected as part of an industry-funded monitoring would vary with the type of coverage target alternative specified for the herring fishery. Economic impacts on vessels participating in the herring fishery associated with specific coverage target alternatives (Herring Alternatives 2.1-2.7) are discussed in a subsequent section.

Monitoring and Service Provider Requirements

Herring Alternative 2 would specify that requirements for industry-funded observers and at-sea monitors include a HVF certification for the herring fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in Herring Amendment 5.

Observers in the herring fishery are currently required to possess a HVF certification under Herring Alternative 1 and both observers and at-sea monitors would be required to possess a HVF certification under Herring Alternative 2. Herring vessels do not pay for observer training under Herring Alternative 1, but vessels would be responsible for additional observer and at-sea monitor training costs under Herring Alternative 2. Therefore, the economic impact on herring vessels of a HVF certification requirement under Herring Alternative 2 would be more negative than under Herring Alternative 1.

Under Herring Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

The direct economic impacts on herring vessels would be more negative under Herring Alternative 2 than under Herring Alternative 1 because vessels would be paying for additional monitoring coverage. To the extent that increased information on herring catch has indirect economic benefits for herring vessels under Herring Alternative 2, those indirect impacts may not be realized under Herring Alternative 1.

4.2.8.2 Impacts of Herring Coverage Target Alternatives 2.1- 2.7 on Fishery-Related Businesses

The Council selected Herring Alternatives 2.5 and 2.7 as preferred alternatives.

Herring Alternatives 2.1-2.7 are intended to allow for increased monitoring in the herring fishery by specifying coverage targets, above SBRM, for industry-funded monitoring. If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the herring fishery, Herring Alternative 2 may have both positive and negative economic impacts on vessels participating in the herring fishery.

While the positive and negative economic impacts on herring vessels may be difficult to quantify under Herring Alternatives 2.1-2.7, the impacts would be less likely to be realized under Herring Alternative 1.

The magnitude of positive and negative economic impacts on herring vessels is expected to vary with the monitoring coverage target specified and the realized coverage level in a given year. The realized coverage level in a given year would be largely driven by the amount of funding available to cover NMFS cost responsibilities in that year and would fall

somewhere between no additional coverage above SBRM (Herring Alternative 1) and the specified monitoring coverage target (Herring Alternatives 2.1-2.7).

Herring Alternatives 2.1-2.7 differ by (1) the type of information collected, (2) the specified amount of coverage, and (3) how coverage is allocated. Both the type of information collected and the amount of monitoring coverage would have a direct economic impact on vessels paying for monitoring coverage in the herring fishery.

Type of Information Collected

Currently, vessel and dealer data are used to track retained catch of herring, haddock, and mackerel and SBRM observer data are used to track catch of river herring and shad as well as the discarded catch of herring, haddock, and mackerel. Additionally, vessel, SBRM observer data, and portside sampler data are used for stock assessments.

The herring fishery is managed with gear and area specific catch caps for haddock and river herring and shad. If a catch cap is harvested, effort in the fishery using that gear in that area is restricted. River herring and shad catch caps are in place for vessels using midwater trawl gear (Gulf of Maine, Cape Cod, and Southern New England catch caps) and small mesh bottom trawl gear (Southern New England catch cap), while the haddock catch cap is only specified for vessels using midwater trawl gear (Gulf of Maine and Georges Bank catch cap).

Herring Alternatives 2.1and 2.5 would specify NEFOP-level observer coverage, Herring Alternative 2.2 would specify ASM coverage, Herring Alternatives 2.3, 2.6, and 2.7 would specify ASM coverage and/or EM and portside sampling coverage, and Herring Alternative 2.4 would specify EM and portside sampling coverage.

Both NEFOP-level observer coverage and at-sea monitoring coverage would provide species composition data on retained and discarded catch, while portside sampling coverage would provide species composition data on retained catch. NEFOP-level observers and at-sea monitors can estimate amounts of discards. EM cannot estimate the amount of discards, but EM can verify retention of catch.

Because discarding in the herring fishery is minimal, Alternatives that increase the amount of information on retained and discarded catch (Herring Alternatives 2.1, 2.2, 2.3, 2.5, 2.6, and 2.7) will likely have the same likelihood of affecting the data tracked against catch caps than alternatives that increase the amount of information on just retained catch (Herring Alternative 2.4).

Increased monitoring of haddock and river herring and shad catch may help reduce uncertainty in estimates of catch that is tracked against catch caps, when that uncertainty may have otherwise led to effort restrictions in the herring fishery. Conversely, additional monitoring may illustrate higher than expected catch of haddock and river herring and shad, resulting in catch caps that are fully harvested earlier than expected and reduced opportunities to harvest herring. Increased information to help track catch against catch

caps may help allow the herring fishery to fully harvest the ACLs or it may curtail the harvest of herring by the herring fishery.

Amount of Coverage

Herring Alternatives 2.1 and 2.5 specify monitoring coverage at 100%, while Herring Alternatives 2.2-2.4 and 2.7 allow monitoring coverage to range between 25% and 100%.

The economic impact on herring vessels of paying for higher levels of monitoring coverage would be more negative than paying for lower levels of monitoring. Therefore, alternatives that specify higher coverage targets may have a more negative direct impact on herring vessels paying for monitoring coverage than alternatives with lower coverage targets.

While high levels of monitoring are not always necessary to address a monitoring goal, because the Council is interested in increasing monitoring to improve the accuracy of catch estimates, in particular the ability to track catch against catch caps, more monitoring could be more effective than less monitoring. Additionally, because the catch of river herring and shad is highly variable, both spatially and temporally, increased monitoring for those species may be more effective than less monitoring. To the extent that increased monitoring helps reduce the uncertainty of data tracked against catch caps and helps increase the likelihood that vessels can fully harvest herring sub-ACLs, specifying a higher coverage target may have more indirect positive economic impacts on herring vessels than specifying a lower coverage target.

The Council's selection of Herring Alternative 2.5 as a preferred alternative would maintain the existing requirement for 100% NEFOP-level observer coverage on midwater trawl vessels fishing in Groundfish Closed Areas, but would allow those vessels to pay for NEFOP-level observers to access Groundfish Closed Areas. The Council also selected a 50% coverage on Category A and B vessels (Alternative 2.7) as a preferred alternative. These coverage targets are high to moderate compared to other alternatives. Therefore, the direct economic impacts associated with paying for additional monitoring are high to moderate compared to other alternatives and any indirect benefits associated with additional monitoring to reduce the uncertainty around catch estimates are high to moderate compared to other alternatives.

A CV analysis of Herring Alternatives 2.1 and 2.2 was used simulate the precision associated with tracking catch against catch caps. For the GB Haddock Catch Cap, coverage targets of 25% and higher would have generated CVs less than 30%. For the RHS SNE catch caps, coverage targets of 25% and higher would generated CVs less than 30%. For the RHS GOM and CC catch caps, coverage targets of 50% and higher would generate CVs around 30% and lower. Based on this analysis, coverage targets of 50%, and often times even 25%, would generate CVs on the catch tracked against catch caps of 30% or lower.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target

is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage. But because SBRM coverage has the potential to vary year to year, the cost of monitoring paid by industry may also vary year to year and may be difficult to plan/budget.

How Coverage is Allocated

Herring Alternatives 2.1, 2.2, and 2.7 would allocate monitoring coverage by vessel permit category (i.e., Category A and B herring permits), Herring Alternative 2.4 would allocate monitoring coverage by fishing fleet (i.e., midwater trawl fleet), and Herring Alternative 2.3 would allocate monitoring coverage by permit category and fishing fleet.

The extent to which the allocation of industry-funded coverage is consistent with the SBRM fishing fleet will determine how the resulting data can be used. Data collected by vessel permit category can be used for catch limit and catch cap monitoring, while data collected by fleet can be used for catch monitoring and generating discard estimates for stock assessments. Therefore, a positive biological impact is expected when coverage is allocated by fleet and a low positive biological impact is expected when coverage is allocated by vessel permit category. However, the only alternatives allocating coverage by fleet (Herring Alternatives 2.3 (portside sampling) and 2.4) would not be collecting an estimate of discards.

Overall, data utility would be similar whether coverage is allocated by permit or by fleet. Therefore any indirect economic benefits for herring vessels related to data utility would be similar across alternatives.

Herring Alternative 2.5 maintains the requirement that midwater trawl vessels fishing in the Groundfish Closed Areas must carry a NEFOP-level observer while Herring Alternative 2.6 would specify that coverage for midwater trawl vessels fishing in Groundfish Closed Areas matches the coverage target recommend by the Council for the rest of the fishery. The Herring Alternative 2 Sub-Options would apply to Herring Alternative 2.6 but not to Herring Alternative 2.5.

Even though Herring Alternative 2.5 would not allow coverage requirements to be waived (Sub-Option 1) for a trip inside the Groundfish Closed Areas, it is unlikely that reduced fishing effort in the Groundfish Closed Areas would prevent herring the ACL from being harvested. If the benefits associated with increased monitoring and/or the negative economic impacts of paying for monitoring coverage associated with Herring Alternative 2.6 are reduced or minimized by the selection of Sub-Options, 1, 2 or 5, then the benefits of increased monitoring and/or negative economic impacts associated with paying for monitoring coverage may be less under Herring Alternative 2.6 than under Herring Alternative 2.5.

During 2005-2010, prior to any observer coverage requirements for midwater trawl vessels fishing in Groundfish Closed Areas, less than 10% of the herring effort, less than

12% of the herring harvest, and less than 13% of the herring revenue for the midwater trawl fleet came from inside the Groundfish Closed Areas. Additionally, herring catch accounted for almost 100% of the revenue generated by the midwater trawl fleet. Haddock is the only non-target species of interest that is typically harvested by midwater vessels inside the Groundfish Closed Areas. The haddock catch by midwater trawl vessels inside Groundfish Closed Areas is tracked against the haddock catch caps and haddock ACL.

The magnitude of negative economic impacts associated with Herring Alternative 2.5 is much less than under Herring Alternatives 2.1-2.4 and 2.7 because of the limited amount of time the midwater trawl fleet spends inside the Groundfish Closed Areas. The indirect benefits of increased monitoring to herring vessels associated with Herring Alternative 2.5 would be similar to other alternatives that specify NEFOP-level observer coverage (Herring 2.1) and allocate monitoring coverage by midwater trawl fleet (Herring Alternatives 2.3-2.4) or permit category (Herring Alternatives 2.2 and 2.7). However, the magnitude of those benefits would be less than Herring Alternatives 2.1-2.4 and 2.7 because increased monitoring would be focused on effort in the Groundfish Closed Areas and not across all herring management areas.

Herring Alternative 2.6 specifies that industry-funded monitoring requirements inside Groundfish Closed Areas would match monitoring requirements for the general herring fishery. Therefore, the economic impacts, both positive and negative, associated with Herring Alternative 2.6 would have already been considered as part of the alternative selected by the Council as a preferred alternative (Herring Alternative 2.7).

Slippage Requirements

Herring Alternatives 2.1–2.7 would require compliance with slippage restrictions, reporting requirements, and consequence measures. Specifically, all existing slippage restrictions, reporting requirements, and consequence measures would apply on all trips with a NEFOP-level observer or at-sea monitor was aboard. Additionally, slippage restrictions, reporting requirements, and the 15-mile move requirement would apply on all trips selected for portside sampling.

Slippage requirements are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Any indirect benefits associated with improved catch monitoring from slippage requirements would likely be similar across Herring Alternatives 2.1-2.7.

Any potential negative economic impacts associated with complying with slippage restrictions, reporting requirements, and consequence measures would be similar across Herring Alternatives 2.1-2.7. However, there is the potential for slightly reduced negative economic impacts associated with the 15-mile move requirement associated with Herring Alternatives 2.3, 2.4, and 2.7. The lower impact associated with the 15-mile move requirement is compared to the impact of terminating a fishing trip and returning to port, if catch was slipped for reasons other than safety, mechanical failure, or excess catch of dogfish, associated with Herring Alternatives 2.1, 2.2, and 2.5.

Potential Reductions in Returns-to-Owner

The industry cost responsibility associated with NEFOP-level observer coverage is the most expensive ($818 per sea day) followed by at-sea monitor coverage ($717 per sea day), and EM ($172-$325 per sea day) plus portside sampling ($3.84-$5.12 per mt).

Returns-to-owner (RTO) is calculated by subtracting fixed and operational costs from gross revenue (Table 82) and was used rather than net revenues to more accurately reflect income from fishing trips.

The following table describes the potential reduction to RTO associated with paying for monitoring coverage across herring coverage target alternatives. Shaded cells in the following table indicate when the potential reduction to RTO associated with paying for monitoring coverage exceeds 10%. Additional background and summary information can be found in the tables and box plots starting on page 268.

TABLE 82. POTENTIAL REDUCTION TO RETURN-TO-OWNER FOR HERRING COVERAGE TARGET ALTERNATIVES.

Herring Coverage Target Alternatives									
Alternative	Gear Type	Paired MWT		Single MWT		Purse Seine		SMBT	
	Median potential reduction to RTO from coverage	≥1 lb	> 25 MT	≥1 lb	> 25 MT	≥1 lb	> 25 MT	≥1 lb	> 25 MT
2.1	100% NEFOP-level	44.7%	42.2%	24.4%	5.8%	13.9%	10.4%	11.5%	14.2%
2.2 and 2.3	100% ASM	38.9%	36.7%	21.3%	5.1%	12.1%	9.1%	10.0%	12.3%
	75% ASM	29.5%	28.2%	15.9%	3.8%	9.1%	6.8%	7.5%	9.4%
	50% ASM	20.4%	18.9%	10.5%	2.5%	6.0%	4.5%	5.4%	6.4%
	25% ASM	10.1%	9.6%	5.6%	1.4%	3.0%	2.2%	3.5%	3.8%
2.3 and 2.4	100% EM/PS Year 1	42.2%	40.1%	37.3%	19.5%	N/A		N/A	
	100% EM/PS Year 2	29.1%	27.5%	12.8%	4.9%				
	50% EM/PS Year 1	25.1%	24.2%	26.7%	16.9%				
	50% EM/PS Year 2	14.4%	13.3%	6.9%	2.4%				
2.5	100% NEFOP-level	5.4%	5.4%	1.0%	1.0%				
2.6	Potential Reduction to RTO would depend on which other Herring Alternative was selected (2.2-2.4 or 2.7)								
2.7	Potential Reduction to RTO associated with ASM would be the same as Herring Alternatives 2.2 and 2.3								
	100% EM/PS Year 1	42.3%	39.7%	38.1%	29.2%	19.4%	18.3%	21.0%	19.9%
	100% EM/PS Year 2	29.2%	27.1%	17.3%	6.2%	15.3%	14.1%	6.3%	8.8%
	75% EM/PS Year 1	25.6%	24.8%	27.6%	23.5%	13.0%	12.6%	16.8%	15.4%
	75% EM/PS Year 2	14.8%	13.7%	8.5%	3.3%	8.1%	7.6%	3.0%	4.3%
	50% EM/PS Year 1	19.8%	19.3%	23.7%	21.1%	10.5%	10.3%	14.3%	13.8%
	50% EM/PS Year 2	9.5%	8.8%	5.4%	2.1%	5.3%	4.9%	1.8%	2.7%
	25% EM/PS Year 1	14.4%	14.2%	20.0%	18.8%	8.2%	8.4%	13.3%	12.4%
	25% EM/PS Year 2	4.5%	4.2%	2.5%	1.0%	2.6%	2.4%	0.8%	1.3%
For EM/Portside Costs = Year 1 includes $15,000 for purchase and installation of EM equipment and Year 2 does not include the $15,000 purchase and installation costs.									
The Council revised Alternative 2.7 when it took final action. It recommended a > 50 mt option for 50% ASM coverage. Median potential reduction in RTO with the > 50 mt option is 15.7% for paired MWT, 3.5% for single MWT, 2.6% for purse seine, and 2.5% for SMBT.									

When considering potential reduction in annual RTO, Herring Alternative 2.1 has the greatest potential reduction in RTO (44.7%-11.5%) followed by Herring Alternative 2.2 (38.9%-3.5%). The range in potential reduction in RTO for Herring Alternative 2.1 depends on gear type and it depends on the amount of coverage and gear type for Herring Alternative 2.2.

Herring Alternatives 2.3 and 2.7 both have broad ranges of potential reductions in RTO associated with at-sea monitoring coverage and electronic monitoring and portside sampling. When considering the same coverage target, the potential reduction in RTO associated with at-sea monitoring coverage is generally greater than the potential reduction in RTO associated with electronic monitoring and portside sampling. For example, for Herring Alternatives 2.3 and 2.7, the potential reduction in RTO associated with at-sea monitoring coverage at a 50% coverage target (38.9%-10.0%) is greater than the potential reduction in RTO associated with a 50% coverage target for electronic monitoring and portside sampling (9.5%-5.4%).

The potential reduction in RTO associated with Herring Alternative 2.5 is the lowest (5.4%-1.0%) of all the herring alternatives because RTO reductions were limited to trips by midwater trawl vessels within the Groundfish Closed Areas. The potential reduction in RTO associated with Herring Alternative 2.6 would depend on which other Herring Alternative was selected (2.2-2.4 or 2.7) and is already considered within the RTO analyses for those alternatives.

Based on data in Table 82, the Council's selection of Herring Alternative 2.7 (50% coverage target) as a preferred alternative has the potential to reduce potential RTO up to 20.4% for midwater trawl vessels, up to 6.0% for purse seine vessels,, and up to 5.4 % for small mesh bottom trawl vessels. The Council's selection of Herring Alternative 2.5 as a preferred alternative has the potential to further reduce RTO for midwater trawl vessels paying for NEFOP-level observer coverage to access Groundfish Closed Areas up to an additional 5.4%.

Paired midwater trawl vessels have the highest monitoring costs as a percentage of RTO because these vessels have, on average, more sea days declared into the herring fishery than other gear types. Therefore, midwater trawl vessels have more sea days that would be subject to monitoring costs than vessels that use other gear types.

There are differences across gear types regarding the sources of revenue that would be used to pay for monitoring costs. For example, for small mesh bottom trawl vessels, approximately 50% of their revenue is generated by participating in the herring fishery and the other 50% is generated by participating in other fisheries. This means that if small mesh bottom trawl vessels want to continue to declare herring trips, they may need to use revenue from other fisheries to pay the industry-funded monitoring costs associated with the herring fishery. A metric for considering different revenue sources across gear types is evaluating monitoring costs as a percent of herring revenue. For small mesh bottom trawl

vessels, industry-funded monitoring costs as a percent of herring revenue are higher than for other gear types.

Another method for accounting for these differential impacts on small mesh bottom trawl vessels is to apportion the overall RTO to the different fisheries and then reduce the herring RTO by the monitoring cost. However, to properly apportion RTO to fisheries, much more detailed cost data is required. If data were available on a trip basis, costs that are specific to the fishery pursued on that trip could be assigned. Fuel is a good example of this type of cost. However, the trip related cost data used in the RTO analysis is at an annual level. Even with highly detailed cost information there are still costs that do not vary by trip, such as insurance costs. It is unclear in this instance what method should be used to apportion these costs. For these reasons, herring as a percentage of revenue, rather than herring RTO, is shown in the following tables (starting on page 268) to evaluate impacts on small mesh bottom trawl vessels.

Exempting trips that land less than 25 mt or 50 mt of herring (Sub-Option 5) from industry-funded monitoring costs has the potential greatly reduce industry-funded monitoring costs. Sub-Option 5 would eliminate monitoring costs for vessels who always land less herring than 25 mt or 50 mt of herring and Sub-Option 5 may substantially reduce monitoring costs for particular gear types.

Based on past performance, small mesh bottom trawl vessels landed less than 25 mt of herring on 45% of trips and less than 50 mt of herring on 81% of trips. Similarly, 40% of single midwater trawl trips landed less than 25 mt of herring and 60% of trips landed less than 50 mt of herring. Sub-Option 5 is likely to benefit paired midwater trawl and purse seine vessels less. Only 13% of paired midwater trawl trips landed less than 50 mt of herring and only 33% of purse seine trips landed less than 50 mt of herring.

The total annual costs to vessels associated with additional monitoring ranges from $673,000 (Herring Alternative 2.1) to $75,000 (Herring Alternative 2.5). The Council's selection of a 50 mt-threshold for Sub-Option 5 as a preferred alternative has a greater potential to reduce the cost of additional monitoring than selecting a 25-mt threshold. Single midwater trawl vessels may not need to pay for additional monitoring on up to 60% of trips (possible $36,500 savings across the fleet) and small mesh bottom trawl vessels may not need to pay for additional monitoring on up to 80% of trips (possible $60,000 savings across the fleet).

Selecting Herring Alternative 2.5 rather than Herring Alternative 2.1 reduces total industry monitoring costs from $811,000 to $75,000 – a 91% reduction. However, Herring Alternative 2.5 only provides increased monitoring on midwater trawl vessels fishing in the Groundfish Closed Areas.

Summary of Impacts to Fishery-Related Businesses and Communities

In general, the direct economic impact on herring vessels associated with Herring Alternatives 2.1-2.7 is negative. The total annual costs to vessels associated with additional monitoring ranges from $673,000 (Herring Alternative 2.1) to $75,000 (Herring Alternative 2.5). Similarly, the negative economic impact on herring vessels of paying for monitoring coverage (as measures by the potential reduction in the RTO) is greatest with Herring Alternative 2.1 and the least with Herring Alternative 2.5. The magnitude of the economic impact associated with paying for monitoring coverage associated with Herring Alternatives 2.2-2.6 would vary with the type of information collected and amount of coverage.

Because midwater trawl vessels average more sea days than other gear types, midwater trawl vessels have a greater negative economic impact associated with paying for monitoring coverage, followed by purse seine vessels, and small mesh bottom trawl vessels.

The Council's selection of a 50-mt threshold for Sub-Option 5 as a preferred alternative has a greater potential to reduce the cost of additional monitoring than selecting a 25-mt threshold. Single midwater trawl vessels may not need to pay for additional monitoring on up to 60% of trips (possible $36,500 savings across the fleet) and small mesh bottom trawl vessels may not need to pay for additional monitoring on up to 80% of trips (possible $60,000 savings across the fleet).

Indirect positive impacts on herring vessels associated with Herring Alternative 2 may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs. These benefits may not be realized under Herring Alternative 1.

Indirect negative impacts on herring vessels associated with Herring Alternative 2 may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, resulting in catch caps that are fully harvested earlier than expected and reduced opportunities to harvest herring. These impacts may be similar to impacts under Herring Alternative 1 if no additional monitoring results in overly cautious management and limits herring harvest.

TABLE 83. SUMMARY OF ECONOMIC IMPACTS OF HERRING COVERAGE TARGET ALTERNATIVES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

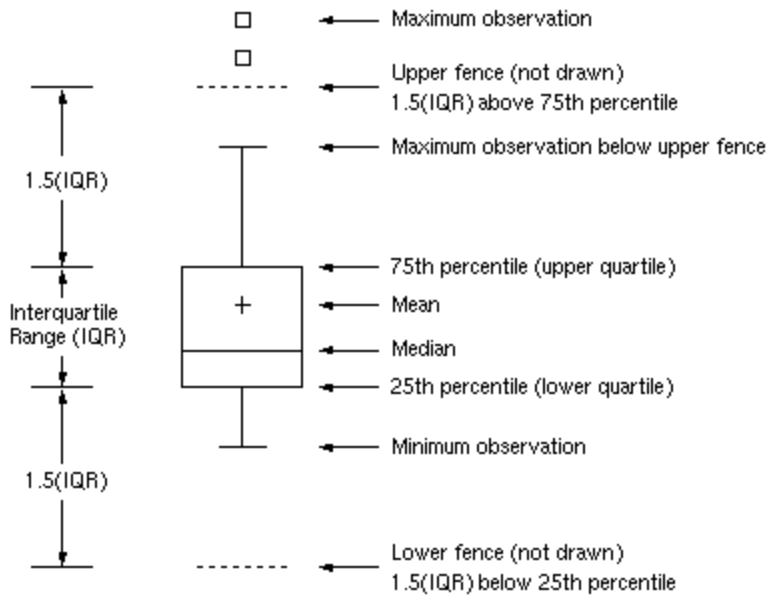
Alternatives	Impacts on Fishery Related-Businesses
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	• Low positive impact associated with observer coverage allocated by SBRM • Low negative impact associated with no additional monitoring to reduce uncertainty around catch estimates
Herring Alternative 2: Coverage Target Specified For IFM Programs	• **Negative impact associated with potential reduction in returns-to-to owner (RTO)** • **Negative impact associated with not selecting Sub-Option 1 if fishing effort is limited by monitoring availability and herring ACLs are not harvested** • **Low positive impact associated with selecting Sub-Options 1 and 2 if additional monitoring is waived** • **Low positive impact associated with selecting Sub-Option 5 if it reduces monitoring costs** • **Low positive impact associated with additional monitoring to reduce uncertainty around catch estimates in the herring fishery** • **Magnitude of impacts associated with additional monitoring would be dependent on the type of information collected, amount of coverage, how coverage is allocated, and amount of available Federal funding**
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	• Negative impact associated with potential reduction in RTO up to 44.7% • Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100% coverage on Category A and B vessels
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	• Negative impact associated with potential reduction in RTO up to 38.9% • Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100%-25% coverage on Category A and B vessels
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	• Negative impact associated with potential reduction in RTO up to 38.5% • Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100%-25% coverage on Category A and B vessels and 100% or 50% coverage on the midwater trawl fleet

Alternatives	Impacts on Fishery Related-Businesses
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	• Negative impact associated with potential reduction in RTO up to 29.1%* • Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100% or 50% coverage on the midwater trawl fleet
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• **Negative impact associated with potential reduction in RTO up to 5.4%** • **Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100% coverage on the midwater trawl fleet fishing in Groundfish Closed Areas**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	• Negative impact associated with potential reduction in RTO • Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 100%-25% coverage on the midwater trawl fleet fishing in the Groundfish Closed Areas
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	• **Negative impact associated with potential reduction in RTO up to 20.4%** • **Low positive impact associated with additional information to reduce uncertainty around catch estimates associated with 50% coverage on Category A and B vessels**
* Reflects RTO from Year 2	

Additional Information on Monitoring Costs

The tables and box plots on the following pages provide summarized economic data for each of the herring coverage target alternatives. The economic impact on vessels associated with paying for monitoring coverage is described as a percentage of RTO for each herring coverage target alternative in the following figures. The tables provide the mean and median number of sea days per vessel that would result from each of the alternatives, as well as the mean and median RTO that would ultimately be reduced by the industry-funded monitoring costs. Additionally, fleet level effort, revenue, and monitoring cost information for each herring coverage target alternative are also provided. Additional economic analysis is available in Appendix 5.

Box plots are a useful tool to show how data are distributed. The following schematic shows what the various pieces of a box plot show regarding the distribution of data:



When examining the box plots, it is important to note the differences between mean and median values by gear type and by alternatives, as well as the differences in the variability of values by these criteria. For example, in the first figure (Herring Alternative 2.1) there is a much wider range of costs for purse seine vessels than small mesh bottom trawl vessels, as represented by the length of the rectangle. Further, the difference between alternatives for purse seine vessels shows that the mean and median values are lower under the 25-mt threshold (Sub-Option 5) but also that the likely range of NEFOP costs are much narrower.

TABLE 84. HERRING ALTERNATIVES 2.1, 2.2, 2.3, 2.7 (PURSE SEINE AND SMBT) – ANNUAL AVERAGE PER VESSEL SUMMARY

	Paired MWT		Purse Seine		Single MWT		SMBT	
	> 1 lb	> 25 mt	> 1 lb	> 25 mt	> 1 lb	> 25 mt	> 1 lb	> 25 mt
Mean RTO	$163,080		$241,180		$141,169		$144,125	$163,329
Median RTO	$159,529		$253,048		$60,156		$121,026	$135,782
Mean Sea Days (100%)	103	83	56	29	28	19	21	20
Median Sea Days (100%)	104	84	57	26	23	16	17	15
Mean Sea Days (75%)	77	62	42	22	21	15	17	15
Median Sea Days (75%)	77	63	43	20	18	12	13	11
Mean Sea Days (50%)	52	42	28	15	14	10	12	10
Median Sea Days (50%)	51	42	29	13	12	8	9	8
Mean Sea Days (25%)	26	21	14	8	8	6	8	7
Median Sea Days (25%)	26	21	14	7	7	5	6	6

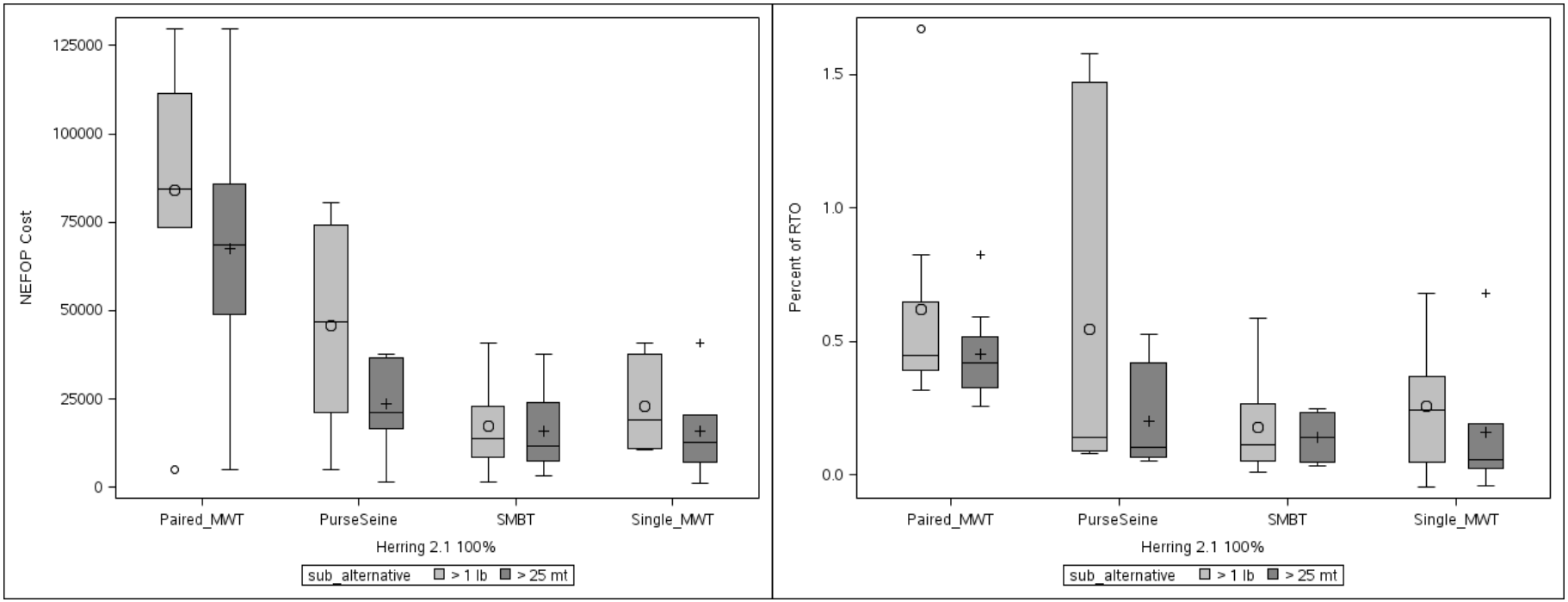


FIGURE 14. HERRING ALTERNATIVE 2.1 100% NEFOP COST AND PERCENT OF RTO

Figure 12 describes the approximate costs that applicable vessels with various gear types would incur annually from Herring Alternative 2.1, which would require 100% coverage by NEFOP-level observers on Category A and B vessels (includes vessels that use midwater trawl, small mesh bottom trawl, and purse seine gear). The Council included thresholds of >1 lb (light grey) or > 25 mt (55,115 pounds) (darker grey) for trips that would require monitoring – a 25-mt threshold would reduce the number of trips that had to be monitored and thus reduce costs.

Since this type of figure is used often in this document, additional detail on how to interpret the figure is provided to serve as a guide for interpreting other similar figures. All costs are based on the fleets operating as they did in 2014, and are derived from the number of days that they fished in 2014 on trips when they landed either 1 lb of herring or 25 mt of herring (the two thresholds being considered that would trigger monitoring). The line in the bar is the median (half of vessels would have higher or lower costs than the median cost) and the "o" or "+" within the bar shows the mean (average). Where the mean and median do not align there is some degree of skewedness to the data (generally if the mean is higher than the median there are a few unusually high values and if

the median is higher than the mean there are a few unusually low values). When the median and mean are substantially different the median is more illustrative of the typical monitoring costs for vessels, so the median is the focus of this analysis.

The shaded bars show where 50% of the data are (the "interquartile range") and the whiskers show the range of values that lie within 1.5 times the interquartile percentile range. Together, the bars and whiskers illustrate whether the data are tightly grouped or highly variable (here highly variable would mean that some vessels would have high costs and some vessels would have low costs). An "o" or "+" outside the whiskers shows an extreme outlier. For example, there is a low outlier data point with the costs for paired midwater trawl vessels at a 1-lb threshold for monitoring.

For Herring Alternative 2.1, due to the higher number of trips that landed herring, paired midwater trawl vessels are most impacted, followed by purse seine. Single midwater trawl and small mesh bottom trawl vessels are least impacted. Median costs for the gear types at the 1 lb of herring threshold (light grey bars) would have been approximately $85,000 for paired midwater trawl vessels, $47,000 for purse seine vessels, $14,000 for small mesh bottom trawl vessels, and $19,000 for single midwater trawl vessels. Recall the median is the point at which half of the vessels would pay more and half would pay less than that amount, and that wide bars and long whiskers indicate a wider range of costs/impacts across vessels.

Costs are generally lower when a 25-mt threshold is used since not as many trips trigger a monitoring requirement. For the analysis of the 25-mt threshold, some vessels had no qualifying trips and drop out of the analysis, so even if the medians/averages stay similar the total fleet costs may still substantially decline. If a 25-mt threshold is used (darker grey bars), median costs are approximately $69,000 for paired midwater trawl vessels, $21,000 for purse seine vessels, $12,000 for small mesh bottom trawl vessels, and $13,000 for single midwater trawl vessels.

Percent of RTO at the 1-lb threshold is most impacted for paired midwater trawl vessels, followed by single midwater trawl vessels, and then purse seine and small mesh bottom trawl. For the 1-lb threshold, RTO for paired midwater trawl vessels is 44.7%, while RTO for single midwater trawl vessels is 24.4%. Purse seine and small mesh bottom trawl vessel RTO is about 12%-14%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 42.2%, while the RTO for single midwater trawl, small mesh bottom trawl, and purse seine vessels is less than 15%. Purse seine vessel RTO (especially at the 1-lb threshold) displayed a high level of variance and also skewed very high, indicating that a portion of vessels face substantially higher impacts to RTO.

Additionally, since vessels would have to declare their intent to fish for herring and the monitoring would be triggered based on that declaration of intent, costs may be higher if vessels want the option to fish for herring on more days than they actually caught herring in 2014.

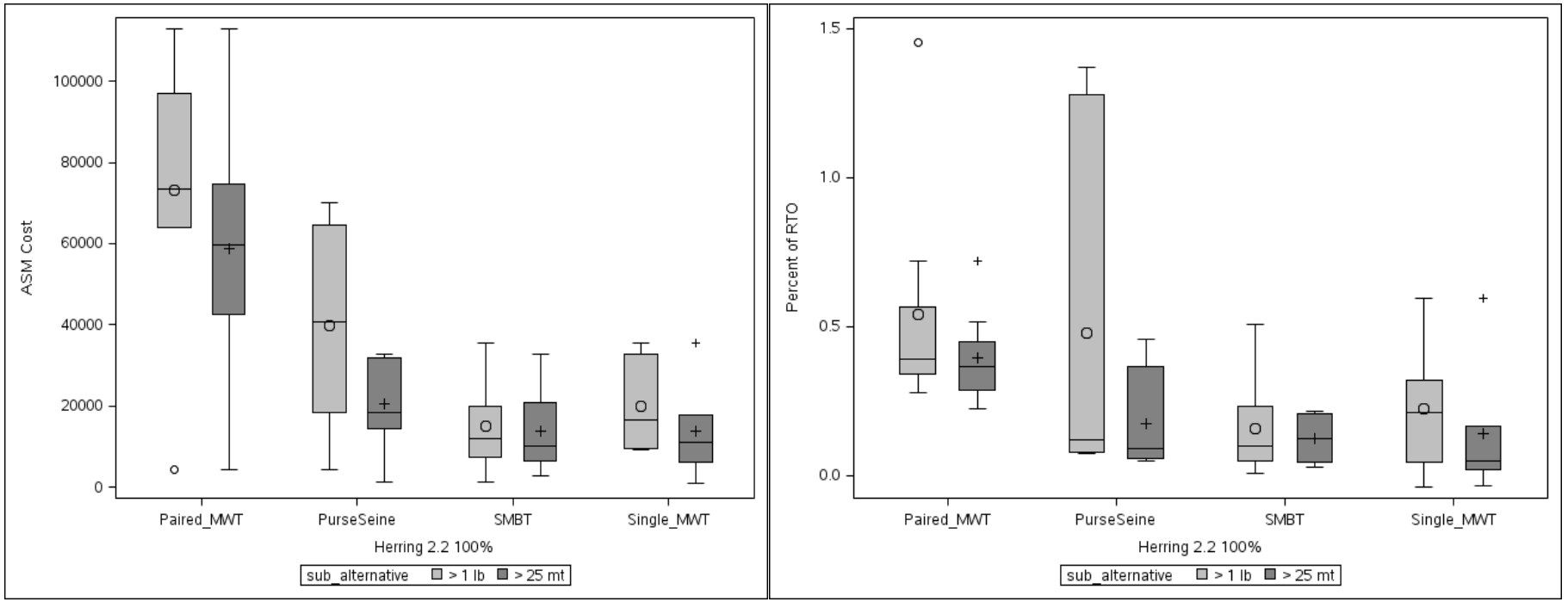


FIGURE 15. HERRING ALTERNATIVE 2.2 100% ASM COST AND PERCENT OF RTO

Due to the higher number of trips that landed herring, paired midwater trawl vessels are most impacted, followed by purse seine vessels. Single midwater trawl and small mesh bottom trawl vessels are least impacted. Median costs for the gear types at the 1-lb of herring threshold (light grey bars) are $73,000 for paired midwater trawl vessels, $41,000 for purse seine vessels, $12,000 for small mesh bottom trawl vessels, and $17,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $60,000 for paired midwater trawl vessels, $18,000 for purse seine vessels, $10,000 for small mesh bottom trawl vessels, and $11,000 for single midwater trawl vessels.

Percent of RTO at the 1-lb threshold is most impacted for paired midwater trawl vessels, followed by single midwater trawl vessels, and then purse seine and small mesh bottom trawl vessels. For the 1-lb threshold, RTO for paired midwater trawl vessels is 38.9%, while RTO for single midwater trawl vessels is 21.3%. Purse seine and small mesh bottom trawl vessel RTO is about 10%-12%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 36.7% and 12.3% for small mesh bottom trawl vessels. RTO for single midwater trawl and purse seine vessels is less than 10%. Purse seine vessel RTO (especially at the 1-lb threshold) displayed a high level of variance and also skewed very high, indicating that a portion of vessels face substantially higher impacts to RTO.

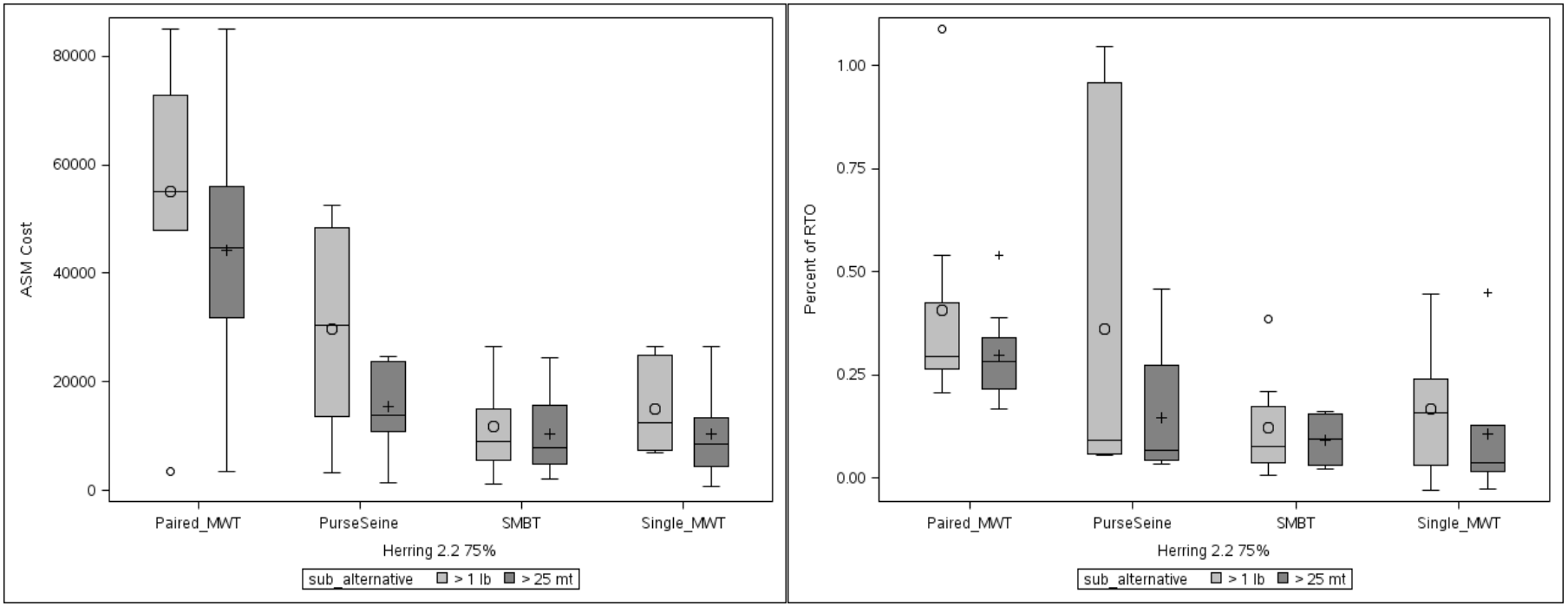


FIGURE 16. HERRING ALTERNATIVE 2.2 75% ASM COST AND PERCENT OF RTO

At 75% ASM coverage, paired midwater trawl vessels are most impacted, followed by purse seine vessels. Single midwater trawl and small mesh bottom trawl vessels are least impacted. Median costs for the gear types at the 1-lb of herring threshold (light grey bars) are $55,000 for paired midwater trawl vessels, $31,000 for purse seine vessels, $9,000 for small mesh bottom trawl vessels, and $12,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $45,000 for paired midwater trawl vessels, $14,000 for purse seine vessels, $8,000 for small mesh bottom trawl vessels, and $8,000 for single midwater trawl vessels.

Percent of RTO at the 1-lb threshold is most impacted for paired midwater trawl vessels, followed by single midwater trawl vessels, and then purse seine and small mesh bottom trawl vessels. For the 1-lb threshold, RTO for paired midwater trawl vessels is 29.7%, while RTO for single midwater trawl vessels is 15.9%. Purse seine vessel and small mesh bottom trawl vessel RTO are less than 10%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 28.2%, while RTO for single midwater trawl, small mesh bottom trawl, and purse seine vessels is less than 10%. Purse seine vessel RTO (especially at the 1-lb threshold) displayed a high level of variance and also skewed very high, indicating that a portion of vessels face substantially higher impacts to RTO.

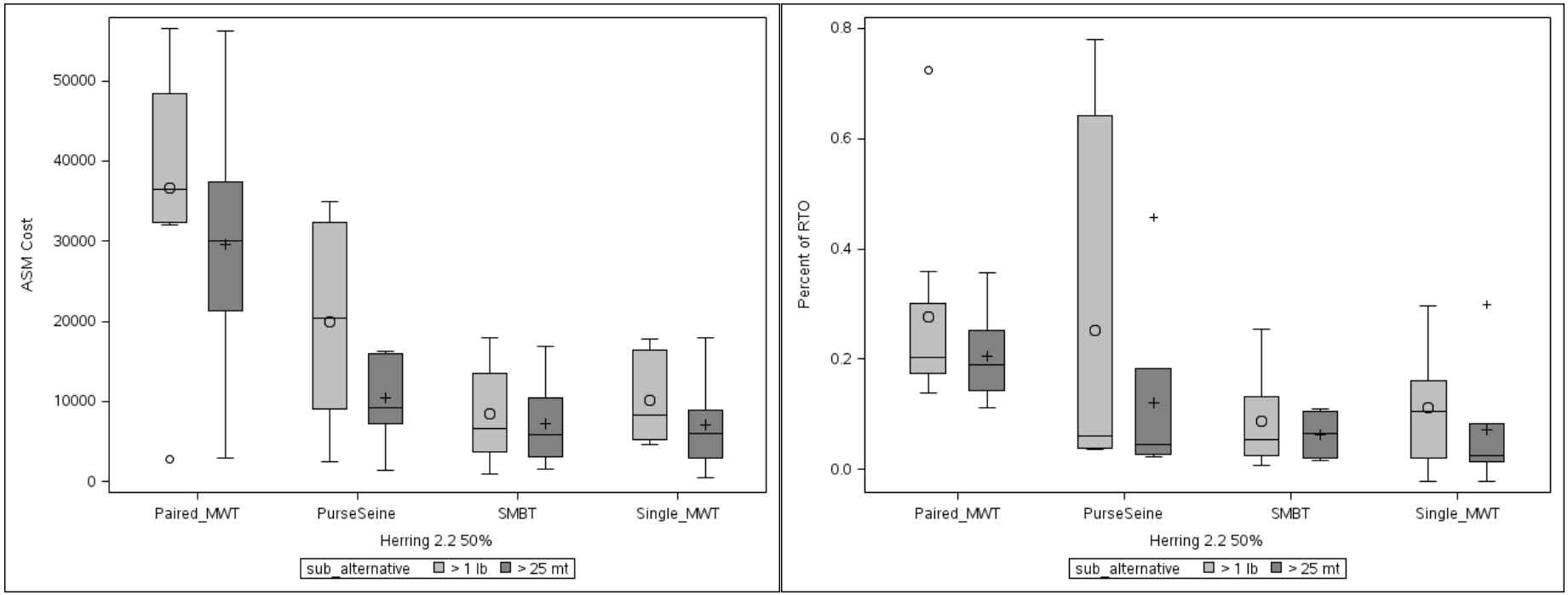
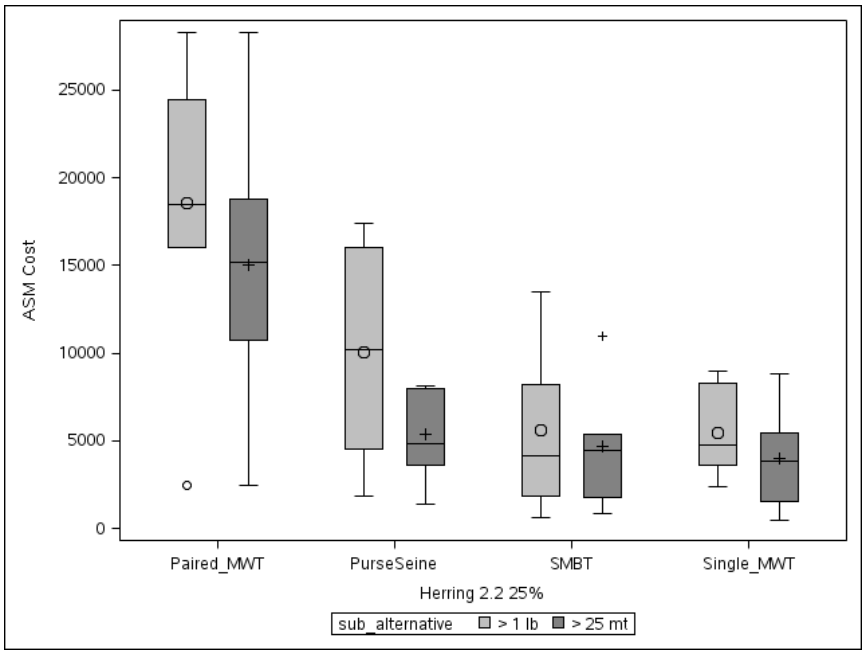


FIGURE 17. HERRING ALTERNATIVE 2.2 50% ASM COST AND PERCENT OF RTO

At 50% ASM coverage, paired midwater trawl vessels are most impacted, followed by purse seine vessels. Single midwater trawl and small mesh bottom trawl vessels are least impacted. Median costs for the gear types at the 1-lb of herring threshold (light grey bars) are $36,000 for paired midwater trawl vessels, $20,000 for purse seine vessels, $7,000 for small mesh bottom trawl vessels and $8,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $30,000 for paired midwater trawl vessels, $9,000 for purse seine vessels, $6,000 for small mesh bottom trawl vessels, and $6,000 for single midwater trawl vessels.

Percent of RTO at the 1-lb threshold is most impacted for paired midwater trawl vessels, followed by single midwater vessels, and then purse seine and small mesh bottom trawl vessels. For the 1lb threshold, RTO for paired midwater trawl vessels is 20.4%, while RTO for single midwater trawl vessels is 10.5%. Purse seine and small mesh bottom trawl vessels RTO is less than 6%. At the 25-mt threshold, RTO for paired midwater trawl vessels is approximately 18.9%, while RTO for single midwater trawl, small mesh bottom trawl, and purse seine vessels is less than 7%. Purse seine vessel RTO (especially at the 1-lb threshold) displayed a high level of variance and also skewed very high, indicating that a portion of vessels face substantially higher impacts to RTO.



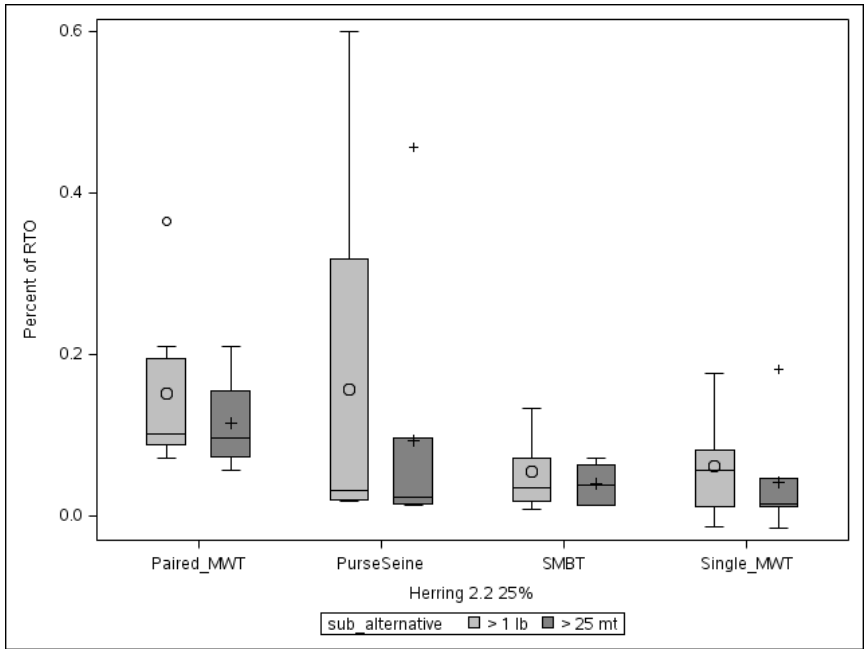


FIGURE 18. HERRING ALTERNATIVE 2.2 25% ASM COST AND PERCENT OF RTO

At 25% ASM coverage, paired midwater trawl vessels are most impacted, followed by purse seine vessels. Single midwater trawl and small mesh bottom trawl vessels are least impacted. Median costs for the gear types at the 1-lb of herring threshold (light grey bars) are $19,000 for paired midwater trawl vessels, $10,000 for purse seine vessels, $4,000 for small mesh bottom trawl vessels, and $5,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $15,000 for paired midwater trawl vessels, $5,000 for purse seine vessels, $4,000 for small mesh bottom trawl vessels, and $4,000 for single midwater trawl vessels.

Percent of RTO at the 1-lb threshold is most impacted for paired midwater trawl vessels, followed by single midwater trawl vessels, and then purse seine and small mesh bottom trawl vessels. For the 1-lb threshold, RTO for paired midwater trawl vessels is 10.1%, while RTO for single midwater trawl vessels is 5.6%. Purse seine and small mesh bottom trawl vessel RTO is less than 4%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 9.6%, while RTO for single midwater trawl, small mesh bottom trawl, and purse seine vessels is less than 4%. Purse seine vessel RTO (especially at the 1-lb threshold) displayed a high level of variance and also skewed very high, indicating that a portion of vessels face substantially higher impacts to RTO.

Note: The box plots for purse seine and small mesh bottom trawl vessels shown in Figures 13-16 under Herring Alternative 2.2 also describe the distribution of values for Herring Alternative 2.3.

TABLE 85. HERRING ALTERNATIVES 2.1, 2.2, 2.3 (PURSE SEINE AND SMBT) – ANNUAL FLEET SUMMARY

Fleet Level	Paired MWT ≥ 1 LB	Paired MWT > 25 MT	Single MWT ≥ 1 LB	Single MWT > 25 MT	Purse Seine ≥ 1 LB	Purse Seine > 25 MT	SMBT ≥ 1 LB	SMBT > 25 MT
Number of Vessels	8	8	6	6	7	7	9	6
Days at Sea	825	663	170	116	392	204	192	117
Total NEFOP Cost (2.1)	$673k	$541k	$138k	$95k	$320k	$166k	$156k	$96k
Total ASM Cost (2.2)	$586k	$471k	$120k	$82k	$278k	$145k	$136k	$83k
Total Revenue	$10.6M	$9.8M	$4.5M	$4.2M	$11.0M	$10.3M	$2.6M	$1.8M
% Revenue Herring	89%	93%	86%		100%		58%	78%
% Revenue Mackerel	11%	7%	13%		-		3%	2%
% Revenue Squid	-		-		-		20%	10%
Data shown by trips harvesting ≥ 1 lb of herring and > 25 mt of herring								

TABLE 86. HERRING ALTERNATIVES 2.3 AND 2.4 – ANNUAL AVERAGE PER MIDWATER TRAWL VESSEL SUMMARY

	Paired MWT		Single MWT	
	> 1 lb	> 25 mt	> 1 lb	> 25 mt
Mean RTO	$163,080		$134,205	$149,714
Median RTO	$159,529		$60,156	$80,070
Mean EM Days (100%)	103	83	22	17
Median EM Days (100%)	104	84	18	13

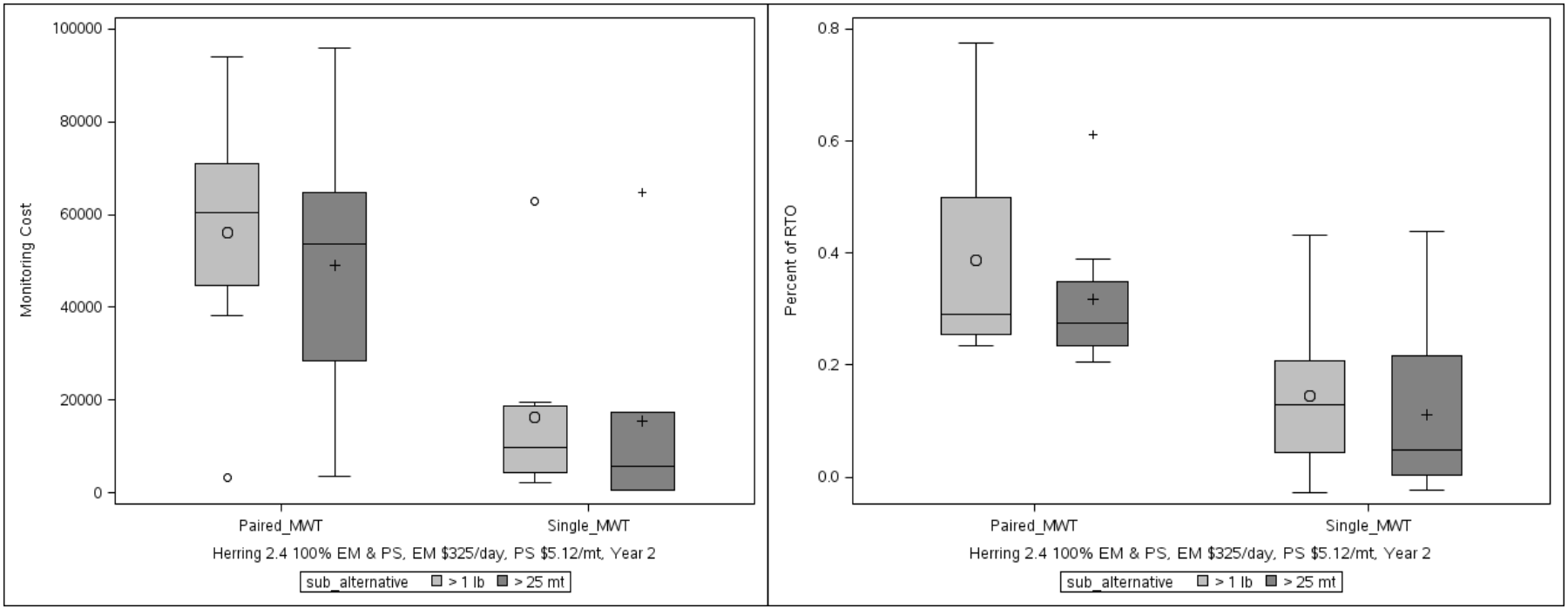


FIGURE 19. HERRING ALTERNATIVE 2.4 100% EM AND PORTSIDE COST AND PERCENT OF RTO

100% EM and portside monitoring costs are substantially higher for paired midwater trawl vessels than for single midwater trawl vessels at both the 1-lb threshold and the 25-mt threshold. Median costs for the gear types at the 1-lb threshold (light grey bars) is $60,000 for paired midwater trawl vessels and $10,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $54,000 for paired midwater trawl vessels and $6,000 for small mesh bottom trawl and single midwater trawl vessels.

Percent of RTO for paired midwater trawl vessels is substantially greater than for single midwater trawl vessels at both the 1-lb and 25-mt thresholds. For the 1-lb threshold, RTO for paired midwater trawl vessels is 29.1%, while RTO for single midwater trawl vessels is 12.8%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 27.5%, while RTO for single midwater trawl vessels is 4.9%.

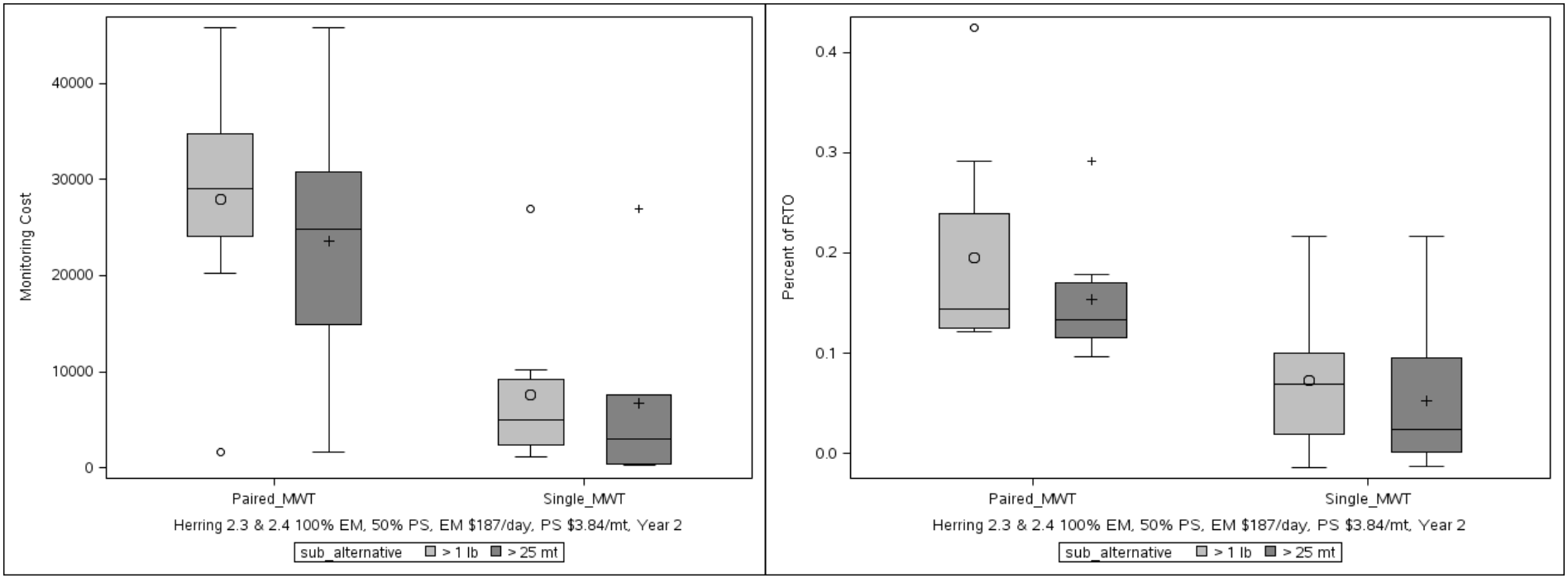


FIGURE 20. HERRING ALTERNATIVE 2.4 50% EM AND PORTSIDE COST AND PERCENT OF RTO

50% EM and portside monitoring costs are substantially higher for paired midwater trawl vessels than for single midwater trawl vessels at both the 1-lb threshold and the 25-mt threshold. Median costs for the gear types at the 1-lb threshold (light grey bars) is $29,000 for paired midwater trawl vessels and $5,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $25,000 for paired midwater trawl vessels and $3,000 for small mesh bottom trawl and single midwater trawl vessels.

Percent of RTO for paired midwater trawl vessels is substantially greater than for single midwater trawl vessels at both the 1-lb and 25-mt thresholds. For the 1-lb threshold, RTO for paired midwater trawl vessels is 14.4%, while RTO for single midwater trawl vessels is 6.9%. At the 25-mt threshold, RTO for paired midwater trawl vessels is 13.3%, while RTO for single midwater trawl vessels is 2.4%.

TABLE 87. HERRING ALTERNATIVES 2.3 AND 2.4 – ANNUAL MIDWATER TRAWL FLEET SUMMARY

Fleet Level	Paired MWT ≥ 1 LB	Paired MWT > 25 MT	Single MWT ≥ 1 LB	Single MWT > 25 MT
Number of Vessels	8	8	8	7
Days at Sea	825	663	180	117
Total Monitoring Cost (100% EM at $325/day, 100% PS at $5.12/mt, year 2)	$457,595	$393,117	$134,165	$107,580
Total Monitoring Cost (100% EM at $187/day, 50% PS at $3.84/mt, year 2)	$222,958	$188,376	$61,067	$47,083
Total Revenue	$10.6M	$9.8M	$4.5M	$4.2M
% Revenue Herring	89%	93%	86%	86%
% Revenue Mackerel	11%	7%	13%	14%
% Revenue Squid	-		-	
Data shown by trips harvesting ≥ 1 lb of herring and > 25 mt of herring				

TABLE 88. HERRING ALTERNATIVE 2.5 – ANNUAL AVERAGE PER MIDWATER TRAWL VESSEL SUMMARY

	Paired MWT		Single MWT	
	> 1 lb	> 25 mt	> 1 lb	> 25 mt
Mean RTO	$172,922		$545,609	
Median RTO	$159,529		$545,609	
Mean Sea Days	14	9	4	4
Median Sea Days	11	9	4	4

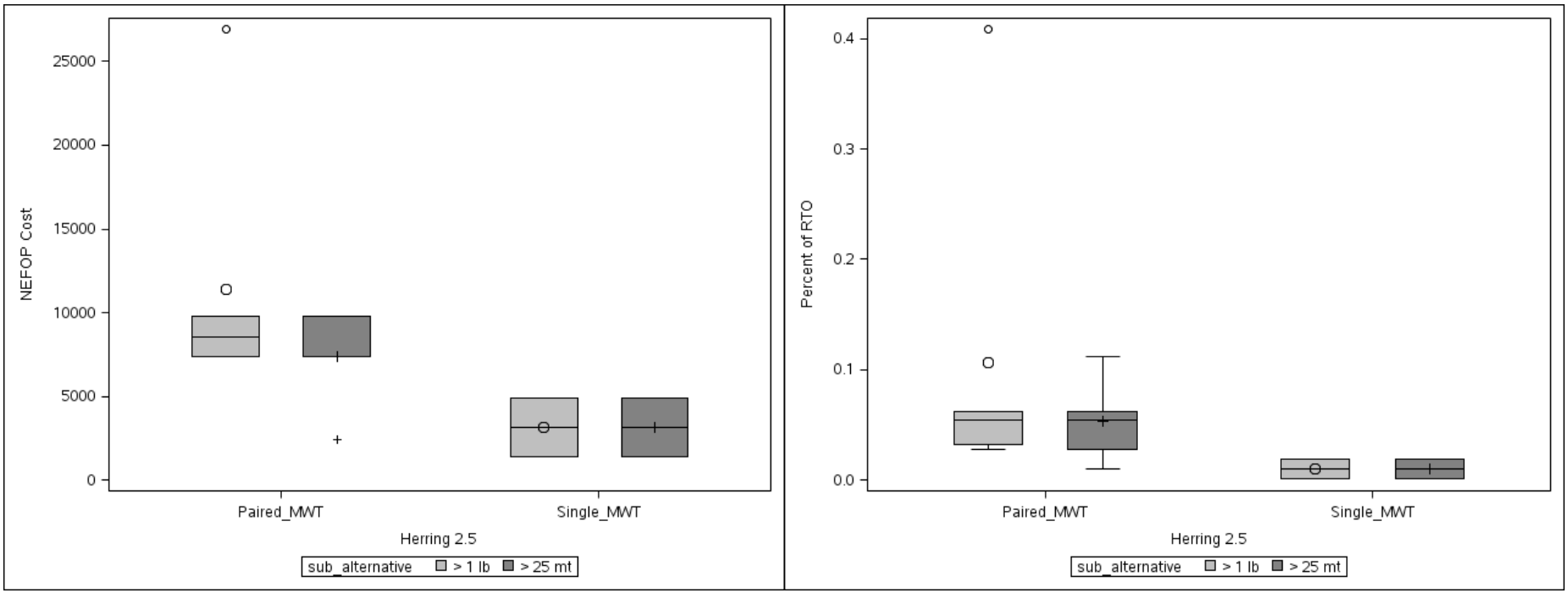


FIGURE 21. HERRING ALTERNATIVE 2.5 100% NEFOP FOR MIDWATER TRAWL VESSELS IN GROUNDFISH CLOSED AREAS COST AND PERCENT OF RTO

Monitoring costs 100% NEFOP for midwater trawl vessels in Groundfish Closed Areas are substantially higher for paired midwater trawl vessels than for single midwater trawl vessels at both the 1-lb threshold and the 25-mt threshold. Median costs for the gear types at the 1-lb threshold (light grey bars) is $9,000 for paired midwater trawl vessels and $3,000 for single midwater trawl vessels. If a 25-mt threshold is used (darker grey bars), median costs are $7,000 for paired midwater trawl vessels and $3,000 for small mesh bottom trawl and single midwater trawl vessels.

Percent of RTO for paired midwater trawl vessels is substantially greater than for single midwater trawl vessels at both the 1-lb and 25-mt thresholds. For both the 1-lb and the 25-mt thresholds, RTO for paired midwater trawl vessels is 5.4%, while RTO for single midwater trawl vessels is 1.0%.

TABLE 89. HERRING ALTERNATIVE 2.5 – ANNUAL MIDWATER TRAWL FLEET SUMMARY

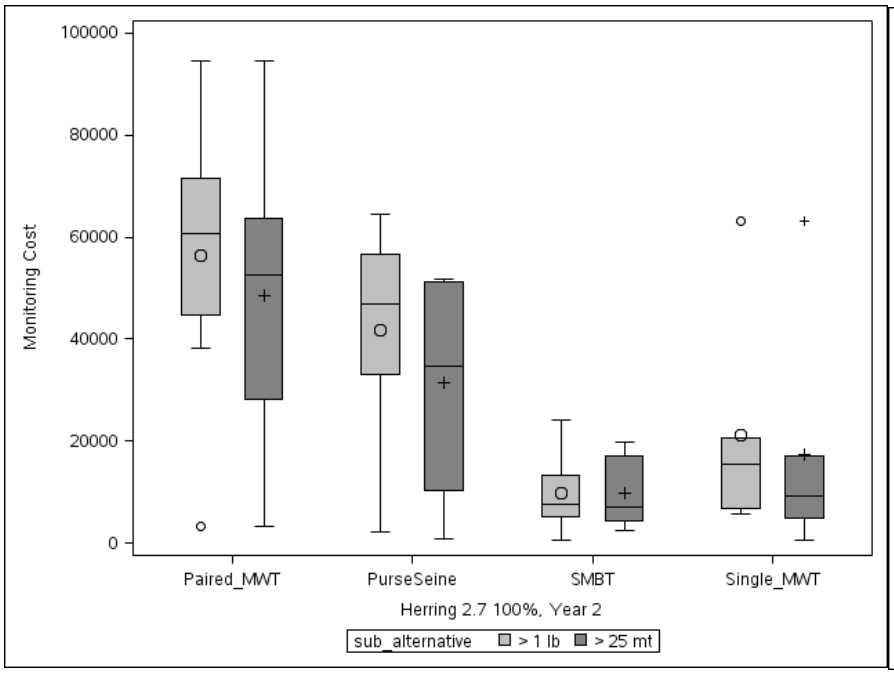
Fleet Level	Single and Paired MWT ≥ 1 LB	Single and Paired MWT > 25 MT
Number of Vessels	8	8
Days at Sea	92	62
Total NEFOP Cost	$74,827	$50,347
Total Revenue	$1.4M	$1.4M
% Revenue Herring	99.9%	100%
% Revenue Mackerel	-	-
% Revenue Squid	-	-
% Other Species	0.1%	0%
Data shown by trips harvesting ≥ 1 lb of herring and > 25 mt of herring		

Economic and effort data for Herring Alternative 2.6 is included in tables for Herring Alternatives 2.1-2.4.

TABLE 90. HERRING ALTERNATIVE 2.7 – ANNUAL FLEET SUMMARY

Fleet Level	Paired MWT ≥ 1 LB	Paired MWT > 25 MT	Single MWT ≥ 1 LB	Single MWT > 25 MT	Purse Seine ≥ 1 LB	Purse Seine > 25 MT	SMBT ≥ 1 LB	SMBT > 25 MT
Number of Vessels	8	8	6	6	7	7	9	6
Days at Sea	825	663	170	116	392	204	192	117
Total EM & PS Costs, year 2 (100% EM and PS. EM at $325/day. PS at $5.12/mt)	$451k	$387k	$128k	$105k	$293k	$220k	$88k	$59k
Total EM & PS Costs, year 2 (75% EM and PS. EM at $202/day. PS at $3.84/mt)	$228k	$197k	$65k	$55k	$152k	$118k	$43k	$29k
Total EM & PS Costs, year 2 (50% EM and PS. EM at $187/day. PS at $3.84/mt)	$146k	$126k	$43k	$36k	$99k	$77k	$27k	$19k
Total EM & PS Costs, year 2 (25% EM and PS. EM at $172/day. PS at $3.84/mt)	$70k	$61k	$21k	$18k	$48k	$38k	$13k	$9k
Total Revenue	$10.6M	$9.8M	$4.5M	$4.2M	$11.0M	$10.3M	$2.6M	$1.8M
% Revenue Herring	89%	93%	86%	100%	58%	78%		
% Revenue Mackerel	11%	7%	13%		-		3%	2%

Fleet Level	Paired MWT ≥ 1 LB	Paired MWT > 25 MT	Single MWT ≥ 1 LB	Single MWT > 25 MT	Purse Seine ≥ 1 LB	Purse Seine > 25 MT	SMBT ≥ 1 LB	SMBT > 25 MT
% Revenue Squid	-	-	-		20%		10%	
Data shown by trips harvesting ≥ 1 lb of herring and > 25 mt of herring								



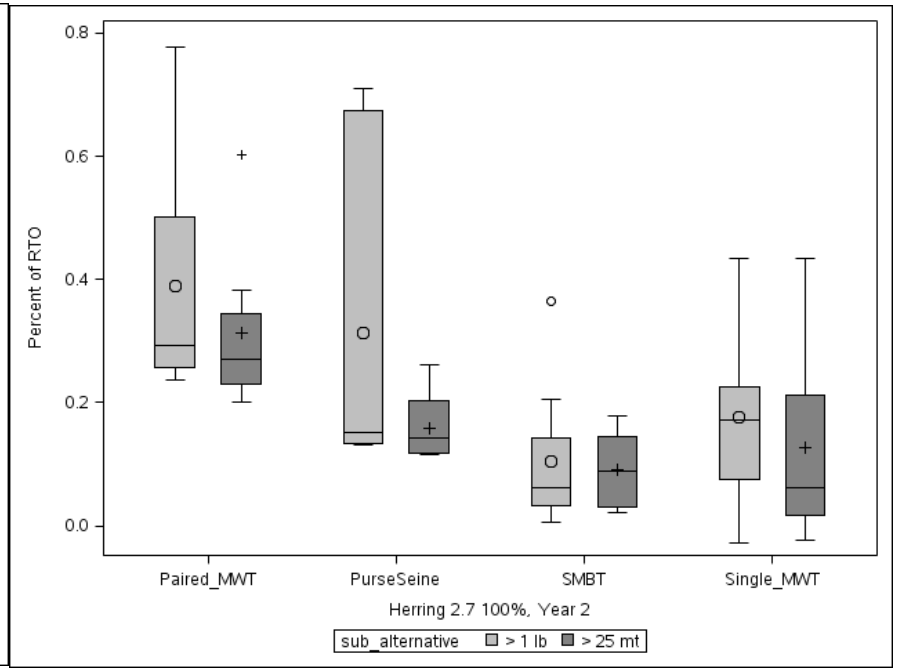


FIGURE 22. HERRING ALTERNATIVE 2.7 100% EM AND PORTSIDE ON ALL VESSELS

100% EM and portside monitoring costs, at both the 1-lb threshold and the 25-mt threshold, are greatest for paired midwater trawl vessels, followed by purse seine vessels. Single midwater trawl vessels and small mesh bottom trawl vessels have similar levels of monitoring costs. Median costs for the gear types at the 1-lb threshold (light grey bars) is $61,000 for paired midwater trawl

vessels, $47,000 for purse seine vessels, $16,000 for single midwater trawl vessels, and $8,000 for SMBT vessels. If a 25-mt threshold is used (darker grey bars), median costs are $53,000 for paired midwater trawl vessels $35,000 for purse seine vessels, $9,000 for single midwater trawl vessels, and $7,000 for SMBT vessels.

Percent RTO reductions at the 1-lb threshold are greatest for paired midwater trawl vessels, followed by single midwater trawl vessels, purse seine vessels, and then SMBT vessels. For the 1-lb threshold, the median RTO reduction for paired midwater trawl vessels is 29.3%, while RTO reductions for single midwater trawl vessels is 17.3%, 15.3% for purse seine vessels, and 6.3% for SMBT vessels. At the 25-mt threshold, RTO reductions for paired midwater trawl vessels are 27.1%, 14.1% for purse seine vessels, 8.8% for SMBT vessels, and 6.2% for single midwater trawl vessels.

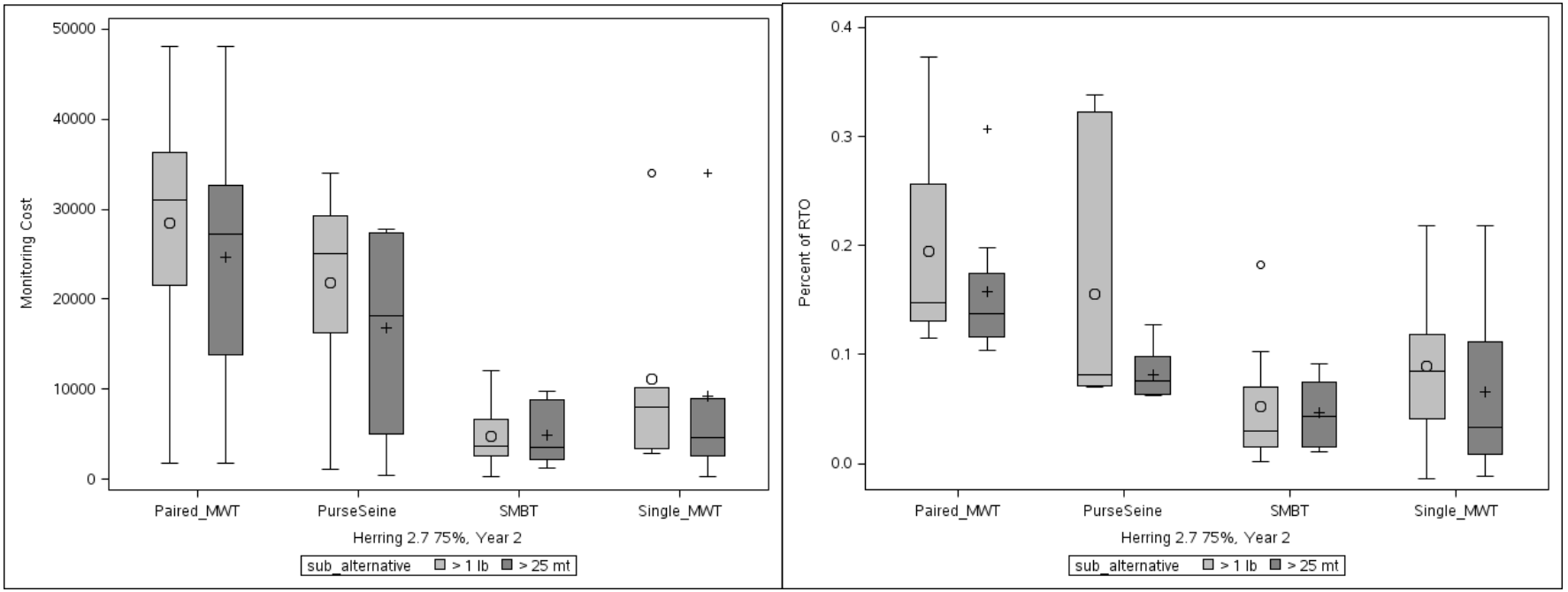


FIGURE 23. HERRING ALTERNATIVE 2.7 75% EM AND PORTSIDE ON ALL VESSELS

75% EM and portside monitoring costs, at both the 1-lb threshold and the 25-mt threshold, are greatest for paired midwater trawl vessels, followed by purse seine vessels. Single midwater trawl vessels and small mesh bottom trawl vessels have similar levels of monitoring costs. Median costs for the gear types at the 1-lb threshold (light grey bars) are $31,000 for paired midwater trawl vessels, $25,000 for purse seine vessels, $8,000 for single midwater trawl vessels, and $4,000 for SMBT vessels. If a 25-mt

threshold is used (darker grey bars), median costs are $27,000 for paired midwater trawl vessels $18,000 for purse seine vessels, $5,000 for single midwater trawl vessels, and $4,000 for SMBT vessels.

Percent RTO reductions at the 1-lb threshold are greatest for paired midwater trawl vessels, followed by single midwater trawl vessels, purse seine vessels, and then SMBT vessels. For the 1-lb threshold, the median RTO reduction for paired midwater trawl vessels is 14.8%, while RTO reductions for single midwater trawl vessels are 8.5%, 8.1 % for purse seine vessels, and 3.0% for SMBT vessels. At the 25-mt threshold, RTO reductions for paired midwater trawl vessels are 13.7%, 7.6% for purse seine vessels, 4.3% for SMBT vessels, and 3.3% for single midwater trawl vessels.

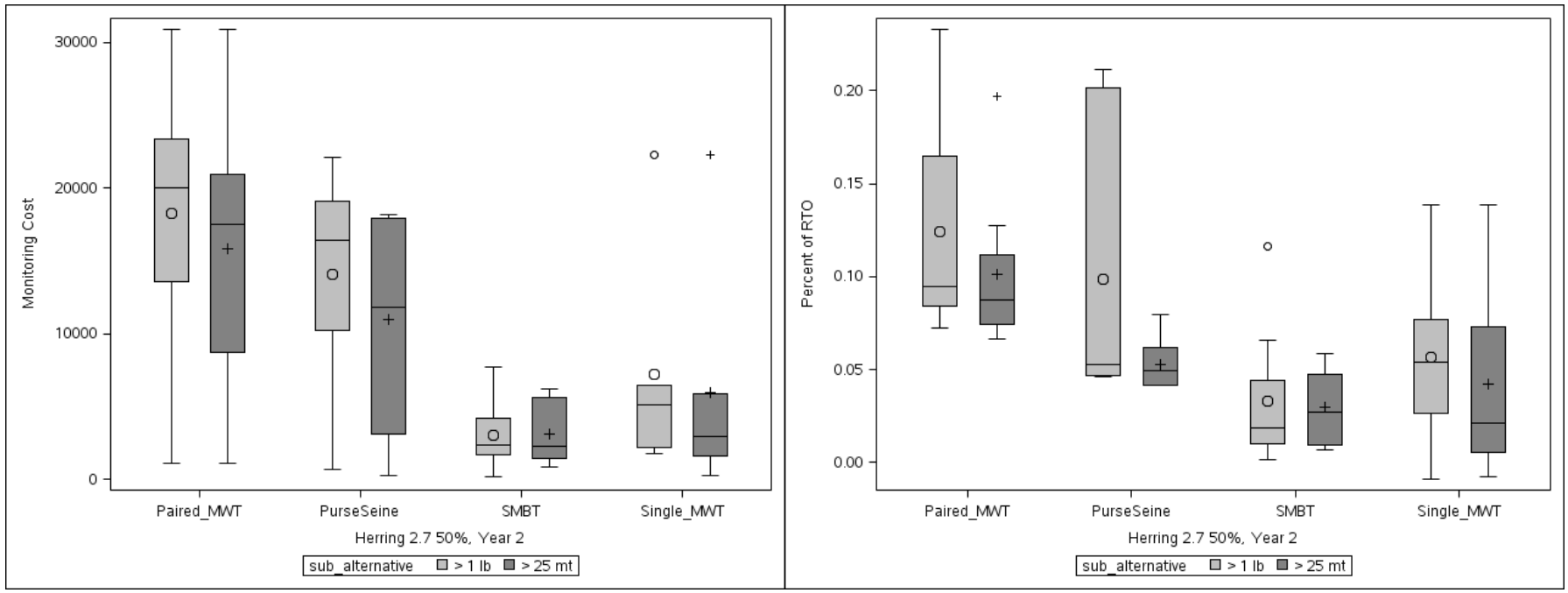


FIGURE 24. HERRING ALTERNATIVE 2.7 50% EM AND PORTSIDE ON ALL VESSELS

50% EM and portside monitoring costs, at both the - lb threshold and the 25-mt threshold, are greatest for paired midwater trawl vessels, followed by purse seine vessels. Single midwater trawl vessels and small mesh bottom trawl vessels have similar levels of monitoring costs. Median costs for the gear types at the 1-lb threshold (light grey bars) is $20,000 for paired midwater trawl vessels, $16,000 for purse seine vessels, $5,000 for single midwater trawl vessels, and $2,000 for SMBT vessels. If a 25-mt

threshold is used (darker grey bars), median costs are $18,000 for paired midwater trawl vessels, $12,000 for purse seine vessels, $3,000 for single midwater trawl vessels, and $2,000 for SMBT vessels.

Percent RTO reductions at the 1-lb threshold is greatest for paired midwater trawl vessels, followed by single midwater trawl vessels, purse seine vessels, and then SMBT vessels. For the 1-lb threshold, the median RTO reduction for paired midwater trawl vessels is 9.5%, while RTO reductions for single midwater trawl vessels are 5.4%, 5.3% for purse seine vessels, and 1.8% for SMBT vessels. At the 25-mt threshold, RTO reductions for paired midwater trawl vessels are 8.8%, 4.9% for purse seine vessels, 2.7% for SMBT vessels, and 2.1% for single midwater trawl vessels.

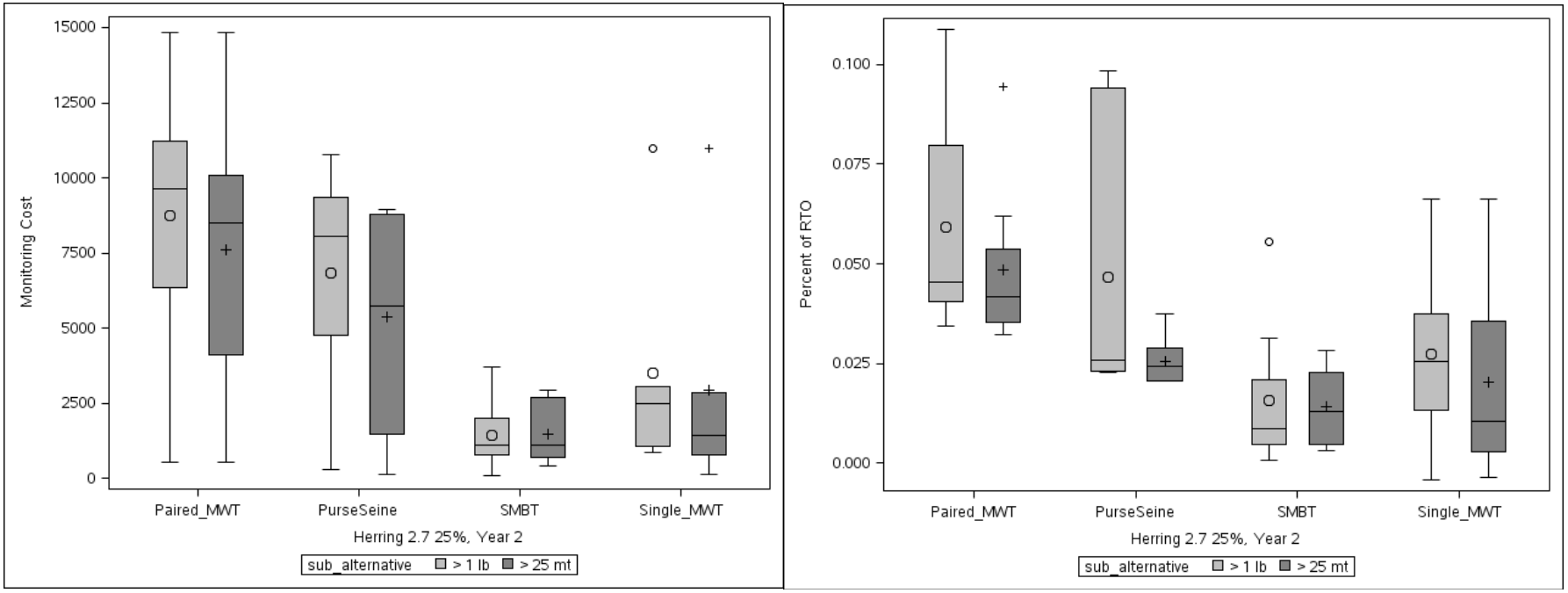


FIGURE 25. HERRING ALTERNATIVE 2.7 25% EM AND PORTSIDE ON ALL VESSELS

25% EM and portside monitoring costs, at both the 1-lb threshold and the 25-mt threshold, are greatest for paired midwater trawl vessels, followed by purse seine vessels. Single midwater trawl vessels and small mesh bottom trawl vessels have similar levels of monitoring costs. Median costs for the gear types at the 1-lb threshold (light grey bars) are $10,000 for paired midwater trawl vessels, $8,000 for purse seine vessels, $2,000 for single midwater trawl vessels, and $1,000 for SMBT vessels. If a 25-mt threshold

is used (darker grey bars), median costs are $8,000 for paired midwater trawl vessels, $6,000 for purse seine vessels, $1,500 for single midwater trawl vessels, and $1,000 for SMBT vessels.

Percent RTO reductions at the 1-lb threshold is greatest for paired midwater trawl vessels, followed by single midwater trawl vessels, purse seine vessels, and then SMBT vessels. For the 1-lb threshold, the median RTO reduction for paired midwater trawl vessels is 4.5%, while RTO reductions for single midwater trawl vessels are 2.5%, 2.6% for purse seine vessels, and 0.8% for SMBT vessels. At the 25-mt threshold, RTO reductions for paired midwater trawl vessels are 4.1%, 2.4% for purse seine vessels, 1.3% for SMBT vessels, and 1.0% for single midwater trawl vessels.

4.2.9 IMPACTS SUMMARY FOR HERRING ALTERNATIVES

TABLE 91. SUMMARY OF OVERALL IMPACTS ASSOCIATED WITH HERRING ALTERNATIVES (*PREFERRED ALTERNATIVES SHOWN IN BOLD*)

Alternatives	Herring Resource	Non-Target Species	Protected Species	Physical Environment	Fishery-Related Businesses and Communities
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	Low Positive	Low Positive	Low Positive	Negligible	Low Positive
Herring Alternative 2: Coverage Target Specified For IFM Programs	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.1: 100% NEFOP-Level Observers Coverage on Category A and B Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**

5.0 CUMULATIVE EFFECTS ANALYSIS

A cumulative effects assessment (CEA) is a required part of an EIS or EA according to the Council on Environmental Quality (CEQ) (40 CFR part 1508.7) and NOAA's agency policy and procedures for NEPA, found in NOAA Administrative Order 216-6. The purpose of the CEA is to integrate into the impact analyses the combined effects of many actions over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective but, rather, the intent is to focus on those effects that are truly meaningful.

This section serves to examine the potential direct and indirect effects of the preferred Herring Alternatives identified in this amendment together with past, present, and reasonably foreseeable future actions that affect the environment related to the herring fishery. It should also be noted that the predictions of potential synergistic effects from multiple actions, past, present and/or future will generally be qualitative in nature.

The regulatory atmosphere within which Federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of biological resources, the physical environment and habitat, and human communities. Consistent with NEPA, the Magnuson-Stevens Act requires that management actions be implemented only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs (except short-term impacts to human communities) from past, present and reasonably foreseeable future actions, when combined with baseline conditions, have generally been positive and are expected to continue in that manner for the foreseeable future. This is not to say that some aspects of the various VECs are not experiencing negative impacts, but rather that when taken as a whole and compared to the level of unsustainable effort that existed prior to and just after the fishery came under management control, the overall long-term trend is positive.

The following analysis will identify and characterize the impact on the environment from the preferred alternatives identified in this amendment when analyzed in the context of other past, present, and reasonably foreseeable future actions. The analysis is generally qualitative in nature because of the limitations of determining effects over the large geographic areas under consideration.

5.1 VALUED ECOSTEM COMPONENTS

Consistent with the guidelines for CEA, cumulative effects can be more easily identified by analyzing the impacts of the propose action on VECs. The affected environment is described in this document based on VECs that were identified for consideration relative to the preferred Herring Alternatives. VECs represent the resources, areas, and human communities that may be affected by alternatives and by other actions that have occurred

or will occur. VECs are generally the "place" where the impacts of management actions are exhibited. An analysis of impacts is performed on each VEC to assess whether the direct/indirect effects of an alternative adds to or subtracts from the effects that are already affecting the VEC from past, present and future actions outside of the proposed action (i.e., cumulative effects).

The Affected Environment is described in this document (Section 3.0). The VECs for consideration in this assessment include:

1. Target Species (Section 3.1.1);
2. Non-Target and Bycatch Species (Section 3.1.2);
3. Physical Environment (Section 3.1.3);
4. Endangered and Other Protected Species (Section 3.1.4); and
5. Human Communities (Section 3.1.5).

Changes to the Atlantic Herring FMP have potential to directly affect the herring resource. Similarly, management actions that would alter the distribution and magnitude of fishing effort for herring could directly or indirectly affect non-target species and other fisheries, which, for the preferred Herring Alternatives, have been identified primarily as haddock, river herring and shad, and Atlantic mackerel. The physical environment VEC focuses on habitat types vulnerable to activities related to directed fishing for herring. The protected resources VEC focuses on those protected species with a history of encounters with the herring fishery. The fishery-related businesses and communities VEC could be affected directly or indirectly through a variety of complex economic and social relationships associated with either target species VEC or any of the other VECs.

The descriptive and analytic components of this document are constructed in a consistent manner. The Affected Environment section is designed to enhance the readers' understanding of the historical, current, and near-future conditions (baselines and trends) in order to fully understand the anticipated environmental impacts of the management alternatives and independent measures under consideration in this management action. The direct/indirect and cumulative impacts of these alternatives and measures are then assessed using a similar structure to that found in the Affected Environment.

The cumulative effects assessment will identify and characterize the impact on the VECs by the alternatives proposed in this document when analyzed in the context of other past, present, and reasonably foreseeable future actions.

5.2 SPATIAL AND TEMPORAL BOUNDARIES

The preferred Omnibus Alternatives identified in this amendment are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and would not directly affect any of the VECs. Any new

industry-funded monitoring program would need to be developed in an amendment to the relevant FMP. For biological resources (target, non-target, and protected resources), there may be indirect low positive benefits associated with standardizing new industry-funded monitoring programs if it improves the quality of the data collected. The preferred Omnibus Alternatives would have negligible impacts on the physical environment because alternatives would not alter fishing behavior or affect fishing regulations. For fishery-related business and human communities, there may be indirect low positive benefits associated with standardizing new industry-funded monitoring programs if it improves the quality of the data collected and helps reduce the cost of monitoring.

The impacts of preferred Herring Alternatives on the herring resource and non-target species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect low positive impacts to the herring resources and non-target species are possible if the increased monitoring associated with preferred Herring Alternatives can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management. However, these preferred Herring Alternatives may lead to direct positive impacts on the herring resource and non-target species if herring fishing effort is limited, by increased information on catch tracked against catch limits, and that increases the reproductive potential of herring and non-target species.

The impacts of preferred Herring Alternatives on the physical environment are expected to be negligible. The impact of the herring fishery on the physical environment is thought to be minimal and temporary. Therefore, the expected impact on the physical environment of increased monitoring in the herring fishery is expected to be negligible under the preferred Herring Alternatives.

The impacts of preferred Herring Alternatives on protected resources are indirect because they affect levels of monitoring rather than harvest specifications. Indirect benefits to protected resources are possible if increased monitoring can improve catch estimates to be incorporated into future stock assessments and improving the available information for protected resources management decisions. The impacts of preferred Herring Alternatives on protected resources are not significant because they would not cause a change in population status.

The impacts of preferred Herring Alternatives on fishery-related businesses and human communities are negative and result from reductions in returns-to-owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue and was used rather than net revenues to more accurately reflect income from fishing trips. Reductions in RTO are related to paying for monitoring coverage. Under Herring Alternative 2.7, the potential reduction in RTO may be up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring in conjunction with portside sampling. Annual returns-to-owner for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. The total annual cost to the herring

fishery is up to $294,999 for Herring Alternative 2.7 and $75,000 for Herring Alternative 2.5.

Indirect positive economic impacts on herring vessels associated with preferred Herring Alternatives may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. Conversely, indirect negative economic impacts on herring vessels associated with preferred Herring Alternatives may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, such that vessels would be less likely be less likely to be able to fully harvest herring sub-ACLs because they were constrained by catch caps.

Because the preferred alternatives are not expected to impact the physical environment or protected resources, the cumulative impacts on the physical environment and protected resources will not be discussed.

The geographic area that encompasses the herring resource, non-target species, and human communities impacts to be considered in the cumulative effects analysis are described in detail in Section 3.0 of this document (Affected Environment).

Overall, while the effects of the historical herring fishery are important and are considered in the analysis, the temporal scope of past and present actions for herring, non-target species, and fishery-related businesses and communities is focused principally on actions that have occurred since 1996, when the Magnuson-Stevens Act was amended and implemented new fisheries management requirements. The temporal scope for herring is focused on the time since the Council's original Herring FMP was implemented at the beginning of the 2001 fishing year. The Atlantic Herring FMP serves as the primary management action for the herring fishery and has helped to shape the current condition of the resource.

The temporal scope of management measures considered in this cumulative impact assessment generally extends ten years into the future for the herring resource, non-target species, and fishery-related businesses and communities. This period was chosen because of the dynamic nature of resource management and lack of specific information on projects that may occur in the future, which make it difficult to predict impacts beyond this time frame with any certainty.

5.3 ANALYSIS OF TOTAL CUMULATIVE EFECTS

A cumulative effects assessment ideally makes effect determinations based on the culmination of the following: (1) impacts from past, present and reasonably foreseeable future actions; plus (2) the baseline condition for resources and human communities (note – the baseline condition consists of the present condition of the VECs plus the combined effects of past, present and reasonably foreseeable future actions); plus (3) impacts from the preferred alternatives.

A description of past, present and reasonably foreseeable future actions is presented in Section 5.4. The baseline conditions of the managed resources and human communities are subsequently summarized in Section 5.5, although it is important to note that quantitative metrics for the baseline conditions are often not available. Finally, a brief summary of the impacts from the preferred alternatives is included in Sections 5.6 and 5.7. The culmination of all these factors is considered when making the cumulative effects assessment.

5.4 PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE ACTIONS

Table 91 (p. 302) summarizes the combined effects of other past, present and reasonably foreseeable future actions that affect the VECs.

Note that most of the actions affecting the VECs related to this action and considered in Table 91 come from fishery-related activities (e.g., Federal fishery management actions). As expected, these activities have fairly straightforward effects on environmental conditions, and were, are, or will be taken, in large part, to improve those conditions. The reason for this is the statutory basis for Federal fisheries management – the reauthorized Magnuson-Stevens Act. That legislation was enacted to promote long-term positive impacts on the environment in the context of fisheries activities. More specifically, the Magnuson-Stevens Act stipulates that management comply with a set of National Standards that collectively serve to optimize the conditions of the human environment. Under this regulatory regime, the cumulative impacts of past, present, and future Federal fishery management actions on the VECs should be expected to result in positive long-term outcomes. Nevertheless, these actions are often associated with offsetting impacts. For example, constraining fishing effort frequently results in negative short-term socio-economic impacts for fishery participants. However, these impacts are usually necessary to bring about the long-term sustainability of a given resource and as such should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon the managed resource.

Non-fishing activities are also considered when determining the combined effects from past, present and reasonably foreseeable future actions. Activities that have meaningful effects on the VECs include the introduction of chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment. These activities pose a risk to the all of the identified VECs in the long term. Human induced non-fishing activities that affect the VECs under consideration in this document are those that tend to be concentrated in near shore areas. Examples of these activities include, but are not limited to agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and, as such, may indirectly constrain the sustainability of the managed resources, non-target species, and protected resources. Decreased habitat suitability would tend to reduce the tolerance of these VECs to the

impacts of fishing effort. Mitigation of this outcome through regulations that would reduce fishing effort could then negatively impact human communities.

5.4.1 ATLANTIC HERRING RESOURCE

Past and Present Actions: Herring management measures were developed in two related, but separate FMPs in 1999 – one by the Council and one by the Atlantic States Marine Fisheries Commission (ASMFC). The status of the herring resource is updated in Section 3.1.1 of this document, and the herring fishery is summarized in Section 3.1.5. of this document. The offshore stock has recovered from its collapse in the early 1970s and, overall, the coastal herring resource is not overfished, and overfishing is not occurring. There is more concern for the inshore stock since it receives more fishing pressure, but the most recent stock assessment (2015) indicates that the herring resource is in a "rebuilt" condition (above the biomass target) and that fishing mortality is well below the overfishing threshold.

The ASMFC manages the Atlantic herring fishery in State waters. The ASMFC adopted Amendment 2 in March of 2006, which revised management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries and required fixed gear fishermen to report herring catches through the IVR program. This action is expected to have low positive impacts on the herring resource by allowing for research funded through research set-asides and increased catch reporting.

The ASMFC also adopted an Addendum in 2010 which modified Amendment 1 and Amendment 2 to the Interstate Fisheries Management Plan for Atlantic Sea Herring by changing the specification setting process and associated definitions. The action is expected to have positive impacts on the herring resource by helping align the ASMFC's and the Council's processes for setting harvest specifications.

The ASMFC adopted Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring in February 2016. The ASMFC adjusted the default closing dates and boundaries of the three inshore spawning areas and allowed for a rollover provision for the fixed gear set-aside. This action is expected to have low positive impacts on the herring resource because it helps to better protect spawning herring.

The Standard Bycatch Reporting Methodology Amendment was implemented in 2007 and revised in 2015. The amendment specified methods and processes to monitor bycatch in Greater Atlantic Region fisheries. This action is expected to have a low positive impact on the herring resource because it improves information on herring discards and may help monitor the impacts of climate change.

Amendment 4 to the Atlantic Herring FMP, in 2011, established provisions for ACLs, set an interim ABC control rule, eliminated JVP, IWP, TALFF and reserve specifications, established provisions for sub-ACLs, and implemented accountability measures. This

action is expected to have positive impacts on the herring resource by ensuring the fishery is sustainably managed using catch limits and accountability measures to prevent harvest overages.

Framework 2 to the Atlantic Herring FMP was implemented by NMFS concurrently with the 2013-2015 Atlantic herring fishery specifications on September 30, 2013. Framework 2 authorizes the Council to split sub-ACLs in all herring management areas seasonally and established a general policy for authorizing annual carryover of unutilized sub-ACL (up to 10%) under specific conditions. In additional to implementing harvest specifications, the 2013-2015 specifications established a new AM to limit catch when 95% of the herring ACL is projected to be reached and lowered the trigger (from 95% to 92% of the sub-ACL) to limit catch in each of the herring management areas. These action are expected to have positive impacts on the herring resource by helping prevent overfishing and supporting sustainable management.

Amendment 5 to the Atlantic Herring FMP was implemented in 2014. Amendment 5 implemented measures for catch reporting, vessel requirements for catch sampling by observers, and slippage restrictions to ensure catch is available for sampling by an observer. This action is expected to have low positive impacts on the herring resource by improving catch reporting and catch sampling.

Framework 4 to the Atlantic Herring FMP became effective in 2016, and built on measures implemented in Amendment 5 to the Atlantic Herring FMP. The action clarified slippage requirements, required slippage to be reported via VMS, and established slippage consequences. This action is expected to have low positive impacts on the herring resource by refining slippage measures to help ensure catch is available to be sampled by an observer.

The 2016-2018 Herring Specifications were effective in 2016. The action set herring harvest limits, as well as river herring/shad catch caps, for the herring fishery. Because the herring ABC was slightly reduced from previous years, based on the 2015 herring stock assessment update, this action is expected to have a positive impact on the herring resource by supporting sustainability.

Reasonably Foreseeable Future Actions: An Omnibus EFH Amendment is likely to be implemented in the foreseeable future (Amendment 3 to the Atlantic Herring FMP). This amendment may increase the protection of benthic habitats and modify the boundaries and access provisions of the Groundfish Closed Areas. This action may have low positive impacts on the herring resource if it increases protection for habitat important to herring and may help negate any negative impacts of climate change.

Amendment 8 to the Atlantic Herring FMP was initiated by the Council in January 2015 to address the need for an ABC control rule for Atlantic herring. The goals for Amendment 8 are to: (1) Account for the role of herring within the ecosystem, including its role as forage; (2) stabilize the fishery at a level designed to achieve optimum yield; and (3) address

localized depletion in inshore waters. This action may have a positive impact on the herring resource if it takes into account the role of herring in the ecosystem when developing an ABC control rule and long-term harvest strategy and may help negate any negative impacts of climate change.

5.4.2 NON-TARGET SPECIES

Past and Present Actions: Updated information about non-target species affected by the herring fishery is provided in Section 3.1.2. of this document. River herring and shad (RH/S) are non-target species of particular concern in the herring fishery. In addition to RH/S, haddock and Atlantic mackerel are other important non-target species encountered in the herring fishery.

The Northeast Multispecies FMP has a multitude of management measures. Past and present actions to the regulated groundfish stocks have created mixed effects, as the combined effects of past actions have decreased effort, improved habitat protection, and implemented rebuilding plans when necessary, but some stocks remain overfished. Overall, the impacts of the FMP on haddock have been mixed, but are currently low positive because the stock is not overfished and overfishing is not occurring.

In 2006, Framework 43 to the Northeast Multispecies FMP established a cap on the amount of herring caught in the herring fishery and prohibited some discarding of haddock. In 2011, Framework 46 adjusted the cap provisions so that they only apply to midwater trawl vessels and created caps for both the Georges Bank and Gulf of Maine haddock stocks. In 2017, Framework 56 increased the cap from 1% of the stock area ABC to 1.5% of the stock area ABC. Overall, the impacts of these actions on haddock have been positive because they improve the accountability for haddock caught in the herring fishery.

The ASMFC adopted Amendment 1 to the FMP for Shad and River Herring in 1998. The amendment included measures to improve data collection and stock assessment capabilities. Amendments 2 and 3 to the Shad and River Herring FMP required approved sustainability plans for any state fishery. Overall, the impacts of the FMP on shad and river herring have been mixed, but would be positive if they help these species no longer be considered depleted.

The Standard Bycatch Reporting Methodology Amendment was implemented in 2007 and revised in 2015. The amendment specified methods and processes to monitor bycatch in Greater Atlantic Region fisheries. This action is expected to have a low positive impact on non-target species because it improves information on non-target species discards and may help monitor the impacts of climate change.

Amendment 5 to the Atlantic Herring FMP was implemented in 2014. Amendment 5 implemented measures for catch reporting, vessel requirements for catch sampling by observers, and slippage restrictions to ensure catch is available for sampling by an

observer. The amendment also expanded the 100% observer coverage requirement aboard midwater trawl vessels fishing in Closed Area I to apply to midwater trawl vessels fishing in any of the Groundfish Closed areas. Lastly, the amendment established provisions for river herring/shad catch caps in the herring fishery. This action is expected to have low positive impacts on non-target species by improving catch reporting and catch monitoring.

Amendment 14 to the Mackerel Squid Butterfish FMP was also implemented in 2014. Like Amendment 5, Amendment 14 implemented measures for catch reporting, vessel requirements for catch sampling by observers, and slippage restrictions to ensure catch is available for sampling by an observer. The amendment also established provisions for river herring/shad catch caps in the mackerel fishery. This action is expected to have low positive impacts on non-target species by improving catch reporting and catch monitoring.

Framework 3 to the Atlantic Herring FMP established catch caps for river herring/shad in the herring fishery. This action is expected to have a positive impact on river herring and shad, because it improves the accountability for river herring and shad caught in the herring fishery. However, the magnitude of that impact is uncertain because caps are not linked to river herring and shad stock status or fishing mortality at this time.

Framework 4 to the Atlantic Herring FMP became effective in 2016, and built on measures implemented in Amendment 5 to the Atlantic Herring FMP. The action clarified slippage requirements, required slippage to be reported via VMS, and established slippage consequences. This action is expected to have low positive impacts on non-target species by refining slippage measures to help ensure catch is available to be sampled by an observer.

The 2016-2016 Herring Specifications were effective in 2016. While this action increased the amount of the river herring/shad catch caps, the resulting caps are still lower than historical river herring and shad catch. This action is expected to have a positive impact on river herring and shad by providing a sufficient incentive for the herring fishery to avoid river herring and shad. However, the magnitude of that impact is uncertain because caps are not linked to river herring and shad stock status or fishing mortality at this time.

In early August 2013, when NMFS published its decision not to list river herring under the ESA, NMFS indicated that it would partner with ASMFC to form a technical expert working group (TEWG). The TEWG is focused on developing a dynamic conservation plan to help restore river herring throughout their range from Canada to Florida, identifying and implementing important conservation efforts, and conducting research to fill in some of the critical data gaps for these species. NMFS plans to continue to coordinate with all of management partners including the Mid-Atlantic and the New England Fishery Management Councils to maximize resources and identify ways to complement ongoing efforts to promote river herring restoration. This action is expected to have low positive impacts on river herring resulting from increased information about threats to river

herring and increased cooperation among management partners to address threats to river herring.

The Mid-Atlantic Unmanaged Forage Omnibus Amendment, implemented in September 2017, restricted the expansion of commercial fisheries for certain forage species. This action included an annual catch limit for Atlantic chub mackerel and possession limits for chub mackerel and other forage species caught within Mid-Atlantic federal waters. This action is expected to have positive impacts on non-target species by help prevent the overharvest of forage species.

Reasonably Foreseeable Future Actions: Implementation of an Omnibus EFH Amendment may increase the protection of benthic habitats and modify the boundaries and access provisions of the Groundfish Closed Areas. This action may have low positive impacts on non-target species if it increases protection for habitat important to non-target species and may help negate any negative impacts of climate change.

Amendment 8 to the Atlantic Herring FMP was initiated by the Council in January 2015 to address the need for an ABC control rule for Atlantic herring. The goals for Amendment 8 are to: (1) Account for the role of herring within the ecosystem, including its role as forage; (2) stabilize the fishery at a level designed to achieve optimum yield; and (3) address localized depletion in inshore waters. This action may have a low positive impact on the non-target species if it results in a more precautionary long-term herring harvest strategy and may help negate any negative impacts of climate change.

Amendment 23 to the Northeast Multispecies FMP was initiated by the Council in 2017. The purpose of Amendment 23 is to implement measures to improve reliability and accountability of catch reporting and to ensure a precise and accurate representation of catch (landings and discards). The amendment will consider alternatives such as electronic monitoring, dockside sampling, and methods to determine total monitoring coverage rate. This action may have a low positive impact on haddock if additional monitoring improves the information for stock assessments and management decisions.

5.4.3 FISHERY-RELATED BUSINESSES AND COMMUNITIES

Past and Present Actions: A general description of fishery-related businesses and communities that may be affected by the proposed action is provided in Section 3.1.5. of this document. Past and present actions described in Section 5.4.1 affecting the herring resource have also affected fishery-related businesses and communities.

The ASMFC manages the Atlantic herring fishery in State waters. The ASMFC adopted Amendment 2 in March of 2006, which revised management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries and required fixed gear fishermen to report herring catches through the IVR program. The ASMFC also adopted an

Addendum in 2010 which modified Amendment 1 and Amendment 2 to the Interstate Fisheries Management Plan for Atlantic Sea Herring by changing the specification setting process and associated definitions. The ASMFC adopted Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring in February 2016. The amendment adjusted the default closing dates and boundaries of the three inshore spawning areas and allowed for a rollover provision for the fixed gear set-aside. In the short-term, these actions are expected to have short-term low negative impacts on fishery-related businesses and communities because of increased reporting requirements and effort reductions. But long-term impacts on fishery-related businesses and communities are expected to be low positive if these measures improve the sustainability of the herring resource.

In 2006, Framework 43 to the Northeast Multispecies FMP established a cap on the amount of herring caught in the herring fishery and prohibited some discarding of haddock. In 2011, Framework 46 adjusted the cap provisions so that they only apply to midwater trawl vessels and created caps for both the Georges Bank and Gulf of Maine haddock stocks. In 2017, Framework 56 increased the cap from 1% of the stock area ABC to 1.5% of the stock area ABC. The impacts of these actions on fishery-related business and communities is expected to be low negative if the haddock measures restrict the fishery's ability to fully harvest the herring ACL.

The ASMFC adopted Amendment 1 to the FMP for Shad and River Herring in 1998. The amendment included measures to improve data collection and stock assessment capabilities. Amendments 2 and 3 to the Shad and River Herring FMP required approved sustainability plans for any state fishery. Overall, the impacts of the Shad and River Herring FMP on fishery-related businesses and communities are expected to be low negative if river herring and shad harvesting opportunities are reduced.

The Standard Bycatch Reporting Methodology Amendment was implemented in 2007 and revised in 2015. The amendment specified methods and processes to monitor bycatch in Greater Atlantic Region fisheries. This action is expected to have a low positive impact on the fishery-related businesses and communities because it improves information on discards and may help ensure the sustainability of fishery resources and harvest opportunities.

Amendment 4 to the Atlantic Herring FMP, in 2011, established provisions for ACLs, set an interim ABC control rule, eliminated JVP, IWP, TALFF and reserve specifications, established provisions for sub-ACLs, and implemented accountability measures. This action is expected to have low negative impacts on fishery-related businesses and communities in the short-term associated with reduced harvesting opportunities, but impacts in the long-term are expected to be low positive if the fishery is sustainably managed using catch limits and accountability measures to prevent harvest overages.

Framework 2 to the Atlantic Herring FMP was implemented by NMFS concurrently with the 2013-2015 Atlantic herring fishery specifications on September 30, 2013. Framework 2 authorizes the Council to split sub-ACLs in all herring management areas seasonally and

established a general policy for authorizing annual carryover of unutilized sub-ACL (up to 10%) under specific conditions. In additional to implementing harvest specifications, the 2013-2015 specifications established a new AM to limit catch when 95% of the herring ACL is projected to be reached and lowered the trigger (from 95% to 92% of the sub-ACL) to limit catch in each of the herring management areas. These actions are expected to have mixed impacts on fishery-related businesses and communities. Low positive impacts are expected to be associated with the ability to carryover unutilized sub-ACLs, while low negative impacts are expected to be associated with the new triggers for AMs to limit catch in the herring fishery.

Amendment 5 to the Atlantic Herring FMP and Amendment 14 to the Mackerel Squid Butterfish FMP were implemented in 2014. These amendments implemented measures for catch reporting, vessel requirements for catch sampling by observers, and slippage restrictions to ensure catch is available for sampling by an observer. These actions are expected to have low negative impacts on businesses operating vessels participating in the herring fishery associated with the increased costs of compliance with catch reporting, catch sampling requirements, and slippage requirements and consequence measures.

Framework 3 to the Atlantic Herring FMP established catch caps for river herring/shad in the herring fishery. This action is expected to have a low negative impact on fishery-related businesses and communities resulting from potentially reduced harvest opportunities associated with the implementation of river herring/shad catch caps.

Framework 4 to the Atlantic Herring FMP became effective in 2016, and built on measures implemented in Amendment 5 to the Atlantic Herring FMP. The action clarified slippage requirements, required slippage to be reported via VMS, and established slippage consequences. This action is expected to have a low negative impact on businesses operating vessels participating in the herring fishery associated with the increased costs of compliance with slippage requirements and consequence measures.

The 2016-2018 Herring Specifications were effective in 2016. The action set herring harvest limits, as well as river herring/shad catch caps, for the herring fishery. This action is expected to have a low negative impact on fishery-related businesses and communities resulting from potentially reduced harvest opportunities associated with a lower ABC and river herring/shad catch caps.

Reasonably Foreseeable Future Actions: Implementation of an Omnibus EFH Amendment may increase the protection of benthic habitats and modify the boundaries and access provisions of the Groundfish Closed Areas. This action may have a low negative impact on fishery-related businesses and communities if increased protection for habitat restricts fishery access.

Amendment 8 to the Atlantic Herring FMP was initiated by the Council in January 2015 to address the need for an ABC control rule for Atlantic herring. The goals for Amendment 8 are to: (1) Account for the role of herring within the ecosystem, including its role as forage;

(2) stabilize the fishery at a level designed to achieve optimum yield; and (3) address localized depletion in inshore waters. This action may have a negative impact on fishery-related businesses and communities if it results in a more precautionary long-term herring harvest strategy and restricts access to inshore areas to minimize localized depletion of herring.

TABLE 92. SUMMARY OF EFFECTS OF PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS ON VECS

VEC	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Atlantic Herring Resource	**Positive** Combined effects of past actions have controlled effort and provided a sustainable fishery with a rebuilt resource	**Positive** Current regulations continue to manage for a sustainable stock and improve monitoring	**Positive** Future actions are anticipated to strive to maintain a sustainable stock and improve monitoring	**Positive** Stock is being managed for sustainability
Non-Target Species	**Low Positive** Combined effects of past actions have decreased effort and reduced incidental catch/bycatch	**Positive** Current regulations continue to decrease effort, reduced incidental catch/bycatch, and improve monitoring	**Positive** Future regulations are being developed to improve monitoring and further address incidental catch/bycatch issues	**Low Positive** Decreased effort and reduced incidental catch/bycatch
Fishery-Related Businesses and Communities	**Mixed** Combined effects of effort reductions and improved monitoring have reduced fishing opportunities	**Mixed** Current regulations continue control effort and improve monitoring in support of sustainable fisheries	**Mixed** Future regulations will likely control effort and improve monitoring, but as stocks improve fishery effort may increase	**Mixed** Continued fisheries management will likely control effort and improve monitoring in support of sustainable fisheries

5.5 BASELINE CONDITIONS

For the purposes of a cumulative effects assessment, the baseline conditions for resources and human communities are considered the present condition of the VECs plus the combined effects of the past, present, and reasonably foreseeable future actions. Table 92 summarizes the added effects of the condition of the VECs and the sum effect of the past,

present and reasonably foreseeable future actions (from Section 5.4 above). The resulting CEA baseline for each VEC is exhibited in the last column (shaded). In general, straightforward quantitative metrics of the baseline conditions are only available for the managed resources, non-target species, and protected resources. The conditions of the habitat and human communities VECS are complex and varied. As such, the reader should refer to the characterizations provided in Section 3.0 of this document (Affected Environment).

TABLE 93. CUMULATIVE EFFECTS ASSESSMENT BASELINE CONDITION OF VECS

VEC	Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 91)	Combined CEA Baseline Conditions
Atlantic Herring Resource	**Positive** - Not overfished and overfishing is not occurring	**Positive –** Stock is being managed for sustainability	**Positive –** Stock is being managed for sustainability
Non-Target Species	**Mixed** - Status of non-target species varies	**Low Positive –** Decreased effort and reduced incidental catch/bycatch	**Low Positive –** Decreased effort and reduced incidental catch/bycatch
Fishery-Related Business and Communities	**Mixed** - Catch has declined, but year to year catch and revenue have been variable	**Mixed** – Although sustainable resources should support future communities and economies, continued effort reductions have had negative impacts on communities	**Negative –** In the short-term, lower revenues would continue until stocks are sustainable **Positive** – In the long-term, sustainable resources should support viable communities and economies

5.6 SUMMARY OF IMPACTS FROM PREFERRED OMNIBUS ALTERNATIVES

There are no direct impacts on biological resources (target, non-target, and protected species), the physical environment, or fishery-related businesses and human communities associated with the preferred Omnibus Alternatives because they are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and do not directly affect fishing effort, fishing operations, amount of fish harvested, or area fished.

Under Omnibus Alternative 2, there is the potential for an indirect low positive impacts on biological resources associated with establishing standardized industry-funded monitoring service provider requirements. Standardized provider requirements may lead to greater consistency in the information collected about target, non-target, and protected species through industry-funded monitoring programs. Improved catch information resulting from greater consistency in how information is collected may lead to better management of biological resources.

Omnibus Alternative 2 may provide an indirect low positive impact on biological resources if the prioritization process increases the likelihood that available Federal funding would be used to support industry-funded monitoring programs. Additionally, Omnibus Alternative 2.2 may have the greatest potential for indirect low positive impacts to biological resources because it would provide the discretion to prioritize available Federal funding towards industry-funded monitoring programs that improve information about specific target, non-target, and protected species.

In the future, if the Council developed an IFM program for a particular FMP, there would be direct negative economic impacts to fishing vessels resulting from the standardized cost responsibilities included in Omnibus Alternative 2, provided there was available Federal funding to support that IFM program and vessels were required to pay for increased monitoring. However, any direct negative economic impacts to fishing vessels resulting from a future IMF program would be evaluated in the amendment to establish that IFM program and are not considered in this amendment.

There may be indirect low positive economic impacts associated with standardizing a process to develop new industry-funded monitoring programs on fishery-related business and communities resulting from Omnibus Alternative 2 if standardizing that process increases the potential for improved management.

Under Omnibus Alternative 2, there is a potential for indirect low positive economic impacts associated with the establishment of standardized IFM service provider requirements. If standardized service provider requirements leads to greater consistency in the information collected by industry-funded monitoring programs, that may lead to better management of biological resources, which may eventually lead to higher harvest levels.

Establishing standardized cost responsibilities under Omnibus Alternative 2 may have low positive economic impacts if it provides the industry with information to better understand and plan for their industry-funded monitoring cost responsibilities, as well as negotiate better contracts with service providers, which may ultimately reduce the dollar amount associated with industry cost responsibilities.

Lastly, Omnibus Alternative 2.2 may have the greatest potential for indirect low positive impacts on businesses and communities because it may help align available Federal funding with the Council's monitoring priorities. Improved catch information that results from the opportunity to align funding with the most critical industry-funded monitoring programs may lead to better management of biological resources, which may eventually lead to higher harvest levels.

TABLE 94. SUMMARY OF IMPACTS OF OMNIBUS ALTERNATIVES

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 1: No Standardized Industry-Funded Monitoring Programs (No Action)	Low negative impact related to allocating funding to IFM programs on a case-by-case basis, rather than evaluating funding across FMPs	Low negative impact related to continued uncertainty about catch rates that may lead to overly cautious management
Alternative 2: Standardized Industry-Funded Monitoring Programs (Action Alternative)	**Negligible impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**	**Low positive impact related to standardized cost responsibilities and process for future IFM programs implemented via amendment and revised via framework** **Low positive impact related to standardized service provider requirements and process to prioritize funding for monitoring**
Alternative 2.1: NMFS-Led Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities

Alternatives	Impacts on Biological Resources	Impacts on Fishery-Related Businesses and Communities
Alternative 2.2: Council-Led Prioritization Process	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**	**Low positive impact related to process to prioritize funding for IFM programs across FMPs** **Allows an evaluation of program need/design when assigning priority and ability to align funding with Council priorities**
Alternative 2.3: Proportional Prioritization Process	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.4 and 2.5: Coverage Ratio-Based Prioritization Processes	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities	Low positive impact related to process to prioritize funding for IFM programs across FMPs Does not allow an evaluation of program need/design when assigning priority and ability to align funding with Council priorities
Alternative 2.6 Monitoring Set-Aside	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**	**Negligible impact related to standardized process for monitoring set-asides implemented via framework**
Impacts to physical environment are not described in this table because they are negligible. These alternatives will not alter fishing behavior or directly impact fishing regulations (gears used or areas fished).		

5.7 SUMMARY OF IMPACTS FROM PREFERRED HERRING ALTERNATIVES

The impacts of preferred Herring Alternatives on biological resources (herring resource, non-target species, and protected species) are indirect because they affect levels of monitoring rather than harvest specifications.

Indirect low positive impacts to biological resources are possible if the increased monitoring associated with Herring Alternatives 2.5 and 2.7 can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management. However, these preferred Herring Alternatives may lead to direct positive impacts on biological resources if herring fishing effort is limited, by increased information on catch tracked against catch limits, leading to increased reproductive potential of the herring resource and non-target species and reduced interactions between the herring fishery and protected species.

Because additional monitoring under Herring Alternative 2.5 is confined to the Groundfish Closed Areas, a low positive biological impact is likely because the area with 100% observer coverage is limited. The 50% coverage associated with Herring Alternative 2.7 is expected to have low positive impacts on the herring resource and non-target species (haddock and river herring and shad) if the uncertainty around catch track against catch caps is reduced.

Sub-Options 1 and 2 have the potential for low negative impacts on biological resources if additional coverage is waived. Sub-Option 5 also has the potential for a low negative impact on the herring resource and non-target species. A low negative impact is possible if the disconnect between vessels with additional monitoring (trips greater than 50 mt of herring) and trips subject to fishery catch caps (trips greater than either 1 lb of herring or 6,600 lb of herring) if it biases data used to track catch against catch caps.

The impacts of these preferred Herring Alternatives on biological resources are not significant because they would not cause any biological resource to become overfished, would not result in overfishing, and/or would not cause a change in population status.

The impacts of preferred Herring Alternatives on the physical environment are expected to be negligible. The impact of the herring fishery on the physical environment is thought to be minimal and temporary. Therefore, the expected impact on the physical environment of increased monitoring in the herring fishery is expected to be negligible under Herring Alternatives 2.5 and 2.7.

If fishing effort is limited, by increased information on catch tracked against catch limits, and there are few interactions between fishing gear and the physical environment, there is the potential for a positive impact on the physical environment associated with the preferred Herring Alternatives. However, the magnitude of any potential positive impact is low because the herring fishery has only minimal and temporary impacts on the environment.

The impacts of preferred Herring Alternatives on fishery-related businesses and human communities are negative and result from reductions in returns-to-owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue and was used rather than net revenues to more accurately reflect income from fishing trips. Reductions in RTO are related to paying for monitoring coverage. Under Herring Alternative 2.7, the potential reduction in RTO may be up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring in conjunction with portside sampling. Annual returns-to-owner for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. The total annual cost to the herring fishery is up to $294,999 for Herring Alternative 2.7 and $75,000 for Herring Alternative 2.5.

Because midwater trawl vessels average more sea days than other gear types, midwater trawl vessels have a greater negative economic impact associated with paying for

monitoring coverage, followed by purse seine vessels, and small mesh bottom trawl vessels.

Sub-Options 1 and 2 have the potential to reduce monitoring costs for herring vessels if coverage is waived. Sub-Option 5 would eliminate monitoring costs for vessels that always land less than 50 mt of herring on a trip. Additionally, Sub-Option 5 may reduce monitoring costs for vessels than often land less than 50 mt of herring on a trip. There benefits will vary with gear type. Small mesh bottom trawl vessels and single midwater trawl vessels take the most trips that land less than 50 mt of herring, 81% and 60%, respectively, followed by purse seine vessels (33% of trips) and paired midwater trawl vessels (13% of trips).

Indirect positive economic impacts on herring vessels associated with preferred Herring Alternatives may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs.

Conversely, indirect negative economic impacts on herring vessels associated with preferred Herring Alternatives may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, such that vessels would be less likely be less likely to be able to fully harvest herring sub-ACLs because they were constrained by catch caps.

TABLE 95. SUMMARY OF IMPACTS OF HERRING ALTERNATIVES

Alternatives	Herring Resource	Non-Target Species	Protected Species	Physical Environment	Fishery-Related Businesses and Communities
Herring Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	Low Positive	Low Positive	Low Positive	Negligible	Low Positive
Herring Alternative 2: Coverage Target Specified For IFM Programs	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.1: 100% NEFOP-Level	Low Positive	Low Positive	Low Positive	Negligible	Negative

Alternatives	Herring Resource	Non-Target Species	Protected Species	Physical Environment	Fishery-Related Businesses and Communities
Observers Coverage on Category A and B Vessels					
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.4: EM and Portside Sampling on Midwater Trawl Fleet	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet Fishing in Groundfish Closed Areas	Low Positive	Low Positive	Low Positive	Negligible	Negative
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**Low Positive**	**Low Positive**	**Low Positive**	**Negligible**	**Negative**

5.8 CUMMULATIVE EFFECTS SUMMARY

Tables 93 and 94 in the previous sections provide a summary of likely impacts associated with the Omnibus and Herring Alternatives considered in this amendment. Impacts are listed as positive, negative, or negligible. Impacts listed as negligible include those alternatives that have no impact or have a negligible impact (either positive or negative).

The cumulative effect is the sum of the cumulative effects baseline plus the impacts from the preferred Omnibus and Herring Alternatives. When an alternative has a positive effect on a VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with the "other" actions that were also designed to increase stock size. In contrast, when an alternative has a negative effect on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the "other" actions. The resultant positive and negative cumulative effects are described below for each VEC.

The significance criteria that would apply to a VEC requires the consideration of whether or not the preferred Omnibus and Herring Alternatives are reasonably expected to jeopardize the sustainability of a VEC and whether or not the preferred Omnibus and Alternatives are expected to result in cumulative adverse impacts with a substantial effect on a VEC.

Herring Resource

Sections 4.1.2 and 4.2.3 describe the impacts of the preferred alternatives on the herring resource. The preferred Omnibus Alternatives are administrative and unlikely to contribute to cumulative impacts. Overall, past and present impacts of other actions on the herring resource are considered positive as the herring resource is not overfished and overfishing is not occurring. In general, cumulative impacts on the herring resource follow a positive trend as management supports a sustainable herring population. The preferred Herring Alternatives will have a minimal impact on this cumulative positive trend given their indirect positive impacts associated with providing additional data for management purposes.

Non-Target Species

Sections 4.1.2 and 4.2.4 describe the impacts of the preferred alternatives on non-target species. The preferred Omnibus Alternatives are administrative and unlikely to contribute to cumulative impacts. Overall, past and present impacts of other actions on non-target species are mixed as the status of non-target species varies. In general, cumulative impacts on non-target species follow a low positive trend as management has decreased fishing effort to reduce incidental catch/bycatch of non-target species. The preferred Herring Alternatives will have a minimal impact on this cumulative low positive trend given their indirect positive impacts associated with providing additional data for management purposes.

Fishery-Related Businesses and Communities

Sections 4.1.4 and 4.2.8 describe the impacts of the preferred alternatives on the fishery-related businesses and communities. The preferred Omnibus Alternatives are administrative and unlikely to contribute to cumulative impacts. Overall, past and present impacts of other actions on fishery-related businesses and communities are mixed. Management efforts to support sustainable fisheries have led to effort reductions that have had negative impacts on communities. In general, cumulative impacts on fishery-related businesses and communities follow a mixed trend. In the short-term, the cumulative impacts trend is negative with lower revenues continuing until stocks are sustainable. In the long-term, the cumulative impacts trend is likely positive as sustainable resources should support viable fishery-related businesses and communities. The preferred Herring Alternatives will help contribute to mixed cumulative trends given the negative impact associated with paying for additional monitoring and the indirect benefit of providing additional data for management purposes.

6.0 OTHER APPLICABLE LAWS

6.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

National Standards

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act requires that fishery management plans (FMPs) contain conservation and management measures that are consistent with ten National Standards:

In General. – Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the…national standards for fishery conservation and management.

The preferred Omnibus Alternatives identified in this amendment do not propose to modify any of the management measures previously implemented, which were found in compliance with all National Standards of the Magnuson-Stevens Act, under the New England FMPs to be amended through this action. The Omnibus Alternatives are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and do not directly affect fishing effort or amount of fish harvested. They facilitate the establishment of future monitoring programs in a manner that is consistent with the National Standards. For example, the prioritization process takes into account the need to develop monitoring programs that may adjust coverage levels, according to available funding, that meet FMP objectives, while ensuring they still meet National Standard requirements. Likewise, the cost responsibilities component of the Omnibus Alternatives does not change existing cost responsibilities, but ensures cost responsibilities in future monitoring programs are consistent with existing programs. Because the Omnibus Alternatives do not change measures that are consistent with the National Standards and establish a process that ensures consideration of and consistency with the National Standards, they are consistent with the National Standards and not addressed specifically below.

The Herring Alternatives affect levels of monitoring. They may indirectly affect fishing behavior or harvest specifications, but they are not expected to have any direct impacts on biological resources or the physical environment. The Herring Alternatives are expected to have direct economic impacts on fishery-related businesses and human communities. Because the preferred Herring Alternatives include measures that change the operation of the fishery and affect businesses and communities, they are discussed below in relation to each National Standard.

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The preferred Herring Alternatives may in increase monitoring and that may improve management of the fishery and provide a better opportunity for achieving optimum yield. Increased monitoring may provide more accurate catch information that could reduce uncertainty of catch tracked against catch limits. Increased monitoring may also generate more information for stock assessments, thereby potentially improving the accuracy of catch limits. Reduced uncertainty around catch limits should provide for better gauging of the amount of fishing effort that prevents overfishing while achieving optimum yield. For example, increased monitoring of haddock and river herring and shad catch may help reduce uncertainty in estimates of catch that is tracked against catch caps, when that uncertainty may have otherwise led to effort restrictions in the herring fishery. Conversely, additional monitoring may illustrate higher than expected catch of haddock and river herring and shad, resulting in catch caps that are fully harvested earlier than expected and reduced opportunities to harvest herring.

(2) Conservation and management measures shall be based upon the best scientific information available.

All information, data, and analyses within this document are based upon the best scientific information available, to the maximum extent practicable. Qualitative discussion is provided in cases where quantitative information was unavailable.

The initial analysis of economic impacts of preferred Herring Alternatives on the herring industry was based on trip cost data collected by NMFS and showed the economic impact of the alternatives on vessel net revenues (gross revenues less certain trip costs). Because NMFS only collects a limited amount of cost data, industry participants expressed concern that an analysis of net revenues underestimated vessel costs. In response, Jason Didden, staff of the Mid-Atlantic Fishery Management Council, offered to coordinate a survey of herring and mackerel vessels to collect more detailed cost information.

The survey requested information from vessel owners on total trip costs in 2014. The cost survey collected information on variable costs; payments to crew; the cost of repairs, maintenance, upgrades; and fixed costs. These data were used to update the impact analyses. To profile vessels, data were averaged across vessel types, by vessel characteristics, and by primary species caught. The cost profiles of vessels, as adjusted by the estimated industry cost responsibilities of each herring coverage target alternative, were used to describe the economic impact on herring vessels. Economic impacts are described at an annual level. Surveys were sent to approximately 18 vessel owners (representing about 26 vessels) in the herring and/or mackerel fisheries. Surveys were sent in May 2015 and information was submitted for 16 of the 26 vessels. A copy of the survey is included in Appendix 9.

Analysis of the economic impact of preferred Herring Alternatives on fishery-related businesses compared industry cost responsibilities to 2014 herring vessel returns-to owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue and was used rather than net revenues to more accurately reflect income from fishing trips. RTO is similar to net income from a financial income statement. Other financial statement approaches, such as a balance sheet or a cash flow statement, are not used. These approaches consider other financial aspects of a business, such as total assets and liabilities and the ability to cover expenses within a particular time frame. Principal payments on loans, which matter from a balance sheet and cash flow perspective, are not typically sued in the calculation of RTO/net income. Depreciation of capital assets is typically part of a RTO/net income calculation. In this analysis, depreciation of vessel improvements is included but the depreciation of the vessel is not included because that information was not collected in the survey.

(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Atlantic herring is managed as a unit throughout its range. The impacts of preferred Herring Alternatives on the herring resource and non-target species are indirect because they affect levels of monitoring rather than harvest specifications. Indirect low positive impacts to the herring resource and non-target species are possible if the increased monitoring associated with Herring Alternatives 2.5 and 2.7 can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management.

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The negative economic impacts of preferred Herring Alternatives are fairly and equitably distributed across participants in the herring fishery in a manner reasonably calculated to promote conservation. Herring Alternative 2.7 affects vessels with a Category A or B herring permits and Herring Alternative 2.5 affects vessels that use midwater trawl gear and fish in Groundfish Closed Areas. These permit categories and Closed Area requirements reasonably reflect current fishery conditions and are designed to meet conservation goals. Participants in the herring fishery whose vessels have Category A or B herring permits or use midwater trawl gear are distributed throughout the range of the herring fishery from Maine to New Jersey. The increased monitoring associated with Herring Alternatives 2.5 and 2.7 may reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management. No individual, corporation, or other entity receives an excessive share of any fishing privilege through this action.

(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The Herring Alternatives considered efficient utilization of fishery resources. Monitoring requirements are applied to permit categories that harvest the majority of available catch. The increased monitoring is designed to provide more accurate information that could lead to improved, more efficient management. The 50% coverage target selected by the Council for vessels with a Category A or B herring permit provides for the benefits of collecting additional information on biological resources while minimizing industry cost responsibilities, especially when compared to non-preferred coverage targets of 100% and 75%. The preferred Herring Alternatives would allow vessels owners to choose electronic monitoring, to the extent that it is suitable for the fishery and cost-effective. The monitoring requirements include waivers when coverage is not available or logistically impossible. Efficiency was also considered when requiring monitoring on trips only if a threshold amount of catch is intended to be harvested by a vessel. This targets coverage on higher volume trips, thereby covering trips with more catch and minimizing or removing costs on lower volume trips. These measures more efficiently focus monitoring resources rather than covering all trips regardless of amounts intended to be harvested. Efficient utilization of monitoring resources was also considered when the Council chose to calculate herring coverage targets by combining SBRM and industry-funding monitoring coverage. Because the coverage target is calculated by combining SBRM and industry-funded coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. This increases efficiency by reducing the cost of industry-funded coverage and minimizing unnecessary duplication.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The preferred Herring Alternatives take into account variations and contingencies in this fishery by adapting coverage levels to available funding or logistics and allowing vessels to choose electronic monitoring and portside sampling coverage, if it is suitable for the fishery and depending on a vessel owner's preference. Also, one of the preferred Herring Alternatives, Sub-Option 4, would require the Council to revisit the preferred Herring Alternatives two years after implementation and evaluate whether changes to management measures are necessary. This requirement to evaluate the impacts of increased monitoring in the herring fishery takes into account and allows for variations and contingencies in the fishery, fishery resources, and catches.

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

When selecting preferred Herring Alternatives, the Council weighed the value of additional monitoring against the industry's costs associated with additional monitoring. Herring Alternative 2.5 does not implement any new requirements on the herring fishery. Rather it maintains an existing requirement for 100% observer coverage on midwater trawl vessels fishing inside of Groundfish Closed Areas, but allows vessels to purchase observer coverage to access Groundfish Closed Areas. The 50% coverage target selected by the Council for vessels with a Category A or B herring permit provides for the benefits of collecting additional information on biological resources while minimizing industry cost responsibilities, especially when compared to non-preferred coverage targets of 100% and 75%.

Exempting trips that land less 50 mt of herring (Sub-Option 5) from industry-funded monitoring costs has the potential greatly reduce industry-funded monitoring costs. Sub-Option 5 would eliminate monitoring costs for vessels who always land less than 50 mt of herring and Sub-Option 5 may substantially reduce monitoring costs for particular gear types. Based on past performance, small mesh bottom trawl vessels landed less than 50 mt of herring on 81% of trips. Similarly, 60% of trips landed less than 50 mt of herring. Sub-Option 5 is likely to benefit paired midwater trawl and purse seine vessels less. Only 13% of paired midwater trawl trips landed less than 50 mt of herring and only 33% of purse seine trips landed less than 50 mt of herring.

The Council recommended that herring coverage targets be calculated by combining SBRM and industry-funding monitoring coverage. NMFS would determine how to calculate the combined coverage target, in consultation with Council staff. Because the coverage target is calculated by combining SBRM and IFM coverage, a vessel would not have SBRM coverage and industry-funded coverage on the same trip. The Council recommended these combined coverage targets to help reduce the cost of industry-funded coverage and to minimize unnecessary duplication.

(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

As described previously, when selecting preferred Herring Alternatives, the Council weighed the value of additional monitoring against the industry's costs associated with additional monitoring. Additional monitoring is expected to reduce the uncertainty around catch estimates in the herring fishery to help improve the tracking of catch against catch limits and, ultimately, to help improve management. Improving management has the potential to provide for the sustained participation of fishing communities in the herring fishery. The Council also selected measures to minimize adverse economic impacts associated with industry-funded monitoring on the fishing industry and communities, such as a 50% coverage target, exempting trips that land less than 50 mt of herring from industry-funded monitoring, and combined coverage targets.

In an effort to provide the herring fishing industry and associated communities with flexibility in meeting industry-funded monitoring requirements, the Council recommended that vessels with Category A or B herring permits would be able to choose either at-sea monitoring coverage or electronic monitoring and portside sampling coverage. This flexibility is expected to help minimize adverse economic impacts associated with industry-funded monitoring.

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The impacts of preferred Herring Alternatives on biological resources are indirect because they affect levels of monitoring rather than harvest specifications or gear requirements. Any additional monitoring resulting from the preferred Herring Alternatives may inform bycatch accounting and methods to avoid bycatch.

(10)Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The preferred Herring Alternatives affect levels of monitoring, rather than fishing effort or fishing behavior, so these alternatives are not expected to impact the safety of human life at sea. When selecting preferred Herring Alternatives, the Council weighed the value of additional monitoring against the industry's costs associated with additional monitoring. While the preferred Herring Alternatives would not have any direct impact on safety at sea, the preferred alternatives may affect the amount of income that would be available to maintain the seaworthiness of fishing vessels.

Under Herring Alternative 2.7, industry-funded monitoring on vessels with Category A or B herring permits has the potential to reduce annual RTO up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring and portside sampling. Under Herring Alternative 2.5, annual RTO for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. These potential reductions in RTO may contribute to vessels being less seaworthy if vessels are not maintained because of reduced income.

Other Required Provisions of the Magnuson-Stevens Act

Section 303 of the Magnuson-Stevens Fishery Conservation and Management Act contains 14 additional required provisions for FMPs, which are discussed below. Any FMP prepared by any Council, or by the Secretary, with respect to any fishery, shall:

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the National Standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

The Atlantic Herring FMP, modified through a number of amendments and framework adjustments, includes a comprehensive set of conservation and management measures applicable to U.S. fishing vessels which are necessary and appropriate for the conservation and management of the fishery to prevent overfishing, and to protect, restore, and promote the long-term health and stability of the herring fishery.

The original Atlantic Herring FMP (1999) provided the Magnuson-Stevens Act requirement to consider the total allowable level of foreign fishing (TALFF) when domestic fishing capacity is not adequate. Generally, foreign fishing for the herring resource is considered during the fishery specifications process when optimal yield (OY) is determined and the management area sub-ACLs are established for a fishing year. In previous specifications for the herring fishery, the Council would specify OY for herring and then consider a domestic annual harvest (DAH) specification. If, at any point in this process, DAH is not adequate to utilize the available OY, then TALFF would be specified. During recent fishing years, however, the domestic herring fleet has been shown to have the capacity to fully utilize DAH. As a result, the Council eliminated the need to annually consider TALFF in Amendment 4 to the Atlantic Herring FMP. However, eliminating the need to specify TALFF annually does not eliminate the legal requirement under the MSA to provide TALFF if DAH is not adequate.

The preferred Herring Alternatives identified in this amendment would not have any direct impacts on existing conservation or management measures in the Atlantic Herring FMP necessary for conservation and management of the herring resource or the herring fishery.

The impacts of preferred Herring Alternatives on the herring resource are indirect because they affect levels of monitoring rather than harvest specifications. Indirect low positive impacts to the herring resource are possible if the increased monitoring associated with Herring Alternatives 2.5 and 2.7 can reduce uncertainty of catch tracked against catch limits and generate more information for stock assessments and improve management.

However, these preferred Herring Alternatives may lead to direct positive impacts on the herring resource and non-target species if herring fishing effort is limited, by increased information on catch tracked against catch limits, and that increases the reproductive potential of the herring resource and non-target species.

The preferred Herring Alternatives would have direct negative impacts on herring vessels associated with industry-funded monitoring requirements. Indirect positive impacts on herring vessels may result if additional monitoring leads to less uncertainty around catch, improved management, and, ultimately, higher herring harvest limits. Indirect negative economic impacts on herring vessels associated with preferred Herring Alternatives may result if additional monitoring illustrates higher than expected catch of haddock and river herring and shad, such that vessels would be less likely to be able to fully harvest the herring optimum yield because they were constrained by catch caps.

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

The information required by this provision can be found in Section 3.0 of this document as well as in the 2016-2018 Herring Specifications. This document includes herring stock and fishery information through the 2014 fishing year when available. A thorough description of the herring analysis regarding the catch information methods, fishing gear used, species of fish involved and their location, costs incurred in management, and actual and potential revenues from the fishery can be found in the 2016-2018 Herring Specifications.

Herring vessels primarily use purse seines, single midwater trawls, midwater pair trawls, or small mesh bottom trawls for fishing gear, with the midwater trawl fleet (single and paired) harvesting the majority of landings in recent years, with over hundred million dollars in revenue.

Aside from the importance of herring as a forage species in the Northwest Atlantic and the use of herring as bait, both of which are considered in the 2016-2018 Herring Specifications, there is no recreational interest in the herring fishery. Currently, there is neither foreign fishing for herring, nor are there any Indian treaty rights related to the herring fishery.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

The preferred Herring Alternatives in this amendment only affect monitoring levels, not harvest levels.

The present and probable future condition of the herring resource and estimates of maximum yield were updated through the most recent herring operational stock assessment in April 2015. Information related to the herring stock assessment and updated biological reference points are summarized in the 2016-2018 Herring Specifications.

The 2016-2018 Herring Specifications describe that the optimal yield should be less than or equal to acceptable biological catch minus the management uncertainty buffer, which accounts for expected catch of herring in the Canadian New Brunswick weir fishery.

(4) assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

The preferred Herring Alternatives in this amendment only affect monitoring levels, not harvest levels. This provision relates directly to the herring fishery specification process and is addressed when the Council develops the specifications for the herring fishery, including OY, Domestic Annual Processing, and Domestic Annual Harvesting (DAH). Information related to DAP and DAH is described in the 2016-2018 Herring Specifications.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

Regulations implemented through the Atlantic Herring FMP apply to all federally-permitted herring vessels and dealers. Reporting requirements for the herring fishery are addressed in the Atlantic Herring FMP and its related amendments and framework adjustments, Frameworks 43 and 46 to the Northeast Multispecies FMP (haddock catch cap for the herring fishery), and the 2011 herring rulemaking by NMFS to clarify reporting and implement VMS reporting for limited access herring vessels. All limited access herring vessels are required to utilize a VMS for reporting and enforcement purposes and open access vessels are required to report catch via an interactive voice recording. There is no direct recreational component to the fishery, however it is recognized that herring is an important resource as bait throughout the businesses and communities. Data regarding the type and quantity of fishing gear used, catch by species, areas fished, season, sea sampling hauls, and domestic harvesting/processing capacity are described in Section 3.0 of this document and in the 2016-2018 Herring Specifications.

(6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

The preferred Herring Alternatives identified in this amendment does not alter any adjustments made in the Atlantic Herring FMP that address opportunities for vessels that would otherwise be prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fisheries. The safety of fishing vessels and life at-sea is a high priority issue for the Council and was considered throughout the development of the Atlantic Herring FMP.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Essential fish habitat was identified for herring in the Atlantic Herring FMP and has been addressed through all subsequent related management actions in a manner that is consistent with the Magnuson-Stevens Act. This document provides a description of the physical environment and essential fish habitat in Section 3.1.3 and evaluates the impacts of the preferred Herring Alternatives and other Herring Alternatives considered on essential fish habitat in Section 4.2.5. The preferred Herring Alternatives are expected to have negligible impacts on the Physical Environment and essential fish habitat.

(8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

The Amendment 5 to the Atlantic Herring FMP provides an updated list of data and research needs with respect to the herring fishery and its management program. Included are general research needs as well as those specific to cooperative research and improving information about the importance of herring as a forage species in the Northwest Atlantic ecosystem. These data and research needs will be reviewed and updated again as part of the next major herring management action.

Preferred Herring Alternatives identified in this amendment would increase monitoring the herring fishery. Data that would be collected includes: Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations); tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends); all retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition); actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling; length data on retained and discarded catch; information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on-- (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

The Council developed this amendment in consultation with the Mid-Atlantic Fishery Management Council. A description of fishery participants and fishing communities is included in Section 3.0 of this document. The fishery impact statement for this amendment, describing the direct and indirect impacts of Preferred Herring Alternatives on fishery participants and fishing communities, is contained in Section 4.0 of this document.

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

The status determination criteria for herring were established in the original Atlantic Herring FMP and are further addressed in Amendment 4 to the Atlantic Herring FMP. Objective and measurable criteria for determining when the fishery is overfished, including an analysis of how the criteria were determined, can be found in the original Atlantic Herring FMP based on a report from the Council's Overfishing Definition Review Panel (1998). Included in the status determination criteria (overfishing definition) is a rebuilding program (control rule) if the stock ever becomes overfished. The preferred Herring Alternatives identified in this amendment would not modify existing status determination criteria.

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority-- (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided;

The first Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment was implemented in February 2008. That amendment addressed the requirements of the Magnuson-Stevens Act to include standardized bycatch reporting methodology in all FMPs of the New England and Mid-Atlantic Fishery Management Councils. The SBRM can be viewed as the combination of sampling design, data collection procedures and analyses used to estimate bycatch and allocate observer coverage across multiple fisheries. In response to litigation on the first SBRM Amendment, NMFS and the New England and Mid-Atlantic Fishery Management Councils developed a new omnibus amendment to ensure consistency with Magnuson-Stevens Act requirements for a standardized bycatch reporting methodology. The revised SBRM Amendment was implemented in 2015.

The preferred Herring Alternatives identified in this amendment would not modify existing provisions for SBRM. The impacts of preferred Herring Alternatives on biological resources are indirect because they affect levels of monitoring rather than harvest specifications or gear requirements. Any additional monitoring resulting from the preferred Herring Alternatives may inform bycatch accounting and methods to avoid bycatch.

(12) assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

There is no direct recreational component to the herring fishery, however it is recognized that herring is an important resource as bait for businesses and communities. The preferred Herring Alternatives identified in this amendment do not address recreational fishing regulations.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

A description of the participants in the herring fishery is included in Section 3.0 of this document and in the 2016-2018 Herring Specifications. Section 3.0 includes data for herring vessels, processors, dealers, communities, and information about industries and other sectors that are dependent on herring (lobster, tuna, ecotourism, recreational, other). It updates all available information about the fishery and characterizes trends through the 2014 fishing year wherever possible. Outside of the consideration of herring as a forage species in the Northwest Atlantic ecosystem and the use of herring as bait, there is no specific recreational interest in the fishery.

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.

The 2015 herring operational assessment evaluated status determination criteria and updated biological reference points for the herring stock complex. According to the best available scientific information, the herring stock is not in an overfished condition and overfishing is not occurring. Therefore, the herring stock is considered to be rebuilt at this time. The status of the herring stock was considered when the 2016-2018 Herring Specifications were developed. A rebuilding plan and/or other conservation and management measures to reduce the overall harvest in the fishery are not necessary at this time.

(15) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

Amendment 1 to the Atlantic Herring FMP implemented a multi-year specifications process for the Atlantic herring fishery (completed every three years). Amendment 4 to the Atlantic Herring FMP implemented changes to the herring fishery specifications process to comply with the new ACL/AM provisions adopted in the MSA. Future Council actions will continue to address the mechanism for specifying ACLs and the need to ensure accountability in the fishery.

The 2016-2018 Herring Specifications implemented multi-year ACLs and sub-ACLs at a level such that overfishing of the herring resource is not expected to occur. The preferred Herring Alternatives identified in this amendment would increase monitoring in the herring fishery and may reduce the uncertainty around catch estimates in the herring fishery. The Council will continue to work with NMFS to ensure adequate monitoring and accountability in the herring fishery so that overfishing does not occur.

6.2 NATIONAL ENVIRONMENTAL POLICY ACT

NEPA provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. This document is designed to meet the requirements of both the Magnuson-Stevens Act and NEPA. The Council on Environmental Quality (CEQ) has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508). All of those requirements are addressed in this document, as referenced below.

To develop the New England Industry-Funded Monitoring Omnibus Amendment, the Council held meetings of its Observer Policy Committee, Herring Oversight Committee, Herring Advisory Panel, and Plan Development/Fishery Management Action Team in addition to Council meetings. All of these meetings were open to the public. Final selection of the preferred alternatives in this document occurred at the April 2017Council meeting.

Environmental Assessment

The required elements of an Environmental Assessment (EA) are specified in 40 CFR 1508.9(b). They are included in this document, in addition to other relevant sections, as follows:

- An Executive Summary (beginning of the document);
- A Table of Contents (beginning of the document);
- The need for this action is described in Section 1.2;
- The alternatives that were considered are described in Section 2.0;
- A description of the Affected Environment is found in Section 3.0;
- The environmental impacts of the Proposed Action are described in Section 4.0;
- Cumulative impacts of the Proposed Action are discussed in Section 5.0;
- A Finding of No Significant Impact is provided in Section 6.2.1 (below);
- The list of preparers and agencies consulted on this action is provided in Section 8.0.

6.2.1 FINDING OF NO SIGNIFICANT IMPACT

The Council on Environmental Quality (CEQ) Regulations state that the determination of significance using an analysis of effects requires examination of both context and intensity, and lists ten criteria for intensity (40 CFR 1508.27). In addition, the Companion Manual for National Oceanic and Atmospheric Administration Administrative Order 216-6A provides sixteen criteria, the same ten as the CEQ Regulations and six additional, for determining whether the impacts of a proposed action are significant. Each criterion is discussed below with respect to the proposed action and considered individually as well as in combination with the others.

1. Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

Response: The proposed action is not expected to cause significant environmental impacts because it establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior.

The preferred Omnibus Alternatives are administrative and would standardize the development of new industry-funded monitoring programs. Standardized elements would include monitoring service provider requirements, NMFS cost responsibilities, a process to prioritize available Federal funding to new industry-funded monitoring programs, and monitoring set-asides. Any new industry-funded monitoring program would be developed in an amendment to the relevant New England FMP.

The preferred Herring Alternatives would establish an industry-funded monitoring program for the Atlantic herring fishery. That program would specify such things as coverage targets, information to be collected, and service provider requirements. These alternatives would generally have indirect low positive impacts on biological resources if additional monitoring reduces uncertainty around catch in the herring fishery and leads to improved management. These alternatives would have direct negative impacts on fishery-related businesses and communities associated with paying for monitoring. Industry-funded monitoring on vessels with Category A or B herring permits has the potential to reduce annual returns-to-owner (RTO) up to 20% for at-sea monitoring coverage and up to 10% for electronic monitoring and portside sampling. Annual RTO for midwater trawl vessels paying for observer coverage to access Groundfish Closed Areas may be reduced up to an additional 5%. These economic impacts may be minimized by the provision to waive coverage on trips that land less than 50 mt of herring and allowing SBRM coverage to contribute toward the 50% industry-funded monitoring coverage target. While these economic impacts are not expected to be significant, NMFS determined that despite the potential economic impacts, there is no need to prepare an environmental impact statement.

2. Can the proposed action reasonably be expected to significantly affect public health or safety?

Response: The proposed action is not expected to significantly affect public health or safety because it establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior.

While the preferred Herring Alternatives would not have any direct impact on safety at sea, the preferred alternatives may affect the amount of income that would be available to maintain the seaworthiness of fishing vessels. As described previously, industry-funded monitoring has the potential to reduce annual RTO up to 20% for at-sea monitoring coverage, up to 10% for electronic monitoring and portside sampling coverage, and up to

an additional 5% for observer coverage in Groundfish Closed Areas. These potential reductions in RTO may contribute to vessels being less seaworthy if vessels are not maintained because of reduced income. The safety of human life at sea is discussed further in Section 6.1 (National Standard 10).

3. Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

Response: The proposed action is not expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. The proposed action would establish a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior.

4. Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

Response: The effect of the proposed action on the quality of the human environment is not expected to be highly controversial, but it may be controversial for portions of the herring industry. During the development of this amendment, fishing industry participants expressed concern with potential economic impacts associated with industry-funded monitoring and insisted that NMFS should pay for all monitoring.

The Magnuson-Stevens Act allows for industry-funded monitoring and industry-funded monitoring is used in other fisheries in the Greater Atlantic Region, as well as in other regions of the United States. Industry-funded monitoring does, however, have the potential to reduce the annual RTO of industry participants. Some concerned stakeholders believe this amendment is inconsistent with the Magnuson-Stevens Act because the Act does not allow for industry-funded monitoring as described in this amendment.

As described previously, the preferred Herring Alternatives have the potential to reduce annual RTO up to 20% for at-sea monitoring coverage, up to 10% for electronic monitoring and portside sampling, and up to an additional 5% for observer coverage in Groundfish Closed Areas. However, these economic impacts may be minimized by the provision to waive coverage on trips that land less than 50 mt of herring and allowing SBRM coverage to contribute toward the 50% industry-funded monitoring coverage target.

Two years after implementation of this amendment, the Council will examine the results of additional monitoring in the herring fishery and consider if adjustments to herring coverage targets are warranted. This re-examination may help mitigate any potential controversy related to industry-funded monitoring in the herring fishery.

5. Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: The proposed action's effects on the human environment are not likely to be highly uncertain or involve unique or unknown risks. Section 4.0 of this document describes the impacts of the proposed action on the human environment. The impacts of the proposed action on biological resources and the physical environment are well understood. The industry costs associated with industry-funded monitoring can be variable and contingent upon negotiations with service providers. Because Federal programs for electronic monitoring and portside sampling are relatively new to the Greater Atlantic Region, the industry costs associated with those programs are less certain. However, the cost estimates used to generate the economic analyses for the preferred Herring Alternatives were based on similar programs in this region and represent the best available information.

6. Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: The proposed action is not expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration.

The preferred Omnibus Alternatives would standardize the development of new industry-funded monitoring programs. Standardized elements would include monitoring service provider requirements, NMFS cost responsibilities, process to prioritize available Federal funding to new industry-funded monitoring programs, and monitoring set-asides. But because any new industry-funded monitoring program would need to be developed in an amendment to the relevant New England FMP, all decisions whether or not to establish that program would be considered in a future action. The preferred Herring Alternatives would establish an industry-funded monitoring program for the herring fishery, similar to other industry-funded programs in the Greater Atlantic Region and elsewhere in the United States. Therefore, neither the preferred Omnibus Alternatives nor the preferred Herring Alternatives would guarantee the outcome of future actions or represent a decision in principle about a future consideration.

7. Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

Response: No. The proposed action is not related to other actions that when considered together will have individually insignificant but cumulatively significant impacts. The cumulative effects analysis presented in Section 5.0 of this document considers the impacts of the proposed action in combination with relevant past, present, and reasonably foreseeable future actions and concludes that no additional significant cumulative impacts are expected from the proposed action.

8. Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

Response: The proposed action cannot reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor is the proposed action expected to cause loss or destruction to significant scientific, cultural, or historical resources. The proposed action would establish a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior.

9. Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

Response: The proposed action cannot reasonably be expected to have a significant impact on endangered or threatened species or their critical habitat because it would establish a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. The preferred Herring Alternatives would establish an industry-funded monitoring program for the herring fishery. As described in Section 4.2.4 of this document, the preferred Herring Alternatives may have indirect low positive impacts on endangered or threatened species. Indirect benefits to endangered or threatened species are possible if increased monitoring can generate more information for stock assessments and inform ways to reduce interactions between the herring fishery and endangered or threatened species.

10. Can the proposed action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection?

Response: The proposed action would affect levels monitoring, rather than harvest specifications, gear requirements, or changes in fishing behavior, and, therefore, it is not expected to threaten a violation of Federal, state, or local law or requirements to protect the environment.

11. Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act?

Response: The proposed action is not expected to adversely affect stocks of marine mammals because it establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. The preferred Herring Alternatives would establish an industry-funded monitoring program for the herring fishery. As described in Section 4.2.4 of this document, the preferred Herring Alternatives may have indirect low positive impacts on marine mammals. Indirect benefits to marine mammals are possible if increased monitoring can generate more information for stock

assessments and inform ways to reduce interactions between the herring fishery and marine mammals.

12. Can the proposed action reasonably be expected to adversely affect managed fish species?

Response: The proposed action is not expected to adversely affect managed fish species because it establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. The proposed action is expected to have indirect low positive impacts on managed fish species if additional monitoring leads to improved management.

The preferred Omnibus Alternatives are administrative and would standardize the development of new industry-funded monitoring programs. If new industry-funded monitoring programs were developed in an amendment to the relevant New England FMP, there may be indirect low positive impacts on those managed fish species if additional monitoring leads to improved management.

The preferred Herring Alternatives would establish an industry-funded monitoring program for the herring fishery. These alternatives would generally have indirect low positive impacts on the herring resource and non-target species (i.e., haddock, river herring, shad, and Atlantic mackerel) if additional monitoring reduces uncertainty around catch in the herring fishery and leads to improved management.

13. Can the proposed action reasonably be expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act?

Response: The proposed action is not expected to adversely affect essential fish habitat because it establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior.

The preferred Omnibus Alternatives would not adversely affect essential fish habitat because they are administrative and would standardize the development of new industry-funded monitoring programs. Any new industry-funded monitoring program would be developed in an amendment to the relevant FMP.

The preferred Herring Alternatives would not adversely affect essential fish habitat because it would establish an industry-funded monitoring program for the herring fishery, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. In general, the impact of the herring fishery on the physical environment, including essential fish habitat, is thought to be minimal and temporary. Therefore, the expected impact on the physical environment, including essential fish habitat, of increased monitoring in the herring fishery is expected to be negligible.

14. Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?

Response: The proposed action is not expected to adversely affect vulnerable marine or costal ecosystems, including but not limited to deep sea coral ecosystems. As described previously, the proposed action establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. Therefore, the expected impact on vulnerable marine or coastal ecosystems of increased monitoring is expected to be negligible. Information collected via industry-funded monitoring may augment existing information on vulnerable marine or costal ecosystem and, ultimately, lead to improved management.

15. Can the proposed action reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?

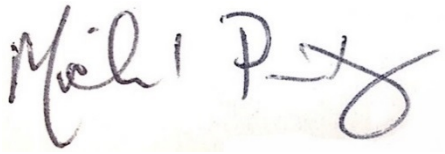
Response: The proposed action is not expected to adversely affect biodiversity and ecosystem functioning. The proposed action establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. Information collected via industry-funded monitoring may augment existing information on biodiversity and ecosystem functioning and, ultimately, lead to improved management.

16. Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

Response: The proposed action is not expected to result in the introduction or spread of a non-indigenous species. The proposed action establishes a monitoring program, rather than specifying harvest specifications, gear requirements, or changes in fishing behavior. Vessels affected by the proposed action are those currently fishing in the Greater Atlantic Region. The fishing-related activity of these vessels is anticipated to occur solely within the Greater Atlantic Region and should not result in the introduction or spread of a non-indigenous species.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the New England Industry-Funded Monitoring Omnibus Amendment, it is hereby determined that the New England Industry-Funded Monitoring Omnibus Amendment will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an environmental impact statement for this action is not necessary.



Regional Administrator
Greater Atlantic Region

December 17, 2018
Date

6.3 MARINE MAMMAL PROTECTION ACT (MMPA)

A description of marine mammals potentially affected by the preferred alternatives in this amendment is provided in Section 3.1.4 of this document. See Section 4.0 for further information on the potential impacts of the preferred alternatives and other alternatives considered by the Council. The Council has concluded preliminarily that there would be no direct impacts on marine mammals, that the preferred alternatives appear consistent with the provisions of the MMPA, and that the preferred alternatives would not alter existing measures to protect the species likely to inhabit the management units of the subject fisheries.

6.4 ENDANGERED SPECIES ACT (ESA)

Section 7 of the ESA requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. A description of the protected resources potentially affected by the preferred alternatives in this amendment is provided in Section 3.1.4. See Section 4.0 for further information on the potential impacts of the preferred alternatives and other alternatives considered by the Council. The Council has determined preliminarily that there would be no direct impacts on protected resources, including endangered or threatened species, or their habitat.

6.5 PAPERWORK REDUCTION ACT (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. The authority to manage information and recordkeeping requirements is vested with the Director of the Office of Management and Budget (OMB). This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

With changes recommended to the catch monitoring program for the Atlantic herring fishery, this amendment contains new collection of information requirements subject to the PRA. The PRA package prepared in support of this action and the information collection required by the proposed action, including forms and supporting statements, will be submitted when this amendment is submitted.

6.6 INFORMATION QUALITY ACT

Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554, also known as the Data Quality Act or Information Quality Act) directed the Office of Management and Budget (OMB) to issue government-wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies." OMB directed each federal agency to issue its own guidelines, establish administrative mechanisms allowing affected persons to seek and obtain correction of information that does not comply with the OMB guidelines, and report periodically to OMB on the number and nature of complaints. The NOAA Section 515 Information Quality Guidelines require a series of actions for each new information product subject to the Data Quality Act. Information must meet standards of utility, integrity and objectivity. This section provides information required to address these requirements.

Utility of Information Product

The New England Industry-Funded Monitoring Omnibus Amendment includes: A description of the management issues to be addressed, statement of goals and objectives, a description of the proposed action and other alternatives/options considered, analyses of the impacts of the proposed action and other alternatives/options on the affected environment, and the reasons for selecting the proposed action. The proposed action implements conservation and management goals consistent with the Magnuson-Stevens Fishery Conservation and Management Act as well as all other existing applicable laws.

Utility means that disseminated information is useful to its intended users. "Useful" means that the content of the information is helpful, beneficial, or serviceable to its intended users, or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain or use. The

information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications. The intended users of the information contained in this document are participants in the Atlantic herring fishery and other interested parties and members of the general public. The information contained in this document may be useful to owners of vessels holding an Atlantic herring permit as well as Atlantic herring dealers and processors since it serves to notify these individuals of any potential changes to management measures for the fishery. This information will enable these individuals to adjust their fishing practices and make appropriate business decisions based on the new management measures and corresponding regulations.

The information being provided in this amendment concerning the status of the Atlantic herring fishery is updated based on landings and effort information through the 2013 and 2014 fishing years when possible. Information presented in this document is intended to support the proposed action, which has been developed through a multi-stage process involving all interested members of the public. Consequently, the information pertaining to management measures contained in this document has been improved based on comments from the public, fishing industry, members of the Council, and NOAA Fisheries.

The media being used in the dissemination of the information contained in this document will be contained in a *Federal Register* notice announcing the Proposed and Final Rules for this action. This information will be made available through printed publication and on the Internet website for the Greater Atlantic Regional Office (GARFO) of NOAA Fisheries. In addition, the final New England Industry-Funded Monitoring Omnibus Amendment will be available on the Council's website (www.nefmc.org) in standard PDF format. Copies will be available for anyone in the public on CD ROM and paper from the Council's office.

Integrity of Information Product

Integrity refers to security – the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Prior to dissemination, NOAA information, independent of the intended mechanism for distribution, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NOAA adheres to the standards set out in Appendix III, "Security of Automated Information Resources," OMB Circular A-130; the Computer Security Act; and the Government Information Security Reform Act. If information is confidential, it is safeguarded pursuant to the Privacy Act and Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business and financial information).

Objectivity of Information Product

Objective information is presented in an accurate, clear, complete, and unbiased manner, and in proper context. The substance of the information is accurate, reliable, and unbiased; in the scientific, financial, or statistical context, original and supporting data are generated and the analytical results are developed using sound, commonly-accepted scientific and research methods. "Accurate" means that information is within an acceptable degree of imprecision or error appropriate to the particular kind of information at issue and otherwise meets commonly accepted scientific, financial, and statistical standards.

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act. Several sources of data were used in the development of this document, including the analysis of potential impacts. These data sources include, but are not limited to: landings data from vessel trip reports, landings data from individual voice reports, information from resource trawl surveys, data from the dealer weighout purchase reports, descriptive information provided (on a voluntary basis) by processors and dealers of Atlantic herring, and ex-vessel price information. Although there are some limitations to the data used in the analysis of impacts of management measures and in the description of the affected environment, these data are considered to be the best available.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this document are based on either assessments subject to peer-review through the Stock Assessment Review Committee (SARC) or on updates of those assessments. Landings and revenue information is based on information collected daily VMS catch reports and VTR reports, and supplemented with state/federal dealer data. Information on catch composition and bycatch is based on reports collected by the NOAA Fisheries Service observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by members of the Plan Development/Fishery Management Action Team.

The proposed action is supported by the best available scientific information. The supporting science and analyses, upon which the proposed action is based, are summarized and described in Section 3.0 and Section 4.0 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific

literature to ensure transparency. Qualitative discussion is provided in cases where quantitative information was unavailable, utilizing appropriate references as necessary.

The review process for any action under an FMP involves the Greater Atlantic Regional Office (GARFO) of NOAA Fisheries, the Northeast Fisheries Science Center (Center), and NOAA Fisheries Headquarters (Headquarters). The Council review process involves public meetings at which affected stakeholders have the opportunity to provide comments on the proposed changes to the FMP. Reviews by staff at GARFO are conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Center's technical review is conducted by senior-level scientists with specialties in population dynamics, stock assessment methodology, fishery resources, population biology, and the social sciences.

Final approval of the proposed action and clearance of the Proposed and Final Rules is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. This review process is standard for any action under an FMP, and provides input from individuals having various expertise who may not have been directly involved in the development of the proposed actions. Thus, the review process for any FMP modification, including the proposed action, is performed by technically-qualified individuals to ensure the action is valid, complete, unbiased, objective, and relevant.

6.7 IMPACTS OF FEDERALISM/EXECTIVE ORDER 13132

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the alternatives under consideration in the Industry-funded Monitoring Omnibus Amendment. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected States have been closely involved in the development of the proposed fishery specifications through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council) and coordination with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council.

6.8 ADMINISTRATIVE PROCEDURES ACT

This action was developed in compliance with the requirements of the Administrative Procedures Act, and these requirements will continue to be followed when the proposed regulation is published. Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking

process, and to give the public adequate notice and opportunity for comment. At this time, the Council is not requesting any abridgement of the rulemaking process for this action.

6.9 COASTAL ZONE MANAGEMENT ACT (CZMA)

Section 307(c)(1) of the Federal CZMA of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. Pursuant to the CZMA regulations at 15 CFR 930.35, a negative determination may be made if there are no coastal effects and the subject action: (1) Is identified by a state agency on its list, as described in § 930.34(b), or through case-by-case monitoring of unlisted activities; or (2) which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) for which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity. The Council has determined that this action is consistent with the coastal zone management plan and policies of the coastal states in this region. NMFS will formally request consistency reviews by CZMA state agencies following submission of this amendment.

6.10 REGULATORY FLEXIBILITY ACT/EXECUTIVE ORDER 12866

6.10.1 E.O. 12866 (REGULATORY PLANNING AND REVIEW)

The purpose of Executive Order 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant action is any regulatory action that may:

1. Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, of the principles set forth in the Executive Order.

In deciding how whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, include the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.

The preferred Omnibus Alternatives are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and do not directly affect fishing effort or amount of fish harvested. Because the Omnibus Alternatives have no direct economic impacts, they will not be discussed in this section.

The preferred Herring Alternatives affect levels of monitoring, rather than fishing behavior or harvest specifications, but they are expected to have economic impacts on fishery-related businesses and human communities.

6.10.1.1 Statement of the Problem

The purpose and need for the action are provided in Section 1.2 of this document.

6.10.1.2 Management Alternatives and Rationale

The management alternatives and their rationale is provided in Section 2.0 of this document.

6.10.1.3 Description of the Fishery

The fishery is described in Section 3.1.5 of this document.

6.10.1.4 Economic Analysis

The baseline is No Action (Herring Alternative 1). Sections 4.2.6 and 4.2.7 in this document describe the additional direct costs on herring fishing vessels associated with the preferred Herring Alternatives. Table 95 computes total direct costs to the herring industry. Recurring costs are likely to be between $274,000-$352,000. If vessels choose the electronic monitoring and portside sampling option, recurring costs are lower, however, there are additional startup costs during Year 1.

TABLE 96. ANNUAL COST TO VESSELS ASSOCIATED WITH PREFERRED HERRING ALTERNATIVES

	Cost to Vessels Associated with At-Sea Monitoring Coverage	Cost to Vessels Associated with Electronic Monitoring and Portside Sampling Coverage
Herring Alternative 2.7	$304,136	$226,234
Herring Alternative 2.5	$47,906	$47,906
Recurring Costs	$352,042	$274,140
Start Up Costs	NA	$285,000
Total	$352,042	$559,140

Source: NMFS

There would also be additional costs associated with the preferred Herring Alternatives. The Federal government would incur additional costs to administer an industry-funded monitoring program for the herring fishery. There would also be small non-pecuniary costs to herring vessels resulting from compliance with existing notification and reporting requirements (described in Section 2.2).

The economic benefits of the preferred Herring Alternatives are described in Section 4.2.7. It is difficult to quantify these benefits, but indirect positive impacts on herring vessels may result from increased monitoring helping to reduce uncertainty around retained and discarded catch estimates leading to additional harvesting opportunities. If increased monitoring reduces the uncertainty in the catch of haddock and river herring and shad tracked against catch caps, herring vessels may be less likely to be constrained by catch caps and more likely to be able to fully harvest herring sub-ACLs.

6.10.1.5 Determination of Significance

Based on the analyses provided in this document, the preferred alternatives are not expected to constitute a "significant regulatory action." This action is not expected to have an impact of $100M or more on the economy, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities. This action is not expected to raise novel legal and policy issues or interfere with an action taken or planned by another agency. Lastly, this action does not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients.

6.10.2 REGULATORY FLEXIBILITY ACT - INITIAL REGULATORY FLEXIBILITY ANALYSIS

6.10.2.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires Federal agencies to describe and analyze the effects of proposed regulations, and possible alternatives, on small business entities. To this end, this section contains an Initial Regulatory Flexibility Analysis (IRFA), which includes an assessment of the effects that the Proposed Action and other alternatives are expected to have on small entities.

The preferred Omnibus Alternatives are administrative, specifying a process to develop and administer future industry-funded monitoring and monitoring set-aside programs, and do not directly affect fishing effort or amount of fish harvested. Because the Omnibus Alternatives have no direct economic impacts, they will not be discussed in this section.

The preferred Herring Alternatives affect levels of monitoring, rather than fishing behavior or harvest specifications, but they are expected to have economic impacts on fishery-related businesses and human communities.

6.10.2.2 Reasons for Considering the Action

The purpose and need for the action are provided in Section 1.2 of this document.

6.10.2.3 Objectives and Legal Basis for the Action

The objectives and legal basis for this action are provided in Section 1.0 of this document.

6.10.2.4 Description and Estimate of Small Entities to Which the Rule Applies

Effective July 1, 2016, NMFS established a small business size standard of $11 million in annual gross receipts for all businesses primarily engaged in the commercial fishing industry (NAICS 11411) for RFA compliance purposes only (80 FR 81194, December 29, 2015). The single size standard is to be used in place of the U.S. Small Business Administration's current standards of $20.5 million, $5.5 million, and $7.5 million for the finfish (NAICS 114111), shellfish (NAICS 114112), and other marine fishing (NAICS 114119) sectors of the U.S. commercial fishing industry in all NMFS rules subject to the RFA after July 1, 2016.

The directly regulated entities are business that own at least one limited access herring vessel. As of 2016, there are 66 businesses that own a least one limited access herring vessel. Four businesses are large entities (gross receipts greater than $11 million). The remaining 62 businesses are small entities. Gross receipts and gross receipts from herring fishing for the small entities are characterized in Table 96.

TABLE 97. GROSS REVENUES AND REVENUES FROM HERRING FOR THE DIRECTLY REGULATED SMALL ENTITIES

	Gross Receipts from Herring Permitted Firms	Gross Receipts from Herring Fishing
Mean	$1,847,392	$422,210
Median	$1,076,172	$0
25th Percentile	$656,965	$0
75th Percentile	$2,684,753	$95,218
Permitted Small Entities	62	62

Source: NMFS

Many of the businesses that hold limited access herring permits are not actively fishing for herring. Of those businesses actively fishing for herring, there are 32 directly regulated entities with herring landings. Two firms are large entities (gross receipts over $11 million). The remaining 30 businesses are small entities. Table 97 characterizes gross receipts and gross receipts from the herring fishery for the active firms.

TABLE 98. GROSS REVENUES AND REVENUES FROM HERRING FOR THE ACTIVE DIRECTLY REGULATED SMALL ENTITIES

	Gross Receipts from Active Herring Permitted Firms	Gross Receipts from Herring Fishing
Mean	$2,070,541	$872,567
Median	$1,030,411	$95,558
25th Percentile	$554,628	$6,570
75th Percentile	$2,955,883	$1,696,758
Active Small Entities	30	30

Source: NMFS

For the 30 small entities, herring represents an average of 36% of gross receipts. For 12 of the small entities, herring represents the single largest source of gross receipts. For 8 of the small entities, longfin squid is the largest source of gross receipts and Atlantic sea scallops is the largest source of gross receipts for 5 of the small entities. The largest source of gross receipts for the remaining 5 small entities are mixed across different fisheries. Eight of the 30 small entities derived zero revenues from herring.

6.10.2.5 Recordkeeping and Reporting Requirements

The preferred Herring Alternatives would require vessels to continue to comply with existing notification and reporting requirements as well as pay for industry-funded monitoring on trips selected for coverage by NMFS. These recordkeeping and reporting requirements would apply to 62 small entities, however, only 30 of those small entities are currently active in the herring fishery.

6.10.2.6 Duplication, Overlap, or Conflict with Other Federal Rules

No relevant Federal rules have been identified that would duplicate or overlap with the preferred alternatives.

6.10.2.7 Economic Impacts on Small Entities Resulting from the Action

Section 4.2.7 of this document describes the economic impacts of the preferred Herring Alternatives on fishing vessels. The first analysis examines the expected costs of monitoring regulations in comparison to the gross receipts at the business level. A business includes all fishing vessels that have identical owners. The second analysis examines the expected costs of monitoring regulations in comparison to vessel profits (revenues minus variable-costs and fixed-costs). Detailed cost data were voluntarily provided by the industry for affected vessels. However, this type analysis cannot be performed at the business level without information on *all* fishing activities by the businesses. The cost structure for those other fisheries is likely to be very different than the cost structure of herring fishing.

The gross receipts from all fishing activities and the additional costs to small businesses resulting from the preferred Herring Alternatives are shown in Table 98. The cost associated with electronic monitoring is from Year 2 and beyond, so it does not include startup costs resulting from the purchase and installation of electronic monitoring equipment. Because estimates of business profits are not available for activity from non-herring activity, gross receipts are used for insight into the ability of businesses to afford the proposed regulatory costs. For the affected small entities, the estimated costs associated with the preferred Herring Alternative are less than 1% of gross receipts.

Since Alternative 2.7 allows businesses to choose between electronic monitoring/portside sampling coverage (EM/PS) and at-sea monitoring coverage (ASM), businesses are expected to select the less costly of the two monitoring types (potentially EM/PS). However, the uncertainty around the monitoring costs estimates is high, thereby increasing the likelihood that businesses may select ASM. Therefore, estimates of costs-per-businesses associated with EM/PS and ASM are analyzed.

Ten small businesses are likely to only be affected by Herring Alternative 2.7 (identified as Group 1) and 6 small businesses are likely to be affected by both Herring Alternative 2.5 and Herring Alternative 2.7 (identified as Group 2) (Table 98). For the 10 small businesses in Group 1, the average cost of monitoring coverage is estimated at $7,228-7,434 per year. These are costs are from EM/PS or ASM. For the 6 businesses in Group 2, the average cost of monitoring is estimated at $25,413-$33,406 per year. These are costs are from EM/PS or ASM and observer coverage (OBS) in Groundfish Closed Areas.

Table 99 describes the additional costs to large businesses from the preferred Herring Alternatives. Only three businesses are expected to be directly regulated; these businesses were not divided into groups by alternative to avoid confidentiality restrictions. For the three large businesses, the average cost of monitoring is estimated at $16,446-$25,751 per year. Gross revenues for the large businesses are approximately $21 million per business. The large entities derive less revenue from herring than the small entities and may be *more likely* to exit the fishery if the cost of monitoring is perceived as too expensive. For large entities, the additional regulatory costs are well below 1% of gross receipts.

TABLE 99. IMPACTS ON THE SMALL, ACTIVE DIRECTLY REGULATED ENTITIES

	Group 1		Group 2	
	EM/PS	ASM	EM/PS + OBS	ASM+OBS
Additional Costs per Businesses	$7,228	$7,434	$25,413	$33,406
Standard Deviation	(6,854)	(7,177)	(14,065)	(20,145)
Firm Gross Revenue	$2,603,158		$3,896,903	
Standard Deviation	(3,481,754)		(2,989,036)	
Number of Small Businesses	10		6	

Source: NMFS

TABLE 100. IMPACTS ON THE LARGE, ACTIVE DIRECTLY REGULATED ENTITIES

	EM/PS + OBS	ASM + OBS
Additional Costs per Business	$16,446	$25,751
Firm Gross Revenue	$21,000,000	
Number of Large Business	3	

Source: NMFS

The second part of this analysis compares estimated monitoring costs with estimates of vessel-level profits. This comparison provides further insight into the ability of businesses to afford the proposed regulatory costs. Estimated monitoring costs for small vessels range from approximately $6,500 for vessels in Group 1 to $20,000-27,000 for vessels in Group 2 (Table 100). Operating profit at the vessel level is approximately $184,000 for Group 1 and approximately $282,000 for Group 2.

Monitoring costs associated with the preferred Herring Alternatives are estimated at 3.5% of operating profits for the small businesses in Group 1 and at 7%-10% for small businesses in Group 2. During Year 1, the electronic monitoring and portside sampling coverage has an additional startup cost of approximately $15,000 per vessel. This additional cost is estimated at 5%-8% of operating profits on small businesses.

Table 101 describes the cost of monitoring to large businesses at the vessel level. As described previously, the large businesses were not divided into groups by alternative to avoid confidentiality restrictions. For the three large businesses, the estimated cost of monitoring at the vessel level is identical to estimated cost of monitoring at the level of the business ($16,446-$25,751 per year). Gross revenues from vessels owned by large business are approximately $838,000 per business. Operating profits are approximately $91,000 per vessel for large businesses and additional monitoring costs are approximately 18%-28% of that profit. Vessels that are large entities derive less revenue from herring than the small entities and may be *more likely* to exit the fishery if the cost of monitoring is perceived as too expensive.

TABLE 101. VESSEL-LEVEL IMPACTS ON THE SMALL, ACTIVE DIRECTLY REGULATED ENTITIES

	Group 1		Group 2	
	EM/PS	ASM	EM/PS + OBS	ASM + OBS
Additional Costs per Vessel	$6,397	$6,478	$20,229	$27,223
Standard Deviation	(6,396)	(4,815)	(5,860)	(7,813)
Vessel Gross Revenue	$2,174,273		$1,802,965	
Standard Deviation	(2,012,878)		(888,036)	
Vessel Operating Profit	$184,146		$281,678	
Standard Deviation	(1,355,980)		(254,141)	
Vessels Owned by Small Businesses	13		7	

TABLE 102. VESSEL-LEVEL IMPACTS ON THE LARGE, ACTIVE DIRECTLY REGULATED ENTITIES

	EM/PS	ASM
Additional Costs per Vessel	$16,446	$25,751
Vessel Gross Revenue	$847,938	
Vessel Operating Profit	$90,940	
Vessels Owned by Large Businesses	3	

When considering the non-preferred Herring Alternatives, Herring Alternatives 2.1, 2.2 (with 100% or 75% coverage), and 2.7 (with 100% or 75% coverage) would have higher costs than the preferred Herring Alternatives. Additionally, the other non-preferred Herring Alternatives, including No Action (Herring Alternative 1) and those with lower coverage targets (25% coverage), may not have achieve the objectives for monitoring in the herring fishery (described in Sections 1.2 and 2.2) and analyzed in Section 4.0.

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8.0 LIST OF PREPARERS AND AGENCIES CONSULTED

This document was prepared by the National Marine Fisheries Service and New England Fishery Management Council, in consultation with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council. Members of the Industry-Funded Monitoring Amendment Plan Development Team/Fishery Management Action Team (PDT/FMAT) include:

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- NOAA Fisheries, National Marine Fisheries Service, Greater Atlantic Regional Office, Gloucester MA
- Northeast Fisheries Science Center, Woods Hole MA
- Atlantic States Marine Fisheries Commission and Atlantic Herring Section
- Mid-Atlantic Fishery Management Council

9.0 LIST OF MEETINGS

Date	Meeting Type	Location
1/2/2013	PDT/FMAT Conference Call	
12/5/2013	PDT/FMAT Conference Call	
1/6/2014	Herring PDT Conference Call	
1/14/2014	Herring Committee meeting	Sheraton Harborside Hotel, Portsmouth, NH

Date	Meeting Type	Location
1/28-30/2014	NEFMC Meeting	Sheraton Harborside Hotel, Portsmouth, NH
2/11-13/2017	MAFMC Meeting	DoubleTree by Hilton-Riverfront, New Bern, NC
2/13/2014	Herring Advisory Panel	DoubleTree by Hilton, Danvers, MA
3/6/204	Herring PDT	GARFO, Gloucester, MA
3/7/2014	PDT/FMAT	
4/22-24/2014	NEFMC Meeting	Hilton Hotel, Mystic, CT
8/5/2014	PDT/FMAT	
8/19/2014	Observer Policy Committee	Sheraton Colonial Hotel, Wakefield, MA
9/30-10/2/2014	NEFMC Meeting	Cape Codder, Hyannis, MA
10/7-9/2014	MAFMC Meeting	Courtyard Marriott Downtown Philadelphia, Philadelphia, PA
10/29/2014	Herring PDT	GARFO, Gloucester, MA
11/3/2014	Herring Advisory Panel	Holiday Inn, Portsmouth, NH

Date	Meeting Type	Location
11/4/2014	Herring Committee	Holiday Inn, Portsmouth, NH
11/18-20/2014	NEFMC Meeting	Newport Marriott, Newport, RI
12/17/2014	Observer Policy Committee	Sheraton Colonial Hotel, Wakefield, MA
1/5/2015	Joint Herring and Ecosystem-Based Fisheries Management PDT Meeting	Holiday Inn, Taunton, MA
1/15/2015	Herring Advisory Panel	Sheraton Harborside Hotel, Portsmouth, NH
1/16/2015	Herring Committee	Sheraton Harborside Hotel, Portsmouth, NH
1/22/2015	Observer Policy Committee	DoubleTree by Hilton, Danvers, MA
1/27-29/2015	NEFMC Meeting	Sheraton Harborside, Portsmouth, NH
2/10-12/2015	MAFMC Meeting	DoubleTree by Hilton Raleigh Brownstone-University, Raleigh, NC
3/3/2015	PDT/FMAT	GARFO, Gloucester, MA
4/3/2015	PDT/FMAT	GARFO, Gloucester, MA

Date	Meeting Type	Location
4/14-16/2015	MAFMC Meeting	Ocean Place Resort, Long Branch, NJ
4/16/2015	Observer Policy Committee	Four Points by Sheraton, Wakefield, MA
4/21-23/2015	NEFMC Meeting	Hilton Hotel, Mystic, CT
5/13/2015	Herring PDT	GARFO, Gloucester, MA
5/29/2015	PDT/FMAT	GARFO, Gloucester, MA
7/1/2015	Joint Observer Policy and Herring Committee	Four Points by Sheraton, Wakefield, MA
8/10-13/2015	MAFMC Meeting	Holiday Inn Midtown, New York, NY
9/14/2015	Herring Advisory Panel	Hilton Garden Inn – Boston Logan Airport, Boston, MA
9/28/2015	Observer Policy Committee	Radisson Hotel, Plymouth, MA
9/29-10/1/2015	NEFMC Meeting	Radisson Plymouth, Plymouth, MA
10/6-8/2015	MAFMC Meeting	DoubleTree Philadelphia Center City, Philadelphia, PA
11/30/2015	PDT/FMAT	GARFO, Gloucester, MA

Date	Meeting Type	Location
12/10/2015	Herring PDT	GARFO, Gloucester, MA
12/17/2015	Observer Policy Committee	Radisson Airport Hotel, Warwick, RI
1/26-28/2016	NEFMC Meeting	Sheraton Harborside, Portsmouth, NH
2/9-11/2016	MAFMC Meeting	DoubleTree by Hilton New Bern, New Bern, NC
3/15/2016	Herring Advisory Panel	DoubleTree by Hilton, Danvers, MA
3/16/2016	Herring Committee	DoubleTree by Hilton, Danvers, MA
3/31/2016	PDT/FMAT	GARFO, Gloucester, MA
4/11-14/2016	MAFMC Meeting	Montauk Yacht Club, Montauk, NY
4/19-21/2016	NEFMC Meeting	Hilton Hotel, Mystic, CT
6/1/2016	Herring Advisory Panel	Four Points by Sheraton, Wakefield, MA
6/2/2016	Herring Committee	Four Points by Sheraton, Wakefield, MA
6/13-16/2016	MAFMC Meeting	University of Delaware – Clayton Hall, Newark, DE

Date	Meeting Type	Location
6/21-23/2016	NEFMC Meeting	Holiday Inn by the Bay, Portland, ME
7/20/2016	PDT/FMAT Conference Call	
9/20-22/2016	NEFMC Meeting	DoubleTree by Hilton, Danvers, MA
10/4/2016	IFM Amendment Public Hearing	GARFO, Gloucester, MA
10/17/2016	IFM Amendment Public Hearing Webinar	
10/20/2016	IFM Amendment Public Hearing	DoubleTree by Hilton, Portland, ME
10/27/2016	IFM Amendment Public Hearing	Congress Hall, Cape May, NJ
11/1/2016	IFM Amendment Public Hearing	Corless Auditorium, Narragansett, RI
11/15-17/2016	NEFMC Meeting	Hotel Viking, Newport, RI
12/12-15/2016	MAFMC Meeting	Royal Sonesta Harbor Court, Baltimore, MD
1/10/2017	Herring Advisory Panel	Four Points by Sheraton, Wakefield, MA

Date	Meeting Type	Location
1/11/2017	Herring Committee	Four Points by Sheraton, Wakefield, MA
1/24-26/2017	NEFMC Meeting	Sheraton Harborside, Portsmouth, NH
3/17/2017	PDT/FMAT Conference Call	
4/4/2017	Herring Advisory Panel	Wentworth by the Sea, New Castle, NH
4/5/2017	Herring Committee	Wentworth by the Sea, New Castle, NH
4/11-13/2017	MAFMC Meeting	Icona Golden Inn, Avalon, NJ
4/18-20/2017	NEFMC Meeting	Hilton Hotel, Mystic, CT
4/4/2018	Herring Committee and Advisory Panel	Hilton Garden Inn – Boston Logan Airport, Boston, MA
4/18-20/2018	NEFMC Meeting	Hilton Hotel, Mystic, CT
10/1-4/2018	MAFMC Meeting	Congress Hall, Cape May, NJ

10.0 GLOSSARY OF TERMS

Accuracy. The closeness of a measured or estimated value (e.g., population parameter) to its true value. Accuracy should not be confused with precision, which

relates to the variability of the measured or estimated value (i.e., the closeness of repeated measurements of the same quantity).

Allocation. The practice of apportioning resources among various entities. Under the SBRM, allocation often regards the assignment of observer effort across the various sampling strata; i.e., geographical region (by port of departure), fishing modes (gear type and mesh size), access area, and trip category.

Bias. A systematic difference between the expected value of a statistical estimate and the quantity it estimates. Absent bias, precision will lead to accuracy; thus, bias and accuracy are used interchangeably, but bias is generally associated with the design of sampling program. Eliminating potential sources of bias improves the accuracy of the results.

Biomass (B). (1) The total weight of a group (or stock) of living organisms (e.g., fish, plankton) or of some defined fraction of it (e.g., spawners) in an area, at a particular time. (2) Measure of the quantity, usually by weight in pounds or metric tons (2,205 lb or 1 metric ton), of a stock at a given time.

Bycatch. According to the Magnuson-Stevens Act, bycatch includes all fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Fish released alive under a recreational catch and release fishery management program are not considered bycatch. The words bycatch and discard are used interchangeably in SBRM documents.

Catch. (1) To undertake any activity that results in taking fish out of its environment dead or alive. To bring fish on board a vessel dead or alive. (2) The total number (or weight) of fish caught by fishing operations, including retained catch (landings) and discarded catch (bycatch). (3) The component of fish encountering fishing gear that is retained by the gear.

Coefficient of variation (CV). A standard measure of precision, calculated as the ratio of the square root of the variance of the bycatch estimate (i.e., the standard error) to the bycatch estimate itself. The higher the CV, the larger the standard error is relative to the estimate. A lower CV reflects a smaller standard error relative to the estimate. A 0-percent CV means there is no variance in the sampling distribution. Alternatively, CVs of 100 percent or higher indicate that there is considerable variance in the estimate.

Discard. To release or return fish to the sea, dead or alive, whether or not such fish are brought fully on board a fishing vessel. Fish (or parts of fish) can be discarded for a variety of reasons such as having physical damage, being a non-target species for the trip, and compliance with management regulations such as minimum size

limits or quotas. The terms discard and bycatch are used interchangeably in SBRM documents.

Effort. The amount of time and fishing power used to harvest fish; includes gear size, boat size, and horsepower.

Environmental assessment (EA). As part of the National Environmental Policy Act (NEPA) process, an EA is a concise public document that provides evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI).

Finding of no significant impact (FONSI). As part of the National Environment Policy Act (NEPA) process, a FONSI is a document that explains why an action that is not otherwise excluded from the NEPA process, and for which an environmental impact statement (EIS) will not be prepared, will not have a significant effect on the human environment.

Fish. Means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.

Fishing mode. A way of grouping fishing activities according to the fishing gears used, port of departure, mesh size, and, in some cases, regulatory fishing program, rather than by FMP or species of fish landed. There are 56 fishing modes defined in the Greater Atlantic Region for the purpose of the SBRM Omnibus Amendment.

Fishing vessel trip report (FVTR) or **Logbook.** A detailed, usually official, record of a vessel's fishing activity registered systematically onboard the fishing vessel, usually including information on catch and its species composition, the corresponding fishing effort, and location. Some form of trip report must be completed and submitted by every holder of a Federal fishing permit in the Greater Atlantic Region, except those who hold a Federal permit only for lobster.

Marine Recreational Fisheries Statistical Survey (MRFSS). An annual national survey conducted by NMFS, in cooperation with the coastal states, to estimate the number, catch, and effort of recreational fishermen. MRFSS was phased out and replaced by MRIP in 2011.

Marine Recreational Information Program (MRIP). An annual national survey conducted by NMFS, in cooperation with the coastal states, along with the supporting statistical methods, that are used to estimate the number, catch, and effort of recreational fishermen.

National Standard 9. A provision in the Magnuson-Stevens Act that requires that "conservation and management measures shall, to the extent practicable, (a) minimize bycatch; and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." NMFS has defined the term "to the extent practicable" to

include a consideration of the effects of reducing bycatch and bycatch mortality on the overall benefit to the Nation.

Observer. At-sea fishery observers are generally biologists trained to collect information on board fishing vessels. They may be deployed for various reasons including monitoring interactions with protected species, measuring catch composition and disposition (including discards), validating or adjusting self-reported data, tracking in-season quotas (including bycatch quotas), or a variety of other reasons. The regional observer program is administered by the Northeast Fisheries Science Center.

Precision. The degree of agreement of repeated measurements of the same quantity or object.

Sampling design. The sampling design of a scientific survey refers to the statistical techniques and methods adopted for selecting a sample and obtaining estimates of the survey variables from the selected sample.

Standardized bycatch reporting methodology (SBRM). The combination of sampling design, data collection procedures, and analyses used to estimate bycatch in fisheries. An SBRM is required to be implemented for each fishery under section 303(a)(11) of the Magnuson-Stevens Act.

Stock assessment. The process of collecting and analyzing biological and statistical information to determine the changes in the abundance of fishery stocks in response to fishing, and, to the extent possible, to predict future trends of stock abundance. Stock assessments are based on resource surveys; knowledge of the habitat requirements, life history, and behavior of the species; the use of environmental indices to determine impacts on stocks; and catch statistics. Stock assessments are used as a basis to assess and specify the present and probable future condition of a fishery.

Stock Assessment and Fishery Evaluation (SAFE) report. A report that provides a summary of the most recent biological condition of a stock of fish and the economic and social condition of the recreational fishermen, commercial fishermen, and seafood processors who use the fish. The report provides information to the fishery management councils for determining harvest levels.

Total allowable catch (TAC). The annual recommended or specified regulated catch for a species or species group. The regional fishery management council sets the TAC from the range of acceptable biological catch (ABC).

Appendix 1

Text from Greater Atlantic Region disapprovals regarding industry-funded monitoring

Excerpt from the Final Rule for Framework Adjustment 48 to the Northeast Multispecies FMP (78 FR 26118; May 3, 2013)

At-Sea Monitoring Cost-Sharing

To serve as a more long-term solution to the cost burden of at-sea monitoring to sectors, Framework 48 proposed a mechanism for sharing of at-sea monitoring costs between sectors and NMFS. Framework 48 proposed that the industry would only ever be responsible for paying the direct costs of at-sea monitoring, specifically the daily salary of the at-sea monitor. All other programmatic costs would be the responsibility of NMFS, including, but not limited to: Briefing, debriefing, training and certification costs (salary and non-salary); sampling design development; data storage, management and security; data quality assurance and control; administrative costs; maintenance of monitoring equipment; at-sea monitor recruitment, benefits, insurance and taxes; logistical costs associated with deployment; and at-sea monitor travel and lodging. This measure was intended to reduce the cost burden of at-sea monitoring to sectors and thereby increase their profitability.

NMFS has disapproved this cost-sharing measure because it is not consistent with other applicable laws as developed. Specifically, the Anti-Deficiency Act and other appropriations law prohibits Federal agencies from obligating the Federal government except through appropriations and from sharing the payment of government obligations with private entities. Framework 48 proposed to require NMFS to pay for some portion of the costs of at-sea activities, such as logistical costs generated by deployment, which are outside its statutory obligations under the Magnuson-Stevens Act. As written, this measure would also have required NMFS and sectors to share payment of obligations defined as belonging to one or the other. For example, Framework 48 proposed to require NMFS to pay some costs related to at-sea activities, such as benefits and insurance for at-sea monitors, while sectors would pay other portions of at-sea costs, like the salary for at-sea monitors. Because such action would be prohibited under the law, NMFS has disapproved this measure in Framework 48.

Although this measure was not approvable as developed, NMFS shares the Council and industry's concern about the ability of sectors to bear the full costs of monitoring in future fishing years. NMFS believes this approach to cost sharing, which defines the items that NMFS versus sectors should be responsible for, could be viable if restructured and may be worth pursuing in a future action. NMFS is already working with the New England and Mid-Atlantic Councils' joint Herring/Mackerel Plan Development Team (PDT)/Fishery Management Action Team (FMAT) to pursue cost-sharing options such as this one for those fisheries for FY 2014. The Council could consider including the NE Multispecies FMP in this joint effort to develop a workable and consistent cost-sharing mechanism for the Northeast region.

Excerpt from the Final Rule for Amendment 5 to the Atlantic Herring FMP

Increased Observer Coverage Requirements

As described previously, the NEFSC determines observer coverage levels in the herring fishery based on the SBRM. Observer coverage in the herring fishery is currently fully funded by NMFS. Amendment 5 proposed increasing observer coverage in the herring fishery by requiring 100-percent observer coverage on Category A and B vessels. Many stakeholders believe this measure is necessary to accurately determine the extent of bycatch and incidental catch in the herring fishery. The Council recommended this measure to gather more information on the herring fishery so that it may better evaluate and, if necessary, implement additional measures to address issues involving catch and discards. The 100-percent observer requirement is coupled with a target maximum industry contribution of $325 per day. There are two types of costs associated with observer coverage: (1) Observer monitoring costs, such as observer salary and travel costs, and (2) NMFS support and infrastructure costs, such as observer training and data processing. The monitoring costs associated with an observer in the herring fishery are higher than $325 per day. Cost-sharing of monitoring costs between NMFS and the industry would violate the Anti-Deficiency Act. Therefore, there is no current legal mechanism to allow cost-sharing of monitoring costs between NMFS and the industry.

Throughout the development of Amendment 5, NMFS advised the Council that Amendment 5 must identify a funding source for increased observer coverage because NMFS's annual appropriations for observer coverage are not guaranteed. Some commenters claim that the $325 per day industry contribution was not a limit, but a target, and that the Council intended the industry to pay whatever was necessary to ensure 100-percent observer coverage. NMFS disagrees, and does not believe the amendment specifies that the industry would pay all the monitoring costs associated with 100-percent observer coverage, nor does it analyze the economic impacts of the industry paying all the monitoring costs. The FEIS for Amendment 5 analyzed alternatives with the industry paying $325 per day or $1,200 per day (estimated sum of observer monitoring costs and NMFS support and infrastructure costs), but it did not analyze a range of alternatives that would approximate total monitoring costs. Budget uncertainties prevent NMFS from being able to commit to paying for increased observer coverage in the herring fishery. Requiring NMFS to pay for 100-percent observer coverage would amount to an unfunded mandate. Because Amendment 5 did not identify a funding source to cover the costs of increased observer coverage, the measure is not sufficiently developed to approve at this time. Therefore, NMFS had to disapprove the 100-percent observer coverage requirement. With the disapproval of this measure, this action maintains the existing SBRM observer coverage levels and Federal observer funding for the herring fishery.

Recognizing funding challenges, Amendment 5 specified status quo observer coverage levels and funding for up to 1 year following the implementation of Amendment 5, with the 100-percent observer coverage and partial industry funding requirement to become effective 1 year after the implementation of Amendment 5. During that year, the Council and NMFS, in cooperation with the industry, were to attempt to develop a way to fund 100-percent observer coverage.

During 2013, a working group was formed to identify a workable, legal mechanism to allow for industry-funded observer coverage in the herring fishery; the group includes staff from the New England and Mid-Atlantic Councils and NMFS. To further explore the legal issues surrounding industry-funded observer coverage, NMFS formed a working group of Northeast Regional Office, NEFSC, General Counsel, and Headquarters staff. The NMFS working group identified an administrative mechanism to allow for industry funding of observer monitoring costs in Northeast Region fisheries, as well as a potential way to help offset funding costs that would be borne by the industry, subject to available funding. This administrative mechanism would be an option to fund observer coverage targets that are higher than SBRM coverage levels. The mechanism to allow for industry-funded observer coverage is a potential tool for all Northeast Region FMPs, but it would need to be added to each FMP through an omnibus amendment to make it an available tool, should the Council want to use it. Additionally, this omnibus amendment could establish the observer coverage targets for Category A and B herring vessels.

In a September 20, 2013, letter to the Council, NMFS offered to be the technical lead on an omnibus amendment to establish the administrative mechanism to allow for industry-funded observer coverage in New England and Mid-Atlantic FMPs. At its September 2013 meeting, the Council considered NMFS's offer and encouraged NMFS to begin development of the omnibus amendment. At this time, NMFS expects to present a preliminary range of alternatives for the omnibus amendment to the New England and Mid-Atlantic Councils in early 2014.

Additionally, other Amendment 5 measures implemented in this action help improve monitoring in the herring fishery. These measures include the requirement for vessels to contact NMFS at least 48 hr in advance of a fishing trip to facilitate the placement of observers, observer sample station and reasonable assistance requirements to improve an observer's ability collect quality data in a safe and efficient manner, and the slippage prohibition and the sampling requirements for midwater trawl vessels fishing in groundfish closed areas to minimize the discarding of unsampled catch.

The same measure that would have required 100-percent observer coverage, coupled with a $325 contribution by the industry, would have also required that: (1) The 100-percent coverage requirement be re-evaluated by the Council 2 years after implementation; (2) the 100-percent coverage requirement be waived if no observers were available, but not waived for trips that enter the River Herring Monitoring/Avoidance Areas; (3) observer service provider requirements for the Atlantic sea scallop fishery apply to observer service providers for the herring fishery; and (4) states be authorized as observer service providers. NMFS believes these additional measures are inseparable from the 100-percent observer coverage requirement; therefore, NMFS had to disapprove these measures too. With the disapproval of these measures, the existing waiver and observer service provider requirements remain in effect.

Excerpt from Amendment 14 to the Atlantic Mackerel, Squid, and Butterfish FMP (79 FR 10029; February 24, 2014)

Increased Observer Coverage Requirements

Currently, the NMFS Northeast Fisheries Science Center (NEFSC) determines observer coverage levels in the mackerel fishery based on the standardized bycatch reporting methodology (SBRM) and after consultations with the Council. Observer coverage in the mackerel fishery is currently fully funded by NMFS. In Amendment 14, the Council recommended increases in the observer coverage in the mackerel fishery, specifically 100-percent observer coverage on all limited access mackerel vessels using midwater trawl (i.e., Tiers 1, 2 and 3) and Tier 1 mackerel vessels using small-mesh bottom trawl, 50-percent coverage on Tier 2 mackerel vessels using small-mesh bottom trawl, and 25-percent on Tier 3 mackerel vessels using small-mesh bottom trawl. Many stakeholders believe this measure is necessary to accurately determine the extent of bycatch and incidental catch in the mackerel fishery. The Council recommended this measure to gather more information on the mackerel fishery so that it may better evaluate and, if necessary, implement additional measures to address catch and discards of river herring and shad. The increased observer coverage level recommendations were coupled with a target maximum industry contribution of $325 per day. There are two types of costs associated with observer coverage: Observer monitoring costs, such as observer salary and travel costs; and NMFS support and infrastructure costs, such as observer training, data processing, and infrastructure. The monitoring costs associated with an observer in the mackerel fishery are higher than $325 per day. Upon legal analysis of this measure, the cost-sharing of monitoring costs between NMFS and the industry would violate the Anti-Deficiency Act. Therefore, based on this analysis, there is no current legal mechanism to allow cost-sharing of monitoring costs between NMFS and the industry.

Throughout the development of Amendment 14, NMFS advised the Council that Amendment 14 must identify a funding source for increased observer coverage because NMFS's annual appropriations for observer coverage are not guaranteed. Some commenters asserted that the $325 per day industry contribution was not a limit, but a target, and that the Council intended the industry to pay whatever is necessary to ensure 100-percent observer coverage. NMFS disagrees, and does not believe the amendment specifies that the industry would pay all the monitoring costs associated with 100-percent observer coverage, nor does the amendment analyze the economic impacts of the industry paying all the monitoring costs. The FEIS for Amendment 14 analyzes the industry paying $325 per day, and the DEIS analyzes the cost of vessels paying $800 per day (estimated sum of observer monitoring costs), but it does not analyze a range of that would approximate total monitoring costs. Budget uncertainties prevent NMFS from being able to commit to paying for increased observer coverage in the mackerel fishery. Requiring NMFS to pay for 100-percent observer coverage would amount to an unfunded mandate. Because Amendment 14 does not identify a funding source to cover the costs of increased observer coverage, the measure is not sufficiently developed to approve at this time. Therefore, NMFS had to disapprove the 100-percent observer coverage requirement. With the disapproval of this measure, this action maintains the existing observer coverage levels and full Federal funding for observer coverage the mackerel fishery.

In 2013, a working group was formed to identify a workable, legal mechanism to allow for industry-funded observer coverage in the herring fishery, including staff from the New England and Mid-Atlantic Councils and NMFS. To further explore the legal issues surrounding industry-funded observer coverage, NMFS formed a working group of Greater Atlantic Regional Fisheries Office, NEFSC, General Counsel, and Headquarters staff. The NMFS working group is currently exploring possibilities.

In the November 7, 2013, partial approval letter to the Council, NMFS offered to be the technical lead on an omnibus amendment to establish an administrative mechanism to allow for industry-funded observer coverage in New England and Mid-Atlantic FMPs. At its October 2013 meeting, the Council considered NMFS's offer and encouraged NMFS to begin development of the omnibus amendment. NMFS expects to present a preliminary range of alternatives for the omnibus amendment to the New England and Mid-Atlantic Councils in early 2014.

Additionally, other measures implemented in this action help improve monitoring in the mackerel fishery. These measures include the requirement for vessels to contact NMFS at least 48 hr in advance of a fishing trip to facilitate the placement of observers, observer sample station and reasonable assistance requirements to improve an observer's ability collect quality data in a safe and efficient manner, and the slippage prohibition and the sampling requirements for midwater trawl vessels fishing in groundfish closed areas to minimize the discarding of unsampled catch.

The same measure that would have required increased observer coverage, coupled with a $325 contribution by the industry, would have also required that: (1) The Council would re-evaluate the increased observer coverage level 2 yr after implementation; and (2) observer service provider requirements for the Atlantic sea scallop fishery would apply to observer service providers for the mackerel fishery. NMFS believes these additional measures are inseparable from the 100-percent observer coverage requirement; therefore, NMFS also disapproved these measures. With the disapproval of these measures, this action maintains the existing SBRM-based observer coverage provisions for the mackerel fishery.

Appendix 2

Monitor and Service Provider Requirements

The following sections are based on the existing regulations for monitoring service providers. This appendix includes minor revisions that NEFOP staff made to the existing regulations. Omnibus Alternative 2 would apply these revised requirements to all new industry-funded monitoring programs in the New England and Mid-Atlantic FMPs.

§ 648.11 At-sea sea sampler/observer coverage.

(g)(5)(3) Vessel owners shall pay observer service providers for observer services within 45 days of the end of a fishing trip on which an observer deployed.

(h) Observer service provider approval and responsibilities—(1) General. An entity seeking to provide observer services must apply for and obtain approval from NMFS following submission of a complete application. A list of approved observer service providers shall be distributed to vessel owners and shall be posted on the NMFS Fisheries Sampling Branch (FSB) website at: www.nefsc.noaa.gov/femad/fsb/.

(2) [Reserved]

(3) Contents of application. An application to become an approved observer service provider shall contain the following:

(i) Identification of the management, organizational structure, and ownership structure of the applicant's business, including identification by name and general function of all controlling management interests in the company, including but not limited to owners, board members, officers, authorized agents, and staff. If the applicant is a corporation, the articles of incorporation must be provided. If the applicant is a partnership, the partnership agreement must be provided.

(ii) The permanent mailing address, phone and fax numbers where the owner(s) can be contacted for official correspondence, and the current physical location, business mailing address, business telephone and fax numbers, and business email address for each office.

(iii) A statement, signed under penalty of perjury, from each owner or owners, board members, and officers, if a corporation, that they are free from a conflict of interest as described under paragraph (h)(6) of this section.

(iv) A statement, signed under penalty of perjury, from each owner or owners, board members, and officers, if a corporation, describing any criminal conviction(s), Federal contract(s) they have had and the performance rating they received on the contracts, and previous decertification action(s) while working as an observer or observer service provider.

(v) A description of any prior experience the applicant may have in placing individuals in remote field and/or marine work environments. This includes, but is not limited to, recruiting, hiring, deployment, and personnel administration.

(vi) A description of the applicant's ability to carry out the responsibilities and duties of a fishery observer services provider as set out under paragraph (h)(5) of this section, and the arrangements to be used.

(vii) Evidence of holding adequate insurance to cover injury, liability, and accidental death for observers during their period of employment (including during training). Workers' Compensation and Maritime Employer's Liability insurance must be provided to cover the observer, vessel owner, and observer provider. The minimum coverage required is $5 million (unless otherwise specified on the NMFS/FSB website at: www.nefsc.noaa.gov/femad/fsb/). Observer service providers shall provide copies of the insurance policies to observers to display to the vessel owner, operator, or vessel manager, when requested.

(viii) Proof that its observers, whether contracted or employed by the service provider, are compensated with salaries that meet or exceed the U.S. Department of Labor (DOL) guidelines for observers. Observers shall be compensated as Fair Labor Standards Act (FLSA) non-exempt employees. Observer providers shall provide any other benefits and personnel services in accordance with the terms of each observer's contract or employment status.

(ix) The names of its fully equipped, NMFS/FSB certified, observers on staff or a list of its training candidates (with resumes) and a request for an appropriate NMFS/FSB Observer Training class. All observer training classes have a minimum class size of eight individuals, which may be split among multiple vendors requesting training. Requests for training classes with fewer than eight individuals will be delayed until further requests make up the full training class size.

(x) An Emergency Action Plan (EAP) describing its response to an “at sea” emergency with an observer, including, but not limited to, personal injury, death, harassment, or intimidation. The observer provider shall develop and NMFS shall approve an Emergency Action Plan that details contractor response to emergencies involving observers or vessel personnel. The EAP shall include communications protocol and appropriate contact information in an emergency.

(4) Application evaluation. (i) NMFS shall review and evaluate each application submitted under paragraph (h)(3) of this section. Issuance of approval as an observer provider shall be based on completeness of the application, and a determination by NMFS of the applicant's ability to perform the duties and responsibilities of a fishery observer service provider, as demonstrated in the application information. A decision to approve or deny an application shall be made by NMFS within 15 business days of receipt of the application by NMFS.

(ii) If NMFS approves the application, the observer service provider's name will be added to the list of approved observer service providers found on the NMFS/ FSB website specified in

paragraph (h)(1) of this section, and in any outreach information to the industry. Approved observer service providers shall be notified in writing and provided with any information pertinent to its participation in the fishery observer program.

(iii) An application shall be denied if NMFS determines that the information provided in the application is not complete or the evaluation criteria are not met. NMFS shall notify the applicant in writing of any deficiencies in the application or information submitted in support of the application. An applicant who receives a denial of his or her application may present additional information to rectify the deficiencies specified in the written denial, provided such information is submitted to NMFS within 30 days of the applicant's receipt of the denial notification from NMFS. In the absence of additional information, and after 30 days from an applicant's receipt of a denial, an observer provider is required to resubmit an application containing all of the information required under the application process specified in paragraph (h)(3) of this section to be re-considered for being added to the list of approved observer service providers.

(5) Responsibilities of observer service providers. (i) An observer service provider must provide observers certified by NMFS/FSB pursuant to paragraph (i) of this section for deployment in a fishery when contacted and contracted by the owner, operator, or vessel manager of a fishing vessel, unless the observer service provider refuses to deploy an observer on a requesting vessel for any of the reasons specified at paragraph (h)(5)(viii) of this section.

(ii) An observer service provider must provide to each of its observers:

(A) All necessary transportation, lodging costs and support with arrangements and logistics of travel for observers to and from the initial location of deployment, to all subsequent vessel assignments, to any debriefing locations, and for appearances in Court for observer-related trials as necessary;

(B) Lodging, per diem, and any other services necessary for observers assigned to a fishing vessel or to attend an appropriate NMFS/FSB observer training class;

(C) The required observer equipment, in accordance with equipment requirements listed on the NMFS/FSB website specified in paragraph (h)(1) of this section, prior to any deployment and/or prior to NMFS observer certification training; and

(D) Individually assigned communication equipment, in working order, such as a mobile phone, for all necessary communication. An observer service provider may alternatively compensate observers for the use of the observer's personal mobile phone, or other device, for communications made in support of, or necessary for, the observer's duties.

(iii) Observer deployment logistics. Each approved observer service provider must assign an available certified observer to a vessel upon request. Each approved observer service provider must be accessible 24 hours per day, 7 days per week, to enable an owner, operator, or

manager of a vessel to secure observer coverage when requested. The telephone system must be monitored a minimum of four times daily to ensure rapid response to industry requests. Observer service providers approved under paragraph (h) of this section are required to report observer deployments to NMFS daily for the purpose of determining whether the predetermined coverage levels are being achieved in the appropriate fishery.

(iv) Observer deployment limitations. (A) A candidate observer's first several deployments and the resulting data shall be immediately edited and approved after each trip by NMFS/FSB prior to any further deployments by that observer. If data quality is considered acceptable, the observer would be certified. Refer to the NMFS/FSB website for program-specific observer training certifications, http://www.nefsc.noaa.gov/fsb.

(v) Communications with observers. An observer service provider must have an employee responsible for observer activities on call 24 hours a day to handle emergencies involving observers or problems concerning observer logistics, whenever observers are at sea, stationed shoreside, in transit, or in port awaiting vessel assignment.

(vi) Observer training requirements. A request for a NMFS/FSB Observer Training class must be submitted to NMFS/FSB 45 calendar days in advance of the requested training. The following information must be submitted to NMFS/FSB at least 15 business days prior to the beginning of the proposed training: A list of observer candidates; observer candidate resumes, cover letters and academic transcripts; and a statement signed by the candidate, under penalty of perjury, that discloses the candidate's criminal convictions, if any. A medical report certified by a physician for each candidate is required 7 business days prior to the first day of training. CPR/First Aid certificates and a final list of training candidates with observer candidate contact information (email, phone, number, mailing address and emergency contact information) are due 7 business days prior to the first day of training. NMFS may reject a candidate for training if the candidate does not meet the minimum qualification requirements as outlined by NMFS/FSB minimum eligibility standards for observers as described on the NMFS/FSB website.

(vii) Reports—(A) Observer deployment reports. The observer service provider must report to NMFS/FSB when, where, to whom, and to what vessel an observer has been deployed, as soon as possible, and according to requirements outlined on the NMFS/FSB website. .The Observer deployment report must be available and accessible to NMFS electronically 24 hours a day, 7 days a week. The observer service provider must ensure that the observer reports back to NMFS its required electronic data, as described in the NMFS/FSB observer training. Electronic data submission will be outlined in observer training and may include accessing government websites via personal computers/devices or submitting data through government issued electronics. The observer service provider shall provide the raw (unedited) data collected by the observer to NMFS at the specified time per program; refer to the NMFS/FSB website for program specific observer training certifications, http://www.nefsc.noaa.gov/fsb.

(B) Safety refusals. The observer service provider must report to NMFS any trip that has been refused due to safety issues, e.g., failure to hold a valid USCG Commercial Fishing Vessel Safety Examination Decal or to meet the safety requirements of the observer's pre-trip vessel safety checklist, within 12 hours of the refusal(C) Biological samples. The observer service provider must ensure that biological samples, including whole marine mammals, sea turtles, and sea birds, are stored/handled properly and transported to NMFS within 7 days of landing. If transport to NMFS/FSB Observer Training Facility is not immediately available then whole animals requiring freezing shall be received by the nearest NMFS freezer facility within twenty four (24) hours of vessel landing. NMFS freezer locations and availability can be found at http://www.nefsc.noaa.gov/fsb/memos/2012/Freezer%20List%2007-2012.pdf

(D) Observer debriefing. The observer service provider must ensure that the observer remains available to NMFS, either in-person or via phone, at NMFS' discretion, including NMFS Office for Law Enforcement, for debriefing for at least 2 weeks following any observed trip. If requested by NMFS, an observer that is at sea during the 2-week period must contact NMFS upon his or her return. Observer service providers must pay for travel and land hours for any requested debriefings.

(E) Observer availability report. The observer service provider must report to NMFS any occurrence of inability to respond to an industry request for observer coverage due to the lack of available observers by 5 p.m., Eastern Time, of any day on which the provider is unable to respond to an industry request for observer coverage.

(F) Incident reports. The observer service provider must report possible observer harassment, discrimination, concerns about vessel safety or marine casualty, or observer illness or injury; and any information, allegations, or reports regarding observer conflict of interest or breach of the standards of behavior, to NMFS/ FSB within 12 hours of the event or within 12 hours of learning of the event. See FSB website for all incident reporting procedures, timelines and requirements. http://www.nefsc.noaa.gov/fsb/forms/.

(G) Observer status report. The observer service provider must provide NMFS/FSB with an updated list of contact information for all observers that includes the observer identification number, observer's name, mailing address, email address, phone numbers, homeports or fisheries/trip types assigned, and must include whether or not the observer is “in service,” indicating when the observer has requested leave and/or is not currently working for an industry funded program. Any observer not working for 30 days will be placed on Leave of Absence (LOA) status (or as specified by NMFS/FSB according to most recent Information Technology Security Guidelines on the FSB website). Observers on LOA for 90 days or more will need to conduct an exit interview with NMFS/FSB, return any NMFS/FSB issued gear and Common Access Card (CAC), unless alternative arrangements are approved by NMFS/FSB. NMFS/FSB requires 2 week notification of when an observer is leaving the program so that an exit interview may be arranged and gear returned.

(H) Vessel contract. The observer service provider must submit to NMFS/FSB, if requested, a copy of each type of signed and valid contract (including all attachments, appendices, addendums, and exhibits incorporated into the contract) between the observer provider and those entities requiring observer services.

(I) Observer contract. The observer service provider must submit to NMFS/FSB, if requested, a copy of each type of signed and valid contract (including all attachments, appendices, addendums, and exhibits incorporated into the contract) between the observer provider and specific observers.

(J) Additional information. The observer service provider must submit to NMFS/FSB, if requested, copies of any information developed and/or used by the observer provider and distributed to vessels or observers, such as informational pamphlets, payment notification, description of observer duties, etc.

(viii) Refusal to deploy an observer. (A) An observer service provider may refuse to deploy an observer on a requesting fishing vessel if the observer service provider does not have an available observer within the required time(see website for information on requirements for notifications and waivers for each fishery http://www.nefsc.noaa.gov/fsb/notification.html), and must report all refusals to NMFS/FSB.

(B) An observer service provider may refuse to deploy an observer on a requesting fishing vessel if the observer service provider has determined that the requesting vessel is inadequate or unsafe pursuant to the reasons described at §600.746, and a vessel may not legally sail if the safety deficiency is not fixed.

(C) The observer service provider may refuse to deploy an observer on a fishing vessel that is otherwise eligible to carry an observer for any other reason, including failure to pay for previous observer deployments, provided the observer service provider has received prior written confirmation from NMFS authorizing such refusal.

(6) Limitations on conflict of interest. An observer service provider:

(i) Must not have a direct or indirect interest in a fishery managed under Federal regulations, including, but not limited to, a fishing vessel, fish dealer, and/or fishery advocacy group; (other than providing observer services)

(ii) Must assign observers without regard to any preference by representatives of vessels other than when an observer will be deployed for the trip that was selected for coverage; and

(iii) Must not solicit or accept, directly or indirectly, any gratuity, gift, favor, entertainment, loan, or anything of monetary value from anyone who conducts fishing or fishing related activities that are regulated by NMFS, or who has interests that may be substantially affected by the performance or nonperformance of the official duties of observer providers.

(7) Removal of observer service provider from the list of approved observer service providers. An observer service provider that fails to meet the requirements, conditions, and responsibilities specified in paragraphs (h)(5) and (6) of this section shall be notified by NMFS, in writing, that it is subject to removal from the list of approved observer service providers. Such notification shall specify the reasons for the pending removal. An observer service provider that has received notification that it is subject to removal from the list of approved observer service providers may submit written information to rebut the reasons for removal from the list. Such rebuttal must be submitted within 30 days of notification received by the observer service provider that the observer service provider is subject to removal and must be accompanied by written evidence rebutting the basis for removal. NMFS shall review information rebutting the pending removal and shall notify the observer service provider within 15 days of receipt of the rebuttal whether or not the removal is warranted. If no response to a pending removal is received by NMFS, the observer service provider shall be automatically removed from the list of approved observer service providers. The decision to remove the observer service provider from the list, either after reviewing a rebuttal, or if no rebuttal is submitted, shall be the final decision of NMFS and the Department of Commerce. Removal from the list of approved observer service providers does not necessarily prevent such observer service provider from obtaining an approval in the future if a new application is submitted that demonstrates that the reasons for removal are remedied. Certified observers under contract with an observer service provider that has been removed from the list of approved service providers must complete their assigned duties for any fishing trips on which the observers are deployed at the time the observer service provider is removed from the list of approved observer service providers. An observer service provider removed from the list of approved observer service providers is responsible for providing NMFS with the information required in paragraph (h)(5)(vii) of this section following completion of the trip. NMFS may consider, but is not limited to, the following in determining if an observer service provider may remain on the list of approved observer service providers:

(i) Failure to meet the requirements, conditions, and responsibilities of observer service providers specified in paragraphs (h)(5) and (h)(6) of this section;

(ii) Evidence of conflict of interest as defined under paragraph (h)(6) of this section;

(iii) Evidence of criminal convictions related to:

(A) Embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; or

(B) The commission of any other crimes of dishonesty, as defined by state law or Federal law, that would seriously and directly affect the fitness of an applicant in providing observer services under this section;

(iv) Unsatisfactory performance ratings on any Federal contracts held by the applicant; and

(v) Evidence of any history of decertification as either an observer or observer provider.

(i) Observer certification. (1) To be certified, employees or sub-contractors operating as observers for observer service providers approved under paragraph (h) of this section must meet NMFS/FSB certification requirements, refer to the program specific observer training certifications on the website at: http://www.nefsc.noaa.gov/fsb.

(2) Observer training. In order to be deployed on any fishing vessel, a candidate observer must have passed an appropriate NMFS/FSB Observer Training course. and must maintain all NMFS/FSB program standards and policies, refer to website for program standards, http://www.nefsc.noaa.gov/fsb If a candidate fails training, the candidate and observer service provider shall be notified immediately by NMFS/FSB. Observer training shall include an observer training trip, as part of the observer's training, aboard a fishing vessel with a trainer. Refer to the NMFS/FSB website for the required number of program-specific observer training certification trips for full certification following an observer training, http://www.nefsc.noaa.gov/fsb.

(3) Observer requirements. All observers must:

(i) Have a valid NMFS/FSB fisheries observer certification pursuant to paragraph (i)(1) of this section;

(ii) Be physically and mentally capable of carrying out the responsibilities of an observer on board fishing vessels, pursuant to standards established by NMFS. Such standards are available from NMFS/FSB website specified in paragraph (h)(1) of this section and shall be provided to each approved observer service provider;

(iii) Have successfully completed all NMFS-required training and briefings for observers before deployment, pursuant to paragraph (i)(2) of this section; and

(iv) Hold a current Red Cross (or equivalence) CPR/First Aid certification.

(v) Accurately record their sampling data, write complete reports, and report accurately any observations relevant to conservation of marine resources or their environment.

(4) Probation and decertification. NMFS may review observer certifications and issue observer certification probation and/or decertification as described in NMFS policy found on the NMFS/ FSB website specified in paragraph (h)(1) of this section.

(5) Issuance of decertification. Upon determination that decertification is warranted under paragraph (i)(4) of this section, NMFS shall issue a written decision to decertify the observer to the observer and approved observer service providers via certified mail at the observer's most current address provided to NMFS. The decision shall identify whether a certification is revoked and shall identify the specific reasons for the action taken. Decertification is effective immediately as of the date of issuance, unless the decertification official notes a compelling

reason for maintaining certification for a specified period and under specified conditions. Decertification is the final decision of NMFS and the Department of Commerce and may not be appealed.

Appendix 3

Omnibus Industry-Funded Monitoring (IFM) Amendment

Amendment 7 to the Atlantic Herring FMP

DRAFT

Options Under Consideration

to Establish IFM in the Atlantic Herring Fishery

(Coverage Targets, Program Requirements, Sea Day Costs)

Lori Steele, NEFMC Staff, Herring Plan Development Team (PDT) Chairman

Industry-Funded Monitoring FMAT

DATE: 8/7/15 for Draft Omnibus IFM Amendment/EA

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Summary of Herring IFM Options Under Consideration

The options under consideration to establish industry-funded monitoring (IFM) in the Atlantic herring fishery are described in detail in the Draft omnibus IFM amendment. The options under consideration are grouped into two categories: (1) options for industry-funded observer coverage (herring OBS options, HER OBS); and (2) options for industry-funded at-sea monitoring (herring ASM options, HER ASM). The primary difference between these options is that the herring OBS options require comprehensive sampling (catch and bycatch) to provide data that is consistent with NEFOP observer data collected to meet the requirements of the standardized bycatch reporting methodology (SBRM). The herring ASM options require comprehensive sampling of bycatch only, i.e., any catch that is not retained on board the vessel for any reason, including full and partial slippage events, operational discards, and catch that is sorted on board the vessel and then discarded. The industry (vessels/vessel owners) would pay for at-sea monitors to collect bycatch data, while NEFOP observers would continue to be deployed to collect observer data on herring vessels to meet SBRM requirements. The details of the industry-funded herring OBS and ASM options under consideration are discussed in the following subsections of this document.

The intent of considering two different kinds of industry-funded monitoring programs for the Atlantic herring fishery is to address specific monitoring needs identified by the Council while providing a basis for understanding and comparing the costs of the monitoring program, particularly those which will be borne by the fishing industry. This approach also provides a mechanism to consider options that may reduce costs for the industry. For comparison purposes, information about the current multispecies (groundfish) at-sea monitoring program (GF ASM) for sector vessels is provided throughout this document as well. Since the sea day costs of the GF ASM program are better understood and current estimates of these costs are available, the sea day costs of a herring ASM program can be estimated based on a comparison to the groundfish ASM program, with particular consideration of the factors that can drive sea day costs up (see Section 2.1, p. 4).

Under the herring OBS options, vessels would be required to hire/pay sea day costs for NMFS-approved observers on some number of trips (based on coverage targets) above those on which vessels are required to carry an observer deployed through the standardized bycatch reporting methodology (SBRM). The industry-funded observers would require NEFOP certification to collect observer data, including a high-volume certification, and they would collect comprehensive catch/bycatch data consistent with NEFOP protocols for observer data collected under the SBRM. Under the herring ASM options, vessels would be required to hire/pay sea day costs for NMFS-approved at-sea monitors on trips (based on coverage targets) other than those on which vessels are required to carry an observer deployed through the SBRM. The industry-funded at-sea monitors would require NEFOP certification for the herring ASM program (HER ASM), and they would collect bycatch (discard) data consistent with NEFOP protocols.

Each set of options for IFM in the Atlantic herring fishery includes sub-options to consider allowances for waivers in the event that an observer or at-sea monitor cannot be provided for a fishing trip (to allow the vessel to fish). Additional sub-options are under consideration to exempt wing vessels (in a pair trawl operation) that do not take on fish from requirements to carry observers/monitors under the industry-funded monitoring program. These vessels would be required to notify NMFS ahead of time (through the pre-trip call-in and/or VMS) and would be prohibited from fishing for or possessing herring on exempted trips.

Some of the herring IFM options under consideration in the IFM amendment would apply to all Category A/B Atlantic herring vessels (single and paired midwater trawl, purse seine, small mesh bottom trawl) on trips declared into the herring fishery, while other options would apply only to midwater trawl vessels (single and paired, all permit categories). The options that apply only to midwater trawl vessels are based on SBRM fleet divisions (gear type and area).

What is a Sea Day Cost?

For the purposes of this discussion document, the *sea day cost* is amount that the participants in the fishery (vessels/vessel owners) pay to service provider companies for deploying an observer/at-sea monitor for a fishing trip to meet the requirements of an industry-funded monitoring program. As described in the Draft omnibus IFM amendment, the *sea day cost* incurred by the industry generally includes travel and salary for observer training, deployment and debriefing; service provider overhead and project management costs; special equipment costs; and other expenses determined by the service provider to meet the monitoring program requirements. Sea day costs are usually estimated based on a 24-hour day but can be billed based on full days, partial days, or hours. In many cases, vessel owners will enter into contracts with service providers to negotiate and secure a specific sea day cost for an agreed-upon number of sea days. Vessels may enter into contracts with multiple service providers to meet the monitoring requirements for a fishery. There are several elements of a sea day cost that can be negotiated through these contracts.

In an industry-funded monitoring program, a primary component of a *sea day cost* (sometimes upwards of 50% of the sea day cost) is **labor**, i.e., wages/salary for observers, which can be estimated by the service provider based on the anticipated number of days per month that each observer will work in the monitoring program. **Insurance** is another significant component of the sea day cost, the annual cost of which (per observer) is spread across the estimated number of sea days. Additional costs related to observer **training** (daily stipend, travel, and lodging), employee **benefits** (health insurance, vacation), and project management and **overhead** (staff, offices) are estimated for the year and then distributed across the estimated number of sea days for the monitoring program.*

**Insurance and workers compensation expenses are higher in the Northeast Region than in west coast fisheries.*

There are currently no industry-funded monitoring programs in the Greater Atlantic Region that include contracts between service provider companies and fishing industry participants. Until now, all contracts for observer coverage and at-sea monitoring have been entered into by the Federal government and service providers, administered by NMFS/NEFOP. The contract for NEFOP observer coverage under the SBRM requirements is signed for five years with one provider (currently MRAG Americas). Until recently, the Federal government has been covering industry sea day costs in the groundfish at-sea monitoring program through contracts with three service providers. Later in 2015, when groundfish sectors will become responsible for paying their at-sea monitoring sea day costs, there will be an opportunity for sector vessels to enter into contracts with provider companies to negotiate sea day costs. There is likely to be some reduction in sea day costs that will result from "privatizing" contracts and eliminating the Federal government as a party entering into the contract (see following discussion). Several industry-funded monitoring programs in U.S. west coast fisheries use vessel/provider contracts; reviewing these programs is helpful to understand the factors that drive sea day costs up and the ways that the monitoring program can be structured to reduce these costs.

Sea day costs are determined by individual service providers based on their overhead and the estimated costs associated with deploying their employees as observers in the monitoring program. There are many elements of the sea day cost that will be unique to individual service provider companies and cannot be predicted or estimated with any certainty. In addition, sea day costs can be variable, and service providers can bid different sea day costs to different vessels under the same monitoring program, depending on the details of the individual contracts. Ultimately, it will be up to the participants in the fishing industry to negotiate sea day costs with service providers in contracts designed to better meet their individual needs. To the extent that vessels that fish out of the same ports can work together to negotiate costs with service provider companies, there may be savings by reducing observer travel costs and offering more days in total for the providers to distribute overhead costs. In addition, there may be opportunities for the industry to reduce their sea day costs by allowing some costs (travel, meals, cancellations) to be negotiated in the contracts with service providers.

A large part of the sea day cost is determined by service providers based on predictions/assumptions of how vessels participating in the monitoring program will operate over the course of a fishing year and how the fishery will respond. If service providers have adequate information to accurately predict their overhead and related costs, then they can increase their efficiency and transfer these cost savings to the industry.

What Drives Sea Day Costs Up?

There are several factors that can significantly affect sea day costs in any industry-funded monitoring program. During the development of this discussion document, representatives from the NEFOP, service provider companies in the northeast U.S., and representatives from U.S. west coast service provider companies identified the following factors that most commonly increase sea day costs. In an effort to reduce sea day costs, the elements of the herring ASM options under consideration (described in Section 3.0 of this document) specifically address the following factors, to the extent possible. *Discussion of each of these factors with respect to the herring ASM options is provided below in italics.*

- **Requirements for New Data Collection/New Equipment.** New or different sampling protocols require modifications to observer training, which could increase training costs for both the government and service providers. If new or different sampling equipment is required to meet the monitoring program needs, the expense of the additional equipment will be incurred by the service provider. In addition, re-designing existing observer databases to incorporate new data introduces a significant administrative expense.

  The herring ASM options build on existing observer data collection protocols and do not require the collection of new/different data and/or new/additional sampling equipment. The protocols for the herring ASM options focus on the sampling of bycatch and is based on existing protocols for sampling bycatch and completing a NEFOP discard log for observed herring trips (see Section 3.1 for more information).

- **SCA and FLSA Requirements.** Requirements associated with the Service Contract Act (SCA) and Fair Labor Standards Act (FLSA) apply to any contracts in which the Federal government is involved. There is likely to a reduction in sea day cost associated with eliminating any legal requirements that apply specifically to contracts involving the Federal government. However, service provider companies would still be subject to FLSA requirements and other applicable labor laws.

  The SCA applies to every contract entered into by the United States (government) or the District of Columbia. Contractors and subcontractors performing on these Federal contracts must observe minimum wage standards (based on the prevailing wage for a locality, as determined by the Department of Labor) as well as safety and health standards, and they must maintain certain records. The SCA requires that every employee working under the contract must be paid not less than the monetary wages, and must be furnished fringe benefits, which are determined based on locality. Fringe benefits include paid holiday leave, vacation time, and minimum requirements for health and welfare (80/20 compensation for health insurance). Because contracts in the Atlantic herring industry-funded monitoring program will be between service providers and participants in the fishing industry, it will not be necessary for these contracts to meet the requirements of the SCA.

However, even without the SCA requirements, service provider companies will still be required to pay employees not less than the federal minimum wage provided in the Fair Labor Standards Act (FLSA). The FLSA establishes minimum wage, overtime pay, recordkeeping, and youth employment standards affecting employees *in the private sector as well as in Federal, State, and local governments.* Covered non-exempt workers are entitled to a minimum wage of not less than $7.25 per hour effective July 24, 2009. Overtime pay at a rate not less than one and one-half times the regular rate of pay is required after 40 hours of work in a workweek.

According to a report published by MRAG Americas (June 2012), Northern Economics (2011) estimated that the SCA and FLSA requirements are likely to add $50-$100 to the sea day cost for an industry-funded monitoring program. However, eliminating SCA requirements by privatizing contracts in this region is not likely to decrease sea day costs by as much as $100 for two reasons: (1) FLSA requirements for minimum wage and overtime would still apply to vessel/provider contracts; and (2) employees working for companies currently providing observer coverage and at-sea monitoring services in this region have been working (some for many years) under government contracts, which are consistent with SCA requirements for wages and fringe benefits. It may be very difficult for service providers in this region to change the wage and benefit structure they offer to their employees, many of whom have been working in observer and ASM programs in this region for several years. Therefore, the reduction in sea day cost that can be expected from the privatization of contracts cannot be estimated with certainty but is likely to be on the lower end of the range predicted in the MRAG Report.

**This savings is not reflected in the current estimate of sea day costs for the groundfish ASM program.*

- **Ability to Predict the Fishery.** Sea day costs will likely be higher if service providers cannot predict how the fishery will operate (numbers of vessels/trips, length of trips, seasonality and spatial distribution of trips) in order to accurately estimate costs (administrative, overhead, communications, logistics) associated with deploying observers to meet the needs of the monitoring program. Predictability increases efficiency and therefore reduces costs. With limited information to predict the fishery, service providers are more likely to over-estimate costs associated with travel and observer deployment to ensure that they cover their costs.

  The Atlantic herring fishery is a small group of vessels that fish in a relatively predictable manner. Ultimately, in order to reduce costs, it will be up to industry participants to provide as much detail as possible about their fishing patterns to the service providers when they negotiate contracts for sea days.

- **Complicated Logistics (Vessel Selection and Observer Deployment).** The more infrastructure necessary to efficiently deploy observers to meet the needs of the monitoring program (field offices, coordinators, communications networks), then the higher the sea day costs will be. If pre-trip notification systems need to be expanded to determine observer/monitor deployment, this will likely increase costs.

  The existing pre-trip notification system (PTNS) can be utilized for vessel selection under the herring ASM options. The coverage targets are relatively simple and should not create overhead/staff costs associated with vessel selection/notification and observer deployment. In addition, travel costs associated with deploying observers on Category A/B herring vessels may be less than those for other IFM programs. The Atlantic herring fishery operates with a relatively small number of boats in a limited geographical area (versus the area covered by west coast

fisheries), so observers can reach a number of deployment ports across several states more easily (ex., driving vs. flying).

How Can Sea Day Costs be Reduced?

Table 1 summarizes the ways that sea day costs can be in an industry-funded monitoring program. The discussion provided in Table 1 was generated from information provided by NEFOP personnel, observers, and representatives from service providers in the northeast and U.S. west coast. To the extent that the issues identified in Table 1 can be addressed through the management measures that establish/implement the IFM program, sea day costs borne by the fishing industry can be reduced.

Table 1 Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Build from existing observer sampling protocols; do not require new/different data to be collected	• Collecting data in a new/different way will require modifications to existing observer sampling protocols and training procedures, new/revised manuals/logs, possibly new/additional sampling equipment, and database design or restructure; this could increase administrative and training costs
Eliminate SCA and related regulatory requirements for Federal contracts	• Federal requirements for wage structure/overtime/paid holidays/vacation are not necessary for contracts between vessels/providers; without specifically implementing these requirements as part of the IFM regulations, wage structure and benefits for employees would be determined by individual service provider companies; MRAG report (June 2012) estimates that eliminating these requirements may reduce costs by $50-$100 per sea day; • FLSA and other Federal labor laws would still apply to service provider companies; however, eliminating the SCA requirements from IFM regulations is likely to result in some reduction in sea day cost; • Not likely to result in $100 per sea day cost savings in this region due to existing pay structure/benefits for observers required by Federal contracts; • *Needs NOAA GC Input**
"Grandfather in" current service providers approved for NEFOP observer coverage and GF ASM programs – approve these providers immediately for Herring ASM program	• Reduces expense of applying/re-approving service provider companies already approved for other programs in the region; observers/monitors for approved service providers would still need NEFOP certification for Herring ASM program; • Allows herring vessels to select from multiple service providers when program is established; increases negotiating opportunities for vessels at onset of program by creating competition between companies; • Provides opportunity for existing service providers in GF ASM program to offer more work days to their observers (could reduce staff/overhead expenses for both programs)
Allow cross-certification of NEFOP and GF ASM observers for HER ASM program; combine/overlap training and recertification whenever possible	• Cross-training and applying training courses to multiple certification reduces training costs (travel, hotel, per diem for service providers); • Reduces equipment costs for service providers – no need to purchase duplicative equipment • As previously noted, this may reduce overhead costs for GF ASM service providers by providing their observers with a greater number of days to work (improving ability for service providers to retain full-time employees)

Table 1 continued. Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Provide detailed information about fishing patterns for vessels participating in the industry-funded monitoring program	• Allows providers to more accurately estimate manpower/resources needed, logistics, overhead, and travel costs - reduces need for providers to over-estimate these costs to cover expenses that cannot be predicted prior to the start of the year; • Increases predictability of fishery for observer/monitor deployment; • Increases efficiency for service providers
Minimize observer deployment logistics	• Simplifying the selection process for vessels/trips that require industry-funded observers/monitors reduces costs for service providers because vessel selection/notification would not require additional staff or resources; • Pre-trip notification and selection for Herring ASM options could be built into existing herring PTNS; 100% coverage target options (and 50% coverage target options) eliminate need for service provider to develop a plan to meet specified coverage targets for the monitoring program;
Allow industry to negotiate less significant costs with providers	• Structure the provisions in the industry-funded monitoring program to allow the industry to negotiate as many minor costs as possible with service providers, to better meet their individual vessel needs circumstances; • These may include costs for trip cancellations and no-shows, meal reimbursements, partial day/hourly billing (see below), land-hour rates (if necessary), or other costs
Encourage service providers/industry to negotiate billing by partial days (versus 24 hour days)	• Sea scallop regulations 648.11(g)(5)(i)(A)(2) state that "For the purposes of determining a daily rate…a service provider may charge a vessel owner for not more than the time an observer boards a vessel until the vessel disembarks (dock to dock), where a day is defined as a 24-hour period, and portions of other days would be pro-rated at an hourly charge." • Industry participants should be aware that this can be negotiated in contracts with providers; may be opportunity to reduce sea day costs for some vessels depending on fishing operations; • Consideration should be given to the possibility of land hour time for observers/monitors, which may be necessary if days are billed partially or by the hour
Allow observers to be deployed on the same vessel for more than two consecutive multi-day trips, and more than twice in any given month for multi-day deployments	• Prohibited in current regulations for industry-funded observer coverage (Herring OBS options), implemented in SBRM amendment • Increases flexibility and reduces travel costs for service providers; appears to be consistent with regulations for Groundfish ASM

Table 1 continued. Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Encourage vessels in close proximity to negotiate contracts together so that they can utilize the same observers and minimize travel expenses	• Industry can reduce costs by collaborating with vessels that fish from same ports and/or during same seasons to reduce travel and related costs for observers/monitors
Streamline debriefing and re-certification requirements	• Reduces costs to service providers (travel/per diem)
Insurance	• There may be ways to reduce/streamline insurance requirements to reduce costs for providers. To the extent that duplicative or redundant insurance requirements can be eliminated, costs can be reduced. This issue requires further investigation.
Combine the IFM programs for herring and mackerel fisheries	• Would reduce complexity (PTNS, deployment, travel) and increase efficiency for service providers; increases number of sea days for amortizing travel/training expenses over the year; • Could increase the total number of work days available for ASM-certified observers/monitors and may reduce staff/overhead costs for service providers • The New England and Mid-Atlantic Councils should consider this further when the goals/objectives for IFM programs in the Atlantic herring and mackerel fisheries are more clearly articulated.

As noted in Table 1, one way to reduce sea day costs is to provide service provider companies with accurate, detailed information about the fishery characteristics to better predict how vessels participating in the industry-funded monitoring program will operate over the course of the upcoming year. This allows providers to more accurately estimate the staff, resources, and overhead that will be needed to meet their contractual requirements. This information also helps service providers predict any travel expenses they may incur, therefore reducing the need to over-estimate these costs to cover expenses that cannot be anticipated ahead of time. Table 2 describes the types of fishery data that can help to better predict how vessels in the fishery will operate over the upcoming fishing year. Ultimately, in order to reduce sea day costs, it will be up to industry participants to provide as much detail as possible about their fishing patterns to the service providers when they negotiate contracts for sea days.

Table 2 Types of Information/Data That Can Improve Predictability of the Fishery

<table>
<tr><td>Number of vessels and trips by gear type, area, and month</td><td rowspan="7">This information helps service providers estimate:
No. of observers are needed for the monitoring program
Number of days per month observers may work
Staff/overhead to deploy observers and maintain communications
Travel expenses and other logistics</td></tr>
<tr><td>Length of vessels, other vessel characteristics</td></tr>
<tr><td>Length of fishing trips</td></tr>
<tr><td>Percentage/proportion of back-to-back trips</td></tr>
<tr><td>Port sailed/port landed; geographical extent of fishing
Proportion of trips with different port sail/land</td></tr>
<tr><td>Total ports sailed from (by month or season)</td></tr>
<tr><td>How many boats will be out fishing at any given time?</td></tr>
<tr><td>Number of hauls per trip (per day)</td><td>This helps to determine minimum number of hours of work per sea day; some service providers may pay their observers differently, depending on the work schedule at sea.</td></tr>
</table>

Elements of Herring Options Under Consideration

The following subsections describe the elements of the options under consideration in the IFM amendment to establish industry-funded monitoring (IFM) in the Atlantic herring fishery, including the options for industry-funded observer coverage (Herring OBS) and the options for industry-funded at-sea monitoring (Herring ASM). The primary focus of the discussion in this document is regarding the details of the herring ASM options, which were added to the IFM amendment by the New England Council in January 2015. (The Mid-Atlantic Council added similar options for industry-funded monitoring in the Atlantic mackerel fishery.)

To the extent possible, the herring ASM options were developed based on the current multispecies (groundfish) at-sea monitoring (GF ASM) program for sectors. However, the elements of the herring ASM options have been designed with a more explicit intent of reducing sea day costs (borne by the fishing industry) to the extent possible. For comparison purposes, and for a better understanding of the factors that can increase sea day costs, the elements of the Groundfish ASM program are discussed throughout the following subsections. Since the sea day costs of the GF ASM program are currently better understood and recent estimates of these costs are available, the sea day costs of a herring ASM program can be estimated based on a comparison to the Groundfish ASM program.

In addition to the coverage targets specified within each option (see Draft IFM Amendment), the elements of the options for industry-funded monitoring in the Atlantic herring fishery include the sampling objectives, sampling design, data to be collected, service provider requirements, training and certification requirements, sampling equipment, logistics (trip notification) and related provisions, debriefing, and data management.

Under all of the herring at-sea monitoring options (HER ASM), to reduce sea day costs for vessels that are subject to the industry-funded monitoring requirements, the following provisions would apply:

- Existing service providers approved for observer coverage (NEFOP) and groundfish at-sea monitoring (GF ASM) would be "grandfathered in" as approved service providers for Herring ASM (observers working for these companies would still require certification for Herring ASM – see Section 3.2 for more information). Re-approval of the Herring ASM service providers after Year 1 would be consistent with the process for re-approving Groundfish ASM service providers.

- Cross-certification of observers from NEFOP and GF ASM programs would be allowed to certify observers for Herring ASM (see Section 3.2 for more information). Any training that is completed for a NEFOP and/or GF ASM certification could be applied to a Herring ASM certification during the same year. Training, certification, debriefing, and re-certification would be streamlined and combined with the NEFOP and GF ASM programs to the extent possible.

Sampling Objectives, Sampling Design, Data Collected

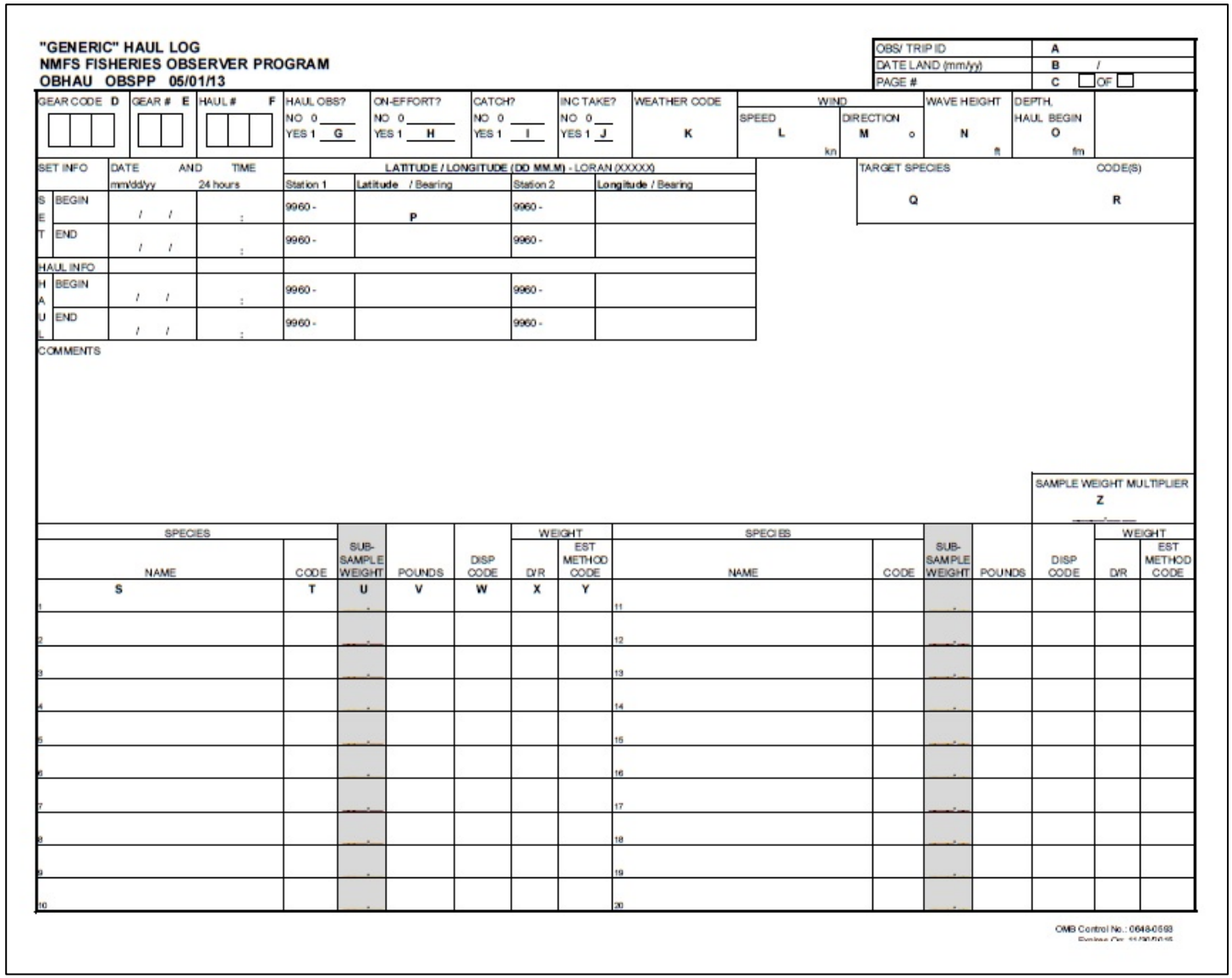
The herring OBS options under consideration in the IFM amendment focus on the collection of comprehensive catch and bycatch data, along with other environmental and economic information, consistent with the NEFOP sampling protocols for high-volume fisheries. The herring ASM options focus on the collection of bycatch data, including documentation of full and partial slippage events, operational discards, and catch that is discarded after being brought on board the vessel, i.e., any catch that is not kept/landed by the vessel. The intent of focusing the herring ASM options on the collection of bycatch (discard) data only is to reduce some of the training and equipment expenses associated with the monitoring program, thereby reducing sea day costs for the industry. The herring ASM options also represent one component of a comprehensive long-term catch monitoring program for the Atlantic herring fishery, which will also incorporate portside sampling and electronic monitoring (EM).

There would be no new or different data collection requirements under the herring ASM options; rather, the ASM options would require that a subset of the catch data that is currently collected by NEFOP observers on a limited number of herring trips (determined by the SBRM) be collected on more trips,. i.e., trips with an industry-funded at-sea monitor. The sampling protocols for the ASM options would be developed by NEFOP based on information needed to document catch that is not kept/landed by the vessels, including slippage events and operational discards. In order to streamline training and equipment costs, the bycatch data (data elements and sampling protocols) collected by herring at-sea monitors would be consistent with bycatch data collected by groundfish at-sea monitors.

In general, data elements collected under the Herring ASM options would be identified based on existing NEFOP haul logs and the NEFOP discard log that was developed in 2010 specifically for vessels that pump fish. Table 3 represents a generic NEFOP haul log, and Table 4 represents a NEFOP discard log, which was developed by the NEFOP in 2010 specifically to meet the monitoring needs of the herring fishery. The discard log is currently required to be completed by observers on all hauls in which fish are pumped, as well as any significant discard events on vessels that do not pump fish. Under the herring ASM options, the discard log would be required to be completed by at-sea monitors on all observer hauls, regardless of gear type or fishing method. Basing the Herring

ASM sampling design on the NEFOP discard log allows data collected by herring at-sea monitors to be compared to observer data since the discard log was created in 2010.

Table 3 NEFOP Generic Haul Log (Example)



"GENERIC" HAUL LOG
NMFS FISHERIES OBSERVER PROGRAM
OBHAU OBSPP 05/01/13

OBS/ TRIP ID	A
DATE LAND (mm/yy)	B /
PAGE #	C ☐ OF ☐

GEAR CODE D	GEAR # E	HAUL # F	HAUL OBS?	ON-EFFORT?	CATCH?	INC TAKE?	WEATHER CODE	WIND SPEED L kn	WIND DIRECTION M °	WAVE HEIGHT N ft	DEPTH, HAUL BEGIN O fm
			NO 0 ____ YES 1 G	NO 0 ____ YES 1 H	NO 0 ____ YES 1 I	NO 0 ____ YES 1 J	K				

SET INFO	DATE mm/dd/yy	AND TIME 24 hours	LATITUDE / LONGITUDE (DD MM.M) - LORAN (XXXXX) Station 1	Latitude / Bearing	Station 2	Longitude / Bearing
SET BEGIN	/ /	:	9960 -	P	9960 -	
SET END	/ /	:	9960 -		9960 -	
HAUL INFO						
HAUL BEGIN	/ /	:	9960 -		9960 -	
HAUL END	/ /	:	9960 -		9960 -	

TARGET SPECIES	CODE(S)
Q	R

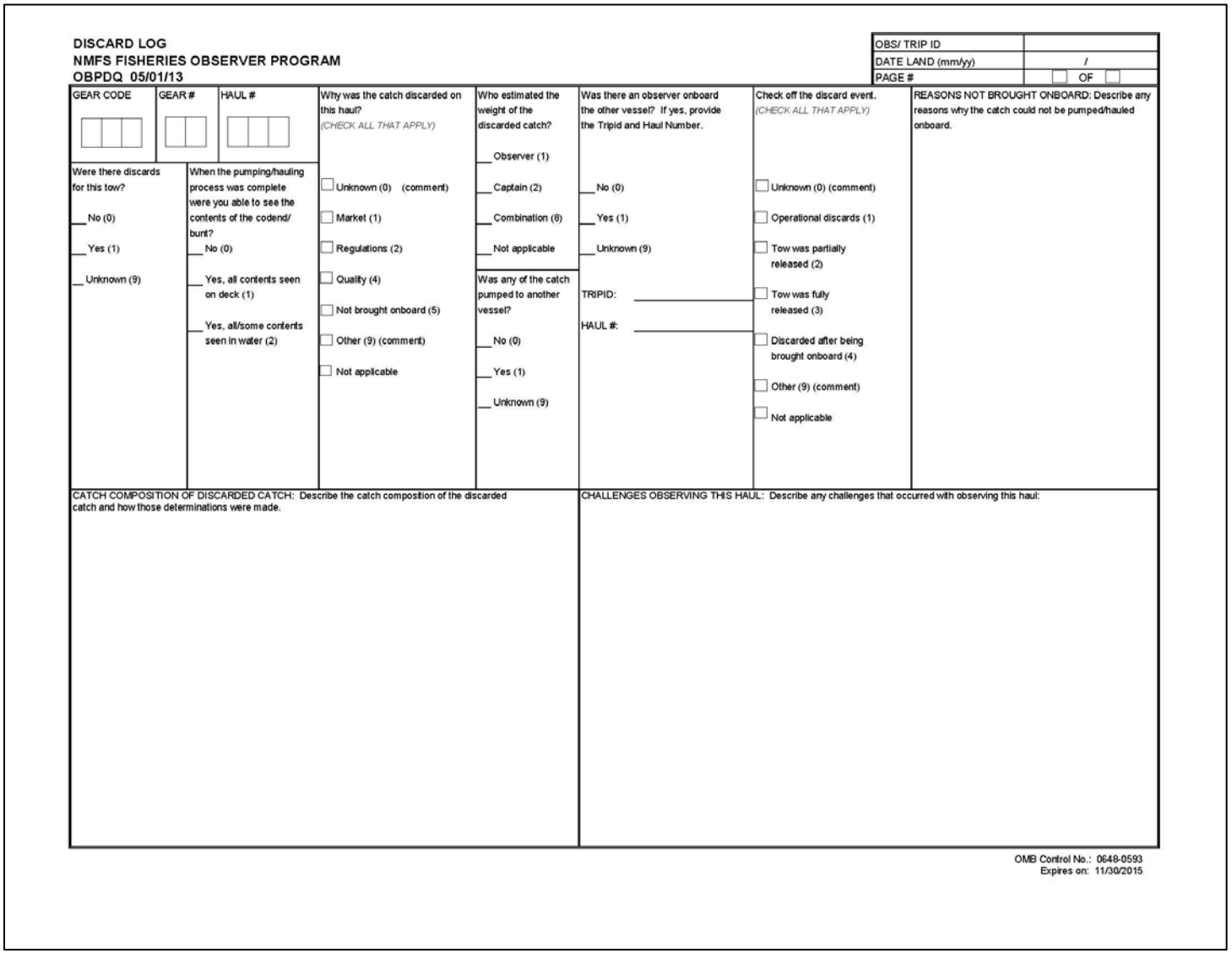
COMMENTS

SAMPLE WEIGHT MULTIPLIER Z ____.____

SPECIES NAME	CODE	SUB-SAMPLE WEIGHT	POUNDS	DISP CODE	WEIGHT D/R	WEIGHT EST METHOD CODE	SPECIES NAME	CODE	SUB-SAMPLE WEIGHT	POUNDS	DISP CODE	WEIGHT D/R	WEIGHT EST METHOD CODE
S	T	U	V	W	X	Y							
1							11						
2							12						
3							13						
4							14						
5							15						
6							16						
7							17						
8							18						
9							19						
10							20						

OMB Control No.: 0648-0593

Table 4 NEFOP Discard Log (Example)



DISCARD LOG
NMFS FISHERIES OBSERVER PROGRAM
OBPDQ 05/01/13

OBS/ TRIP ID	
DATE LAND (mm/yy)	/
PAGE #	☐ OF ☐

GEAR CODE	GEAR #	HAUL #	Why was the catch discarded on this haul? *(CHECK ALL THAT APPLY)*	Who estimated the weight of the discarded catch?	Was there an observer onboard the other vessel? If yes, provide the Tripid and Haul Number.	Check off the discard event. *(CHECK ALL THAT APPLY)*	REASONS NOT BROUGHT ONBOARD: Describe any reasons why the catch could not be pumped/hauled onboard.
			☐ Unknown (0) (comment)	__ Observer (1)	__ No (0)	☐ Unknown (0) (comment)	
Were there discards for this tow?	When the pumping/hauling process was complete were you able to see the contents of the codend/ burnt?		☐ Market (1)	__ Captain (2)	__ Yes (1)	☐ Operational discards (1)	
__ No (0)	__ No (0)		☐ Regulations (2)	__ Combination (8)	__ Unknown (9)	☐ Tow was partially released (2)	
__ Yes (1)	__ Yes, all contents seen on deck (1)		☐ Quality (4)	__ Not applicable		☐ Tow was fully released (3)	
__ Unknown (9)	__ Yes, all/some contents seen in water (2)		☐ Not brought onboard (5)	Was any of the catch pumped to another vessel?	TRIPID: _____	☐ Discarded after being brought onboard (4)	
			☐ Other (9) (comment)	__ No (0)	HAUL #: _____	☐ Other (9) (comment)	
			☐ Not applicable	__ Yes (1)		☐ Not applicable	
				__ Unknown (9)			

CATCH COMPOSITION OF DISCARDED CATCH: Describe the catch composition of the discarded catch and how those determinations were made.	CHALLENGES OBSERVING THIS HAUL: Describe any challenges that occurred with observing this haul:

OMB Control No.: 0648-0593
Expires on: 11/30/2015

Different kinds of reporting and/or monitoring can provide different kinds of information with varying levels of verification, as illustrated for the Atlantic herring and mackerel fisheries in Table 5 and Table 6. These tables were developed by the IFM FMAT based on similar tables provided in the 2013 Fisheries Monitoring Roadmap Report (Lowman et al, 2013).

For landings, vessel trip reporting and dealer landings reporting provide dual records of reported landings with the general location coming from the vessel trip report. If specific location of catch is important, VMS, observers, and monitors can provide independent verification of location. Portside sampling can provide independent verification of total landings amounts but no information on location of catch. If small amounts of incidentally-caught species are typically mixed in and retained with the target species, portside sampling may be the best way to estimate/document those landings.

For discards (of targeted or incidental species), vessel trip reporting provides reported discards, but independent verification of discards is often desired. Observers and monitors can provide detailed location-specific discard information, though monitors may or may not collect species composition and may limit their data collection to confirming retention and generally documenting discarding frequency. Cameras (electronic monitoring) can also confirm retention. If retention is confirmed (by whatever means), then portside monitoring can provide full catch verification. Affidavits of discard/slippage events can provide details of why discard/slippage events occur. If retention is not confirmed, then portside sampling can provide independent verification of landings composition but uncertainty regarding discards will persist (assuming observer coverage is not complete).

Biological information (age/length data) must generally be collected by observers/monitors at sea or dockside samplers/port agents on land.

Depending on the level of detail desired for tracking landings and/or discards, some combination of the above monitoring and reporting requirements should address Council needs (the costs of the various requirements are described in Section 4.0 of this document). If independent verifications of both landings and discards are desired, then having either a high level of observer/monitor coverage that subsamples catch or verification of retention (by monitors or cameras) coupled with portside sampling should address that objective.

Table 5 Monitoring Approaches for the Atlantic Herring Fishery Based on Data Needs

		Self-Reporting			Independent monitoring					
Data Need		**Vessel**	**Dealer**	**Affidavits**	**VMS**	**NEFOP Observers**	**Cameras**	**Portside**	**At-sea monitors**	**At-sea monitors**
									With sampling for species comp	w/o sampling for species comp
Total herring catch accounting [ACL monitoring]	Verifying retained	Vessels report by species	Dealer reports by species		Can verify location fishing activity	Verifying location of fishing activity	Not quantifying, but confirming retention	Not useful for vessels fishing in more than one area	Verifying location of fishing activity	Not quantifying, but confirming retention
	Quantifying discards	Vessels report by species			Can verify location fishing activity	Species composition data Estimates amount of discards	Not quantifying, but confirming retention		Species composition data	Not quantifying, but confirming retention
Non-target catch accounting	Haddock catch cap monitoring [ACL monitoring]	Used for total retained		Can help with details of why slippage occurs	Can verify location fishing activity	Species composition data Estimates amount of discards	Not quantifying, but confirming retention	Not useful for vessels fishing in more than one area	Species comp and estimates of discarded catch	Not quantifying, but confirming retention
	River herring and shad catch cap monitoring	Used for total retained		Can help with details of why slippage occurs	Can verify location fishing activity	Species composition data	Not quantifying, but confirming retention	Not useful for vessels fishing in more than one area	Species comp and estimates of discarded catch	Not quantifying, but confirming retention

						Estimates amount of discards				
Scientific information	Stock assessments for herring	VTR only				Collect age, length data		Collect age, length data	Collect age, length data for discards only	
	Stock assessments for non-target species	VTR only				Collect age, length data		Collect age, length data	Collect age, length data for discards only	
	Spawning information					Collect age, length data		Collect age, length data	Collect age, length data for discards only	

Table 6 Monitoring Approaches for the Atlantic Mackerel Fishery Based on Data Needs

		Self-Reporting			Independent monitoring					
Data Need		**Vessel**	**Dealer**	**Affidavits**	**VMS**	**NEFOP Observers**	**Cameras**	**Portside**	**At-sea monitors**	**At-sea monitors**
									With sampling for species comp	Without sampling for species comp
Total mackerel catch accounting [ACL monitoring]	Verifying retained	Vessels report by species	Dealer reports by species		Can verify location fishing activity	Verifying location of fishing activity	Not quantifying, but confirming retention	Not useful for vessels fishing in more than one area	Verifying location of fishing activity	Not quantifying, but confirming retention

	Quantifying discards	Vessels report by species			Can verify location fishing activity	Species comp data Estimates amount of discards	Not quantifying, but confirming retention		Species comp data	Not quantifying, but confirming retention
Non-target catch accounting	River herring and shad catch cap monitoring	Used for total retained		Can help with details of why slippage occurs	Can verify location fishing activity	Species comp data Estimates amount of discards	Not quantifying, but confirming retention	Not useful for vessels fishing in more than one area	Species comp and estimates of discarded catch	Not quantifying, but confirming retention
Scientific information	Stock assessments for mackerel	VTR only				Collect age, length data		Collect age, length data	Collect age, length data for discards only	
	Stock assessments for non-target species	VTR only				Collect age, length data		Collect age, length data	Collect age, length data for discards only	

Table 7 summarizes the sampling objectives, the primary elements of the sampling design, and the data to be collected under the options for industry-funded monitoring in the Atlantic herring fishery (herring OBS and herring ASM options – see description of options in the Draft IFM Amendment); the elements of the current groundfish ASM program are also provided in the table for comparison purposes. Under all of the options, the details of the sampling protocols and logs to be completed would be determined by NEFOP upon implementation of the IFM amendment.

Table 7 Herring IFM Options: Sampling Objectives, Sampling Design, Data Collected

	Industry-Funded Observer Coverage Options (OBS)	***NE GROUNDFISH ASM PROGRAM***	**Industry-Funded Herring ASM Options (Herring ASM)**
Sampling Objectives	SBRM, MMPA, MSA, ESA Stock Assessment, Discard Estimation	MSA Catch monitoring; discard estimation	*Bycatch documentation* - catch that is not kept/landed on Herring Category A/B herring vessels, including full and partial slippage events and operational discards; also including catch that may be brought aboard, sorted, and then discarded *Elements of data collection based on GF ASM; Herring ASM program is intended to complement portside sampling/EM for comprehensive catch monitoring program (landings + discards)*
Sampling Design	Comprehensive catch and bycatch data collection program; protected species documentation; biological sampling; environmental parameters; economic information	Catch monitoring to ensure that ACLs are not exceeded; data on catch composition to estimate total discards by sectors and common pool vessels, by gear type and stock area	Sampling protocols based on NEFOP Haul Log ("modified" - discards); Discard Log; Documentation of bycatch (discards); Protected species interactions; *(in addition to pre-trip safety checklist and other logs/reports as determined by NEFOP)*
Data Collected	Comprehensive catch/bycatch catch/bycatch; biological samples; protected species; fishery information; environmental parameters	Catch/Bycatch	Catch not brought on board the vessel for any reason; Slippage events; Operational discards; Discards brought on board *No subsampling for kept catch estimation*

**The elements of the Groundfish ASM program are provided in the table above for comparison purposes.*

Service Provider Requirements

Under the herring OBS options, the requirements for approving service providers and certifying observers for observer coverage (HER OBS) are proposed to be consistent with those implemented recently through the SBRM amendment (CFR 648.11(h)). Under the herring ASM options, the requirements for approving service providers and certifying observers for the herring at-sea monitoring program (HER ASM) are proposed to be consistent with those for the groundfish sector ASM program, implemented through Amendment 16 to the Multispecies FMP (CFR 648.47(b)(4) and (b)(5)). This approach is consistent with the January 2015 Council motion regarding the addition of the Herring ASM options.

Appendix I of this document provides a detailed comparison of the service provider regulatory requirements for approval/certification under the herring observer coverage options (HER OBS) and the herring at-sea monitoring options (HER ASM). As previously noted, the HER ASM service provider requirements are based on the current requirements for the groundfish ASM program. The major elements of the options as well as the differences between the herring OBS options and herring ASM options are discussed below.

Under the Herring OBS Options:

- Service provider requirements for industry-funded observer coverage would be consistent with those recently implemented through the SBRM amendment (CFR 648.11(h), Table 8, see details in Appendix I).
- Certified observers would be required to qualify/receive and additional NEFOP high-volume certification to work on herring OBS trips. MRAG Americas is currently the only service provider with high-volume certified observers because this is the company that has the existing (five-year) contract with NMFS for observer coverage under the SBRM amendment. Under the herring OBS options, additional service provider companies would need to apply and be approved by NMFS for observer coverage and train/certify their observers through NEFOP for observer coverage in high-volume fisheries.

Under the Herring ASM Options:

- Service provider requirements for industry-funded herring at-sea monitoring would be consistent with those for the multispecies (groundfish) sector at-sea monitoring program, implemented in Amendment 16 to the Northeast Multispecies FMP (CFR 648.47(b)(4) and (b)(5), Table 8, see details in Appendix I).
- Existing service providers approved for observer coverage and the groundfish ASM program would be "grandfathered in," i.e., automatically approved for the herring ASM program, when the omnibus IFM amendment becomes effective. This increases negotiating opportunities for

participants in the fishery by providing competition between companies at the onset of the industry-funded monitoring program (versus having only one service provider available at the program onset).

- Observers working for HER ASM-approved service providers would be required to obtain a Herring ASM certification before being deployed for at-sea monitoring trips on herring vessels. Re-approval of the herring ASM service providers after Year 1 would be consistent with the process for re-approving groundfish ASM service providers.
- Cross-certification for existing providers/observers across multiple monitoring programs would be allowed and encouraged to minimize additional training for a HER ASM certification. Observers employed by the service provider companies that are approved for NEFOP observer coverage and/or groundfish ASM could apply their training for these certifications to a herring ASM certification during the same year. An abbreviated herring ASM training program would be developed to certify new (HER ASM only) observers who are not already certified/certifying for observer coverage or groundfish ASM. This is discussed more in Section 3.3 of this document.
- Provisions for re-certification of herring ASM observers would be consistent with those for Groundfish ASM, but the time needed for re-certification would likely be shorter (see Section 3.3).

The primary differences between the service provider requirements proposed under the HER OBS options and the HER ASM options is that there is no requirement for observers to have a college degree for HER ASM, and there is no prohibition on deploying observers on back-to-back multi-day trips or multiple multi-day trips on the same vessel in the same month (Table 8). Eliminating the college degree requirement and prohibition on multiple trips should reduce sea day costs by increasing the potential pool of observers for-hire and reducing logistics and travel expenses associated with deploying observers on multiple fishing trips. However, concerns about observer retention and data quality have been expressed regarding the elimination of the college degree requirement; these concerns should be considered carefully under the HER ASM options.

Another difference between the options is that the regulations regarding service provider approval and responsibilities under the herring ASM options do not include requirements for service providers to meet SCA/FLSA and Department of Labor (DOL) wage/overtime standards. While it is expected that service provider companies will continue to adhere to DOL and other applicable Federal labor laws, the proposed regulations for the HER ASM options would not further address these requirements, which is also consistent with the current service provider requirements for the Groundfish ASM program. As previously discussed (see Sections 2.1 and 2.2), there is likely to be a sea day cost savings by eliminating these requirements.

Table 8 Herring IFM Options: Service Provider Requirements

	Industry-Funded Observer Coverage Options (HER OBS)	*NE GROUNDFISH ASM PROGRAM*	Industry-Funded Herring ASM Options (HER ASM)
Service Provider Requirements	***Implemented through SBRM Amendment***	***Implemented through Am 16 Multispecies FMP***	***Same as Groundfish ASM Program***
	CFR 648.11(h) Observer Service Provider Approval/Responsibilities	CFR 648.47(b)(4) and (b)(5)	*No requirement for providers to meet SCA/FLSA/DOL wage/overtime standards*
	Bachelor's Degree required	High School Diploma or equivalency	*High School Diploma or equivalency*
		No prohibition on observer deployment on back-to-back trips or multiple multi-day trips	*No prohibition on observer deployment on back-to-back trips or multiple multi-day trips*
Current NMFS-Approved Providers	MRAG Americas	MRAG Americas East West Technical Services AIS, Inc. ACD USA Ltd.* Fathom Research, LLC*	MRAG Americas East West Technical Services AIS, Inc. ACD USA Ltd.* Fathom Research, LLC*

**Service provider companies with an asterisk by their names have been approved for Groundfish ASM but are not currently providing sea day coverage.*

The elements of the Groundfish ASM program are provided in the table above for comparison purposes.

Observer Training, Certification, and Sampling Equipment

General provisions related to observer training, certification, and sampling equipment under the herring OBS and ASM options are summarized in Table 9 and Table 10. Training and certification of industry-funded observers under the HER OBS and HER ASM options would be administered/managed through NEFOP, consistent with training and certification for the groundfish ASM program (GF ASM). Approved service providers for would be responsible for covering the costs associated with providing their employees with a daily stipend, meals, hotel/lodging, and covering other related expenses associated with attending training/certification courses at NEFOP (Falmouth, MA). This can include lodging, meals, and a daily stipend over weekends if training courses more than one week.

Cross-certification of observers and carryover of overlapping training/equipment from NEFOP and GF ASM programs would be allowed to certify observers under the herring ASM options. Any training courses that are completed for a NEFOP observer coverage certification and/or GF ASM certification could be applied to a herring ASM certification during the same year. Training, certification, debriefing, and re-certification would be streamlined (ex., provided remotely) and combined with the NEFOP and GF ASM programs to the extent possible. Because the herring ASM program focuses only on the collection of discard data on Category A/B herring vessels, training requirements and equipment needs for a HER ASM only certification (observers not certified for other programs) would be less than those for the industry-funded observer coverage (OBS options) or the GF ASM program. Therefore, the costs paid by service providers to certify observers for the HER ASM program are expected to be less than those for observer coverage (OBS options) and the GF ASM program, which is likely to reduce the sea day costs for the HER ASM options. Any newly-approved service providers that do not have observers currently certified for either NEFOP observer coverage or GF ASM would incur the largest training/certification/equipment costs under the HER ASM options.

Under the Herring OBS Options:

- Observers (employed by approved service providers) would need to attend 15 training days to obtain a NEFOP certification for observer coverage (Table 9). Newly certified observers would be required to work four training trips, including one trip with a veteran observer. Additional experience (sea days) is necessary prior to qualifying for a high-volume certification, which would then require one additional training day.
- Current GF ASM-certified observers could obtain a NEFOP certification for observer coverage under the Herring OBS options with additional training days and a high-volume certification.

Under the Herring ASM Options:

- Any training that is completed for a NEFOP observer coverage and/or GF ASM certification by observers working for approved service providers could be applied to a HER ASM certification during the same year. Observers already certified for NEFOP and/or GF ASM would not require training trips with a veteran observer to certify for HER ASM. This should significantly reduce costs for existing service providers that may want to "dual certify" their observers for multiple monitoring programs, including herring ASM. Many costs associated with training/certifying observers under the herring ASM options would be incurred only by service provider companies that are certifying their observers for HER ASM only.
- Current NEFOP-certified observers with high-volume certification would not require additional training days to certify for HER ASM, but would likely require some overview/instruction regarding the protocols for HER ASM trips (possibly conducted remotely/online).
- Current groundfish ASM-certified observer would likely require 1-2 additional training days to learn more about herring fishing operations (midwater trawl, purse seine, and small mesh bottom trawl gear) and sampling protocols in high-volume fisheries. Based on cost information provided by service provider companies (*see below), the cost of certifying GF ASM observers for HER ASM would be about $320-$640 (1-2 training days), or about 10-20% of the cost of certifying observers for the GF ASM program (11 training days).
- New observers certifying for HER ASM-only (employed by approved service providers) would likely require 4-5 training days, which includes two days of safety training plus 2-3 days or training for the HER ASM program (herring fishing operations, sampling protocols, data entry, species identification). To obtain a HER ASM certification, new observers would be required to work four training trips, including one trip with a veteran observer. Based on the cost information provided by service provider companies (*see below), the cost of certifying new observers for HER ASM only would be about $1,500-$2,000 per observer (4-5 training days), or about 50% of the cost of certifying observers for the GF ASM program (11 training days).
- Annual recertification would be required for the HER ASM program, but the recertification process could likely be reduced to one day. The GF ASM program recertification currently lasts three days. The costs to service providers for recertifying observers under the herring ASM options, therefore, is expected to be 1/3 of the cost for recertifying observers for Groundfish ASM. To the extent possible, the recertification courses for these programs would be combined and/or provided remotely.

**The cost for training/certifying one observer for the Groundfish ASM program is estimated by service providers to be $3,000-$4,000 (personal communication). This includes travel, meals, lodging, and a daily stipend for 11 training days at the NEFOP training center in Falmouth, MA. This results in an average estimate of about $320 per training day per observer.*

Under the herring ASM options, expenses for sampling equipment would be shared between the Federal government and the service providers in a manner that is similar to the current groundfish ASM program. Because of the focus on bycatch/discards only, less sampling equipment would likely be needed for the herring ASM options versus the herring OBS options (Table 10). Personal safety equipment (immersion suit, inflatable vest, etc.) would continue to be paid for by the service providers; existing observers certified observer coverage and the GF ASM program already possess personal safety equipment and would not need to purchase it again to certify for HER ASM. Other personal issue and off-the-shelf gear such as small scales, gloves, bags, measuring tapes, knives, clipboards, etc. would be covered by the service provider. Additional costs for this equipment would be incurred primarily by newly-approved service providers that do not have observers currently certified for either NEFOP observer coverage or GF ASM. Special prints, special electronics, and not-off-the-shelf gear would continue to be funded by the Federal government, although the availability of future funding is unknown. This includes manuals, field guides, tablets, logs, laptops, and other electronics. The costs of any sampling equipment not provided by the Federal government must be covered by the service providers and is therefore transferred to the industry in the sea day cost.

Overall, because of the need for less sampling equipment and the ability for current NEFOP and GF ASM observers to utilize existing equipment for a herring ASM program, the equipment costs associated with the herring ASM options are expected to be less than those for the herring OBS options. The equipment costs for the herring ASM options will also be lower for service providers with observers who are already certified for groundfish ASM.*

**Information provided by NMFS indicates that the estimated sea day cost incurred by the service provider for equipment in the Groundfish ASM program is $17.50 per observer (based on the observer working 150 sea days in a year).*

Table 9 Herring IFM Options: Observer Training and Certification

	Industry-Funded Observer Coverage Options (OBS)	*NE GROUNDFISH ASM PROGRAM*	Industry-Funded Herring ASM Options (Herring ASM)
Training and Certification			**NEFOP-Certified Observers with Current High-Volume Certification** - no extra training days, but possibly some instruction on protocols for ASM trips; **GF ASM-Certified Observers** - 1-2 training days for herring/high-volume; **New HER ASM Observers** - 4-5 training days for HER ASM only certification (2 days safety, plus herring/high-volume training); *Providers pay for travel/lodging, and daily pay to observers for attending training;* *Est. provider cost for Gfish ASM training (11 days) - $3000-$4000 per observer ($325/day)*
Training Courses	15 days (3 working weeks) comprehensive training, plus high-volume certification for qualified observers (one extra day); **Current Groundfish ASM-certified Observers** - can certify for OBS with additional training days and high-volume certificaiton	11 days (covers multiple gear types - gillnet, longline, otter trawl, handline - catch estimation procedures, protected species)	
Certification/Shadow Trips	Yes, 4 trips incl. 1 with trainer	Yes, 4 trips incl. 1 with trainer	Not required for existing NEFOP and GF ASM-certified observers (already certified); New HER ASM only observers - one shadow trip with trainer; first four trips would be training trips
Re-certification	No	Yes, Annual	Yes, annual - one day (Gfish ASM - 3 days; cost reduced by 2/3)
Safety Refresher (two days)	Yes, every 18 months	Yes, every 18 months	Yes; cross-certify; additional cost only for HER ASM-only observers
CPR/First Aid Certification	Annual	Annual	Annual; cross-certify; additional cost only for HER ASM-only observers

Table 10 Herring IFM Options: Observer Equipment

	Industry-Funded Observer Coverage Options (Herring OBS)	*NE GROUNDFISH ASM PROGRAM*	Industry-Funded Herring ASM Options (Herring ASM)
Equipment	Comprehensive - 83 items	Limited - 44 items	Limited - Similar to Groundfish ASM; any equipment necessary for discard sampling/documentation
Personal Safety Equipment- Immersion suit, PLB, Inflattable Vest	Yes	Yes, covered by provider	Yes, covered by provider; Equipment for NEFOP and GFASM can be used; Additional cost only for HER ASM-only observers
Personal Issue and Off-the-Shelf Gear	*(baskets, small scales, gloves, bags, measuring tapes, disposable cameras, knives, clipboards)*	Yes, covered by provider	Yes, covered by provider; Est. total cost for new observer ($2,600 amortized for life of equipment); Est. sea day cost (service provider) per observer (150 days) - $17.50
Special Prints, Electronics, Not Off-the-Shelf Gear	*(manuals, guides, Marel scales, tablets, logs, electronics)*	Yes, covered by NMFS	Yes, covered by NMFS; *future funding unknown*

The elements of the Groundfish ASM program are provided in the tables above for comparison purposes.

Pre-Trip Notification, Debriefing, and Data Management

Provisions related to vessel selection (through pre-trip call-in/notification), debriefing, and data management for the herring OBS and ASM options are summarized in Table 11. Under all of the herring OBS and ASM options, vessel selection/notification for industry-funded coverage would occur through the existing pre-trip call-in system for Atlantic herring vessels (Amendment 5). The Atlantic herring notification process differs from the Groundfish Pre-Trip Notification System.

The existing notification system for observer deployment on Atlantic herring vessels requires all limited access herring vessels (as well as Category D vessels fishing with midwater trawl gear in Areas 1A, 1B, and/or 3) and all Atlantic herring carrier vessels to notify NMFS/NEFOP at least 48 or 72 hours (depending on permit category) prior to the beginning of any trip where the vessel may harvest, possess, or land Atlantic herring. Vessels/representatives must provide information including the vessel name, permit number/permit category, contact person name and contact phone number, date sail, time sail, port of departure, gear type, and area intending to fish (i.e., herring management area, closed area, etc., consistent with regulatory requirements), as well as target species (target species is helpful to identify directed herring versus directed mackerel trips). Notification is through a telephone number. Vessels can provide pre-trip notification for multiple trips at one time. If a trip is cancelled, a vessel representative must notify NMFS of the cancelled trip, even if the vessel is not selected to carry an observer. All waivers or observer selection notices for observer coverage are issued to the vessel by VMS so as to have on-board verification of the waiver or selection.

The existing pre-trip notification system (PTNS) for observer deployment on groundfish and longfin vessels requires all vessels fishing on PTNS-eligible groundfish trips or PTNS-eligible longfin trips to notify NMFS/NEFOP at least 48 hours prior to the beginning of any trip. Groundfish sector vessels with category A, C, D, E, F, and HA multispecies permits must notify for all multispecies trips. Common pool vessels with categories A, D, E, and F permits, as well as those fishing monkfish or multispecies using A DAS must notify for their groundfish trips. Vessels with a longfin/butterfish moratorium (SMB 1) permit must notify for all trips on which they plan on landing greater than 2500 pounds of longfin squid. Vessels/representatives must provide information including the vessel name, permit number, contact person name and contact phone number, date sail, time sail, port of departure, estimated length of trip, gear type, and area intending to fish. There are several methods available for the pre-trip notification: internet, email, and telephone. Vessels can provide pre-trip notification for multiple trips at one time and may enter their own trips directly into the PTNS without contacting FSB staff. Trips are entered into the PTNS and go through a programmed algorithm to determine which trips get selected for observer coverage. Trips are cancelled by FSB staff based on automated sail reports. All waivers or observer selection notices for observer coverage are issued to the vessel via VMS so as to have on-board verification of the waiver or

selection. The PTNS system in all its complexity requires a full time contractor to oversee the system on a daily basis. The NEFOP also contracts with an afterhours phone service to provide access 24 hours a day, 7 days a week to allow for notifications or troubleshooting.

Under the Herring OBS and ASM Options, vessels would be notified via VMS if they are selected for industry-funded coverage. The 100% coverage target options simplify vessel selection, as all vessels that are not selected for observer coverage under the SBRM provisions would be required to obtain an industry-funded observer employed by one of the service providers approved for the monitoring program.

Debriefing is an important component of any monitoring program, as it helps to resolve data issues expeditiously and ultimately enhances data quality. It also provides an opportunity to review observer performance and address any problems with data collection and data entry. Provisions for debriefing under the Herring ASM options would be consistent with those for the Groundfish ASM program. To the extent possible, debriefing will be streamlined (for example, conducted remotely) to reduce travel and other related costs. The most successful debriefings are conducted soon after the vessel lands and after the preliminary data are uploaded to the NEFOP program. Preliminary data can be reviewed by staff and follow-up questions answered in a timely manner. Information is then edited near real-time and is therefore more accurate. Sampling in the high volume fisheries can be challenging and direct communication with observers after trips land is key to understanding the data, especially slippage information.

Responsibilities and provisions for **data management** under the Herring ASM options would be the same as those for observer data and data collected for Groundfish ASM. The NEFOP would manage the data. A summary of preliminary data would be uploaded electronically, by observers and reviewed by the NEFOP staff. Once verified the data are available for use by GARFO and other end users. Data are stored in master tables in the Observer database, and fully audited data are available 90 days after date landed.

Table 11 Herring IFM Options: Logistics (Notification), Debriefing, and Data Management

	Industry-Funded Observer Coverage Options (HER OBS)	*NE GROUNDFISH ASM PROGRAM*	Industry-Funded Herring ASM Options (HER ASM)
Logistics and Related Provisions	PTNS	Gfish PTNS	Build into existing pre-trip notification system for Herring A/B vessels (different from GFish) *No need to develop strategy for vessel selection under 100% coverage options (or possibly 50%)*
Debriefing	Yes	Yes	Yes; Pre-trip and post-trip briefing important for discard logs; *Streamline/combine debriefing to the extent possible*
Data Management	NEFSC/NEFOP	NEFSC/NEFOP	Data submitted to NEFOP for use by all users (NEFSC, GARFO, NEFMC) under a separate program code
	Upload OB PRELIM record 48 hours from landing	Upload OB PRELIM record 48 hours from landing	OBPRELIM upload - a) Delivery of paper log data shall be received within 5 calendar days (120 hours) of the vessel landing (b) Delivery of electronic data shall be received within 2 calendar days (48 hours) of the vessel landing
	Paper logs due 5-7 business days	Paper logs due 5-7 business days	Paper logs due 5-7 business days

**The elements of the Groundfish ASM program are provided in the table above for comparison purposes.*

Summary: Comparison of Herring OBS and ASM Options

Table 12 provides a qualitative comparison of some of the pros/cons associated with the options under consideration in the IFM amendment to establish industry-funded monitoring in the Atlantic herring fishery.

Table 12 Qualitative Comparison of Options for Industry-Funded Monitoring in the Atlantic Herring Fishery (Herring OBS Options vs. Herring ASM Options)

	Pros	**Cons**
Observer Coverage Options (HER OBS)	Comprehensive catch sampling (kept and discarded)	Higher sea day cost
	Biological samples collected	Limited ability to reduce industry/sea day costs
	More applications/uses for data (stock assessment, catch monitoring, etc.)	Industry-funded observer data not collected consistently with SBRM strata (gear type, area) not utilized for bycatch estimation and stock assessment
		Limited to only one service provider at onset of industry-fund program; higher costs for other providers to certify observers
At-Sea Monitoring Options (HER ASM)	**Pros**	**Cons**
	Reduces sea day costs for industry	Discard data only; more limited applications of data
	Builds on existing discard data collected by observers (provides basis for comparison to observer data)	Loss of opportunity to collect other important data while paying for an observer
	Focuses on at-sea component of comprehensive long-term catch monitoring program that will likely include portside sampling and EM	
	Multiple service providers available at onset of industry-funded program; increases flexibility and negotiating ability for industry; competition reduces costs	
	Discard data collected by at-sea monitors can help to inform decisions about maximized retention provisions for the portside sampling/EM components of the IFM program	

Estimated Sea Day Costs for the Herring ASM Options

For the purposes of the omnibus IFM Amendment, an estimate of the sea day cost that may be expected under the Herring ASM options will be developed by the IFM FMAT based on estimates of sea day costs for NEFOP observer coverage (currently estimated at $806 in the Draft IFM Amendment) and the Groundfish ASM program. This sea day cost can be used in the economic analysis for a comparison of the impacts of the Herring ASM options to the Herring OBS options.

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Omnibus Industry-Funded Monitoring (IFM) Amendment

Amendment 7 to the Atlantic Herring FMP

DRAFT APPENDIX I:

SERVICE PROVIDER REQUIREMENTS

Proposed Regulations for Herring Industry-Funded Observer Coverage (OBS) and Herring Industry-Funded At-Sea Monitoring (ASM)

Regulations for Service Provider Approval

	Industry-Funded Observer Coverage (OBS) Options Service Provider Requirements *Consistent with SBRM Amendment*	**Proposed Atlantic Herring At-Sea Monitoring (ASM) Service Provider Requirements** *Consistent with NE Groundfish ASM Requirements*
At-Sea Sampler/Observer Coverage (CFR 648.11) **CFR 648.11(h) Observer Service Provider Approval/Responsibilities**		**Independent Third-Party Monitoring Provider Standards** **CFR 648.47(b)(4) and (b)(5)**
3. Contents of Application	*Corporate structure, contact information, confict-of-interest and other statements*	*Same requirements (b)(4)*
	Summary of prior experience, monitoring services provided	*Same requirements (b)(4)*
	Proof of Insurance - Workers Compensation and Maritime Employer's Liability Insurance $5M min)	*Addressed in i(G) Evidence of adequate insurance to cover in jury, liability, and accidental death*
	Proof that salaries meet/exceed DOL Guidelines, compensation for FLSA non-exempt employees, information about benefits and personnel services provided	*Addressed in (b)(4)(i)(H) Proof of benefits and personnel services, but no reference to DOL Guidelines or FLSA requirements*
	Names of NMFS-certified observers and trainees	*Addressed in (b)(4)(i)(I) Proof that monitors have passed adequate training course to the extent not funded by NMFS, consistent with NEFOP*
	Emergency Action Plan	*(b)(4)(i)(J) Same*
		(b)(4)(i)(K) Evidence that the company is in good financial standing

Regulations for Service Provider Responsibilities

	Industry-Funded Observer Coverage (OBS) Options **Service Provider Requirements** *Consistent with SBRM Amendment*	**Proposed Atlantic Herring At-Sea Monitoring (ASM)** **Service Provider Requirements** *Consistent with NE Groundfish ASM Requirements*
At-Sea Sampler/Observer Coverage (CFR 648.11) **CFR 648.11(h) Observer Service Provider Approval/Responsibilities**		**Independent Third-Party Monitoring Provider Standards** **CFR 648.47(b)(4) and (b)(5)**
5. Responsibilities of Observer Service Providers	*Provide observers with transportation to initial location of deployment, subsequent vessel assignments, and debriefing locations*	*(b)(4)(ii)(A) Must establish and carry out a comprehensive plan to deploy NMFS-certified at-sea monitors, or other at-sea monitoring mechanism (ex., NMFS-approved EM equipment) to meet specified coverage levels;* *(b)(4)(ii)(A)(1)-(A)(6) include specific requirements for groundfish sector monitoring*
	Lodging, per diem, and any other services for observers to attend training classes	
	Required observer equipment prior to training or deployment	*Addressed in (b)(4)(ii)(J); and* *(b)(5)(i) - providers are responsible for cost of gear to the extent not funded by NMFS*
	Individually-assigned communication equipment (cell phones, other devices)	
iii. Logistics	*Must be able to deploy observers based on comprehensive plan (24/7) with phone system to secure coverage, must access all ports, report deployments to NMFS, fair/equitable assignment of observers*	*Addressed in (b)(4)(ii)(A)*
iv. Limitations	*Review/edit/approve data from first four deployments by candidate observer before certifying*	
	Observers cannot be deployed on the same vessel for more than two consecutive multi-day trips; observers cannot be deployed on the same vessel more than twice in any given month for multi-day deployments	*Not addressed in Groundfish ASM Provider Requirements*
v. Communications with Observers	*Must have employee on call 24/7 to handle issues*	
vi. Observer Training Requirements	*Must submit information about trainees at least 7 days prior to training*	
vii. Reports	*Observer deployment reports w/in 24 hours; reports back in OBSCON data w/in 24 hours of landing; raw data w/in four days of landing*	
	Safety refusals within 24 hours; Return biological samples within 7 days; Debriefing availability for up to 2 weeks following trip; Observer availbaility report to NMFS by 5 p.m.; other reports (harassment, discrimination, injury, etc.) within 24 hours of event	*(b)(4)(ii)(B) Monitors must remain available to NMFS for debriefing at least two weeks following trip; (b)(4)(ii)(C) similar requirements for other reports in this section*
	Requirements for observer status reports, vessel contracts, observer contracts and additional information that may be distributed to vessels	*(b)(4)(ii)(D) contracts and (b)(4)(ii)(E) other paperwork distributed to vessels*
viii. Refusal to Deploy Observer	*If provider does not have observer available within 48 hours of request; if the vessel is determined unsafe; other reasons including failure to pay for previous deployments (if authorized in writing by NMFS)*	*(b)(4)(ii)(F); also includes refusal for inadequate notice for departure or landing*
6. Limitations on Conflict of Interest	*No direct/indirect interest in fishery/vessels/dealers/research/advocacy; must assign observers without preference; must not soliciy or accept gifts, favors, loans, etc.*	*Addressed in (b)(4)(ii)(G)*
7. Removal of Service Provider	*Process for removal if provider does not meet requirements/conditions of service, conflict of interest, criminal convictions, embezzlement, theft, etc., crimes of dishonesty, unsatisfactory performance ratings on Federal contracts, evidence of de-certification*	*(b)(4)(ii)(I) A means to protect the confidentiality and privacy of data submitted by vessels, as required under the MSA*

Regulations for Observer Certification

	Industry-Funded Observer Coverage (OBS) Options **Service Provider Requirements** *Consistent with SBRM Amendment*	**Proposed Atlantic Herring At-Sea Monitoring (ASM)** **Service Provider Requirements** *Consistent with NE Groundfish ASM Requirements*
648.11(i) Observer Certification		**Independent Third-Party Monitoring Provider Standards**
(1) Eligibility Standards	*Observers must meet NMFS National Minimum Eligibility Standards (National Observer Program), Provided Below*	**CFR 648.47(b)(4) and (b)(5)**
Education/Experience	*Unless waived by the RA, must possess Bachelor's Degree with a major in one of the sciences; must have had at least one undergad course on math/stats; must have experience with data entry on computers; these requirements can be waived by RA or NEFSC Directors if skills have been acquired through alternative training program (observing fishing activities, research cruises, marine mammal data recording, collecting biological samples, entering data, completing NMFS biological training program*	*(b)(4)(iii)(A) High school diploma or legal equivalent*
Training Requirement	*Must pass tests 80% or greater for program; must complete acknowledgement of risk*	*(b)(4)(iii)(B) Successful completion of NMFS-required training and briefings before deployment*
Conflict of Interest	*No direct financial interest, ownership, etc. in catching, taking, harvesting, processing fish; may not solicit or accept gifts; may not observe on vessels previously employed in another capacity; must not work for other vessels/processors while hired as observer*	*Addressed in (b)(4)(ii)(G)*
Physical/Mental Confition	*Documentation of physician certification within 12 months of completing training*	*Addressed in (b)(4)(iii)(C)*
Communication Skills	*Must be able to communicate verbally and written in English*	
Citizenship/Ability to Work Legally in US	*Must be a U.S. citizen, non-citizen with green card, TN authorization, H1 visa, or valid work visa, and social security card*	
(2) Observer Training	*Must pass NMFS/NEFOP course(s); one training trip with another observer; data from first four trips reviewed/approved for certification*	*Addresssed in (b)(4)(iii)(B)*
(3) Observer Requirements	*Must be NMFS/NEFOP certified; completed all required training and briefings for observers*	
	Physically and mentally capable fo carrying out responsibilities	
	Red Cross/CPR certification	*Addressed in (b)(4)(iii)(D)*
	Must accurately record sampling data, write complete reports, report observations accurately	
(4) and (5) Probation/Decertification	*Process for NMFS to review certifications and written issuance of de-certification*	
	Automatic background check when observers are issued a "CAC" card	*(b)(4)(iii)(E) Absence of fisheries-related convictions, based upon a thorough background check*
		(b)(4)(iii)(F) Independence from fishing-related parties
		(b)(5)(ii) includes requirements for groundfish vessel selection protocols

Appendix 4

Monitoring Cost Estimates for the Industry-Funded Monitoring Omnibus Amendment

NMFS Costs for NEFOP-level observers, at-sea monitors and dockside monitors. Based on fiscal year 2013 expenses, Table 1 shows the level of costs required to support the deployment of all Northeast Region at-sea monitoring programs, including NEFOP observers, and groundfish at-sea monitors, and the scallop industry-funded monitoring program. These are presented as annual costs because while some components can be scaled up proportional to an increase in the total number of sea days, many cannot be scaled proportionally. For example, an increase in observer days would increase the number of hours needed to process data and that need could be met by hiring additional data processing personnel (proportional to the increased need). However, the facilities (particularly office space) needed to accommodate the additional data processing personnel is not proportionally scalable. The approximately $5 million of NMFS costs, detailed below, supported 10,666 sea days in FY 2013, but could support about a maximum of 15,000 sea days per year. The currently leased facilities could accommodate additional personnel to support an additional 2,000 sea days. However, beyond that, new facilities cost would have to be incurred. Facility costs cannot be obtained in small increments, so if sea days beyond 17,000 are considered, new facilities would have to be obtained so that there is sufficient capacity to cover the upper end of any anticipated increase. NMFS costs for dockside monitoring programs are likely similar to the costs described in this annual estimate.

The operational costs are presented as a single figure and are not broken out by each of the three components because there is some overlap, particularly when allocating employees' time over these activities.

Table 1. NMFS Cost Responsibilities for monitoring

NMFS Cost Responsibilities		Annual Cost (FY2013) for all Programs (NEFOP, ASM, and industry funded scallops)
Training and Data Processing Costs	The labor and facilities costs associated with training and debriefing of monitors	$805,700
	Data processing	$2,057,100
Operational Costs	Certification of monitoring providers and individual monitors; performance monitoring to maintain certifications	$2,244,700
	Developing and executing vessel selection	

NMFS Cost Responsibilities		Annual Cost (FY2013) for all Programs (NEFOP, ASM, and industry funded scallops)
	Costs associated with liaison activities between service providers, NMFS, Councils, sectors and other partners	
Total		$5,107,500

The groundfish electronic monitoring cost comparison report estimates NMFS costs for the groundfish at-sea monitoring program for fiscal year 2014 costs. In fiscal year 2014, NMFS spent an estimated $531,953 on training, $626,043 on data processing, and $719,548 on program management for the groundfish at-sea monitoring program for a total cost of $1,877,544 (Table 2). This total cost is divided by the number of at-sea monitor sea days accomplished in 2014 (3,541 days) to get a per sea day administrative costs of $530 (Table 2).

Table 13: Annual At-Sea Monitoring Costs for NOAA Fisheries

	Estimated Cost	
Program Component	**Total**	**Per Sea Day**
Training	$531,953	$150
Data Processing	$626,043	$177
Program Management	$719,548	$203
Total	$1,877,544	$530

NMFS cost responsibilities for electronic monitoring. In this section, we estimate NMFS costs for administering the example EM programs for groundfish sectors (audit approach) and the midwater trawl fleet (optimized/full retention approach) based on the roles and responsibilities described above. The reader should note that generalized descriptions for industry costs for electronic monitoring programs presented in this section were derived separately and differently than the NMFS costs presented here.

Many of the costs to NMFS for administering the example EM program would be driven by the scale of the program and the level of participation, although these costs do not necessarily increase linearly with the amount of sea days. Thus, we present a range of potential NMFS costs from overseeing an audit approach EM program for a single hypothetical sector (20 vessels) to a program for the entire active groundfish fleet (400 vessels), and for an optimized/full retention approach EM program for an example midwater trawl fleet (9 vessels). We based NMFS costs for the EM program on costs the Northeast

Fishery Observer Program incurred for administering programs with similar roles and responsibilities and from the New England EM Project (Archipelago, 2014). These are rough estimates of NMFS potential costs and, unlike the NEFOP-level observer/at-sea monitoring program costs presented in the section above, may not reflect efficiencies or economies of scale that are possible in a mature program. NMFS would also have other incremental costs for enforcement and use of the data for management, which were not estimated here in order to be consistent with the estimates of the NEFOP-level observer/at-sea monitoring program.

In Table 3, training costs include labor and costs of licenses for any proprietary EM review software. The number of annual trainings that would need to be held and, hence, the number of trainers, would depend on the number of EM reviewers employed by the service providers, which would depend on the number and activity levels of vessels using EM in the fishery. For the audit model, training costs do not increase linearly. Although the number of participants increases by a factor of 20 when scaling up from 20 vessels to a fleet-wide program, the training costs increase by a factor of 8. This type of relationship makes it difficult to estimate costs at a unit that is easily multiplied (e.g., sea day cost). For the optimized/full retention model, although the example fleet includes only 9 midwater trawlers, there is a large amount of video footage to be reviewed, due to a high number of assumed trips (500) and the assumed rate of video review (100 percent) used in the analysis. This much video footage may require a larger cadre of EM reviewers than the number of vessels might indicate, also increasing demand for training and certifications and NMFS's training costs.

NMFS may also have some costs for reviewing and approving individual Vessel Monitoring Plans (VMPs), which are each vessels individualized plans for equipment specifications, installation, and catch handling, and inspecting equipment installation on the vessel. Annual labor and travel associated with this activity is estimated at $15,500 for 9 vessels, $31,000 for 20 vessels and $232,500-$310,000 for 400 vessels.

For the audit model, NMFS costs for auditing the service provider's review of logbooks were estimated to be $46,795 for 20 vessels and $432,405-$525,905 for 400 vessels (Table 3), assuming NOAA Fisheries audits 5 percent of trips. These costs include staff time and licenses for proprietary EM review software. Use of open source software would negate the cost of software licenses in this category. For the optimized full retention model, the staff time and equipment costs to conduct periodic video reviews to audit the service providers are estimated at $26,295, assuming 5 percent of trips are audited.

Program management cost is labor for a program manager, which is necessary to administer the new program, liaise with the service providers, vessel, and enforcement, and coordinate staff. Program management cost is estimated at $86,000 annually, irrespective of the number of vessels participating in the program.

Not included in these cost estimates is the cost of storing any EM data submitted by the service providers or sectors. NMFS data storage costs would be driven by record-keeping and security

requirements for EM data, which NMFS is still working to determine. Alternately, NMFS may be able to get remote access to EM data and video stored by the provider, and reduce or eliminate its data storage costs (Van Oyen, pers. comm., 2014).

Table 3: nmfs cost responsibilities for electronic monitoring programs

	Estimated NMFS Cost Responsibilities for Audit and Optimized/Full Retention EM program models		
	Audit Model		Optimized/Full Retention Model
Program Component	**20 vessels**	**400 vessels**	**9 vessels**
EM Reviewer Training	$25,000	$187,500 - $250,000	$12,500
VMP Approval, Inspections	$31,000	$232,500 - $310,000	$15,500
EM Review Audit	$46,795	$423,405 - $525,905	$26,295
Program Management	$86,000	$86,000	$86,000
Total	$188,795	$929,405 - $1,171,905	$140,295

Industry Costs for NEFOP-level observers and FMP-specific at-sea monitors. The industry cost responsibilities are presented as costs per sea day because these costs are, for the most part, proportionally scalable to the number of sea days. These per day costs by cost component are shown in the tables below. This per day cost estimate does not include "Other costs of the provider to meet performance standards laid out by a fishery management plan" because those costs will not be known until the details are made explicit in subsequent management plans. These costs are based on the period from October 2012 through May 2014 and are averaged across the three service providers.

Table 4. Industry Cost Responsibilities for NEFOP and At-Sea monitoring

Industry Cost Responsibilities	NEFOP-level observer cost per observed sea day (FY2013)	Fishery Specific At-sea monitoring cost per sea day
Costs to the provider for deployments and sampling (e.g., travel and salary for observer deployments and debriefing)	Sea day charges paid to providers: $640/day Travel: $71/day Meals: $22/day Other non-sea day charges: $12/day	Sea day charge paid to providers: $561/day Travel: $67/day Meals: $18/day Other non-sea day charges: $14/day
Equipment, as specified by NMFS, to the extent not provided by NMFS	$11/day	
Costs to the provider for observer time and travel to a scheduled deployment that doesn't sail and was not canceled by the vessel prior to the sail time.	$1/day	
Provider overhead and project management costs not included in sea day charges above (e.g., per diem costs for trainees)	Training: $61/day	Training: $50/day
Other costs of the provider to meet performance standards laid out by a fishery management plan	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery
Total (not including other costs)	$818/day	$710/day

Additional estimates for industry contributions for NEFOP-level observer coverage and the groundfish at-sea monitoring program were provided in the Fisheries Monitoring Roadmap (Lowman et al., 2013). This report based the estimated costs on the 2011 fiscal year. For 2011, the industry cost for NEFOP-level coverage was estimated at $917 per sea day, and the industry cost groundfish at-sea monitoring

was estimated at $847 per sea day. These additional estimates are provided to highlight the inter-annual variability in the sea day estimate for NMFS and industry costs, as outlined in the introduction (Section 1.0).

Industry cost responsibilities for dockside monitoring. The industry costs of a dockside monitoring program are generally broken into several components: Program management and overhead costs of the provider company; travel costs for the monitor to travel from home or office to offload port, for non-principle ports; and hourly salary for the monitor, including, in some instances, waiting time at the dock.

A number of example industry costs for dockside monitoring are presented below. Dockside monitoring costs can be represented in three ways: 1) as a cost per sea day; 2) as a cost per landing event; and 3) as a cost per pound landed. The paragraphs below will discuss the different available estimates of dockside monitoring costs using each of these representations, and the pros and cons of each representation.

- Cost per sea day – This document uses a cost estimate of $106 per sea day based on publicized estimates for other dockside monitoring programs. In particular, the estimate is influenced by the industry costs for the NE Multispecies dockside monitoring program. The Fisheries Monitoring Roadmap (Lowman et al., 2013) provides per sea day rates of $51 and $82 for dockside monitoring for the British Columbia Hook and Line Groundfish fishery and the Pacific Groundfish (non-whiting) IFQ fishery, respectively. The "cost per sea day" representation makes the cost of dockside monitoring easy to compare against industry costs for at-sea and electronic monitoring. However, this representation of dockside monitoring costs implies that costs scale linearly with trip length, which does not accurately represent dockside monitoring costs. For example, if we assume the cost for monitoring is $106 per sea day, then a 3 day trip would cost $318 and 10 day trip would cost $1,060 to monitor. However, a 10-day trip could come back with its hold only half full with fish, or a 3-day trip could come back with a full hold. In this example, the 3-day trip with the full hold would actually cost more to monitor than the 10-day trip.
- Cost per landing event - The average cost per landing event for the NE Multispecies groundfish dockside monitoring program ranged from $36.87-$212.32 for all sectors. Though this range is a more accurate representation of costs than the cost per sea day representations, it is not easy to compare against industry costs for at-sea and electronic monitoring.
- Cost per pound of fish landed – The analysis assumes the cost per pound landed for each specific FMP is the most accurate way to represent the potential industry costs for monitoring. The average cost per pound of groundfish landed for the NE Multispecies groundfish dockside monitoring program range ranged from $0.006-$0.12 per pound for all sectors. The average cost per pound landed and per trip is inversely related to the average pounds landed – that is, larger trips are less expensive to monitor, by pound, than

smaller trips. This was due to several factors, including that larger trips typically landed in a principle port (no roving monitor required and, depending on the location, no travel costs) and much of the cost of providing a monitor is fixed, due to the logistics of having monitors present while vessels land their catch (e.g., insurance, administrative costs). The analysis uses estimated a cost of $0.002 per pound of herring landed, based on state dockside monitoring programs for herring, to analyze the economic impacts of Herring Alternative 2.3 and 2.4 and Mackerel Alternative 2.3 and 2.4.

Industry cost responsibilities for electronic monitoring. Portions of the discussion that follows were originally included in the March 2015 version of the Environmental Assessment for the Omnibus Standardized Bycatch Reporting Methodology Amendment. The description of costs and costs responsibilities below is generalized to encompass a range of potential program designs.

The economic impacts associated with the alternative to implement an electronic video monitoring program for one or more fisheries in the Greater Atlantic Region are derived directly from the expected costs to purchase, install, and maintain the electronic monitoring systems. Industry would be required to purchase, install, and maintain the electronic monitoring equipment aboard their vessels.

Based on cost estimates as of May 2006, it is likely that the cost to purchase a complete electronic video monitoring system would be approximately $7,200 per vessel (Archipelago Marine Research, Ltd. 2006).[1, 2] Installation costs are highly variable and depend upon the size of the vessel, the number of cameras to be installed, and other complicating factors such as the need to retrofit the vessel to support the installation of the equipment. Kinsolving (2006) estimates installation costs as ranging from $650 to $4,225 per vessel, based on a service rate of $65 per hour and the installation time ranging from 10 hours to as many as 65 hours per vessel, depending on the aforementioned complexity. In addition to the cost to purchase and install a system, it is expected that an annual registration fee would be required by the contractor providing the equipment and this is estimated to be approximately $600 per year. Maintenance costs would be expected to vary, but for the purposes of analysis, Kinsolving's (2006) estimate of $975 per year is used. The total first year costs would be approximately $10,200 per vessel, with continuing costs of approximately $1,600 per vessel per year for the second year and beyond .

[1] Archipelago Marine Research, Ltd. (2006), identifies the costs to purchase, install, and maintain a complete electronic monitoring system. While this fee schedule is focused on the British Columbia groundfish longline fisheries, the costs identified are presumed to be transferable to other fisheries. Published costs in Canadian dollars were converted to U.S. dollars based on the published exchange rate for September 7, 2006.

[2] Kinsolving (2006) also provides estimates of the cost to purchase a complete electronic monitoring system, ranging from $4,250, if off-the-shelf components are used, to $8,000 if a package system is purchased from an approved contractor. For the purposes of this analysis, the costs published by Archipelago Marine Research, Ltd. (2006), were used to simplify the analysis and to clearly identify the source of the costs used.

Table 5. Estimated costs per fishing vessel to purchase, install, and maintain an electronic video monitoring system (Archipelago Marine Research, Ltd. 2006; Kinsolving 2006).

	Year 1 (per vessel)	Year 2+ (per vessel)
Equipment purchase	$7,194	N/A
Installation costs (average)	$2,438	N/A
Annual program registration fee	$608	$608
Annual maintenance	N/A	$975
Total	**$10,240**	**$1,583**

The information presented above and in **Error! Reference source not found.** provide an estimate of the per vessel costs of implementing an industry-funded electronic monitoring requirement. The next step is to estimate the number of affected vessels within the fisheries for which this alternative would be considered.

The costs discussed above address only the purchase, installation, and annual maintenance of the electronic video monitoring systems, but do not address the costs associated with extracting the data from the video recording systems, or storing, maintaining, editing, and reviewing the data.

Agency or contractor personnel would be required to obtain the video data from fishing vessels (either through dockside extraction or a mail-in hard drive exchange program), to review the video footage in order to document discard events, to oversee and perform quality control on the extracted data, and to archive and maintain the data. Video reviewing and data archiving equipment would also be required. Kinsolving (2006) estimates that data storage systems would be required to support approximately 20 terabytes of data per year, but this was an estimate solely for the Pacific rockfish pilot program, which has a fleet of approximately 25 vessels (consolidating to 18 active vessels) that make an average of seven fishing trips per year, with trips averaging 3 days each. Therefore, extrapolating to determine the data storage needs were this program implemented in the Greater Atlantic Region would most likely be orders of magnitude greater.

Potential Industry Cost Saving with Electronic Monitoring and Portside Monitoring. For both electronic monitoring and portside monitoring it is difficult to predict whether and/or how costs may change if industry is contracting directly with providers (versus the federal government contracting with providers). General program overhead/management is a substantial part of the costs and it is difficult to know whether these costs will be reduced when industry is contracting with providers, and if so how much. Based on the amount of coverage/monitoring several potential cost savings have been identified however, as described below. It is also important to remember that all of these cost figures (including the original values) are estimates, and may be higher or lower than actual costs once implemented.

Electronic Monitoring

Based on "A Cost Comparison of At-Sea Observers and Electronic Monitoring fora Hypothetical Midwater Trawl Herring/Mackerel Fishery." https://www.greateratlantic.fisheries.noaa.gov/stories/2015/september/em_cost_assessment_for_gar_herring_150904_v6.pdf

100% recording, 100% Review: ***$325***

Haulback Recording Only, 100% Review: $***248*** - Reduction: $78 of the $160 data services cost (49%). [(325 – (.49*160)) = (325 – 78) = $248]. $82 of data services costs remaining.

Haulback Recording Only, 50% Review: ***$218*** - $61 is the cost for haulback review, so if only half of the trips are reviewed, this would save about another $30. [(248 – (61/2)) = (248 – 30.5) = $218]

Field Services are $78/day, and "Field services costs are largely driven by the frequency of hard drive retrievals from the vessel, and the associated travel and labor costs." "Repair and technical support needs also drive field services costs." However, the document also states that repair and technical support costs were low because it was believed that minor problems could be addressed during data retrieval. If 25% of costs were repair and technical support but this amount doubled due to additional single purpose technical support trips, an overall 40% savings from mailing hard drives appears reasonable. 40% of $78 = $31. Saving $31 would reduce the overall cost to around ***$187*** per seaday. [(218 – 31) = $187]

Portside Monitoring

The Portside Monitoring cost estimate is $5.12/mt, but this includes administration costs that have been borne by the State of Massachusetts, and could be paid for by NMFS (subject to funds being available to run such a program). For NEFOP observers, the administrative cost for NMFS is approximately 37% ($479 NMFS cost $818 at-sea industry cost - http://s3.amazonaws.com/nefmc.org/150929-NEFMC-Meeting-Presentation-without-notes.pdf, slide 32). If one assumes that 25% or 33% of these costs would not be directed at vessels (conservatively less than 37%), the cost for vessels per mt would be $3.84/mt and $3.41/mt respectively.

If only 50% of trips were sampled, while any particular trip might still have to pay $3.84/mt or $3.41/mt, over the course of a year it should reduce average costs to $1.92/mt or $1.71/mt. The table below describes the total costs for trips landing different amounts of fish, and daily costs assuming a 3-day trip.

	25% Admin		33% Admin	
Full Cost	$5.12	Per day cost	$5.12	Per day cost
Cost less Admin	$3.84	with 3/day	$3.41	with 3/day
50% Coverage	$1.92	trip	$1.71	trip
100 mt trip cost	$192	$64	$171	$57
200 mt trip cost	$384	$128	$341	$114
300 mt trip cost	$576	$192	$512	$171
400 mt trip cost	$768	$256	$683	$228

Table 6 summarizes the ways that sea day costs can be minimized reduced in an industry-funded monitoring program. The discussion provided in Table 6 was generated from information provided by NEFOP personnel, observers, and representatives from service providers in the northeast and west coast. To the extent that the issues identified in Table 6 can be addressed through the management measures that establish/implement the IFM program, sea day costs borne by the fishing industry can be reduced.

Table 6 Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Build from existing observer sampling protocols; do not require new/different data to be collected	• Collecting data in a new/different way will require modifications to existing observer sampling protocols and training procedures, new/revised manuals/logs, possibly new/additional sampling equipment, and database design or restructure; this could increase administrative and training costs
Eliminate SCA and related regulatory requirements for Federal contracts	• Federal requirements for wage structure/overtime/paid holidays/vacation are not necessary for contracts between vessels/providers; without specifically implementing these requirements as part of the IFM regulations, wage structure and benefits for employees would be determined by individual service provider companies; MRAG report (June 2012) estimates that eliminating these requirements may reduce costs by $50-$100 per sea day; • FLSA and other Federal labor laws would still apply to service provider companies; however, eliminating the SCA requirements from IFM regulations is likely to result in some reduction in sea day cost; • Not likely to result in $100 per sea day cost savings in this region due to existing pay structure/benefits for observers required by Federal contracts
"Grandfather in" current service providers approved for NEFOP observer coverage and GF ASM programs – approve these providers immediately for any new, fishery-specific ASM program	• Reduces expense of applying/re-approving service provider companies already approved for other programs in the region; observers/monitors for approved service providers would still need to be certified for existing monitoring programs to participate as fishery-specific at-sea monitors; • Allows vessels to select from multiple service providers when program is established; increases negotiating opportunities for vessels at onset of program by creating competition between companies; • Provides opportunity for existing service providers to offer more work days to their observers (could reduce staff/overhead expenses for both programs)
Allow cross-certification of NEFOP and GF ASM observers for new, fishery-specific ASM programs; combine/overlap training and recertification whenever possible	• Cross-training and applying training courses to multiple certifications reduces training costs (travel, hotel, per diem for service providers); • Reduces equipment costs for service providers – no need to purchase duplicative equipment • As previously noted, this may reduce overhead costs for service providers by providing their observers with a greater number of days to work (improving ability for service providers to retain full-time employees)

Table 6 continued. Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Provide detailed information about fishing patterns for vessels participating in the industry-funded monitoring program	• Allows providers to more accurately estimate manpower/resources needed, logistics, overhead, and travel costs - reduces need for providers to over-estimate these costs to cover expenses that cannot be predicted prior to the start of the year; • Increases predictability of fishery for observer/monitor deployment; • Increases efficiency for service providers
Minimize observer deployment logistics	• Simplifying the selection process for vessels/trips that require industry-funded observers/monitors reduces costs for service providers because vessel selection/notification would not require additional staff or resources
Allow industry to negotiate less significant costs with providers	• Structure the provisions in the industry-funded monitoring program to allow the industry to negotiate as many minor costs as possible with service providers, to better meet their individual vessel needs circumstances; • These may include costs for trip cancellations and no-shows, meal reimbursements, partial day/hourly billing (see below), land-hour rates (if necessary), or other costs
Encourage service providers/industry to negotiate billing by partial days (versus 24 hour days)	• Sea scallop regulations 648.11(g)(5)(i)(A)(2) state that "For the purposes of determining a daily rate…a service provider may charge a vessel owner for not more than the time an observer boards a vessel until the vessel disembarks (dock to dock), where a day is defined as a 24-hour period, and portions of other days would be pro-rated at an hourly charge." • Industry participants should be aware that this can be negotiated in contracts with providers; may be an opportunity to reduce sea day costs for some vessels depending on fishing operations; • Consideration should be given to the possibility of land hour time for observers/monitors, which may be necessary if days are billed partially or by the hour
Allow observers to be deployed on the same vessel for more than two consecutive multi-day trips, and more than twice in any given month for multi-day deployments	• Prohibited in current regulations for industry-funded observer coverage, implemented in SBRM amendment • Increases flexibility and reduces travel costs for service providers; appears to be consistent with regulations for Groundfish ASM

Table 6 continued. Summary Discussion – How to Reduce Sea Day Costs

How to Reduce Sea Day Costs	Discussion/Rationale
Encourage vessels in close proximity to negotiate contracts together so that they can utilize the same observers and minimize travel expenses	• Industry can reduce costs by collaborating with vessels that fish from same ports and/or during same seasons to reduce travel and related costs for observers/monitors
Streamline debriefing and re-certification requirements	• Reduces costs to service providers (travel/per diem)
Insurance	• There may be ways to reduce/streamline insurance requirements to reduce costs for providers. To the extent that duplicative or redundant insurance requirements can be eliminated, costs can be reduced. This issue requires further investigation.
Combine the IFM programs for multiple fisheries, when appropriate	• Would reduce complexity (PTNS, deployment, travel) and increase efficiency for service providers; increases number of sea days for amortizing travel/training expenses over the year; • Could increase the total number of work days available for ASM-certified observers/monitors and may reduce staff/overhead costs for service providers

Cost drivers for electronic monitoring. There are a number of variables in the design of an electronic monitoring program. The text below briefly summarizes some of the program specifications related to data submission, video review, video audit, and data storage that can reduce the industry contribution for electronic monitoring programs.

Data Submission

-
  - Allow the hard drives that store EM footage to be submitted by mail, rather than requiring them to be retrieved by a technician.
  - For fisheries that have dockside monitoring programs in addition to EM, consider having dockside monitor retrieve/transmit hard drives.
-

Video Review

- Design a random sampling program to select trips or portions of trips (i.e., around haulback on herring and mackerel trips) from which video would be reviewed.
- For audit approaches, specify an assumed discard rate in lieu of additional video review in the instances where the EM validation fails.
- Documentation of discards at the species level, including identifying and counting the fish and measuring the length of the fish, for only a few species of interest (e.g., only species in the NE multispecies complex on groundfish trips).
- Software solutions may be able to automate review of portions of video footage.

Data storage

- Allow video data to be stored in the “cloud” (as permitted within security and data confidentiality regulations).
- Determine the lowest possible frame rate and image resolution necessary to document the activity of interest for the EM program. Slow activities such as identifying large objects in a pile of fish being sorted, requires more frames per second. The higher the frame rate, the more likely it is that the camera will capture detailed information. Similarly, identifying fish to species requires higher resolution than verifying when fishing gear is deployed. Higher frame rate and resolution results in larger video files and requires additional storage requirements.

Appendix 5

ATLANTIC HERRING ALTERNATIVE ECONOMIC IMPACTS ON HERRING FISHING BUSINESSES

Impact Analysis Methods

Four types of industry-funded monitoring for the herring fishery are being considered: Northeast Fisheries Observer Program (NEFOP) level observer, at-sea monitor (ASM), Electronic Monitoring (EM), and portside sampling (PS) coverage. NEFOP-level and at-sea monitoring coverage would function independently, but EM and portside are intended to be used together.

MONITORING COSTS TO INDUSTRY

Types of Monitoring	NEFOP-Level Observer	At-Sea Monitor	Electronic Monitoring	Portside Sampling
Industry Cost Responsibility	$818 per seaday	$710 per seaday	Year 1: $15,000 one-time set up cost then $325 (also $187) per seaday Year 2: $325 (also $187) per seaday	$0.0023 per lb ($5.12 per mt) and at $0.00174 per lb ($3.84 per mt)

Trips that occurred in 2014 were used to estimate the likely future impacts of the herring alternatives. This is the most recent year for which data is available and 2014 activity should represent what is likely to occur in future years in terms of the vessels participating in the fishery, the condition of the stock, the regulatory environment, and fishing methods. Each alternative has different criteria for defining which types of trips would be monitored (based on permit type, gear used, etc.). Trips from 2014 that met these criteria were evaluated in terms of how the monitoring costs impacted annual returns to owner (see below for description of how return-to-owner (RTO) was calculated). If an alternative specified 100% coverage, then the monitoring costs that would have been paid for all trips occurring in 2014 were calculated and assessed in terms of impacts to RTO. For alternatives that have options with less than 100% coverage, trips from the pool of 2014 trips were randomly selected until the coverage target was met. This was repeated 1,000 times for each trip selection simulation. Mean annual ASM/NEFOP costs per vessel are then calculated from the simulated trip selections.

Vessels were assigned a major gear type based on the gear that earned the greatest revenue (from all species landed) among the trips selected for evaluation (according to the criteria in the alternative). It is not necessarily the major gear for the year for a particular vessel.

In the tables, any information that pertains to amounts of revenue from various species and numbers of days at sea and trips are for the trips that met the criteria under each of the alternatives only, not for the year.

Return-to-Owner

A previous analysis of economic impacts of herring and mackerel coverage target alternatives was based on trip cost data collected by the NEFOP and showed the economic impact of the alternatives on vessel net revenues (gross revenues less trip costs). Because NEFOP only collects a limited amount of cost data, industry participants expressed concern that net revenue estimates used in the previous economic analysis underestimated vessel costs. In response, Jason Didden, staff of the Mid-Atlantic Council, offered to survey herring and mackerel vessels to collect more detailed cost information.

The survey requested information from vessel owners on total trip costs in 2014. The cost survey collected information on variable trip costs, the cost of repairs/maintenance/upgrades/haulout, fixed costs, and payments to crew. These data were used to update the impact analyses. If the vessel owner completed a survey then that vessel's actual costs were used in the analysis. Otherwise, respondent data were used to project costs on other vessels that did not provide a survey response. To do this, responses from the surveys were categorized by the annual primary species caught based on value. Two categories were used: herring/mackerel vessels and squid vessels. For each of these vessel types, costs were assigned into one of four categories: variable costs, crew share, repair/maint/upgrades/haulout, and fixed costs. Average percentages of annual gross revenue by cost category and vessel type were used to estimate costs for vessels that did not have survey data. See table below for cost category descriptions and average percentages of gross revenue.

Surveys were sent to approximately 18 vessel owners (representing about 26 vessels) in the herring and/or mackerel fisheries. Surveys were sent in May 2015 and information was submitted for 16 of the 26 vessels.

Cost category	Description	Average percent of gross revenue	
		Herring/ mackerel vessels	Squid vessels
Variable costs	Annual fuel, oil, food, water, ice, carrier vessel, communication, fishing supplies, crew supplies, and catch handling costs	25%	35%
Crew share	Total annual payments to crew	28%	26%
Repair/ maintenance/ upgrades/ haulout (RMUH)	Annual cost of repairs to engines, deck equipment, machinery, hull, fishing gear, electronics, processing equipment, refrigeration, and safety equipment. Includes haulout costs. Because these costs vary considerably from year to year and upgrade costs were combined with repair/maintenance costs, half of these costs were amortized over 7 years.	13%	11%
Fixed costs	Annual mooring/dockage, permits/licenses, insurance, quota/DAS lease, crew benefits, vessel monitoring, workshop/storage, office, vehicle, travel, association, professional, interest, taxes, and non-crew labor costs. Note: principal payments on business loans are not included in fixed costs.	19%	21%
Return to Owner (RTO)	Gross revenue less variable, crew share, RMUH, and fixed costs	15%	7%

Major Findings

Across the vessel types examined, the paired MWT vessels have the highest monitoring costs as a percentage of RTO. This is due to the fact that these vessels have, on average, more sea days that would have monitoring costs than the other vessel types.

There are differences among vessel types in terms of the sources of revenue that would be used to pay for monitoring costs. For example, for SMBT vessels, half of their revenue comes from herring and the other half from other species. What this means is that for monitoring that is required for the herring fishery, other non-herring sources of revenue must be used to cover the herring related costs. A metric for evaluating these differences is monitoring cost as a percent of herring revenue. For SMBT monitoring costs as a percent of herring revenue are higher than for other vessel types.

Exempting trips less than 25 mt of herring (Herring Alternative 2 Sub-Option 5) from industry-funded monitoring costs reduces the monitoring cost substantially in many cases. The degree of saving varies by gear type. Using Alternative 2.1

as an example, aggregate NEFOP costs decline by 48% for purse seine vessels ($320k to $166k). For paired midwater trawl vessels, the percentage difference (20%; $673k to $541k) is not as great.

For midwater trawl vessels, selecting Herring Alternatives 2.3 or 2.4 rather than Herring Alternative 2.2 results in about a 60% cost saving for paired midwater vessels in Year 2 and beyond and about a 45% cost saving for single midwater trawl vessels.

Selecting Herring Alternative 2.5 rather than Herring Alternative 2.1 reduces total industry monitoring costs from $811k to $75k – a 91% reduction.

Reducing EM costs from $325 to $187 per day and only monitoring half of the portside sampling trips at a rate of $3.84 per mt, as opposed to all trips at $5.12 per mt, reduces total monitoring costs by 51% for paired MWT vessels ($457,595 to $222,958) in year 2. For single MWT vessels, costs are reduced by 54% ($134,165 to $61,067).

Herring Alternative 2.1

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$1,364,372	$920,296	$1,026,390	$1,179,521	$1,875,233	$1,505,034
Annual Variable Costs	$318,252	$167,769	$330,865	$233,767	$284,996	$267,061	$594,112	$412,374
Annual Crew Share	$410,406	$213,633	$358,167	$270,086	$292,093	$332,733	$519,728	$451,846
Annual Repair/Maint/Upgrade/Haulout	$177,888	$98,231	$182,172	$119,312	$120,240	$101,172	$149,714	$94,073
Annual Fixed Costs	$268,728	$172,799	$251,988	$177,397	$187,892	$200,926	$467,553	$476,899
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$144,125	$113,903
Annual Cost of NEFOP	$84,150	$37,945	$45,700	$28,075	$23,077	$13,108	$17,380	$14,134
NEFOP as pct of RTO (median)	44.7%		13.9%		24.4%		11.5%	
post-NEFOP RTO	$78,930	$77,928	$195,480	$159,212	$118,091	$352,542	$126,745	$110,764
Percent of Revenue from Herring	91.2%	9.5%	100.0%	0.0%	81.9%	17.0%	52.4%	42.0%
Percent of Revenue from Mackerel	13.9%	8.2%			19.4%	17.0%	2.6%	4.1%
Percent of Revenue from Squids							44.3%	39.7%
Percent of Revenue from Other Species	0.1%	0.1%			7.7%	17.0%	21.5%	17.9%
Average Number of Days at Sea	103	47	56	34	28	16	21	17
Average Number of Trips	34	16	64	37	22	20	11	16

Herring Alternative 2.1

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	9
Total Days at Sea	825	392	170	192
Total Number of Trips	275	451	129	103
Total Herring Revenue	$9,409,389	$11,042,232	$3,842,873	$1,483,242
Total Mackerel Revenue	$1,155,588	$225	$570,246	$97,806
Total Squid Revenue				$529,723
Total Other Species Revenue	$5,906		$50,399	$485,180
Total Revenue	$10,570,883	$11,042,457	$4,463,518	$2,595,951
Total NEFOP Cost	$673,200	$319,902	$138,463	$156,420
NEFOP as pct of Total Revenue	6.4%	2.9%	3.1%	6.0%
NEFOP as pct of Herring Revenue	7.2%	2.9%	3.6%	10.5%

Herring Alternative 2.1 – Sub Option 5

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$1,364,372	$920,296	$1,026,390	$1,179,521	$2,057,720	$1,835,879
Annual Variable Costs	$318,252	$167,769	$330,865	$233,767	$284,996	$267,061	$626,872	$501,818
Annual Crew Share	$410,406	$213,633	$358,167	$270,086	$292,093	$332,733	$583,258	$550,531
Annual Repair/Maint/Upgrade/Haulout	$177,888	$98,231	$182,172	$119,312	$120,240	$101,172	$141,508	$110,893
Annual Fixed Costs	$268,728	$172,799	$251,988	$177,397	$187,892	$200,926	$542,753	$581,061
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$163,329	$137,021
Annual Cost of NEFOP	$67,626	$36,730	$23,759	$13,141	$15,756	$13,934	$15,975	$12,682
NEFOP as pct of RTO (median)	42.2%		10.4%		5.8%		14.2%	
post-NEFOP RTO	$95,454	$72,095	$217,421	$153,564	$125,412	$351,076	$147,354	$135,976
Percent of Revenue from Herring	94.9%	6.3%	100.0%	0.0%	88.0%	15.0%	88.5%	17.9%
Percent of Revenue from Mackerel	8.1%	6.1%			19.5%	17.1%	2.1%	1.3%
Percent of Revenue from Squids							12.2%	8.5%
Percent of Revenue from Other Species	0.0%	0.1%			0.4%	0.5%	20.3%	12.5%
Average Number of Days at Sea	83	45	29	16	19	17	20	16
Average Number of Trips	28	15	46	29	12	15	10	12

Herring Alternative 2.1 – Sub Option 5

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	6
Total Days at Sea	663	204	116	117
Total Number of Trips	221	320	73	59
Total Herring Revenue	$9,152,836	$10,263,855	$3,606,269	$1,352,045
Total Mackerel Revenue	$657,345	$225	$570,246	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109		$2,721	$237,472
Total Revenue	$9,814,290	$10,264,080	$4,179,236	$1,789,473
Total NEFOP Cost	$541,008	$166,313	$94,538	$95,852
NEFOP as pct of Total Revenue	5.5%	1.6%	2.3%	5.4%
NEFOP as pct of Herring Revenue	5.9%	1.6%	2.6%	7.1%

Herring Alternative 2.2 & 2.3 (100%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$1,364,372	$920,296	$1,026,390	$1,179,521	$1,875,233	$1,505,034
Annual Variable Costs	$318,252	$167,769	$330,865	$233,767	$284,996	$267,061	$594,112	$412,374
Annual Crew Share	$410,406	$213,633	$358,167	$270,086	$292,093	$332,733	$519,728	$451,846
Annual Repair/Maint/Upgrade/Haulout	$177,888	$98,231	$182,172	$119,312	$120,240	$101,172	$149,714	$94,073
Annual Fixed Costs	$268,728	$172,799	$251,988	$177,397	$187,892	$200,926	$467,553	$476,899
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$144,125	$113,903
Annual Cost of ASM	$73,219	$33,016	$39,764	$24,428	$20,079	$11,405	$15,122	$12,298
ASM as pct of RTO (median)	38.9%		12.1%		21.3%		10.0%	
post-ASM RTO	$89,862	$78,545	$201,417	$159,318	$121,089	$353,817	$129,003	$111,075
Percent of Revenue from Herring	91.2%	9.5%	100.0%	0.0%	81.9%	17.0%	52.4%	42.0%
Percent of Revenue from Mackerel	13.9%	8.2%	0.0%		19.4%	17.0%	2.6%	4.1%
Percent of Revenue from Squids							44.3%	39.7%
Percent of Revenue from Other Species	0.1%	0.1%			7.7%	17.0%	21.5%	17.9%
Average Number of Days at Sea	103	47	56	34	28	16	21	17
Average Number of Trips	34	16	64	37	22	20	11	16

Herring Alternative 2.2 & 2.3 (100%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	9
Total Days at Sea	825	392	170	192
Total Number of Trips	275	451	129	103
Total Herring Revenue	$9,409,389	$11,042,232	$3,842,873	$1,483,242
Total Mackerel Revenue	$1,155,588	$225	$570,246	$97,806
Total Squid Revenue				$529,723
Total Other Species Revenue	$5,906		$50,399	$485,180
Total Revenue	$10,570,883	$11,042,457	$4,463,518	$2,595,951
Total ASM Cost	$585,750	$278,346	$120,477	$136,100
ASM as pct of Total Revenue	5.5%	2.5%	2.7%	5.2%
ASM as pct of Herring Revenue	6.2%	2.5%	3.1%	9.2%

Herring Alternative 2.2 & 2.3 – Sub Option 5 (100%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$1,364,372	$920,296	$1,026,390	$1,179,521	$2,057,720	$1,835,879
Annual Variable Costs	$318,252	$167,769	$330,865	$233,767	$284,996	$267,061	$626,872	$501,818
Annual Crew Share	$410,406	$213,633	$358,167	$270,086	$292,093	$332,733	$583,258	$550,531
Annual Repair/Maint/Upgrade/Haulout	$177,888	$98,231	$182,172	$119,312	$120,240	$101,172	$141,508	$110,893
Annual Fixed Costs	$268,728	$172,799	$251,988	$177,397	$187,892	$200,926	$542,753	$581,061
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$163,329	$137,021
Annual Cost of ASM	$58,841	$31,959	$20,673	$11,434	$13,710	$12,124	$13,900	$11,034
ASM as pct of RTO (median)	36.7%		9.1%		5.1%		12.3%	
post-ASM RTO	$104,239	$73,608	$220,508	$154,643	$127,459	$352,543	$149,429	$136,046
Percent of Revenue from Herring	94.9%	6.3%	100.0%	0.0%	88.0%	15.0%	88.5%	17.9%
Percent of Revenue from Mackerel	8.1%	6.1%	0.0%		19.5%	17.1%	2.1%	1.3%
Percent of Revenue from Squids							12.2%	8.5%
Percent of Revenue from Other Species	0.0%	0.1%			0.4%	0.5%	20.3%	12.5%
Average Number of Days at Sea	83	45	29	16	19	17	20	16
Average Number of Trips	28	15	46	29	12	15	10	12

Herring Alternative 2.2 & 2.3 – Sub Option 5 (100%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	6
Total Days at Sea	663	204	116	117
Total Number of Trips	221	320	73	59
Total Herring Revenue	$9,152,836	$10,263,855	$3,606,269	$1,352,045
Total Mackerel Revenue	$657,345	$225	$570,246	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109		$2,721	$237,472
Total Revenue	$9,814,290	$10,264,080	$4,179,236	$1,789,473
Total ASM Cost	$470,730	$144,709	$82,257	$83,400
ASM as pct of Total Revenue	4.8%	1.4%	2.0%	4.7%
ASM as pct of Herring Revenue	5.1%	1.4%	2.3%	6.2%

Herring Alternative 2.2 & 2.3 (75%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$144,125	$113,903
Annual Cost of ASM	$54,936	$24,736	$29,898	$18,339	$15,021	$8,472	$11,709	$9,100
ASM as pct of RTO (median)	29.7%		9.1%		15.9%		7.5%	
post-ASM RTO	$108,144	$80,253	$211,282	$159,725	$126,148	$356,073	$132,416	$111,831
Percent of Revenue from Herring	91.3%	9.4%	100.0%	0.0%	82.5%	16.2%	52.7%	42.0%
Percent of Revenue from Mackerel	13.8%	8.0%	0.0%		19.3%	16.7%	2.6%	4.0%
Percent of Revenue from Squids							44.3%	39.8%
Percent of Revenue from Other Species	0.1%	0.1%			7.5%	16.5%	22.6%	19.1%
Average Number of Days at Sea	77	35	42	26	21	12	16	13

Herring Alternative 2.2 & 2.3 (75%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	9
Total Days at Sea	619	295	127	148
Total Herring Revenue	$7,069,090	$8,301,401	$2,870,099	$1,106,513
Total Mackerel Revenue	$865,766	$225	$436,137	$73,907
Total Squid Revenue				$440,897
Total Other Species Revenue	$4,749		$39,714	$385,635
Total Revenue	$7,939,606	$8,301,626	$3,345,950	$2,006,952
Total ASM Cost	$439,489	$209,288	$90,126	$105,382
ASM as pct of Total Revenue	5.5%	2.5%	2.7%	5.3%
ASM as pct of Herring Revenue	6.2%	2.5%	3.1%	9.5%

Herring Alternative 2.2 & 2.3 – Sub Option 5 (75%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$163,329	$137,021
Annual Cost of ASM	$44,198	$23,997	$15,571	$8,472	$10,298	$9,099	$10,474	$8,230
ASM as pct of RTO (median)	28.2%		6.8%		3.8%		9.4%	
post-ASM RTO	$118,882	$76,712	$225,610	$156,562	$130,870	$354,992	$152,855	$136,065
Percent of Revenue from Herring	94.9%	6.2%	100.0%	0.0%	88.1%	14.8%	89.2%	16.8%
Percent of Revenue from Mackerel	8.7%	6.0%	0.0%		19.4%	17.0%	2.2%	1.1%
Percent of Revenue from Squids							11.8%	8.4%
Percent of Revenue from Other Species	0.0%	0.1%			0.5%	0.8%	19.6%	11.3%
Average Number of Days at Sea	62	34	22	12	15	13	15	12

Herring Alternative 2.2 & 2.3 – Sub Option 5 (75%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	6
Total Days at Sea	498	154	87	89
Total Herring Revenue	$6,874,690	$7,702,188	$2,712,401	$1,024,121
Total Mackerel Revenue	$526,863	$225	$433,487	$21,556
Total Squid Revenue				$130,869
Total Other Species Revenue	$3,148		$2,345	$190,706
Total Revenue	$7,404,700	$7,702,413	$3,148,233	$1,367,252
Total ASM Cost	$353,586	$108,996	$61,791	$62,845
ASM as pct of Total Revenue	4.8%	1.4%	2.0%	4.6%
ASM as pct of Herring Revenue	5.1%	1.4%	2.3%	6.1%

Herring Alternative 2.2 & 2.3 (50%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$163,080	$241,180	$241,180	$141,169	$141,169	$144,125	$144,125
Annual Cost of ASM	$36,875	$16,417	$19,846	$12,053	$10,145	$5,662	$8,483	$6,375
ASM as pct of RTO (median)	20.4%		6.0%		10.5%		5.4%	
post-ASM RTO	$126,205	$82,980	$221,334	$160,394	$131,024	$358,152	$135,643	$112,417
Percent of Revenue from Herring	91.4%	9.3%	100.0%	0.0%	83.3%	15.4%	53.6%	42.2%
Percent of Revenue from Mackerel	14.1%	8.0%	0.0%		19.1%	16.2%	2.9%	4.4%
Percent of Revenue from Squids							44.5%	39.8%
Percent of Revenue from Other Species	0.1%	0.2%			8.2%	17.9%	24.7%	21.7%
Average Number of Days at Sea	52	23	28	17	14	8	12	9

Herring Alternative 2.2 & 2.3 (50%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	9
Total Days at Sea	415	196	86	108
Total Herring Revenue	4,732,456	5,510,474	1,943,001	748,019
Total Mackerel Revenue	591,520	225	310,908	56,804
Total Squid Revenue				369,787
Total Other Species Revenue	3,503		33,722	312,508
Total Revenue	5,327,480	5,510,699	2,287,630	1,487,117
Total ASM Cost	$294,999	$138,922	$60,867	$76,346
ASM as pct of Total Revenue	5.5%	2.5%	2.7%	5.1%
ASM as pct of Herring Revenue	6.2%	2.5%	3.1%	10.2%

Herring Alternative 2.2 & 2.3 – Sub Option 5 (50%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$163,329	$137,021
Annual Cost of ASM	$29,489	$15,844	$10,464	$5,525	$6,999	$6,001	$7,247	$5,562
ASM as pct of RTO (median)	18.9%		4.5%		2.5%		6.4%	
post-ASM RTO	$133,591	$80,718	$230,716	$158,500	$134,170	$357,624	$156,082	$136,133
Percent of Revenue from Herring	95.0%	6.2%	100.0%	0.0%	88.5%	14.0%	90.2%	15.2%
Percent of Revenue from Mackerel	10.3%	6.6%	0.0%		19.3%	16.4%	2.7%	0.6%
Percent of Revenue from Squids							11.2%	7.8%
Percent of Revenue from Other Species	0.0%	0.1%			0.8%	1.3%	20.1%	9.6%
Average Number of Days at Sea	42	22	15	8	10	8	10	8

Herring Alternative 2.2 & 2.3 – Sub Option 5 (50%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	6
Total Days at Sea	332	103	59	61
Total Herring Revenue	$4,580,747	$5,158,742	$1,820,329	$708,574
Total Mackerel Revenue	$417,898	$225	$310,536	$15,657
Total Squid Revenue				$95,931
Total Other Species Revenue	$2,109		$2,117	$159,514
Total Revenue	$5,000,754	$5,158,967	$2,132,982	$979,676
Total ASM Cost	$235,915	$73,250	$41,994	$43,482
ASM as pct of Total Revenue	4.7%	1.4%	2.0%	4.4%
ASM as pct of Herring Revenue	5.2%	1.4%	2.3%	6.1%

Herring Alternative 2.2 & 2.3 (25%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$144,125	$113,903
Annual Cost of ASM	$18,578	$7,854	$10,041	$5,914	$5,498	$2,600	$5,642	$4,539
ASM as pct of RTO (median)	10.1%		3.0%		5.6%		3.5%	
post-ASM RTO	$144,503	$86,107	$231,139	$161,277	$135,671	$360,600	$138,483	$112,951
Percent of Revenue from Herring	91.8%	9.0%	100.0%	0.0%	85.0%	13.7%	55.0%	42.1%
Percent of Revenue from Mackerel	16.3%	8.9%	0.1%		20.0%	15.2%	3.1%	4.4%
Percent of Revenue from Squids							44.6%	39.8%
Percent of Revenue from Other Species	0.2%	0.4%			9.0%	19.4%	27.6%	26.7%
Average Number of Days at Sea	26	11	14	8	8	4	8	6

Herring Alternative 2.2 & 2.3 (25%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	9
Total Days at Sea	209	99	46	72
Total Herring Revenue	$2,394,688	$2,774,156	$981,948	$448,402
Total Mackerel Revenue	$357,710	$225	$213,945	$39,547
Total Squid Revenue				$305,034
Total Other Species Revenue	$2,470		$28,154	$249,797
Total Revenue	$2,754,868	$2,774,381	$1,224,046	$1,042,780
Total ASM Cost	$148,622	$70,288	$32,987	$50,782
ASM as pct of Total Revenue	5.4%	2.5%	2.7%	4.9%
ASM as pct of Herring Revenue	6.2%	2.5%	3.4%	11.3%

Herring Alternative 2.2 & 2.3 – Sub Option 5 (25%) – ASM Coverage Only

Per Vessel	Paired MWT		Purse Seine		Single MWT		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$241,180	$162,152	$141,169	$362,448	$163,329	$137,021
Annual Cost of ASM	$14,949	$7,649	$5,370	$2,578	$3,994	$2,978	$4,560	$3,380
ASM as pct of RTO (median)	9.6%		2.2%		1.4%		3.8%	
post-ASM RTO	$148,131	$85,224	$235,811	$160,535	$137,175	$360,395	$158,769	$136,042
Percent of Revenue from Herring	95.4%	5.8%	100.0%	0.0%	89.3%	12.8%	90.9%	14.1%
Percent of Revenue from Mackerel	15.5%	9.9%	0.1%		20.1%	15.6%	3.1%	0.1%
Percent of Revenue from Squids							11.0%	7.2%
Percent of Revenue from Other Species	0.0%	0.1%			1.3%	2.0%	21.7%	8.6%
Average Number of Days at Sea	21	11	8	4	6	4	6	5

Herring Alternative 2.2 & 2.3 – Sub Option 5 (25%) – ASM Coverage Only

Fleet Level	Paired MWT	Purse Seine	Single MWT	SMBT
Number of Vessels	8	7	6	6
Total Days at Sea	168	53	34	39
Total Herring Revenue	$2,317,299	$2,591,280	$940,773	$452,532
Total Mackerel Revenue	$336,069	$225	$205,825	$10,562
Total Squid Revenue				$68,202
Total Other Species Revenue	$1,128		$1,920	$135,106
Total Revenue	$2,654,496	$2,591,505	$1,148,518	$666,402
Total ASM Cost	$119,591	$37,587	$23,964	$27,358
ASM as pct of Total Revenue	4.5%	1.5%	2.1%	4.1%
ASM as pct of Herring Revenue	5.2%	1.5%	2.5%	6.0%

Herring Alternative 2.3 and 2.4 (100% EM at $325 per day, 100% PS at $5.12 per mt)

Per Vessel	Paired MWT		Single MWT	
	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$912,105	$1,024,851
Annual Variable Costs	$318,252	$167,769	$264,620	$232,352
Annual Crew Share	$410,406	$213,633	$239,242	$297,854
Annual Repair/Maint/Haulout	$177,888	$98,231	$110,742	$90,131
Annual Fixed Costs	$268,728	$172,799	$163,296	$175,943
Annual Return-to-owner	$163,080	$89,827	$134,205	$310,157
Annual Cost of EM - year 1	$48,516	$15,113	$22,300	$5,316
Annual Cost of EM - year 2	$33,516	$15,113	$7,300	$5,316
Annual Cost of PS	$23,684	$15,503	$9,471	$16,229
Total Monitoring Costs as pct of RTO - year 1 (median)	42.2%		37.3%	
Total Monitoring Costs as pct of RTO - year 2 (median)	29.1%		12.8%	
Post-monitoring RTO -- year 1	$90,881	$74,211	$102,434	$292,275
Post-monitoring RTO -- year 2	$105,881	$74,211	$117,434	$292,275
Percent of Revenue from Herring	91.2%	9.5%	86.0%	16.3%
Percent of Revenue from Mackerel	13.9%	8.2%	15.5%	17.1%
Percent of Revenue from Squids			2.9%	
Percent of Revenue from Other Species	0.1%	0.1%	6.4%	15.5%
Average Number of Days at Sea	103	47	23	17
Average Number of Trips	34	16	18	18

Herring Alternative 2.3 and 2.4 (100% EM at $187 per day, 50% PS at $3.84 per mt)

Per Vessel	Paired MWT		Single MWT	
	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$134,205	$310,157
Annual Cost of EM - year 1	$34,284	$8,696	$19,200	$3,059
Annual Cost of EM - year 2	$19,284	$8,696	$4,200	$3,059
Annual Cost of PS	$8,585	$5,620	$3,433	$5,883
Total Monitoring Costs as pct of RTO - year 1 (median)	25.1%		26.7%	
Total Monitoring Costs as pct of RTO - year 2 (median)	14.4%		6.9%	
Post-monitoring RTO -- year 1	$120,211	$82,109	$111,572	$302,913
Post-monitoring RTO -- year 2	$135,211	$82,109	$126,572	$302,913

Herring Alternative 2.3 and 2.4(100% EM at $325 per day, 100% PS at $5.12 per mt)

Fleet Level	Paired MWT	Single MWT
Number of Vessels	8	8
Total Days at Sea	825	180
Total Number of Trips	275	140
Total Herring Revenue	$9,409,389	$3,873,778
Total Mackerel Revenue	$1,155,588	$570,248
Total Squid Revenue		$441
Total Other Species Revenue	$5,906	$50,421
Total Revenue	$10,570,883	$4,494,888
Total EM Cost - year 1	$388,125	$178,398
Total EM Cost - year 2	$268,125	$58,398
Total PS Cost	$189,470	$75,767
Total Monitoring Costs - year 1	$577,595	$254,165
Total Monitoring Costs - year 2	$457,595	$134,165
Monitoring Costs as pct of Total Revenue -- year 1	5.5%	5.7%
Monitoring Costs as pct of Total Revenue -- year 2	4.3%	3.0%
Monitoring Costs as pct of Herring Revenue -- year 1	6.1%	6.6%
Monitoring Costs as pct of Herring Revenue -- year 2	4.9%	3.5%

Herring Alternative 2.3 and 2.4 (100% EM at $187 per day, 50% PS at $3.84 per mt)

Fleet Level	Paired MWT	Single MWT
Number of Vessels	8	8
Total Days at Sea	825	180
Total Number of Trips	275	140
Total Herring Revenue	$9,409,389	$3,873,778
Total Mackerel Revenue	$1,155,588	$570,248
Total Squid Revenue		$441
Total Other Species Revenue	$5,906	$50,421
Total Revenue	$10,570,883	$4,494,888
Total EM Cost - year 1	$274,275	$153,601
Total EM Cost - year 2	$154,275	$33,601
Total PS Cost	$68,683	$27,465
Total Monitoring Costs - year 1	$342,958	$181,067
Total Monitoring Costs - year 2	$222,958	$61,067
Monitoring Costs as pct of Total Revenue -- year 1	3.2%	4.0%
Monitoring Costs as pct of Total Revenue -- year 2	2.1%	1.4%
Monitoring Costs as pct of Herring Revenue -- year 1	3.6%	4.7%
Monitoring Costs as pct of Herring Revenue -- year 2	2.4%	1.6%

Herring Alternative 2.3 and 2.4 – Sub Option 5 (100% EM at $325 per day, 100% PS at $5.12 per mt)

Per Vessel	Paired MWT		Single MWT	
	Average	Stnd Dev	Average	Stnd Dev
Annual Gross Revenue	$1,338,354	$704,254	$990,082	$1,081,027
Annual Variable Costs	$318,252	$167,769	$284,110	$243,803
Annual Crew Share	$410,406	$213,633	$259,816	$315,519
Annual Repair/Maint/Haulout	$177,888	$98,231	$120,806	$92,369
Annual Fixed Costs	$268,728	$172,799	$175,636	$186,264
Annual Return-to-owner	$163,080	$89,827	$149,714	$331,640
Annual Cost of EM - year 1	$41,934	$14,629	$20,425	$5,543
Annual Cost of EM - year 2	$26,934	$14,629	$5,425	$5,543
Annual Cost of PS	$22,205	$15,461	$9,943	$17,483
Total Monitoring Costs as pct of RTO - year 1 (median)	40.1%		19.5%	
Total Monitoring Costs as pct of RTO - year 2 (median)	27.5%		4.9%	
Post-monitoring RTO -- year 1	$98,941	$73,425	$119,346	$312,177
Post-monitoring RTO -- year 2	$113,941	$73,425	$134,346	$312,177
Percent of Revenue from Herring	94.9%	6.3%	89.7%	14.4%
Percent of Revenue from Mackerel	8.1%	6.1%	19.5%	17.1%
Percent of Revenue from Squids				
Percent of Revenue from Other Species	0.0%	0.1%	0.4%	0.5%
Average Number of Days at Sea	83	45	17	17
Average Number of Trips	28	15	11	15

Herring Alternative 2.3 and 2.4 – Sub Option 5 (100% EM at $187 per day, 50% PS at $3.84 per mt)

Per Vessel	Paired MWT		Single MWT	
	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$149,714	$331,640
Annual Cost of EM - year 1	$30,498	$8,417	$18,122	$3,189
Annual Cost of EM - year 2	$15,498	$8,417	$3,122	$3,189
Annual Cost of PS	$8,049	$5,605	$3,604	$6,338
Total Monitoring Costs as pct of RTO - year 1 (median)	24.2%		16.9%	
Total Monitoring Costs as pct of RTO - year 2 (median)	13.3%		2.4%	
Post-monitoring RTO -- year 1	$124,533	$81,356	$127,988	$323,695
Post-monitoring RTO -- year 2	$139,533	$81,356	$142,988	$323,695

Herring Alternative 2.3 and 2.4 – Sub Option 5 (100% EM at $325 per day, 100% PS at $5.12 per mt)

Fleet Level	Paired MWT	Single MWT
Number of Vessels	8	7
Total Days at Sea	663	117
Total Number of Trips	221	75
Total Herring Revenue	$9,152,836	$3,618,705
Total Mackerel Revenue	$657,345	$570,246
Total Squid Revenue		
Total Other Species Revenue	$4,109	$2,721
Total Revenue	$9,814,290	$4,191,672
Total EM Cost - year 1	$335,475	$142,978
Total EM Cost - year 2	$215,475	$37,978
Total PS Cost	$177,642	$69,602
Total Monitoring Costs - year 1	$513,117	$212,580
Total Monitoring Costs - year 2	$393,117	$107,580
Monitoring Costs as pct of Total Revenue -- year 1	5.2%	5.1%
Monitoring Costs as pct of Total Revenue -- year 2	4.0%	2.6%
Monitoring Costs as pct of Herring Revenue -- year 1	5.6%	5.9%
Monitoring Costs as pct of Herring Revenue -- year 2	4.3%	3.0%

Herring Alternative 2.3 and 2.4 – Sub Option 5 (100% EM at $187 per day, 50% PS at $3.84 per mt)

Fleet Level	Paired MWT	Single MWT
Number of Vessels	8	7
Total Days at Sea	663	117
Total Number of Trips	221	75
Total Herring Revenue	$9,152,836	$3,618,705
Total Mackerel Revenue	$657,345	$570,246
Total Squid Revenue		
Total Other Species Revenue	$4,109	$2,721
Total Revenue	$9,814,290	$4,191,672
Total EM Cost - year 1	$243,981	$126,852
Total EM Cost - year 2	$123,981	$21,852
Total PS Cost	$64,395	$25,231
Total Monitoring Costs - year 1	$308,376	$152,083
Total Monitoring Costs - year 2	$188,376	$47,083
Monitoring Costs as pct of Total Revenue -- year 1	3.1%	3.6%
Monitoring Costs as pct of Total Revenue -- year 2	1.9%	1.1%
Monitoring Costs as pct of Herring Revenue -- year 1	3.4%	4.2%
Monitoring Costs as pct of Herring Revenue -- year 2	2.1%	1.3%

Herring Alternative 2.5

Per Vessel	Average	Stnd Dev
Annual Gross Revenue	$1,752,994	$822,480
Annual Variable Costs	$409,945	$181,028
Annual Crew Share	$527,920	$227,404
Annual Repair/Maint/Upgrade/Haulout	$208,650	$73,627
Annual Fixed Costs	$340,386	$171,281
Annual Return-to-owner	$266,094	$239,382
Annual Cost of NEFOP	$9,353	$7,604
NEFOP as pct of RTO (median)	4.0%	
post-NEFOP RTO	$256,740	$244,116
Percent of Revenue from Herring	99.9%	0.4%
Percent of Revenue from Mackerel		
Percent of Revenue from Squids		
Percent of Revenue from Other Species	0.2%	0.4%
Average Number of Days at Sea	11	9
Average Number of Trips	4	3

Fleet Level	
Number of Vessels	8
Total Days at Sea	92
Total Number of Trips	33
Total Herring Revenue	$1,437,094
Total Mackerel Revenue	
Total Squid Revenue	
Total Other Species Revenue	$1,170
Total Revenue	$1,438,264
Total NEFOP Cost	$74,827
NEFOP as pct of Total Revenue	5.2%
NEFOP as pct of Herring Revenue	5.2%

Herring Alternative 2.5 – Sub Option 5

Per Vessel	Average	Stnd Dev
Annual Gross Revenue	$1,752,994	$822,480
Annual Variable Costs	$409,945	$181,028
Annual Crew Share	$527,920	$227,404
Annual Repair/Maint/Upgrade/Haulout	$208,650	$73,627
Annual Fixed Costs	$340,386	$171,281
Annual Return-to-owner	$266,094	$239,382
Annual Cost of NEFOP	$6,293	$3,131
NEFOP as pct of RTO (median)	3.7%	
post-NEFOP RTO	$259,800	$241,604
Percent of Revenue from Herring	100.0%	0.0%
Percent of Revenue from Mackerel		
Percent of Revenue from Squids		
Percent of Revenue from Other Species	0.0%	0.0%
Average Number of Days at Sea	8	4
Average Number of Trips	3	1

Fleet Level	
Number of Vessels	8
Total Days at Sea	62
Total Number of Trips	23
Total Herring Revenue	$1,379,191
Total Mackerel Revenue	
Total Squid Revenue	
Total Other Species Revenue	
Total Revenue	$1,379,191
Total NEFOP Cost	$50,347
NEFOP as pct of Total Revenue	3.7%
NEFOP as pct of Herring Revenue	3.7%

Herring Alternative 2.6

Analyses are not yet complete for this alternative. Alternative 2.6 applies the same criteria as found in Alternatives 2.2, 2.3, and 2.4 but only for vessels that fish in groundfish closed areas. However, in order to provide a means for obtaining a reasonably reliable estimate of the impacts of Alternative 2.6, the following two tables are provided. The first table shows the major differences between Alternatives 2.1 and 2.5 at 100% coverage for trips with > 1 lb of herring landed (the second table shows the differences for trips > 25 mt – Sub-Option 5). These two alternatives are identical except that Alternative 2.5 applies only to vessels that fish in groundfish closed areas and applies to MWT vessels with category A through E herring permits whereas Alternative 2.1 applies to vessel with category A and B permits only. Therefore, these differences can be used to estimate the impacts of Alternative 2.6.

Trips with Herring Landings > 1 lb (includes all gear types)

	Herring Alternative 2.1	Herring Alternative 2.5	Herring Alternative 2.5 as a Percent of Alternative 2.1	
Number of Vessels	30	8	26.7%	
Total Days at Sea	1,579	92	5.8%	
Number of Trips	958	33	3.4%	
Total Revenue	$28,672,809	$1,438,264	5.0%	Use this for estimating portside sampling costs for Alternative 2.6
Total NEFOP Cost	$1,287,985	$74,827	5.8%	Use this for estimating EM and ASM costs for Alternative 2.6

Trips with Herring Landings > 25 mt (Sub-Option 5) (includes all gear types)

	Herring Alternative 2.1	Herring Alternative 2.5	Herring Alternative 2.5 as a Percent of Alternative 2.1	
Number of Vessels	27	8	29.6%	
Total Days at Sea	1,100	62	5.6%	
Number of Trips	673	23	3.4%	
Total Revenue	$246,047,079	$1,379,191	5.6%	Use this for estimating portside sampling costs for Alternative 2.6
Total NEFOP Cost	$897,711	$50,347	5.6%	Use this for estimating EM and ASM costs for Alternative 2.6

Herring Alternative 2.7. 100% EM and PS. EM at $325/day. PS at $5.12/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$144,125	$113,903
Annual Cost of EM - year 1	$48,516	$15,113	$24,191	$5,221	$33,202	$11,182	$21,922	$5,629
Annual Cost of EM - year 2	$33,516	$15,113	$9,191	$5,221	$18,202	$11,182	$6,922	$5,629
Annual Cost of PS	$22,914	$14,999	$12,097	$17,447	$23,633	$15,699	$2,844	$3,000
Total Monitoring Costs as pct of RTO - year 1	43.8%	Median: 42.3%	25.7%	Median: 38.1%	23.6%	Median: 19.4%	17.2%	Median: 21.0%
Total Monitoring Costs as pct of RTO - year 2	34.6%	Median: 29.2%	15.1%	Median: 17.3%	17.3%	Median: 15.3%	6.8%	Median: 6.3%
Post-monitoring RTO -- year 1	$91,651	$74,471	$104,881	$341,867	$184,345	$144,814	$119,359	$111,844
Post-monitoring RTO -- year 2	$106,651	$74,471	$119,881	$341,867	$199,345	$144,814	$134,359	$111,844

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	9
Total Days at Sea	825	170	392	192
Total Number of Trips	275	129	451	103
Total Herring Revenue	$9,409,389	$3,842,873	$11,042,232	$1,483,242
Total Mackerel Revenue	$1,155,588	$570,246	$225	$97,806
Total Squid Revenue				$529,723

Total Other Species Revenue	$5,906	$50,399		$485,180
Total Revenue	$10,570,883	$4,463,518	$11,042,457	$2,595,951
Total EM Cost - year 1	$388,125	$145,148	$232,412	$197,300
Total EM Cost - year 2	$268,125	$55,148	$127,412	$62,300
Total PS Cost	$183,313	$72,580	$165,433	$25,597
Total Monitoring Costs - year 1	$571,438	$217,728	$397,845	$222,897
Total Monitoring Costs - year 2	$451,438	$127,728	$292,845	$87,897
Monitoring Costs as pct of Total Revenue -- year 1	5.4%	4.9%	3.6%	8.6%
Monitoring Costs as pct of Total Revenue -- year 2	4.3%	2.9%	2.7%	3.4%
Monitoring Costs as pct of Herring Revenue -- year 1	6.1%	5.7%	3.6%	15.0%
Monitoring Costs as pct of Herring Revenue -- year 2	4.8%	3.3%	2.7%	5.9%

Herring Alternative 2.7 – sub option 5. 100% EM and PS. EM at $325/day. PS at $5.12/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$163,329	$137,021
Annual Cost of EM - year 1	$41,934	$14,629	$21,276	$5,550	$24,463	$5,234	$21,363	$5,051
Annual Cost of EM - year 2	$26,934	$14,629	$6,276	$5,550	$9,463	$5,234	$6,363	$5,051
Annual Cost of PS	$21,484	$14,958	$11,173	$17,974	$22,027	$15,705	$3,410	$2,535
Total Monitoring Costs as pct of RTO - year 1	38.9%	Median: 39.7%	23.0%	Median: 29.2%	19.3%	Median: 18.3%	15.2%	Median: 19.9%
Total Monitoring Costs as pct of RTO - year 2	29.7%	Median: 27.1%	12.4%	Median: 6.2%	13.1%	Median: 14.1%	6.0%	Median: 8.8%
Post-monitoring RTO -- year 1	$99,662	$73,641	$108,720	$341,047	$194,691	$143,060	$138,556	$136,267
Post-monitoring RTO -- year 2	$114,662	$73,641	$123,720	$341,047	$209,691	$143,060	$153,556	$136,267

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	6
Total Days at Sea	663	116	204	117
Total Number of Trips	221	73	320	59
Total Herring Revenue	$9,152,836	$3,606,269	$10,263,855	$1,352,045
Total Mackerel Revenue	$657,345	$570,246	$225	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109	$2,721		$237,472

Total Revenue	$9,814,290	$4,179,236	$10,264,080	$1,789,473
Total EM Cost - year 1	$335,475	$127,653	$171,240	$128,176
Total EM Cost - year 2	$215,475	$37,653	$66,240	$38,176
Total PS Cost	$171,869	$67,038	$154,189	$20,461
Total Monitoring Costs - year 1	$507,344	$194,691	$325,429	$148,637
Total Monitoring Costs - year 2	$387,344	$104,691	$220,429	$58,637
Monitoring Costs as pct of Total Revenue -- year 1	5.2%	4.7%	3.2%	8.3%
Monitoring Costs as pct of Total Revenue -- year 2	3.9%	2.5%	2.1%	3.3%
Monitoring Costs as pct of Herring Revenue -- year 1	5.5%	5.4%	3.2%	11.0%
Monitoring Costs as pct of Herring Revenue -- year 2	4.2%	2.9%	2.1%	4.3%

Herring Alternative 2.7. 75% EM and PS. EM at $202/day. PS at $3.84/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$144,125	$113,903
Annual Cost of EM - year 1	$30,623	$7,045	$19,285	$2,434	$23,485	$5,212	$18,227	$2,624
Annual Cost of EM - year 2	$15,623	$7,045	$4,285	$2,434	$8,485	$5,212	$3,227	$2,624
Annual Cost of PS	$12,878	$8,430	$6,798	$9,805	$13,282	$8,823	$1,598	$1,686
Total Monitoring Costs as pct of RTO - year 1	26.7%	Median: 25.6%	18.5%	Median: 27.6%	15.2%	Median: 13.0%	13.8%	Median: 16.8%
Total Monitoring Costs as pct of RTO - year 2	17.5%	Median: 14.8%	7.9%	Median: 8.5%	9.0%	Median: 8.1%	3.3%	Median: 3.0%
Post-monitoring RTO -- year 1	$119,579	$81,021	$115,086	$351,250	$204,413	$152,458	$124,300	$112,806
Post-monitoring RTO -- year 2	$134,579	$81,021	$130,086	$351,250	$219,413	$152,458	$139,300	$112,806

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	9
Total Days at Sea	825	170	392	192
Total Number of Trips	275	129	451	103
Total Herring Revenue	$9,409,389	$3,842,873	$11,042,232	$1,483,242
Total Mackerel Revenue	$1,155,588	$570,246	$225	$97,806
Total Squid Revenue				$529,723

Total Other Species Revenue	$5,906	$50,399		$485,180
Total Revenue	$10,570,883	$4,463,518	$11,042,457	$2,595,951
Total EM Cost - year 1	$244,988	$115,707	$164,394	$164,041
Total EM Cost - year 2	$124,988	$25,707	$59,394	$29,041
Total PS Cost	$103,025	$40,791	$92,976	$14,386
Total Monitoring Costs - year 1	$348,012	$156,498	$257,369	$178,427
Total Monitoring Costs - year 2	$228,012	$66,498	$152,369	$43,427
Monitoring Costs as pct of Total Revenue -- year 1	3.3%	3.5%	2.3%	6.9%
Monitoring Costs as pct of Total Revenue -- year 2	2.2%	1.5%	1.4%	1.7%
Monitoring Costs as pct of Herring Revenue -- year 1	3.7%	4.1%	2.3%	12.0%
Monitoring Costs as pct of Herring Revenue -- year 2	2.4%	1.7%	1.4%	2.9%

Herring Alternative 2.7 – sub option 5. 75% EM and PS. EM at $202/day. PS at $3.84/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$163,329	$137,021
Annual Cost of EM - year 1	$27,556	$6,819	$17,925	$2,587	$19,411	$2,440	$17,966	$2,355
Annual Cost of EM - year 2	$12,556	$6,819	$2,925	$2,587	$4,411	$2,440	$2,966	$2,355
Annual Cost of PS	$12,074	$8,407	$6,279	$10,102	$12,380	$8,826	$1,917	$1,425
Total Monitoring Costs as pct of RTO - year 1	24.3%	Median: 24.8%	17.1%	Median: 23.5%	13.2%	Median: 12.6%	12.2%	Median: 15.4%
Total Monitoring Costs as pct of RTO - year 2	15.1%	Median: 13.7%	6.5%	Median: 3.3%	7.0%	Median: 7.6%	3.0%	Median: 4.3%
Post-monitoring RTO -- year 1	$123,451	$80,634	$116,964	$350,826	$209,390	$151,744	$143,446	$136,600
Post-monitoring RTO -- year 2	$138,451	$80,634	$131,964	$350,826	$224,390	$151,744	$158,446	$136,600

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	6
Total Days at Sea	663	116	204	117
Total Number of Trips	221	73	320	59
Total Herring Revenue	$9,152,836	$3,606,269	$10,263,855	$1,352,045
Total Mackerel Revenue	$657,345	$570,246	$225	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109	$2,721		$237,472

Total Revenue	$9,814,290	$4,179,236	$10,264,080	$1,789,473
Total EM Cost - year 1	$220,445	$107,552	$135,878	$107,796
Total EM Cost - year 2	$100,445	$17,552	$30,878	$17,796
Total PS Cost	$96,593	$37,676	$86,657	$11,499
Total Monitoring Costs - year 1	$317,037	$145,228	$222,535	$119,295
Total Monitoring Costs - year 2	$197,037	$55,228	$117,535	$29,295
Monitoring Costs as pct of Total Revenue -- year 1	3.2%	3.5%	2.2%	6.7%
Monitoring Costs as pct of Total Revenue -- year 2	2.0%	1.3%	1.1%	1.6%
Monitoring Costs as pct of Herring Revenue -- year 1	3.5%	4.0%	2.2%	8.8%
Monitoring Costs as pct of Herring Revenue -- year 2	2.2%	1.5%	1.1%	2.2%

Herring Alternative 2.7. 50% EM and PS. EM at $187/day. PS at $3.84/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$144,125	$113,903
Annual Cost of EM - year 1	$24,642	$4,348	$17,644	$1,502	$20,236	$3,217	$16,991	$1,619
Annual Cost of EM - year 2	$9,642	$4,348	$2,644	$1,502	$5,236	$3,217	$1,991	$1,619
Annual Cost of PS	$8,585	$5,620	$4,532	$6,537	$8,855	$5,882	$1,066	$1,124
Total Monitoring Costs as pct of RTO - year 1	20.4%	Median: 19.8%	15.7%	Median: 23.7%	12.1%	Median: 10.5%	12.5%	Median: 14.3%
Total Monitoring Costs as pct of RTO - year 2	11.2%	Median: 9.5%	5.1%	Median: 5.4%	5.8%	Median: 5.3%	2.1%	Median: 18.4%
Post-monitoring RTO -- year 1	$129,853	$83,958	$118,992	$355,072	$212,089	$155,712	$126,068	$113,189
Post-monitoring RTO -- year 2	$144,853	$83,958	$133,992	$355,072	$227,089	$155,712	$141,068	$113,189

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	9
Total Days at Sea	825	170	392	192
Total Number of Trips	275	129	451	103
Total Herring Revenue	$9,409,389	$3,842,873	$11,042,232	$1,483,242
Total Mackerel Revenue	$1,155,588	$570,246	$225	$97,806
Total Squid Revenue				$529,723
Total Other Species Revenue	$5,906	$50,399		$485,180
Total Revenue	$10,570,883	$4,463,518	$11,042,457	$2,595,951

Total EM Cost - year 1	$197,138	$105,866	$141,655	$152,923
Total EM Cost - year 2	$77,138	$15,866	$36,655	$17,923
Total PS Cost	$68,683	$27,194	$61,984	$9,591
Total Monitoring Costs - year 1	$265,821	$133,060	$203,639	$162,514
Total Monitoring Costs - year 2	$145,821	$43,060	$98,639	$27,514
Monitoring Costs as pct of Total Revenue -- year 1	2.5%	3.0%	1.8%	6.3%
Monitoring Costs as pct of Total Revenue -- year 2	1.4%	1.0%	0.9%	1.1%
Monitoring Costs as pct of Herring Revenue -- year 1	2.8%	3.5%	1.8%	11.0%
Monitoring Costs as pct of Herring Revenue -- year 2	1.5%	1.1%	0.9%	1.9%

Herring Alternative 2.7 – sub option 5. 50% EM and PS. EM at $187/day. PS at $3.84/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$163,329	$137,021
Annual Cost of EM - year 1	$22,749	$4,209	$16,805	$1,597	$17,722	$1,506	$16,831	$1,453
Annual Cost of EM - year 2	$7,749	$4,209	$1,805	$1,597	$2,722	$1,506	$1,831	$1,453
Annual Cost of PS	$8,049	$5,605	$4,186	$6,735	$8,253	$5,884	$1,278	$950
Total Monitoring Costs as pct of RTO - year 1	18.9%	Median: 19.3%	14.9%	Median: 21.1%	10.8%	Median: 10.3%	11.1%	Median: 13.8%
Total Monitoring Costs as pct of RTO - year 2	9.7%	Median: 8.8%	4.2%	Median: 2.1%	4.6%	Median: 4.9%	1.9%	Median: 2.7%
Post-monitoring RTO -- year 1	$132,282	$83,719	$120,177	$354,798	$215,205	$155,292	$145,221	$136,744
Post-monitoring RTO -- year 2	$147,282	$83,719	$135,177	$354,798	$230,205	$155,292	$160,221	$136,744

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	6
Total Days at Sea	663	116	204	117
Total Number of Trips	221	73	320	59
Total Herring Revenue	$9,152,836	$3,606,269	$10,263,855	$1,352,045
Total Mackerel Revenue	$657,345	$570,246	$225	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109	$2,721		$237,472
Total Revenue	$9,814,290	$4,179,236	$10,264,080	$1,789,473
Total EM Cost - year 1	$181,991	$100,832	$124,057	$100,983

Total EM Cost - year 2	$61,991	$10,832	$19,057	$10,983
Total PS Cost	$64,395	$25,118	$57,771	$7,666
Total Monitoring Costs - year 1	$246,386	$125,950	$181,828	$108,649
Total Monitoring Costs - year 2	$126,386	$35,950	$76,828	$18,649
Monitoring Costs as pct of Total Revenue -- year 1	2.5%	3.0%	1.8%	6.1%
Monitoring Costs as pct of Total Revenue -- year 2	1.3%	0.9%	0.7%	1.0%
Monitoring Costs as pct of Herring Revenue -- year 1	2.7%	3.5%	1.8%	8.0%
Monitoring Costs as pct of Herring Revenue -- year 2	1.4%	1.0%	0.7%	1.4%

Herring Alternative 2.7. 25% EM and PS. EM at $172/day. PS at $3.84/mt

Vessel Level	**Paired MWT**		**Single MWT**		**PurseSeine**		**SMBT**	
	Average	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**	**Average**	**Stnd Dev**
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$144,125	$113,903
Annual Cost of EM - year 1	$19,434	$2,000	$16,216	$691	$17,408	$1,479	$15,916	$745
Annual Cost of EM - year 2	$4,434	$2,000	$1,216	$691	$2,408	$1,479	$916	$745
Annual Cost of PS	$4,293	$2,810	$2,266	$3,268	$4,427	$2,941	$533	$562
Total Monitoring Costs as pct of RTO - year 1	14.5%	14.4%	13.1%	20.0%	9.1%	8.2%	11.4%	13.3%
Total Monitoring Costs as pct of RTO - year 2	5.4%	4.5%	2.5%	2.5%	2.8%	2.6%	1.0%	0.8%
Post-monitoring RTO -- year 1	$139,353	$86,909	$122,686	$358,805	$219,345	$158,946	$127,677	$113,557
Post-monitoring RTO -- year 2	$154,353	$86,909	$137,686	$358,805	$234,345	$158,946	$142,677	$113,557

Fleet Level	**Paired MWT**	**Single MWT**	**PurseSeine**	**SMBT**
Number of Vessels	8	6	7	9
Total Days at Sea	825	170	392	192
Total Number of Trips	275	129	451	103
Total Herring Revenue	$9,409,389	$3,842,873	$11,042,232	$1,483,242
Total Mackerel Revenue	$1,155,588	$570,246	$225	$97,806
Total Squid Revenue				$529,723
Total Other Species Revenue	$5,906	$50,399		$485,180
Total Revenue	$10,570,883	$4,463,518	$11,042,457	$2,595,951
Total EM Cost - year 1	$155,475	$97,296	$121,858	$143,243
Total EM Cost - year 2	$35,475	$7,296	$16,858	$8,243
Total PS Cost	$34,342	$13,597	$30,992	$4,795
Total Monitoring Costs - year 1	$189,817	$110,893	$152,850	$148,038

Total Monitoring Costs - year 2	$69,817	$20,893	$47,850	$13,038
Monitoring Costs as pct of Total Revenue -- year 1	1.8%	2.5%	1.4%	5.7%
Monitoring Costs as pct of Total Revenue -- year 2	0.7%	0.5%	0.4%	0.5%
Monitoring Costs as pct of Herring Revenue -- year 1	2.0%	2.9%	1.4%	10.0%
Monitoring Costs as pct of Herring Revenue -- year 2	0.7%	0.5%	0.4%	0.9%

Herring Alternative 2.7 – sub option 5. 25% EM and PS. EM at $172/day. PS at $3.84/mt

Vessel Level	Paired MWT		Single MWT		PurseSeine		SMBT	
	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev	Average	Stnd Dev
Annual Return-to-owner	$163,080	$89,827	$141,169	$362,448	$241,180	$162,152	$163,329	$137,021
Annual Cost of EM - year 1	$18,564	$1,936	$15,830	$734	$16,252	$692	$15,842	$668
Annual Cost of EM - year 2	$3,564	$1,936	$830	$734	$1,252	$692	$842	$668
Annual Cost of PS	$4,025	$2,802	$2,093	$3,367	$4,127	$2,942	$639	$475
Total Monitoring Costs as pct of RTO - year 1	13.9%	Median: 14.2%	12.7%	Median: 18.8%	8.4%	Median: 8.4%	10.1%	Median: 12.4%
Total Monitoring Costs as pct of RTO - year 2	4.7%	Median: 4.2%	2.1%	Median: 1.0%	2.2%	Median: 2.4%	0.9%	Median: 1.3%
Post-monitoring RTO -- year 1	$140,492	$86,801	$123,245	$358,672	$220,802	$158,762	$146,848	$136,885
Post-monitoring RTO -- year 2	$155,492	$86,801	$138,245	$358,672	$235,802	$158,762	$161,848	$136,885

Fleet Level	Paired MWT	Single MWT	PurseSeine	SMBT
Number of Vessels	8	6	7	6
Total Days at Sea	663	116	204	117
Total Number of Trips	221	73	320	59
Total Herring Revenue	$9,152,836	$3,606,269	$10,263,855	$1,352,045
Total Mackerel Revenue	$657,345	$570,246	$225	$28,633
Total Squid Revenue				$171,323
Total Other Species Revenue	$4,109	$2,721		$237,472
Total Revenue	$9,814,290	$4,179,236	$10,264,080	$1,789,473
Total EM Cost - year 1	$148,509	$94,982	$113,764	$95,051
Total EM Cost - year 2	$28,509	$4,982	$8,764	$5,051
Total PS Cost	$32,198	$12,559	$28,886	$3,833
Total Monitoring Costs - year 1	$180,707	$107,541	$142,650	$98,884
Total Monitoring Costs - year 2	$60,707	$17,541	$37,650	$8,884

Monitoring Costs as pct of Total Revenue -- year 1	1.8%	2.6%	1.4%	5.5%
Monitoring Costs as pct of Total Revenue -- year 2	0.6%	0.4%	0.4%	0.5%
Monitoring Costs as pct of Herring Revenue -- year 1	2.0%	3.0%	1.4%	7.3%
Monitoring Costs as pct of Herring Revenue -- year 2	0.7%	0.5%	0.4%	0.7%

Appendix 6

Background on the Development of Omnibus Alternatives

The Council adopted the following principles to guide the selection and implementation of future industry-funded monitoring programs. Data collection program for the estimation of fishery catch should:

- Be fit for purpose – the reason, or clear need, for data collection should be identified to ensure objective design criteria.
- Be affordable – the cost of data collection programs should not diminish net benefits to the nation, nor threaten the continued existence of our fisheries. However, essential data collection is needed to assure conservation and sustainability, and is reason to seek less data intensive ways to assess and manage fisheries on the economic margins.
- Should apply modern technology – data collection should prioritize the utilization of modern technology to the extent possible to meet our data collection needs, while recognizing an affordable robust program is likely to need a mix of data collection by people and technology.
- Incentivize reliable self-reporting.

<u>Existing Monitoring Types in New England Fisheries</u>

The existing types of monitoring programs include:

1. NEFOP-level observer monitoring focuses data collection at sea, recording the type and quantity of retained and discarded catch on fishing trips. In addition, NEFOP-level observers collect biological data and samples on marine mammal, sea birds, and sea turtles.
2. At-sea monitoring, which focuses on data collection at sea, recording the type and quantity of retained and discarded catch.
3. Portside monitoring, which focuses on data collection in port, accounting for landings of target species and incidental catch. If all fish caught are retained and landed, portside monitoring can also record type and quantity of total catch.
4. Electronic monitoring (EM), which uses video cameras and other sensors to monitor discarding events at sea and/or to monitor compliance with full retention requirements or other at-sea requirements.

The following section provides further detail on these monitoring types, and their current uses in the Greater Atlantic Region.

Basic description of monitoring at sea. Monitoring at sea is used to refer to the collection of data at sea aboard fishing vessels by human observers. The NEFSC Fisheries Sampling Branch currently manages the collection and processing of data and biological samples obtained during commercial fishing trips through the NEFOP and groundfish ASM programs.

The Fisheries Sampling Branch oversees observer training, translates data requirements from the NEFSC research programs into a detailed schedule of fisheries to be sampled, manages data collected by observers, and provides qualified researchers with audited data files and summaries. Observers collect operational fishing data, biological data, and economic data while on board fishing vessels. Additionally, in support of the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA), observers monitor interactions with protected and endangered species. Summaries of fishery observer data are provided to scientists and analysts of the GARFO, NEFSC, and the Regional Fishery Management Councils to support quantitative and qualitative evaluations of various management actions.

NEFOP-level observers collect a wide array of information on a subset of the trips in all Greater Atlantic Region fisheries. The information they collect includes:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All kept and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Kept catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling methodologies;
- Whole specimens, photos, and biological samples (i.e., scales, ear bones, and/or vertebrae from fish, invertebrates, and incidental takes);
- Information on interactions with protected species, such as sea turtles, porpoise, dolphins, whales, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

In recent years, NEFOP-level observer coverage has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-specific basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under one or more FMPs, the SBRM is designed around “fishing modes” defined by the type of fishing gear used and the area from which the vessels depart.

There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine. The SBRM is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through an FMP developed by either the Mid-Atlantic or NEFMC.

The Atlantic Sea Scallop observer program, described in further detail in the introduction section of this document, is the only existing industry-funded monitoring program in the region that uses NEFOP-level observer coverage.

While NEFOP-level observers are used to cover all fisheries, including sector trips, groundfish at-sea monitors are deployed on vessels participating in the groundfish sector program. Groundfish at-sea monitors follow a rigorous sampling protocol to collect weights of fish catch (kept and discarded), to measure the lengths of groundfish species, and document interactions with protected species. Groundfish at-sea monitors also collect information on trip costs, gear type, and tow locations. In contrast to NEFOP-level observers, groundfish at-sea monitors collect a reduced set of data (i.e., no biological samples and reduced information on gear configurations), thereby reducing training time, gear requirements, and internal support resources necessary to administer this program.

Basic description of portside (or dockside) monitoring. Portside monitoring programs deploy trained monitors to vessel landing locations to monitor the weights and species composition of landed catch. Landings sampling protocols for portside monitoring differ between programs depending on the program goals. Monitors typically monitor offloads directly to dealers, but roving monitoring programs can be established in cases where landings are offloaded to a truck for later delivery to a dealer.

There are not any Federal portside monitoring programs currently administered in the Greater Atlantic Region. However, there was previously an industry-funded dockside monitoring requirement for groundfish sectors. Sectors were required to implement a dockside monitoring program to validate dealer-reported landings, with 50-percent coverage of sector trips in the 2010 groundfish fishing year, and 20-percent coverage each year thereafter. In 2010, NMFS reimbursed sectors for the costs of dockside monitoring. Shortly after the implementation of Amendment 16 to the NE Multispecies FMP, the Council became concerned that the industry would not be able to support full responsibility for the costs of monitoring programs, beginning with dockside monitoring in 2011 and at-sea monitoring in 2012. Through Framework 45 to the Northeast Multispecies FMP, the Council suspended the dockside monitoring requirements until FY 2013 and required dockside monitoring only to the extent that NMFS could fund it. In 2011, NMFS made the determination that dockside intercepts by enforcement personnel were sufficient to monitor sector landings and reprioritized financial support for dockside monitoring to alleviate general sector operating costs. The dockside monitoring program was ultimately

eliminated in Framework 48 to the Northeast Multispecies FMP in advance of the 2013 groundfish fishing year.

A number of states in this region administer portside monitoring programs related to state-managed species; a number of Federal permit holders are sampled through the state portside monitoring programs. The Massachusetts Department of Marine Fisheries and Maine Department of Marine Resources portside monitoring programs for Atlantic herring are described under the herring coverage target alternatives.

Basic description of electronic monitoring. The use of electronic monitoring (EM) systems on fishing vessels, namely electronic systems that incorporate video cameras, sensors, and electronic reporting systems into a vessel's fishing operations, has been a relatively recent development in fisheries around the world. EM can be used to augment or replace onboard human observers in some data collection tasks.

The technology supporting electronic monitoring has advanced significantly in a short time span and issues of image quality that were once prevalent are virtually nonexistent when the cameras are properly placed. There have been regional and national workshops to explore the technology and capabilities of EM, examine how EM can meet scientific and management needs, and understand the legal requirements, data integration, and costs of implementing EM.

The majority of applications using EM have been developed to monitor gear interactions with protected species and birds, to detect presence or absence of specific fish species occurring as bycatch, or to validate vessel landing and logbook information. There are two primary approaches for EM: 1) the audit approach, and 2) the optimized or full retention approach.

- Under the audit approach, EM technology is used to account for catch, and catch estimation is substantiated through a data validation source, such as vessel trip reports. This model is associated with increased captain responsibility and places a greater emphasis on industry-reported data. EM applications have been deployed successfully in fixed gear fisheries (i.e., longline, pot/trap, mechanical jig) and in trawl fisheries with relatively homogeneous catch composition.
- Under optimized or full retention approach, EM is used to monitor for discards. In this case, EM should be paired with portside monitoring to gather information about landed species composition.

In the Greater Atlantic Region, the NEFOP observer programs are very complex in their sampling schemes and in regards to the data collected. EM technology is currently not capable of performing most of the detailed data collection tasks performed by human observers. However, depending on the monitoring needs for a given fishery, EM could provide a cost-effective alternative to human observers. EM is being developed for the groundfish fishery, as described below. In addition, this amendment contains alternatives for EM for the midwater trawl vessels that participate in the herring fishery.

The need to balance the financial viability of sectors with the expectation to have the fishing industry fund groundfish ASM precipitated several efforts to explore electronic monitoring as an alternative to ASM. EM may be a suitable replacement to ASM, provided EM has the ability to identify species, and verify weights and counts of discards in the groundfish fishery. Balancing management data needs with the costs of a comprehensive EM system that satisfies monitoring requirements remains an ongoing endeavor.

From 2004-2006, the Cape Cod Commercial Fishermen's Alliance (CCCFA) and Archipelago Marine Research Ltd. (AMR) tested EM systems on longline and gillnet vessels targeting groundfish and compared EM and observer data. Beginning in 2010, NMFS and Archipelago conducted a more comprehensive study in three phases. Phase one identified baseline metrics for detecting fishing events, counting fish, and identifying species. Phase two addressed issues such as weight estimation and expanded species identification methods through catch handling. The third phase tested catch handling methods to simulate an operational EM program. Currently, the Gulf of Maine Research Institute (GMRI), the Maine Coast Community Sector (MCCS), The Nature Conservancy (TNC), and Ecotrust Canada (EC), have collaborated to operationalize an EM program using open-source software. Funding for this pilot project has come from grants through foundations. Their model uses EM to validate captain-reported data on vessel trip reports and has introduced a new EM provider to the fishery. The first year (2013) was designed to be a training period for captains. For 2014 and 2015, the project's goal was to complete the necessary data collection and analysis to demonstrate the ability that EM can replace ASM for sectors in the New England groundfish fishery.

Since these pilot projects, EM proponents have supported implementation of EM in the groundfish fishery. However, given legal, analytical, and logistical obstacles that remain, EM has not yet been approved for implementation as an alternative to ASM.

In January 2015, NMFS' GARFO and NEFSC released a Regional Electronic Technologies Implementation Plan that articulated the remaining aspects of a comprehensive EM program that need to be addressed. Some outstanding questions include:

- What are the detailed roles and responsibilities of the various parties involved?
- Who will have responsibility to store the data and for how long?
- Who will have access to the data and for what purpose?
- How much will it cost the government and the industry?

In concert with the release of the Plan, GARFO and NEFSC partnered with GMRI, MCCS, TNC, and EC as they continue their project to address these final issues and fully develop an EM model for groundfish sectors. This pre-implementation group has worked from an agreed set of questions and tasks, which has facilitated a transparent and coordinated process. The group holds monthly face-to-face meetings to discuss data collection, retrieval, review, and storage, the roles and responsibilities in a functional program, and the process for approving and implementing EM for 2016. These partnerships have provided GARFO and NEFSC with an understanding of how reasonable certain program requirements may be for a fisherman or an EM provider, and have also provided insight to

non-NMFS partners on the existing gaps between the pilot projects and fully implementing EM. The intention is that this group will continue to meet moving forward, adding additional partners such as CCCFA and AMR, to develop the final data and provider standards, EM monitoring plans, and regulatory framework for implementing EM for a portion of the groundfish fishery.

Currently, GARFO and NEFSC are building the database infrastructure and processing tools for data collected from EM video footage, conducting comparative analysis to the existing catch monitoring systems in the groundfish fishery, and addressing the final legal and logistical hurdles. The EM project partners have pursued having EM operational on all trips, with a portion of the video used to validate electronic vessel trip reports (the eVTR audit model). Given some of the challenges with using EM footage for species identification, the partners have shifted their experimental program design to having groundfish EM operate on only trips that would otherwise be covered by an at-sea monitor.

GARFO is developing an exempted fishing permit (EFP) with TNC for fishing year 2016, rather than making modifications to each sector's operations plan. Under the EFP and the new program design, the entire EM video will be reviewed and will serve as the basis for identifying and counting discards on trips that would otherwise have an at-sea monitor. The approach to using an EFP is similar to ongoing EM efforts on the West Coast and would provide us with an opportunity to address the remaining questions to implement the EM/eVTR audit model in a future fishing year.

GARFO expects the ongoing pre-implementation work to continue and may propose approval of EM standards and monitoring plans prior to next groundfish fishing year, set to begin May 1, 2017. GARFO expects that grant funding, through the partner organizations noted above, will be used to fund industry costs for the groundfish sector participants that use EM in 2016.

In 2016 and 2017, GARFO and NEFSC, in cooperation with Saltwater Inc., are evaluating the utility of EM aboard midwater trawl vessel participating in the Atlantic herring and mackerel fisheries. The purpose of the program is to:

- Analyze the utility of EM in monitoring fisheries as a means of informing future EM programs.
- Deploy and test an EM program in an operational setting, allowing analysis and adjustment of EM program requirements.
- Evaluate the range of information that can be gathered with EM systems, such as: Verify slippage events; categorize the types of slippage events; verify other discard sources; and determine if EM can help estimate the amount of catch retained (if not all catch is retained).
- Refine EM cost estimates for NMFS and the fishing industry.

Factors that Affect Industry Costs for Monitoring

The following section discusses the factors that affect industry costs for at-sea, dockside, and electronic monitoring programs. There are several factors that can significantly affect industry cost responsibilities in any industry-funded monitoring program, and the per day at-sea component of these costs (sea day costs) can vary. Industry costs would be largely determined by the contracts with the service providers. For example, the $640/day paid to providers may cover such things as: Labor and overtime, data editing, project management and administration, benefits (vacation and sick leave), health insurance, and workers compensation. Additionally, service providers may have individual requirements for training and debriefing, such as annual observer training or semi-annual safety training.

Cost for industry-funded monitoring programs is a very important consideration. The requirement to pay for an observer increases operating costs for fishing vessels, which in turn reduces net revenues and overall profitability (as described later in Section 4). While the total cost for each sea day can vary between service providers, the individual components (i.e., costs for deployment and sampling, costs for equipment) are necessary to successfully execute a monitoring program. Because each of these components is essential, in most cases, it is not appropriate to reduce industry's cost responsibilities by removing or adjusting components of the sea day cost. Since vessels would be contracting directly with service providers they may be able to negotiate prices. However, due to the requirements for monitoring coverage and a variety of other factors (including number of vessels participating and coverage rates), the ability to negotiate lower prices may be limited. Since vessels are contracting with the providers for much smaller amounts of monitoring coverage than NMFS does, project management costs for service providers may increase, which could increase some costs that providers charge vessels. However, unlike NMFS, vessels are not constrained by certain laws when establishing contracts, which could lower some costs that providers charge for contracts directly with vessels.

There are two ways to limit the costs of an industry-funded monitoring program for industry. Both of these approaches limit the total cost of the observer program rather than adjusting the industry cost responsibilities. The first way to limit costs to industry is to set coverage levels at the lowest level necessary to gather information to meet fishery management plan goals. For example, it may be possible to sufficiently increase precision around catch and discard estimates for a certain species by setting a coverage target of 50%, rather than a coverage target of 100%. The second way to limit costs to industry is to select the appropriate type of coverage for the fishery management plan goals.

Factors that affect industry costs for at-sea and portside monitoring. Representatives from the NEFOP, service provider companies in the northeast U.S., and representatives from U.S. west coast service provider companies identified the following factors that most commonly increase sea day costs. The cost drivers for at-sea and portside monitoring programs are similar, so are discussed together here.

- **Requirements for New Data Collection/New Equipment.** New or different sampling protocols require modifications to observer training, which could increase training costs for both the government and service providers. If new or different sampling equipment is required to meet the monitoring program needs, the expense of the additional equipment will be incurred by the service provider. In addition, re-designing existing observer databases to incorporate new data introduces a significant administrative expense.
- **SCA and FLSA Requirements.** Requirements associated with the Service Contract Act (SCA) and Fair Labor Standards Act (FLSA) apply to any contracts in which the Federal government is involved. There may be some reduction in sea day cost associated with eliminating any legal requirements that apply specifically to contracts involving the Federal government. However, service provider companies would still be subject to FLSA requirements and other applicable labor laws.
- **Ability to Predict the Fishery.** Sea day costs will likely be higher if service providers cannot predict how the fishery will operate (numbers of vessels/trips, length of trips, seasonality and spatial distribution of trips) in order to accurately estimate costs (administrative, overhead, communications, logistics) associated with deploying observers to meet the needs of the monitoring program. Predictability increases efficiency and therefore reduces costs. With limited information to predict the fishery, service providers are more likely to over-estimate costs associated with travel and observer deployment to ensure that they cover their costs.
- **Complicated Logistics (Vessel Selection and Observer Deployment).** The more infrastructure necessary to efficiently deploy observers to meet the needs of the monitoring program (field offices, coordinators, communications networks), then the higher the sea day costs will be. If pre-trip notification systems need to be expanded to determine observer/monitor deployment, this would likely increase costs.

Special considerations for service provider requirements

During development of this section of the Amendment, the Councils explored options to reduce the cost of industry-funded monitoring programs by adjusting the service provider requirements or modifying the monitor certification requirements. After analyzing the possible adjustments to the service provider regulations, the PDT/FMAT concluded that the best ways to limit the financial burden of an industry-funded monitoring program is to carefully design the program to minimize total program costs. This can be accomplished by selecting the appropriate type of coverage or setting coverage levels at the lowest level necessary to meet fishery management plan goals.

Given this, the overarching service provider requirements for all industry-funded programs, including at-sea, dockside, and electronic monitoring programs, are proposed to be the same for all FMPs. This means that the overarching industry-funded monitoring service provider regulations will be standardized for all FMPs, whether industry funding is necessary to support statutory monitoring requirements (Magnuson-Stevens Act, MMPA, ESA), or monitoring coverage above statutory requirements. However, the Amendment would allow individual FMPs to deviate from the overarching monitoring service provider requirements on an FMP-specific basis. For example, the groundfish at-sea monitor service provider requirements only require a monitor to have a high school diploma, while the overarching industry-funded monitoring service provider regulations require a college degree. The herring and mackerel at-sea monitoring programs also have deviations from the overarching monitoring service provider regulations, described in the herring and mackerel alternative descriptions in Sections 2.2 and 2.3.

The following is a description of some of the provisions in the overarching industry-funded monitoring service provider regulations that the Councils discussed adjusting during the development of this amendment.

Observer education requirements. The National Minimum Eligibility Standards for Marine Fisheries Observers were published in 2007 (04-109-01). The development of the national standards grew out of concern from the Office of Inspector General, NOAA Science Board, National Observer Program Advisory Team, observer provider companies, professional observer associations, and the fishing industry that observers were not appropriately trained to observe fishing trips, that high levels of attrition were resource inefficient, and that the lack of standards was confusing and deterring interested and qualified observer candidates nationally. All observer programs in the United States (Greater Atlantic Region, Southeast, Alaska, Northwest, Southwest, and Pacific Islands) currently follow the National Minimum Eligibility Standards. The standards are also adopted and supported as best practices by the International Fisheries Observer and Monitoring Conference.

The most controversial standard is the requirement that observer candidates must have a bachelor's degree with a major in the natural sciences. However, Regional Administrators and Science Directors may waive the education and experience requirements if a candidate has acquired the required skills to be considered eligible for observer training through a NMFS-approved alternative training program that includes activities such as:

a) Participating in or/and observing ocean fishing activities consistent with those that would be required during observer work performance;

b) Participating in fisheries research cruises;

c) Recording data on marine mammal sightings and fishing activities;

d) Tallying incidental take of marine mammals, sea turtles, and sea birds from fishing platforms;

e) Collecting biological samples and specimens from postmortem animals;

f) Entering data into a database using computers; and

g) Completion of a biological training program, equivalent to that received as part of a bachelor's degree, conducted by or approved by NMFS with the specific objective of preparing potential candidates for observer training.

The Council expressed interest in removing the bachelor's degree requirement from the overarching industry-funded monitoring service provider regulations for observers in order to save costs, with the rationale that monitors with bachelor's degrees may command a higher hourly wage than those without bachelor's degrees. While it is consistent with regional policy to require a lower education requirement for fishery specific at-sea monitoring programs, for the overarching industry-funded monitoring service provider requirement for observers a bachelor's degree is obligatory to comply with national standards and for the reasons detailed below. Through future development of FMP-specific industry-funded monitoring programs, the minimum education requirement for an observer can be reconsidered.

Contrary to the intent of negating the national education standard for becoming a fisheries observer, requiring only a high school diploma will likely not lower the cost of observer coverage. Nationally, there was no increase in sea day costs with the adoption of the educational standard national policy in 2007. Instead, national observer programs found that the education standard resulted in recruitment of higher quality observer candidates and better observer retention. There is not currently a shortage of interested and qualified applicants with bachelor's degrees, and many candidates have fishing and sea-going experience in addition to their bachelor's degrees. Observers often hold multiple certifications in a variety of observing programs, which helps with observer availability to meet coverage targets and improves retention of certified observers.

The information observers collect is necessary for assessing the nation's managed biological resources, and for evaluating the social and economic impacts of catch allocations, entitlements and fishing regulations on fishermen and their communities. Thus reducing education standards has a direct impact on the information used to support critical NMFS goals. Studies comparing observer candidates without a college degree to those with college degrees show that candidates without degrees had:

- Higher drop-out and failure occurrences during observer training, despite additional resources invested to support the candidates;

- Lower compliance in following detailed program requirements and meeting data loading deadlines;
- Lower accuracy with species identification and catch estimation;
- Lower data quality scores and overall performance; and
- Lower retention rates (Chilton et al. 2011).

In addition, there was concern that codifying the requirement in the overarching service provider regulations would prevent fisherman from participating as observers. However, we reiterate that the current education standard policy includes a waiver if the observer candidate has fishing experience. There are a number of current observers who were fishermen, though the policy does outline potential conflicts of interest that may prohibit some fishermen who are still financially vested in the industry from participating as observers. In order to encourage and support employment of former fishermen, NEFOP developed an optional alternative training program for fishermen with interest in becoming observers.

The Fair Labor Standards Act and Service Contract Act requirements. The Services Contract Act (SCA) applies to every contract entered into by the United States (government) or the District of Columbia. Contractors and subcontractors performing on these Federal contracts must observe minimum wage standards (based on the prevailing wage for a locality, as determined by the Department of Labor) as well as safety and health standards, and they must maintain certain records. The SCA requires that every employee working under the contract must be paid not less than the monetary wages, and must be furnished fringe benefits, which are determined based on locality. Fringe benefits include paid holiday leave, vacation time, and minimum requirements for health and welfare (80/20 compensation for health insurance). Because contracts for industry-funded monitoring program will be between service providers and participants in the fishing industry, it will not be necessary for these contracts to meet the requirements of the SCA.

However, even without the SCA requirements, service provider companies will still be required to pay employees not less than the federal minimum wage provided in the Fair Labor Standards Act (FLSA). The FLSA establishes minimum wage, overtime pay, recordkeeping, and youth employment standards affecting employees in the private sector as well as in Federal, State, and local governments. Covered non-exempt workers are entitled to a minimum wage of not less than $7.25 per hour effective July 24, 2009. Overtime pay at a rate not less than one and one-half times the regular rate of pay is required after 40 hours of work in a workweek.

According to a report published by MRAG Americas (June 2012), Northern Economics (2011) estimated that the SCA and FLSA requirements are likely to add $50-$100 to the sea day cost for an industry-funded monitoring program. However, eliminating SCA requirements by privatizing contracts in this region is not likely to decrease sea day costs by as much as $100 for two reasons: (1) FLSA requirements for minimum wage and overtime would still apply to vessel/provider contracts; and (2) employees working for companies currently providing observer coverage and at-sea monitoring services in this region have been working (some for many years) under government contracts, which are consistent with SCA requirements for wages and fringe benefits. It may be very difficult for service providers in this region to change the wage and benefit structure they offer to their employees, many of whom have been working in observer and ASM programs in this region for several years. Therefore, the reduction in sea day cost that can be expected from the privatization of contracts cannot be estimated with certainty but is likely to be on the lower end of the range predicted in the MRAG Report.

Streamlining the application process for observer service providers. The Councils discussed a number of options to simplify the application process for service providers, including "grandfathering in" states as service providers, allowing the service provider approval from one NMFS region to extend to other regions, or developing a standardized national application for service providers. The rationale for these provisions is that limiting the application process for service providers could translate into reductions in program administration costs, which could ultimately reduce sea day costs for industry. While there are potential cost savings with these approaches, many have national implications and will need to be investigated outside of this amendment. Ultimately, because the information collected through our monitoring programs support our mission to conserve and manage fisheries and other marine resources, we are obligated to assure the quality of data collected through these programs. This means that any process used to evaluate service providers ensures that the providers are able to comply with regional requirements. NMFS is investigating these ideas at a national level, and any results from this effort will not be available for informing this amendment.

TABLE 14. PROS AND CONS OF DISCRETIONARY VERSUS FORMULAIC PRIORITIZATION ALTERNATIVES.

	Pros	Cons
Discretionary Alternatives: **Alternative 2.1 and 2.2**	More discretion over funding priorities	Complex, and requires additional workload to prioritize

	Takes objectives, performance and fishery context into account	Timeline > 1 year
	Could result in funding of most important programs first	May require rulemaking
Formulaic Alternatives: Alternatives 2.3, 2.4, and 2.5	Shorter timeline	No discretion
	Adaptive to budget changes and timing	No flexibility to consider management objectives when prioritizing with a formulaic approach

The weighting approach is generally based on the draft processes developed by the Mid-Atlantic Fishery Management Council's Scientific and Statistical Committee to prioritize research proposals. The weighting approach could give NMFS or the Council a transparent, deliberative process for prioritizing industry funded monitoring coverage in order to allocate NMFS's available resources for funding of NMFS cost responsibilities required to achieve coverage targets for industry-funded monitoring.

If Alternative 2.1 (NMFS-led Prioritization) is selected, NMFS will use the approach outlined below to prioritize industry-funded programs in order to allocate available NMFS funding. The proposed weighting approach has 2 steps outlined in more detail in the following pages:

Step 1

- Compare industry-funded monitoring criteria to each other to create a criteria weighting

Step 2

- Evaluate how each industry-funded monitoring program meets each criterion

Step 1: Compare industry-funded monitoring criteria to each other to create a criteria weighting

The weighting approach first requires NMFS or the Council to determine the relative importance of criteria that will be used to evaluate the industry-funded monitoring programs. The list of eight criteria proposed below would be used by NMFS, and could be used by the Council, for the first prioritization cycle, and every cycle thereafter, unless the Council changes the criteria in a framework adjustment.

1. The industry-funded monitoring program relates to stocks that are overfished or subject to overfishing.

   Overfished stocks have biomass levels depleted to a degree that the stock's capacity to produce maximum sustainable yield (MSY) is jeopardized. Stocks subject to overfishing have a mortality rate that is higher than the rate that produces MSY. Under this criterion, preference would be given to stocks that are in poor condition because those stocks may benefit from additional monitoring support.

2. The species has high commercial or recreational value.

   This criterion prioritizes industry-funded monitoring programs related to species with high dollar value in the case of a commercial fishery, or a high number of annual landings or gross weight in the case of a recreational fishery.

3. The industry's daily revenue is high relative to the cost of industry costs for monitoring.

   This criterion evaluates industry's ability to fund its cost responsibilities related to industry-funded monitoring programs requirements established by the Council. Preference will be given to industry-funded monitoring programs with high daily revenue relative to the daily costs of the industry funded monitoring.

4. The species has special importance to the ecosystem.

   An industry-funded monitoring program may be important because of the biological relationship of the target species to the ecosystem. For example, the species could be a choke species, a forage fish, or have positive or negative impacts on other species. This criterion evaluates the need to prioritize industry-funded monitoring programs species with special ecosystem importance.

5. Industry-funded monitoring program has clear objectives, and a strong statistical basis for the FMP coverage target, including evaluation of the basis for the coverage target.

Monitoring should have clear objectives and a statistical design for sampling that achieves those objectives. Monitoring programs should also have a clear link to current or future FMP needs. The basis for coverage rates, and/or target coefficient of variation (CV) or variance should be justified. As an example, an industry funded monitoring program with a 100% coverage target should have statistical analysis supporting this need (e.g., identification/quantification of significant bias).

6. Fleets monitored under the program are compatible with existing SBRM fleet definitions.

There are a number of reasons why it is beneficial to design monitoring programs to be compatible with SBRM fleet definitions.

First, NMFS must be able to identify trips *a priori* in order to deploy coverage effectively. The SBRM fleet definitions (gear, mesh size, area) are robust to this requirement. Some other definitions (e.g., by target species or permit category) have proven difficult to implement coverage for, leading to inefficient use of resources. One example is the design of the coverage requirements for the longfin squid fishery related to the butterfish cap. Vessels intending to land over 2,500 lb longfin squid must notify the observer program 48 hours prior to departure in order to facilitate observer placement. Many vessels fishing with small mesh gear wished to have the option to land large quantities of longfin squid, should they encounter it. However, in that case, requiring vessels to notify the observer program about intent to target squid could lead to coverage on trips that do not ultimately target squid.

Second, vessel trip reports typically include information on gear and statistical area associated with a trip, but do not include other identifiers to link the landed catch (e.g., several sector exempted fisheries). If a vessel trip report does not include details on a specific type of gear (e.g., Ruhle Trawl) or indicate that the trip is part of an exempted fishery or in an access area, then one cannot properly use the information to obtain expanded discard totals for the fleet.

Finally, increasing coverage for a specific target species or certain permit types can bias discard estimates for a given SBRM fleet.

Overall, industry-funded monitoring programs designed to allocate observer coverage according to SBRM fleets should have priority over those that allocate observers using other

criteria because monitors can be deployed effectively, and can provide information to be included in SBRM discard analyses, which makes them more cost-efficient.

7. Uncertainty surrounding catch estimates

This criterion prioritizes industry-funded monitoring programs related to target and non-target species with high uncertainty regarding catch estimates. This means that species with higher CVs related to discards or landings would be rated higher and receive higher priority for funding.

8. Risk to management based on fishery performance

A stock for which the quota is consistently under-harvested is unlikely to face the same management risk as one with a constraining quota. Industry-funded monitoring programs related to fisheries for stocks with constraining quotas should have priority over those for under-harvested stocks.

Some of the information above would be defined or analyzed in the original FMP action that created the industry-funded monitoring program. NMFS or the Council would first look to the original FMP action for information and update or supplement this information as necessary.

The eight criteria may not have equal importance, so NMFS or the Council would assign weights to the relative importance of these criteria. The end result of this process is just a simple percentage weight for each criterion. For example, one criterion might count for 15% of the decision. The proposed method described below, and shown in Table 15 allows an explicit evaluation of each criterion against all the other criteria so that the final weights are consistent with the values decision makers actually place on the criteria. While it seems intricate, it is a systematic way to arrive at weights for the criteria based on what decision makers really think is important.

- The comparison table is built by entering each criterion to be prioritized into a table, with criteria repeated along both the horizontal and vertical axis.

- The NMFS or the Council would then compare the criterion to each other to determine importance. For example, first "stock status" is compared to "ecosystem importance", then "stock status" is compared to "SBRM compatibility," and so on, until all of the criteria have

been compared to each other. Place an "x" in the boxes where the same two criteria are being compared.

- Each time a weight is recorded in a row cell, its reciprocal value must be recorded in the corresponding column.

- Comparison values:
  - 1 = criteria are equally important
  - 5 = criterion is more important
  - 10 = criterion is much more important
  - 0.2 = criterion is less important
  - 0.1 = criterion is much less important

- After completing the comparisons, total each horizontal row.

- The row totals should then be added to create a grand total.

- Then each row should be divided by the grand total to get a relative weighting value. This value is termed the "IFM Criterion Weighting."

TABLE 15. EXAMPLE IFM CRITERIA COMPARISON TABLE

IFM Evaluation Criteria	Stock status	Com/ Rec Value	Ability to pay	Ecosystem importance	Strong statistical	SBRM compatibility	Catch estimate	Risk to management	Row total	IFM Criterion Weighting	Percent
Stock status	x	10	0.1	5	1	10	1	0.2	27.3	0.15	15%
Com/Rec Value	0.1	x	5	1	10	0.1	0.2	10	26.4	0.14	14%
Ability to pay	10	0.2	x	1	5	0.2	10	5	31.4	0.17	17%
Ecosystem importance	0.2	1	1	x	0.2	1	10	1	14.4	0.08	8%
Strong statistical basis	1	0.1	0.2	5	x	0.2	0.1	0.1	6.7	0.04	4%

SBRM compatibility	0.1	10	5	1	5	x	10	0.2	31.3	0.17	17%
Catch estimate uncertainty	1	5	0.1	0.1	10	0.1	x	10	26.3	0.14	14%
Risk to management	5	0.1	0.2	1	10	5	0.1	x	21.4	0.12	12%
								Grand total	185.2		

In the above example, industry's ability to pay and SBRM compatibility are the most important criteria, and will each contribute 17% to the weight of the score of the industry-funded monitoring programs. The statistical basis for the program is the least important criterion, and will only contribute 4% to the weight of the score.

In practice, a very simple survey of Council members can be used to implement this exercise, and the NEFMC's Observer Policy Committee has already successfully participated in a trial of such a survey.

Once the relative importance of each evaluation criteria is determined, the next step is to compare how the industry-funded monitoring programs measure up against the criteria.

Step 2: Evaluate how each industry-funded monitoring program rates relative to each criterion

Rate each industry-funded monitoring program:

- For criteria, reading across the vertical axis, assign a number based on how much each industry funded monitoring program meets the criterion. These are the ratings in the table below:
    - 0 = doesn't meet criterion at all
    - 1 = slightly meets criterion
    - 2 = somewhat meets criterion
    - 3 = mostly meets criterion
    - 4 = fully meets criterion

- After completing the comparisons, multiply the rating assigned to each criterion by the IFM Criterion Weighting in Step 1.

- Total the columns. Now the industry-funded monitoring programs can be ranked.

TABLE 16. EXAMPLE FMP RANKING USING IFM EVALUATION CRITERIA

IFM Evaluation Criteria	IFM Criteria Weighting	FMP 1 Ranking	IFM Criteria Weighting x FMP 1 Ranking	FMP 2 Ranking	IFM Criteria Weighting x FMP 2 Ranking	FMP 3 Ranking	IFM Criteria Weighting x FMP 3 Ranking
Stock status	0.15	4	0.59	0	0.00	2	0.00
Com/Rec Value	0.14	1	0.14	3	0.43	1	0.43
Ability to Pay	0.17	2	0.34	1	0.34	0	0.00
Ecosystem importance	0.08	0	0.00	2	0.00	4	0.00
Strong objective	0.04	3	0.11	3	0.33	1	0.33
SBRM compatibility	0.17	1	0.17	3	0.51	4	2.03
Catch estimate uncertainty	0.14	0	0.00	4	0.00	4	0.00
Risk to management	0.12	1	0.12	1	0.12	4	0.46
IFM Program Overall Ranking			1.46		1.71		3.24

In the example, FMP 3 ranks the highest, followed by FMP 2, then FMP 1.

After the process is complete, NMFS and the Council may now use the rankings to prioritize the industry-funded monitoring program for allocation of available funding to the FMPs to cover NMFS's costs. One possible way to do this would be to fully fund the highest ranked program, and then work through the ranking list sequentially until funding to cover NFMS's cost was completely allocated. Funding would not be allocated to a program if the available allocation would fund less than ¼ of the necessary funding.

Considerations for Monitoring Set-Asides

The text below outlines some of the concepts for the Council and NMFS to consider when determining whether developing a future monitoring set-aside program for a given fishery could be successful.

Value of the Resource

It is important to determine if the value of a monitoring set-aside program would be significantly beneficial for the goals of off-setting additional monitoring costs.

For example, in 2010, the stock wide Atlantic herring ACL was 201 million lb and the herring ex-vessel price was approximately $0.13/lb. Landings that year were approximately 145 million lb (approximately 72% of the ACL). If 3 percent of the ACL was set-aside for monitoring (6.03 million lb), that would equate to approximately $784,140 to cover monitoring costs in the Atlantic herring fishery. However, the fishery may only catch a portion of the monitoring set-aside. For example, if only approximately 72 percent of the monitoring set-aside was harvested, then only approximately $564,581 (72% of $784,140) would be available to cover monitoring costs for the entire fishery (all gear types and permit categories). There are also costs associated with fishing, and only the extra profits, not the full ex-vessel value, are a benefit to the fishermen.

Depending on the monitoring program in place, a set-aside would only partially cover monitoring costs. The high ex-vessel value of scallops and modest level of additional sampling currently allows for the scallop monitoring set-aside program to fully off-set the monitoring costs in the scallop fishery, but if ex-vessel value of scallops falls to a low enough level, it may not allow full funding in the future.

Management Measures and Fishery Operations

When developing a monitoring set-aside program managers need to consider the operation of the fishery as well as the comprehensive management measures within a fishery to create a successful monitoring set-aside program. It is also important to consider fishery management partners when developing exemptions or measures for a monitoring set-aside program. Finally, and perhaps most importantly, there needs to be incentive and benefit to the vessels associated with the ability to harvest additional pounds to off-set additional monitoring costs.

In the scallop monitoring set-aside program, vessels can harvest additional scallops above the possession limit, or fish at a reduced days-at-sea accrual rate, when they carry an

observer. This provides vessels additional revenue from that trip to off-set the costs of the observer. However, in a fishery like Atlantic herring, some limited access vessels do not have a regulated possession limit and often fish to the maximum capacity of the vessel. Since some vessels in this fishery do not have a possession limit, harvesting additional fish on a trip may not be an effective option. However, there could be other management measure incentives such as allowing fishing during a closed season, in a closed area, or following a seasonal closure. However, benefits from such exemptions would only occur in some fisheries and may not offer an immediate return of funds to offset monitoring costs.

In the summer flounder, scup, and black sea bass fisheries, in addition to Federal possession limits, states often implement possession limits for these species. If vessels participating in these fisheries were provided exemptions to the Federal possession limits for a monitoring set-aside program, they would also need to be exempt from a state possession limit in order to land over the possession limit in that state. This type of monitoring set-aside program would require coordination with the states and the Atlantic States Marine Fisheries Commission, and may create additional administrative burden for states.

ACL Allocation Within a Fishery

FMPs use a wide range of structures to apportion ACLs to different fishery participants (e.g., commercial and recreational allocations). Monitoring set-aside program managers must consider how the ACL is distributed within the fishery when deciding how to structure the set-aside program. For example, in the Bluefish FMP, there is only one ACL from which a commercial and a recreational annual catch target (ACT) are derived. If 3 percent of the ACL is allocated for a monitoring set-aside program, both the commercial and recreational ACTs would be reduced proportionally. However, it is most likely that only the commercial sector would have additional monitoring requirements, therefore the commercial fishery would benefit from the additional monitoring set-aside pounds to cover monitoring costs, but the recreational fishery would simply have a reduced quota.

On the other hand, Amendment 16 to the Northeast Multispecies FMP allows the Council to set sub-ACLs for groundfish stocks through framework adjustments. This vehicle could be used to create a monitoring set-aside program by designating sub-ACLs for some, or all, of the groundfish stocks. The landings allocated to those sub-ACLs could then be used to cover additional monitoring costs in that fishery. It is important to consider how quotas are allocated within the fishery and how to most appropriately distribute the monitoring set-aside pounds. As an aside, it is worth exploring whether the sub-ACL approach may be an alternative approach for establishing monitoring set-asides for the groundfish fishery.

Shared Burden and Benefit

It is important to consider whether the reallocation of quota for a monitoring set-aside program will be equally beneficial and/or burdensome to all fishery participants, and how monitoring set-aside programs could affect different permit categories or different gear types within a fishery. For example, in the Atlantic herring fishery, hypothetically a

monitoring set-aside program could allocate 3 percent of the ACL to off-set monitoring costs. However, the monitoring alternatives under consideration for the herring fishery apply coverage to a subset of the herring fishery participants. For example, in some alternatives, the midwater trawl vessels may be the only gear type that has industry-funded monitoring requirements. If a monitoring set-aside were established to offset the costs of this program, the midwater trawl vessels would receive the benefits of additional pounds for monitoring costs, but the purse seine vessels would have a smaller annual quota to harvest, and may therefore endure increased hardship despite not having additional monitoring requirements.

In contrast, in the groundfish fishery, the burden of monitoring costs may be more evenly dispersed with the establishment of a monitoring set-aside program. Currently, not all vessels participating in sectors are active in the fishery. Those inactive vessels lease their allocation to the active vessels, but the active vessels would be responsible for additional monitoring costs. If the monitoring set-aside program reserved 3 percent of the overall ACL, then the allocation to each vessel would be equally reduced, therefore sharing the burden more evenly among all participants in the fishery as opposed to just the active vessels.

Availability and Prevalence of the Resource

The health and availability of a fishery will dictate whether the fishery can sustain a monitoring set-aside program. For example, the Atlantic mackerel fishery has continually been underperforming and annual landings have been declining for approximately the past 10 years (Table 65). At this time it is unclear if the mackerel stock is declining or if the fish are behaving differently in terms of migration or schooling. Providing mackerel vessels with additional pounds of fish to land to off-set additional monitoring cost would not be beneficial because the fish are predominately unavailable or unattainable and the quota has not been limiting.

Additionally, it is important to consider whether the monitoring set-aside program would affect fishing pressure on a sub-component of a stock. For example, if monitoring is only required for vessels fishing in certain areas, those vessels would be provided the additional monitoring set-aside pounds, and therefore could increase fishing effort in those areas. In this example, there may be disproportionate fishing pressure on a sub-component of the stock that exists in the area where additional monitoring is required. Managers need to consider the current health of the stock, the recent performance of the fishery, whether the current management measures appropriately address the potential for the effects of catch on different components of the stock, and how to create a dynamic monitoring set-aside program for changes in stock status and performance to develop a successful program.

Enforcement Issues

Fishery managers should also consider methods to enforce a monitoring set-aside program to prevent abuse to the system. The Mid-Atlantic Research Set-Aside (RSA) program was recently suspended, in part due to issues revolving around enforcement and abuse of the

program that resulted in overexploitation of some fisheries. Some monitoring set-aside models could be structured similarly to the Mid-Atlantic RSA program where vessels receive exemptions from certain regulations (i.e., possession limits or closed seasons/areas) to harvest monitoring set-aside pounds. Similar enforcement, monitoring, and reporting issues would need to be addressed when developing a monitoring set-aside program to prevent abuse and over-exploitation of a fishery resource.

Estimated Potential Revenue for Certain FMPs

An estimate of the amount of revenue that could be generated from a set aside is shown in the table below. This table is generated using the lowest and highest average ex-vessel price of herring from the 2010-2014 fishing years. Inability to locate herring, reductions in ABCs, or lower prices would reduce expected revenues from a monitoring set-aside. In addition, changes to the management program (i.e., changes to the current unlimited possession limits for Category A herring) may be necessary, depending on the structure of the set aside. For the herring fishery, using 1 to 5 percent of the 2015 annual catch limit could fund 357 to 2,020 NEFOP-level monitoring days at $818 per sea day, and 411 to 2,327 at-sea monitoring days at $710 per sea day.

APPENDIX 7

Herring and Mackerel Fishery Electronic Monitoring Project

Contract EA-133F-16-SE-1143

Prepared for:

U.S. Department of Commerce

National Oceanic and Atmospheric Administration

National Marine Fisheries Service

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Table of Contents

Acronyms 7

I. Executive Summary **9**

Summary Overview 9

Summary of Data Findings 10

Summary of Lessons Learned 11

II. Project Background & Overview **13**

The Atlantic Herring and Mackerel Fisheries 13

Electronic Monitoring (EM) 15

Project Goals & Objectives 18

III. Project Implementation **20**

Project Timeline 20

Outreach 20

EM systems Installations & Field Support 21

NEFOP Data Collection 23

VMS Data Collection 24

Data Management & Review 24

Data Transfer 24

Data Security & Storage 24

Data Review 24

IV. Data Analysis/Findings **26**

Project Data Overview 26

Comparison of Review Time 33

Comparison of Reviewer Annotations 36

Comparison to NEFOP Data 40

Additional Data 43

V. Cost Drivers 46
Start-Up Costs 46
Ongoing Costs 49
VI. Lessons Learned/Recommendations **53**
Implementation 53
System Components 53
System Use & Reliability 53
Compliance 55
Incentives to Participate 57
Data Management & Review 58
Data Retrieval 58
Data Processing Times 59
Modified Catch Handling 60
Distinguishing Between Discarding Events 61
Methods To Address Undetected Discard Events 61
Fish Disposition Categorization For Fish Not Brought Onboard 62
Applicability To Other Greater Atlantic Fisheries 62
VII. Conclusions **64**
VIII. Acknowledgements **65**
IX. References **66**
X. Appendices **67**
Appendix 1: Discarding Event Descriptions 67
Appendix 2: EM Study Outreach Sheet 69
Appendix 3: Vessel Reference Sheet 71
Appendix 4: Trip Feedback Form 77
Appendix 5: Quarterly Summary Form 80
Appendix 6: Vessel Representative Exit Interview 81
Appendix 7: Vessel Monitoring Plan 86

Appendix 8: NMFS/NEFSC EM System Specifications 107

Appendix 9: Image Quality Assessment 113

Appendix 10: Data Release Form 114

Table of Figures

Figure 1: Graphic User Interface (GUI) as seen on EM system monitor in wheehouse 16

Figure 2: Diagram of the electronic monitoring system used in this project 17

Figure 3: Project Timeline 20

Figure 4: Boom arm installed on one of the participating vessels. 22

Figure 5: View of fish pumping before and after installation of the boom arm. 22

Figure 6: EM data displayed using Saltwater's Open Source Review Software. 25

Figure 7: A timeline of trips included in the analysis. 27

Figure 8: Haul-level agreement throughout the course of the project. 28

Figure 9: The spatial distribution of discard records. 30

Figure 10: Breakdown of event types by vessel. 31

Figure 11: Effect of trip effort on the number of discard events. 32

Figure 12: Summary of review time for trips sampled. 34

Figure 13: Effect of trip effort on review time. 34

Figure 14: Total review time for trips with varying numbers of events. 35

Figure 15: Percent of trip length that is active fishing. 36

Figure 16: Comparison of EM reviewers' slippage annotations. 38

Figure 17: Comparison of EM reviewers' slippage annotations by vessel. 38

Figure 18: Comparison of EM reviewers' operational discard annotations. 39

Figure 19: Comparison of EM reviewers' operational discard annotations by vessel. 39

Figure 20: The distributions of estimated weights for each discard event type. 44

Figure 21: A comparison of reviewer notes of protected species interactions. 45

Figure 22: A comparison of reviewer notes of individual animal interactions. 45

Figure 23: Overall EM program costs broken down into startup costs and ongoing costs by category. 46

Figure 24: Startup costs for EM Project broken down into categories. 49

Figure 25: EM implementation ongoing costs broken down into categories. 52

Figure 26: Reasons for missing video data. 54

Figure 27: Image quality assessment. **55**

Figure 28: Project Participation. **56**

Figure 29: Days between trip end and receipt of trip data **59**

Table of Tables

Table 1: IFM alternatives for the herring fishery **19**

Table 2: Observer coverage rates. **23**

Table 3: The summary of camera installation information. **26**

Table 4: Summary of events recorded by each review type. **29**

Table 5: Partial and full release agreement between census reviewer and NEFOP observer. **40**

Table 6: Agreement among three sources of data: census EM, audit EM, and NEFOP observer. **41**

Table 7: Discarding event descriptions **67**

ACRONYMS

ASM	At-Sea Monitor
AWS	Amazon Web Service
EM	Electronic Monitoring
ESA	Endangered Species Act
ET	Electronic Technology
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
GARFO	Greater Atlantic Regional Fisheries Office
GPS	Global Positioning System
GUI	Graphical User Interface
HDD	Hard Disk Drive
IFM	Industry Funded Monitoring
IP	Internet Protocol
MADMF	Massachusetts Division of Marine Fisheries
MAFMC	Mid-Atlantic Fisheries Management Council
MEDMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
NAS	Network Attached Storage
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service
NFWF	National Fish and Wildlife Foundation
PoE	Power-over-Ethernet
RSA	Research Set-Aside
SBRM	Standardized Bycatch Reporting Methodology

UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
VMP	Vessel Monitoring Plan
VMS	Vessel Monitoring System
VTR	Vessel Trip Report

I. EXECUTIVE SUMMARY

SUMMARY OVERVIEW

Electronic Monitoring (EM) is increasingly being used as a tool for catch monitoring and reporting compliance in fisheries around the world. There are several EM initiatives and programs underway in the United States, but full program implementation in the Northeast remains limited. As part of the Greater Atlantic Region's Electronic Technology (ET) Implementation Plan, the New England Fishery Management Council (NEFMC) and the National Marine Fisheries Service (NMFS) are considering implementation of EM in the Atlantic herring midwater trawl fishery to improve catch monitoring. In the Industry Funded Monitoring (IFM) omnibus amendment, the New England Fishery Management Council recommended increased monitoring in the herring fishery to address the following goals: 1) accurate estimates of catch (retained and discarded), 2) accurate catch estimates for incidental species for which catch caps apply, and 3) affordable monitoring for the herring fishery. The IFM amendment evaluates how different coverage target alternatives meet the specific monitoring goals identified by the New England Council while comparing the costs of the monitoring programs, particularly costs that would be borne by the fishing industry. The herring coverage target action alternatives include Northeast Fisheries Observer Program-level (NEFOP-level) observer, at-sea monitoring (ASM), EM, and portside sampling (PS) coverage. Because midwater trawl vessels discard only a small percentage of catch at sea, EM and portside sampling have the potential to be a cost effective way to address monitoring goals for the midwater trawl vessels harvesting herring. EM would be used to verify retention of catch on the midwater trawl fleet and portside sampling would be used to verify amount and species composition of landed catch.

Additionally, the Mid-Atlantic Fishery Management Council is considering EM as a monitoring option in the mackerel fishery pending the results of this study. While EM has been successfully deployed in other fisheries, its suitability for use in the Atlantic herring (and potentially mackerel) has not been explored. To this end, the NMFS Northeast Fisheries Science Center (NEFSC) and the Greater Atlantic Regional Fisheries Office (GARFO) designed a project to simulate, test and refine an operational EM program.

In August 2016, the NEFSC contracted Saltwater Inc. (Saltwater) to conduct a project to determine if EM is an appropriate tool to improve monitoring and address bycatch issues in the Atlantic herring and Atlantic Mackerel midwater trawl fisheries. Specifically, the goals of this project were to inform:

- Development of EM program requirements;
- Development of a data program and EM service provider performance standards;
- The establishment of roles and responsibilities for the fishing industry, service providers, and NMFS;
- How EM data collected in this project could be integrated into other reporting requirements; and
- How information could be provided to enhance fishery-wide implementation requirements.

This information will assist NMFS and the Fishery Management Councils in the development of EM program requirements and EM performance standards. To achieve these objectives, NMFS identified the following Contractor specific project deliverables:

- Installation and deployment of EM systems on up to twelve (12) Atlantic herring midwater trawl vessels;
- Develop local infrastructure for vessel and program support;
- Develop Vessel Monitoring Plans (VMPs) and establish standards and procedures for approving VMPs and equipment installations;
- Use EM to monitor fishing activity to determine if there are discards on herring and mackerel trips;
- Review sensor and video data; and

- Work with NMFS to review program performance for refinement.

NMFS and Saltwater staff conducted industry outreach and recruited volunteers willing to participate in the EM study during the 2016 and 2017 fishing years. Saltwater EM technicians installed systems on eleven commercial herring and mackerel midwater trawl fishing vessels in Maine, Massachusetts and New Jersey. Video and sensor data were collected for over 12 months on 192 trips and reviewed by Saltwater and NEFSC staff. Using the collected data, the project team evaluated the EM system's ability to capture data to meet the forthcoming monitoring requirements in the herring fishery, evaluated the major drivers that could impact the costs associated with full implementation, and looked for applicability to other Northeast fisheries.

Summary of Data Findings

As a result of collaborative voluntary participation by the fleet and the diligent work of Saltwater and NMFS staff, an expansive and unique data set was collected as a part of this project.

- Data was collected on 192 trips across the 11 actively fishing midwater trawl vessels.
- These data were initially reviewed by both Saltwater and a secondary review was performed by NMFS reviewers; Saltwater staff performed a comprehensive 'census' review while NMFS staff performed a shorter 'audit' that focused exclusively on fishing events.
- 'Dual reviews' were successfully completed on 126 trips (i.e., both 'census' and 'audit' reviews were completed).
- Of the 126 dual reviewed trips in this study, 32 trips (25%) had overlapping Northeast Fisheries Observer Program (NEFOP) coverage.
- Video reviewers were tasked with identifying and documenting discard events to determine what information could be consistently gathered and which types of discard events could be accurately categorized using EM. Please refer to *Appendix 1* for descriptions used by reviewers to categorize discard events.
- In total, review staff performed more than 1,000 hours of video review and catalogued 1,461 discard records (902 census reviewer records, 559 audit reviewer records).
- Of the the discard events as reported by the audit review, the most frequently assigned category was "discarded after being brought onboard," followed by "operational discards," "other," "unknown," "partial release," and "full release."
- Fishing activity made up approximately 23% of trips, suggesting that a reduced portion of the total video could be reviewed in detail to detect discard events.

Following the completion of the data collection period, the project team compiled the data and performed a series of summaries and analyses. Initial results of this work suggest that video-based EM has potential to be an effective monitoring tool in this fishery.

- Census and audit EM reviewers agreed that approximately 41 slippage events (26 partial release and 15 full release) had occurred in addition to another estimated 88 operational discard events.
- There was a high level of agreement among EM reviewers in categorizing full release events (94%).
- For smaller release events reviewers were generally able to identify that a release event had occurred, but often did not use the same classification to describe the events. For partial release events reviewers agreed in approximately 55% of the cases. In cases of disagreement, one reviewer typically classified a discard event as a partial release and the other reviewer classified the event as operational discards. The comments entered by reviewers suggested that in many of these events, reviewers were viewing similar releases of catch but categorizing them differently.

- Data comparisons between EM reviewers and NEFOP observers showed general agreement in identifying and categorizing slippage events. A close comparison of these events highlights the strengths and weaknesses of each data stream.
- Agreement between reviewers (our primary metric of performance in this study) was often impacted by factors such as the total number and placement of cameras on a vessel; factors that could be better controlled in an operational program where vessels would be expected to meet required standards and protocols regarding camera set-up (EM system set-up varied by participating vessel as participation was voluntary and vessels have different layouts).

In addition to comparisons of event categorization, data collected in this project assisted with the development of recommended operational considerations to maximize the effectiveness of video-based monitoring systems in this fleet. Specifically, results provide valuable information on the average times for EM video review and potential drivers of increased review time (mainly individual annotations of discard after being brought on board events). Further, our results suggest that an audit approach to video review may be sufficient, and may substantially reduce total review time, program costs, and storage requirements.

Summary of Lessons Learned

A primary goal of this project was to determine if EM technology was a suitable monitoring option for this fishery. Throughout the project, feedback was collected from project participants and with that input, the project team identified what worked well and where improvements were needed. Overall, EM was effective in detecting and categorizing full release slippage events when EM cameras were appropriately situated and used as recommended. Furthermore, EM was effective in detecting and categorizing catch discarded after being brought onboard. While EM was effective in the detection of discard events, reviewers had some difficulty in differentiating between operational discards and partial release slippage events consistently. Incorporating a mechanism which allows vessel operators to provide information regarding discard events throughout the trip may further aid when distinguishing among these events. The following are recommendations to promote a successful EM program in the herring midwater trawl fishery.

Implementation

System components: The EM systems provided by Saltwater functioned reliably and captured high quality data that allowed reviewers to identify discard events. Unnecessary recording occurred when the vessels engaged in non-fishing activity at the dock that incorporated the vessel hydraulics and initiated camera recording. The incorporation of using geofencing technology to restrict the onset and completion of video recording eliminated these unintended recordings and should be required in an operational program.

System use and reliability: Power interruptions to the EM system caused incidences of data loss. The use of voltage conditioners and uninterruptible power supplies (UPS) decreased the risk of power loss to the EM system. Camera connectivity issues that occurred were due to high vibration on the rail mounted cameras. Vibration resistant cameras are recommended for boom mounted cameras in this fishery.

Compliance: The project had lower participation in the last quarter for a variety of reasons that are addressed later in this report, but ultimately were a result of the voluntary structure of the study. In an operational program, vessels would be required to operate their systems or would be subject to consequence measures. Another common issue we encountered was a lack of proper training for the vessel personnel responsible for operating the EM system. The vessel representative trained by Saltwater during the install was often the vessel owner or fleet manager, not the captain. For this reason, captains and crews did not always fully understand their responsibilities. Under full implementation, the captain should be present during the install for operator training.

To maximize the ability of EM reviewers to view all discards, we determined that cameras should be installed to capture all 4 possible discard locations as listed below;

- Fish pumping
- Dewatering box
- Full deck
- Stern

These four views can generally be captured by three properly placed cameras. On most vessels, getting the required views will require the installation of a boom arm mount (as described in section III below).

Data Management and Review:

Data review: It is important for all project partners to work together at the onset of any EM project to determine which data fields should be collected and how they should be reported. Doing this early ensures the EM systems are installed with the best possible configuration to collect the necessary information and that data is properly documented in the review process. All events of interest should be clearly defined to prevent variation in the classification of discard events among reviewers. Data reviewers should be trained to ensure categorization of events and species identification is standardized.

Data retrieval: In fisheries with complex logistics where the vessels are not all located in the same port, in person data retrieval can be costly and logistically complicated. Mailing EM data to the review center can simplify this process and result in cost savings. However, mailing the data diminishes the opportunity for face to face contact, which allows vessel operators to ask questions, build working relationships with technicians and facilitates advantageous system performance checks. This issue may be mitigated by more frequent communication with the vessel operators early in the project (after the first few trips) to ensure EM responsibilities are understood and data collection is optimized. In an operational EM program with required compliance, vessel operators would be required to perform a "system check" prior to each trip, and ensure that any issues with the system are reported immediately to the EM service provider. In a fleet that makes frequent, short trips and is somewhat migratory, sufficient spare hard drives should be made available to the vessels to ensure data collection is not hindered due to HDD resource limitations.

II. Project Background & Overview

Saltwater Inc. is an observer and EM service provider headquartered in Anchorage, Alaska with field offices in Massachusetts, Washington, and Kodiak, Alaska. Saltwater has collected high quality data on fisheries and oceans for government agencies, research organizations, and fishermen for nearly 30 years. Since 2010, Saltwater has provided electronic monitoring services on vessels in the Atlantic pelagic longline fishery, the North Pacific longline and pot cod fisheries, the Pacific/West Coast groundfish fishery, the Pacific Islands shallow and deep set longline fishery, and the Gulf of Mexico reef and shrimp fisheries. The EM systems in these fisheries consistently produce high quality digital imagery integrated with precise Global Positioning System (GPS) and sensor data. These projects have allowed Saltwater to engage with fishery managers, the fishing industry, and other stakeholders to identify key challenges and define the best means of implementing EM in each fishery. This includes hardware and software decisions, data retrieval and management planning, data review protocols and procedures, skipper engagement and training, and infrastructure development.

The Atlantic Herring and Mackerel Fisheries

Atlantic herring (*Clupea harengus*) are a schooling fish distributed throughout the North Atlantic and Arctic Oceans, including the eastern seaboard of North America, where they migrate between Canada and North Carolina to feed and spawn[3]. These herring are a slow-growing species, generally reaching maturity at age 3 (~10 in) and attaining lengths of 15 inches[4]. Herring are an important forage species for tuna, sharks, haddock, flounder, squid, and marine mammals[5]. They are commercially valuable as bait fish, for fish oil, fish meal, and for human consumption. The fishery is managed through a stock-wide annual catch limit allocated to four separate management areas overseen by NMFS and the NEFMC (for Federal waters), and the Atlantic States Marine Fisheries Commission and individual states (for coastal waters).[6] Atlantic herring are caught with a variety of gear types, including trawl, purse seines, and gillnets, with midwater trawls (paired and single) accounting for the majority of the catch, 35,074 metric tons of herring from all areas, landed in 2016. This amount includes Research Set-Aside (RSA) quota.

Atlantic mackerel (*Scomber scombrus*) have a similar distribution and life history as Atlantic herring, and the two are often caught in conjunction. Mackerel grow to lengths of up to 16 inches; like herring, they feed on zooplankton and small crustaceans, and are an important forage species for other animals. There is a recreational fishery for mackerel, and their stock-wide annual catch limit is divided between the commercial and recreational fishery, managed entirely by NMFS and the Mid-Atlantic Fisheries Management Council (MAFMC)[7]. Mackerel are commercially fished with a wide variety of gears, such as handline, longline, purse seine, pot/trap, gillnets, and trawls, with midwater trawls accounting for the majority of the catch.

Under the Northeast Fisheries Observer Program (NEFOP), when selected by NMFS, vessels operating in the herring and mackerel fisheries must carry at-sea observers who document catch and discards, economic information, gear characteristics, fishing location, and biologically sample the catch.[8]. The herring fishery is not currently characterized

[3] http://s3.amazonaws.com/nefmc.org/herring_FMP.PDF

[4] https://www.nefsc.noaa.gov/publications/tm/tm126/tm126.pdf

[5] https://www.mass.gov/service-details/learn-about-atlantic-herring

[6] https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/atlherring/index.html

[7] https://www.fisheries.noaa.gov/species/atlantic-mackerel

[8] https://www.greateratlantic.fisheries.noaa.gov/regs/2015/June/15sbrmomnibusamendea.pdf, pg. 125, 4.5.1.1 Federal Observer Program

as overfished, or as experiencing overfishing[9], but stakeholders have expressed concerns with bycatch and interactions with marine mammals. Given the the findings of the recent Atlantic Mackerel assessment (available at https://www.nefsc.noaa.gov/saw/reports.html), its official status will soon change to overfished with overfishing occurring. Plans are underway to implement a rebuilding program commencing January 2019 (pers com Jason Didden, MAFMC staff). The Standardized Bycatch Reporting Methodology (SBRM) sets the rate at which each fishery is covered; the actual rate depends on the amount of variability in the observer data used to complete the analysis. As a result, the coverage rate changes from year to year. The sea day schedule is released to the public in the spring each year.

Paired and single midwater trawling for Atlantic herring and mackerel are characterized as *High Volume Fisheries*, defined by large catch of many small fish, which are typically brought onboard using a high powered vacuum pump. Catches flow at a rate of 3,600 - 8,900pounds per minute (final loaded NEFOP data, 2010-2017, midwater trawl vessels only; flow rate estimate based on observed pump times and weights by permit) directly through a series of chutes into the vessel's hold, which contains refrigerated sea water. Currently monitored bycatch includes haddock, and river herring (alewife and blueback herring), and shads.

There are 12 vessels that actively fish for herring and mackerel with midwater trawl gear, and the vessels fish out of 5 main ports: Rockland, ME; Portland, ME; Gloucester, MA; New Bedford, MA; and Cape May, NJ. The vessels in these fisheries are usually large (80-150 feet or more in length), and in roughly half the fleet, two vessels fish together, which is referred to as "pair trawling". Trips typically last 3-5 days, though much of that time may be spent searching for fish via electronic sounders. The vessels rely heavily on their sonar systems (sounders, fish finders) to locate the targeted schools of fish.

Paired midwater trawling is only possible in relatively good weather because the paired vessels must maintain a uniform distance while towing and hauling back[10]. Setting begins with one vessel putting the net over the stern. The second vessel then approaches, pulling alongside its sister ship to retrieve a line attached to the net bridle from the vessel setting the net. The receiving vessel will then attach the bridle to their steel wire and, at the specified signal, both vessels begin to pay out a certain amount of wire in unison. Communications throughout the operation are maintained over VHF radio. Once the wire is paid out, towing begins, with the vessels on parallel courses and about one half to one third the warp length apart. Depth can be modified by increasing or decreasing wire length and towing speed.

One of the challenges to fishing with two vessels is that they need to be of similar size and power, and the captains must work in close cooperation for successful fishing to occur. Sensors are used to ensure the gear is fishing correctly and to monitor the catch in the net. Haul back begins at a given signal, with the warps being pulled in until the legs are brought up to the vessels. The vessels come alongside each other once more, when one of the vessels releases its cable and throws the line attached to the net bridle back to the hauling vessel, and the net is brought alongside at the surface to have the catch pumped onboard, into refrigerated saltwater tanks.

A primary objective of the study was to determine if EM technology could monitor catch retention in the midwater trawl fishery. The NEFOP provides at-sea coverage in the high volume fisheries and classifies discards into three categories: 1) Catch discarded after being brought on board 2) Slippage, referred to as the partial or full release of catch 3) Operational Discards. This classification structure was utilized by video reviewers throughout the EM

[9] https://www.fisheries.noaa.gov/species/atlantic-herring

[10] Thomson, D. 1978 "Pair trawling and pair seining; the technology of two-boat fishing." Fishing New Books. 0-85238-087-9

project. Once a discard event was identified, reviewers selected one of five options to document the discard event type. These discard event types are defined in *Appendix 1.*

ELECTRONIC MONITORING (EM)

The use of EM systems on fishing vessels is an increasingly popular addition to the monitoring portfolio of fishery management tools. The systems are comprised of video cameras, sensors, and data collection software. Data generated by the EM system includes vessel location, speed, gear deployment logs, and video of fishing activity, but does not collect audio. The data can augment or replace human observers to meet certain monitoring goals. EM has advanced significantly in the past 10 years, making high-quality, consistent data capture a cost-effective option to at-sea observers in some, if not all, fisheries. The following is a more detailed description of the EM system components:

Digital Cameras: Saltwater's internet protocol (IP) digital cameras have an ingress protection rating of IP67, which means they are manufactured with housings designed to protect against water immersion up to 1 meter and up to 30 minutes. Each camera is capable of capturing high-resolution imagery (1920 x 1080) at a rate of up to 30 frames per second. The cameras were selected for their low lux rating, ensuring clear imagery in low light, and use wide dynamic range technology to better handle fluctuating lighting conditions. Saltwater has deployed these cameras on vessels from Alaska to Hawaii, fishing in all kinds of challenging conditions. For this project, video resolution was set to 720p (1280x720) at a 15 fps, which is the recommended setting for smooth video playback.

GPS Receiver: Saltwater's GPS receiver is integrated within the control box which is coupled with an external antenna. It provides heading, velocity, latitude, longitude, and time/date. It begins producing data the moment it receives power and records continuously as long as there is power to the EM system. For this project, GPS data was logged every 10 seconds, though the capture rate can easily be adjusted to as often as every second (1 Hz) or as seldom as every hour. This information is used during data review to track vessel activity and to identify fishing effort.

Hydraulic & Drum Rotation Sensors: Hydraulic pressure transducers and rotation sensors are central to Saltwater's EM systems. Hydraulic pressure transducers monitor a vessel's hydraulic pressure and rotation sensors monitor mechanics, like line drums or warp winches. Sensor status is logged continuously from the start to the end of each fishing trip. This information helps reviewers identify fishing activity during the review process. The sensors can also be used to trigger video recording.

Control Center: Saltwater's small footprint EM control center (12" x 7.5" x 4.5") is fanless, noiseless, and ruggedized to withstand a wide temperature range, as well as shock and vibration. It includes a built in GPS receiver and two hard drive bays. All data collected by the EM system is recorded to high capacity (1 TB) hard disk drives (HDDs). The system is configured to write all information on encrypted HDDs to ensure data security and confidentiality. The system software monitors storage capacity and when one drive fills up, the system automatically stores additional data on the second drive.

The control center has eight built-in Power-over-Ethernet (PoE) ports for IP camera connectivity, which eliminates the need for additional power delivery to an external switch. Universal serial bus (USB) ports allow for simple system software upgrades via flash drive and the opportunity for the integration of other electronic devices. The control box and all of Saltwater's EM system components have low power requirements and can run off either alternating current (AC) or direct current (DC) power.

Wheelhouse Monitor: A wheelhouse monitor with waterproof keyboard allows vessel crew to see current date, time and location data, live camera feeds that show camera views at all times, even when the cameras are not recording, camera status (e.g., recording or not), and view what is being recorded in real-time. Our graphical user interface (GUI) is designed to provide vessel operators with a clear, simple way to confirm that all system components are operating correctly, the presence of a functioning HDD, and the percentage of disk space used. The GUI also allows viewers to determine which HDD has data--and how much--and which drive to send in at the end of a trip.

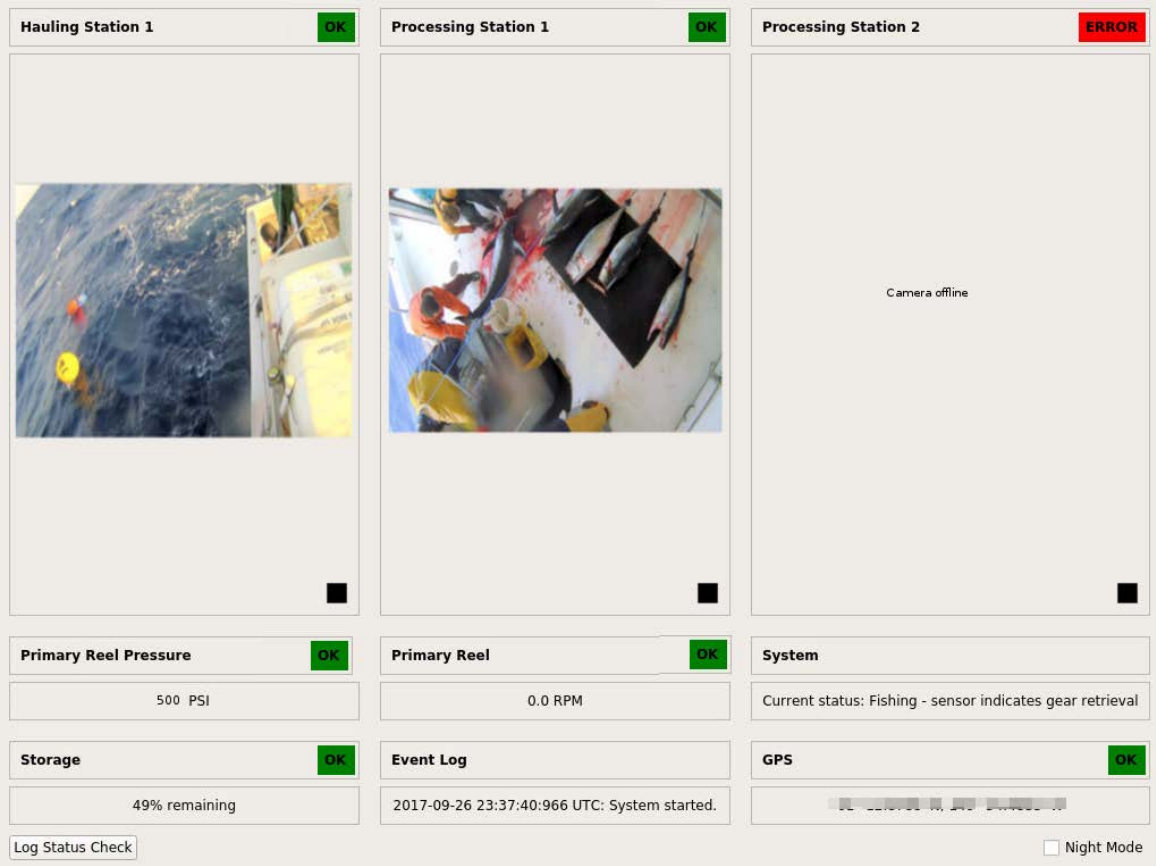

***Figure 1**: Graphic User Interface (GUI) as seen on the Saltwater EM system wheelhouse monitor .*

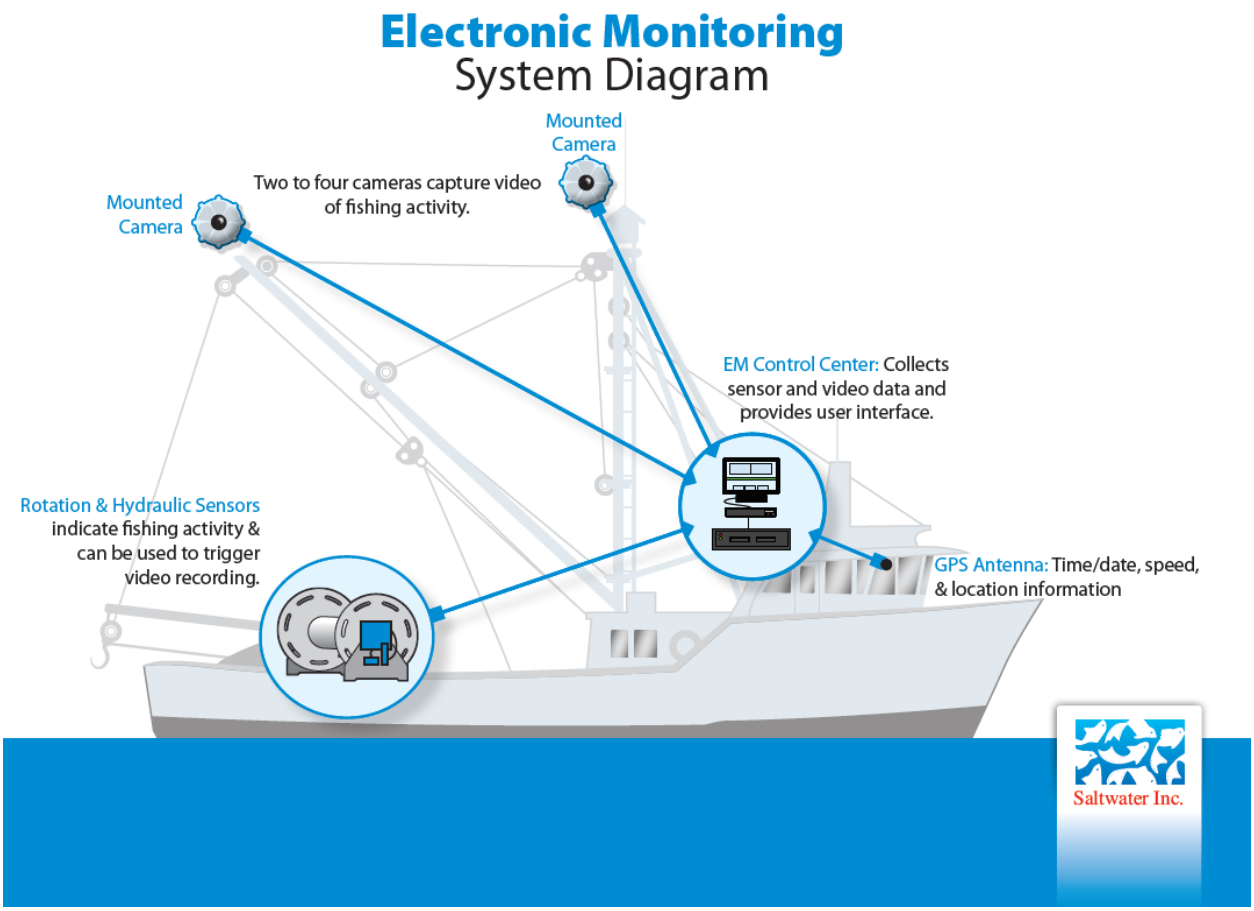

***Figure 2**: Diagram of the Saltwater EM system used in this project.*

EM has been suggested to monitor gear interactions with protected species, compliance with discard and retention regulations, to account for catch and bycatch, and to validate vessel landing and logbook information. A key constraint to effective EM implementation in many fisheries is the cost of data review and storage. Operational implementation of EM requires not only collecting hours of video and sensor data, but also the ability to efficiently extract from that data, the meaningful information needed to manage a particular fishery. Saltwater has developed open-source review software that integrates video and sensor data for efficient data review and analysis. Open-source software avoids the limitations and expense associated with proprietary code, encourages collaboration and innovation, and will speed the development of cost effective review solutions. A key constraint to successful EM program implementation is the cost of data review. The use of open-source data review software will be critical to the long-term success and sustainability of EM programs. Open source software can be used, changed, and shared (in modified or unmodified form) by anyone. The open-source movement promotes collaborative development of computer source code by multiple independent developers. It is among the most transformative trends shaping technology in the 21st century and companies such as Google, Oracle, IBM, LinkedIn, Square, Twitter, Netflix and others already rely on it.

PROJECT GOALS & OBJECTIVES

The overarching objectives were to evaluate the utility of EM for monitoring catch retention and to detect discard events in the Atlantic herring and mackerel midwater trawl fisheries according to the proposed use of EM in the IFM (as component of a monitoring option that would complement a portside sampling program). To assess the potential of EM to serve as a means for ensuring catch retention this project sought to 1) Compare annotations associated with discard event events among EM reviewers to quantify how consistently events can be detected by EM, 2) Compare the review times among review types to determine the review time needed, 3) Compare EM discard event detections to those noted by a NEFOP observer to assess the relative efficacy of the technology relative to existing monitoring options, and 4) Refine industry and NMFS EM cost estimates by identifying the variables that impacted the total project cost. The design of the program involved installing EM systems on volunteer vessels actively participating in these fisheries, collecting the video data after each trip, and reviewing 100% of the collected video data. The project team sought to determine if the collected data met specific monitoring needs, what factors were critical to successful program implementation, whether there were ways to improve any aspect of the program, and to identify the primary cost drivers and any cost efficiencies.

The NEFMC developed the Industry Funded Monitoring (IFM) Omnibus Amendment to increase monitoring and/or other types of data collection in some of its Fishery Management Plans (FMP). The goal of the IFM Amendment is to improve the amount and type of catch data, to more precisely monitor annual catch limits, and/or provide other information for management. This increased monitoring will be in addition to coverage required through SBRM, the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA). The IFM Amendment specifically addresses increased monitoring in the Atlantic Herring FMP, and contains alternatives that maintain or increase observer coverage in the herring fishery. Although the IFM Amendment was originally intended to be a joint venture between the NEFMC and the MAFMC, the MAFMC has decided to delay any decision on an industry-funded monitoring action until the results of this study are complete.

At its April 2017 meeting, the NEFMC selected IFM Herring Alternative 2.7, which will implement a combined coverage target of 50% for all herring Category A and B vessels, and will provide herring midwater trawl vessels the option to choose between monitoring with At-Sea Monitors (ASM) or with the combination of EM and Portside monitoring. Final approval of EM as a monitoring option will be made at its April, 2018 meeting, and will be based largely upon results and recommendations of this study.

If approved by the New England Council, midwater trawl vessels could choose EM in association with portside monitoring. Since 2008, the Massachusetts Division of Marine Fisheries (MADMF) and the Maine Department of Marine Resources (MEDMR) have collected data (species, morphometrics) on the herring and mackerel midwater trawl fishery through independent portside data sampling programs. MADMF has opportunistically targeted 50% sampling of midwater trawl trips landed in MA, while MEDMR generally samples 5-10% of trips landed in ME. Though these programs are not currently used in NMFS quota monitoring, they have provided valuable and expedited information on catch composition to fishermen and fishery managers. In conjunction with EM, these states will continue to collect data through the first year of IFM implementation in 2018, after which a federal program (modeled after the state programs) will commence in 2019.

Table 1: *IFM alternatives for the herring fishery.*

Gear Type	Midwater Trawl	Purse Seine	Small Mesh Bottom Trawl
Herring Alternative 1: No Coverage Target for IFM Program (No Action)	**SBRM**		
Herring Alternative 2: Coverage Targets for IFM Program	**Includes Sub-Options: 1) Waiver Allowed, 2) Wing Vessel Exemption, 3) 2-Year Sunset, 4) 2-Year Re-evaluation, and 5) 25 mt or 50 mt Exemption Threshold**		
Herring Alternative 2.1: 100% NEFOP-Level Coverage on Category A and B Vessels	**100% NEFOP-Level Observer**		
Herring Alternative 2.2: ASM Coverage on Category A and B Vessels	**25%, 50%, 75% or 100% ASM**		
Herring Alternative 2.3: Combination Coverage on Category A and B Vessels and Midwater Trawl Fleet	**50% or 100% EM/Portside**	**25%, 50%, 75% or 100% ASM**	
Herring Alternative 2.4: EM and Portside Coverage on Midwater Trawl Fleet	**50% or 100% EM/Portside**	**SBRM (No Action)**	
Herring Alternative 2.5: 100% NEFOP-Level Coverage on Midwater Trawl Fleet in Groundfish Closed Areas*	**100% NEFOP-Level Coverage**	**SBRM (No Action)**	
Herring Alternative 2.6: Combination Coverage on Midwater Trawl Fleet in Groundfish Closed Areas	**Coverage would match selected alternative 2.1-2.4**	**SBRM (No Action)**	
Herring Alternative 2.7: ASM Coverage on Category A and B Vessels, then Vessels may choose either ASM or EM/Portside Coverage	**50% ASM or EM/Portside**	**50% ASM**	**50% ASM**
*** Sub-Options do not apply to Herring Alternative 2.5.**			

III. Project Implementation

Project Timeline

The contract was awarded to Saltwater and signed on August 12, 2016. The timeline included a 2 month project setup period which included clarifying project objectives, hardware and software specifications, vessel requirements, defining roles and responsibilities, and development of a project plan. In addition, Saltwater setup local capacity and infrastructure to provide and support field services. The EM operational and data collection period consisted of 13 months (October 2016 - October 2017). Activities included; vessel visits, installation and servicing of EM units, field and project support and data collection. Analysis and report writing occurred over 3 months.

Herring & Mackerel Midwater Trawl EM Program Timeline

	Start Date	End Date	Timeline
Total Project Period	**8/12/2016**	**12/31/2017**	
Project Award	8/12/2016	8/12/2016	
Project Setup	8/12/2016	10/12/2016	
Project Outreach	8/12/2016	12/1/2017	
Component Procurement	8/12/2016	9/23/2016	
Installations	9/30/2016	1/5/2017	
Field Support	10/1/2016	10/31/2017	
Data Review	10/14/2016	11/22/2017	
EM System Removal	9/21/2017	12/31/2017	
Analysis and Reporting	11/1/2017	1/31/2018	

Figure 3: *Project Timeline*

Outreach

Beginning in 2016, NMFS conducted initial outreach, alerting the herring and mackerel midwater trawl fleet vessel owners that a voluntary EM project had been funded and would be taking place in 2016-17. Vessel owners were informed about the objectives of the project, the timeline, and their roles and responsibilities if they chose to volunteer. NMFS created an EM study outreach sheet (*Appendix 2*) to explain the project goals. Participation in the project was not remunerated and did not remove vessel owners from the requirement to carry observers on selected trips. Saltwater prepared a *Vessel Reference Sheet (Appendix 3),* outlining vessel power requirements and basic EM system operations that was provided to potential volunteer participants, along with a detailed description of the install process.

In order to prepare for the installations, an in-person vessel assessment was conducted on all but one vessel in October 2016. In order to make the best use of the limited time in port, the remaining vessel assessment took place in November, on the first day of the EM system installation on that vessel. During the vessel assessment meeting, members of NMFS and Saltwater met with the vessel owner and/or captain to create an EM installation plan. Saltwater worked with the owner or captain to determine where each of the components should be installed for optimal function. Project goals and objectives were also discussed at this meeting.

Throughout the project, vessel feedback was provided in a variety of formats. Saltwater staff contacted vessel owners or operators if there was something that needed more immediate feedback, such as keeping the EM system powered for the entirety of the trip. Video reviewers also filled out trip feedback forms *(Appendix 4)* to effectively

address issues on a particular trip. Quarterly evaluations summarizing all declared herring/mackerel trips and several metrics evaluating adherence to EM project requirements were sent to the vessel owners (*Appendix 5)*. Throughout the project, representatives from NMFS and Saltwater met with vessel owners and operators to review the quarterly evaluations and trip feedback forms as well as go over video footage from that quarter and address any questions or concerns the owners or operators had about the project. At the end of the project, NMFS and Saltwater conducted exit interviews (*Appendix 6*) with representatives from each vessel to discuss the project and gather feedback. A total of 37 outreach meetings took place during the course of the project, including 10 vessel assessments/pre-install meetings, 17 quarterly feedback meetings and 10 exit interviews.

EM SYSTEMS INSTALLATIONS & FIELD SUPPORT

Saltwater developed an EM system that has been successfully deployed in the past six years on well over 150 vessels in multiple fisheries, including over 100 vessels across the Atlantic Coast fishing in the Pelagic Longline fleet for Tuna and Swordfish. This EM system used for this project has proved capable of collecting high-quality digital video data and accurate, supporting sensor data. Saltwater's EM system consists of a control box with two bays for removable hard drives, one to three Internet protocol (IP) cameras per vessel, hydraulic pressure sensors, drum rotation sensors, a GPS receiver, and a monitor and keyboard for the vessel's wheelhouse. Saltwater's data acquisition software utilizes open-source code to log and process GPS, sensor, and video data into usable EM datasets. All of the EM systems were leased by NMFS for the duration of project. Industry participants were not required to pay for any of the components or service costs, but were given the option to purchase the systems for a nominal fee at the end of the project.

During the initial vessel visits, Saltwater and NMFS discussed the installation with the vessel representative. After discussing fishing operations, NMFS and Saltwater communicated the preferred location for the cameras to capture the ideal views. Typically, these vessels pull the net along the starboard side of the vessel to pump the fish and the catch is pumped through the dewatering box where discarding may occur. Once pumping is complete, the net is pulled back around to the stern where the codend is opened up and the net is brought back onboard on the net reel. With these fishing operations, there are three locations where discards could occur; at the pumping location, at the dewatering box, and at the stern. It was determined that cameras should be installed in a way that captures all 3 of these possible discard locations, usually requiring 3 cameras. A full deck view camera (often used to capture a view of the dewatering box) also proved helpful to allow the reviewer to be able to see when the vessel was setting out the net and hauling it back. There was one vessel in the project that pumped at the stern and therefore did not require a starboard camera.

The typical installation took 3 - 3.5 days for a two technician team (or roughly 60 man hours). Much of this time was spent running wires since many wire runs were behind wall and ceiling panels and were difficult to access. After reviewing the initial datasets from each vessel, it was determined that a camera mounted on a boom could provide a direct line of sight of the pump station, starboard rail, and water while eliminating physical obstructions unique to each vessel participant. It was determined that most pump views in this project, could be improved by the installation of a boom arm extending over the edge of the vessel, allowing the camera an unobstructed view of the pump in the water. Booms were installed on five vessels, however, all but one vessel would have benefited from the installation of a boom. In some situations, captains declined to install a boom because they felt that it would have been an obstruction during the offload process, and others felt the view without the boom should be sufficient for the project. Dewatering box/deck camera views were seen by some participants as unnecessary or intrusive to personal space for a project looking at documenting discard events, so those participants declined to have those views captured on their vessels. It was determined during the project that a deck view, dewatering box view, stern view and pump view were all required to accurately classify discard events. However, since this was a voluntary

project, booms and cameras were installed to capture the best views possible while adhering to the vessel owner's guidance and level of comfort.

***Figure 4**: Boom arm installed on one of the participating vessels. Boom arms were added to 5 vessels in this project to determine if a better view of pumping activity and the contents of the net could be obtained. Photograph used with vessel owner's permission.*

***Figure 5**: View of fish pumping before and after installation of the boom arm. Photograph used with vessel owner's permission.*

When the installation was complete, the vessel owner or operator was trained by the EM technician in system operation and maintenance. A system operating manual was provided at the time of install and a VMP (*Appendix 7*) was created and provided to the vessel operator once complete.

Saltwater established a call-in number and service tracking system that was used to meet the support needs of the 11 vessels participating in the project. During the system installs, Saltwater technicians provided vessel owners and/or operators the call-in number, available twenty-four hours a day, seven days a week, and appropriate email contact information. Trained Saltwater EM staff answered all calls and were able to carry out remote troubleshooting and help identify and/or resolve system issues. The majority of calls were answered by the same technicians who carried out the installs, had developed working relationships with the captains, and were familiar with the set up on the boats.

NEFOP Data Collection

The Northeast Fisheries Observer Program (NEFOP) collects fishery dependent data from the midwater trawl herring fleet. Observers collect a suite of data on herring trips, including: trip-level information (costs, vessel description, safety), gear, catch (kept and discarded), and data to assist NEFOP in the determination of slippage events, and incidental take information on protected species. For a complete description of all data collected by observers, refer to the observer program operations manual, data entry manual, and on-deck reference guide[11].

NEFOP data are used by GARFO to monitor catch caps for river herring/shad and haddock. The NEFSC uses NEFOP data in support of SBRM to estimate the amount of bycatch occurring in the fishery. The SBRM analysis is described in detail on the observer program website[12].

The SBRM sets the rate at which the fishery is covered; the actual rate is determined based on the amount of variability in the observer data used to complete the analysis. As a result, the coverage rate changes from year to year. The sea day schedule is released to the public in the spring each year. The table below demonstrates the observer coverage over the time-frame of the project.

***Table 2.** Midwater Trawl Quarterly Observer Coverage Rates, Nov. 2016-Oct. 2017. Includes observed (at least one observed haul per trip) single and paired midwater trawl trips divided by VTR trips reporting kept catch. Includes all fisheries, not just herring and mackerel fisheries. The herring EM project data collection period overlapped with two SBRM years, 2016-2017 and 2017-2018 (SBRM schedule runs from April-March). Observer coverage was relatively high Feb-Apr during the study as this aligned with increased SBRM coverage needs during this same period. SBRM coverage of the fleet can vary from year to year, driven by funding and data needs to monitor bycatch (Source: GARFO's DMIS and NEFSC's OBDBS databases as of 2018-01-24).*

Period	Observer Coverage
NOV-JAN	14.60%
FEB-APR	31.30%
MAY-JUL	13.50%
AUG-OCT	11.00%

VMS Data Collection

[11] https://www.nefsc.noaa.gov/fsb/training/
[12] https://www.nefsc.noaa.gov/fsb/SBRM/

All participants in the Atlantic herring fleet are required to carry a vessel monitoring system (VMS) for use by NMFS to track vessel activity as a condition of their federal fishing permit. VMS data were used during the project to aid in data retrieval. NMFS staff were able to verify vessel activity and communicate expected landing dates to EM technicians. This relay of information allowed the EM provider to plan ahead for data retrievals and system maintenance. VMS data were also used to compare declared herring trips with EM data, which allowed project staff to determine the proportion of trips that were recorded by the EM system. Vessel trip report (VTR) data were used as a second check to compare EM data collection with known fishing activity, particularly in cases where the cameras were not activated due to the absence of fishing activity. Lessons learned from using these tools are applicable to an operational program.

Data Management & Review

Data Transfer

Saltwater's onboard EM hardware and software are designed to facilitate data retrieval by vessel owner/operators. Vessel operators were asked to mail in HDDs after each trip. At the time of installation, they received training and written instructions on how to retrieve and replace the HDDs. Each vessel operator was also provided with four HDDs, with the understanding that two per trip was generally sufficient (one for data storage, and one as a backup). On average, each 1 TB HDD can hold about 8 full days of video with the 3 camera setup at 720p and 15 fps. To submit HDDs, vessel owners were given protective mailers and pre-paid envelopes with tracking information which they could drop in any USPS mailbox.

Data Security & Storage

All of the EM data stored on thel HDDs are encrypted and password protected to ensure that they cannot be tampered with and remains confidential. In addition, Saltwater's "system log" records the serial number of the HDDs that are in the system, and the dates of install and removal. This enables the establishment of chain of custody, documenting that the HDD installed is the one removed and the one received.

When the HDDs were received in the Saltwater office, they were decrypted and the data were copied onto a redundant Network Attached Storage (NAS) device. After being backed up and verified, HDDs were reformatted and sent back to participating vessels for future deployment. A chain-of-custody log showing when the drives were received, copied, reformatted, and returned to circulation was maintained during the duration of the project. Additional copies of data from each trip were made and shared with the NMFS project team. Once review was completed, all of the data, including all video files, were transferred from the NAS and uploaded to Glacier, the Amazon Web Cloud Service (AWS), where they will be stored for three years. Amazon Glacier is a secure, durable, and extremely low-cost cloud storage service for data archiving and long-term backup. It provides comprehensive security and compliance capabilities that can help meet even the most stringent regulatory requirements. Data can be stored in Glacier for as little as $0.004 per gigabyte per month, a significant savings compared to local storage solutions.

Data Review

All of Saltwater's EM data reviewers are current or previously certified at-sea observers. This experience provides them with a keen understanding of the importance of data integrity, familiarity with reporting requirements, vessel operations and the fishery, and training and experience in species identification. For this project, two EM technicians (also former observers) were cross-trained to carry out data review, which allowed for the efficient use of time and talent. To ensure timely review, we also employed a current NEFOP observer as a part time reviewer to assist with video review during times when higher volumes of data were being collected.

Saltwater's onboard EM system collects high-quality digital imagery. Logged sensor data tracks fishing location and effort. Saltwater's open-source review software, which was used for all of the video review carried out under this project, integrates the collected EM video files and sensor data for efficient review and analysis.

Saltwater and Chordata, LLC, under a National Fish and Wildlife Foundation (NFWF) supported grant, developed the review software that was used for this project. The software is also being used by NMFS program in the Pacific Islands, Gulf of Mexico, and Alaska. The software is Windows-compatible, and produces data exports as comma separated value files.

All sensor data captured during a trip is displayed on a timeline to allow reviewers to identify events like gear deployment and retrieval, changes in vessel speed, and other key sensor readings. The reviewer can then click on any point in the timeline to see video imagery

captured at that time. A map showing the trip's GPS track is also synchronized to the video and timeline, allowing reviewers to click on a particular point on the map to access corresponding video imagery.

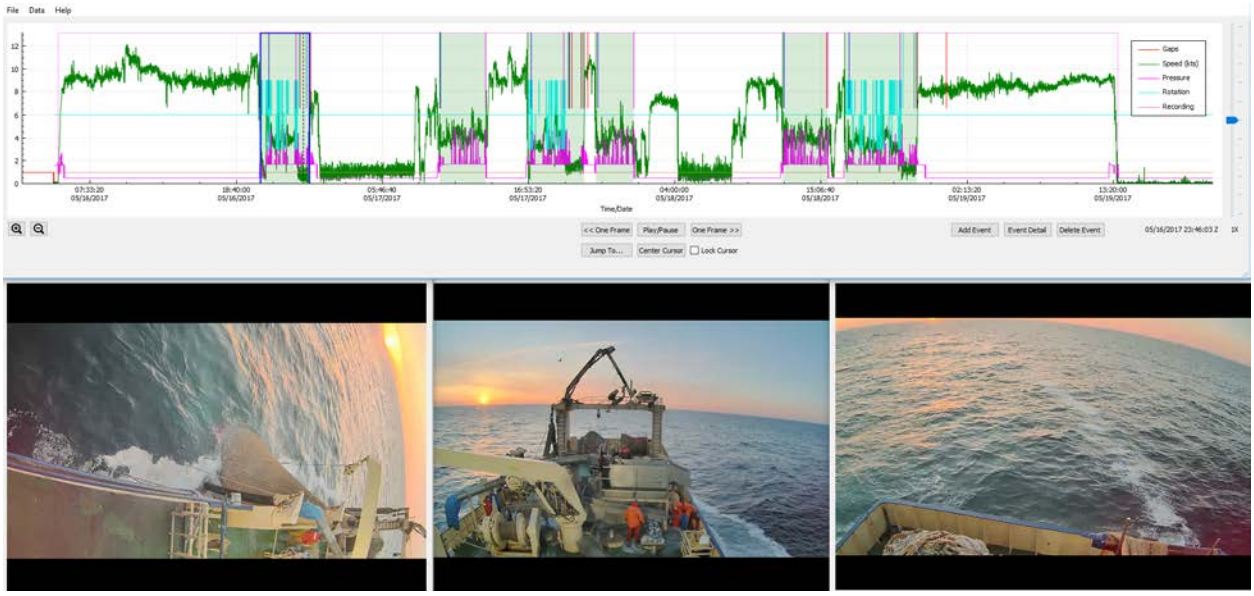

Figure 6: *EM data displayed using Saltwater's Open Source Review Software. Photographs used with vessel owner's permission.*

For this project, all of the EM sensor and video data collected for each trip were checked by Saltwater reviewers for completeness, loaded into the software, and reviewed in their entirety. Data reviewers documented all fishing activities and discard events. Summary reports were produced as comma separated value (CSV) files and were made available to NMFS. Along with a census review of all of the collected data, Saltwater reviewers performed an internal quality control audit on 89 (46%) of the trips. For this project, staff from both Saltwater and NMFS reviewed the trip footage and data and compared their findings to check for accuracy and consistency. The EM data and discard events were also compared for accuracy and consistency to observer data for all NEFOP observed trips.

IV. Data Analysis/Findings

This project generated a large volume of information. There are many ways that these data can be summarized and this report is not a comprehensive treatment of the data. Instead, we summarize data in an effort to address some of the primary goals of this project. First, we provide an overview of the data that were collected and provide some context and to explore how fishing effort recorded during this project compares to recent years. Second, we examine the review data generated by Saltwater and NMFS and explore the review time needed to generate observations of fishing effort. Finally, we delve into comparisons of trip and haul level notes and discard event classifications compiled by reviewers. We discuss how reviewer event classifications differ, and propose what might have led reviewers to categorize specific discard events in different discard event classifications. Through this analysis, we examine the potential pros and cons of using EM for monitoring slippage in the midwater trawl herring fishery.

Project Data Overview

The number of cameras deployed on the 11 vessels varied from one to three cameras. Each vessel was slightly different in configuration leading to some differences in camera placement and the quality of the video framing. Booms were used to improve the framing of pump/rail camera views on some but not all vessels (Table 3). Vessels owners were voluntary participants in the study and ultimately determined the number and location of installed equipment.

Table 3: *The summary of camera installation information and a qualitative assessment of the views they provided. Some vessels are also currently outfitted with triplex rollers (see page 26 for description of triplex) that can be used in catch handling and may increase our ability to discern between different types of fishing events. Views that were clear had minimal obstructions and were ideal for the review of footage. Views that were adequate provided coverage of the area but had some defect (e.g., equipment blocking a portion*

of the vessel from sight or slight blind spots). Obstructed views significantly impacted the ability of the reviewers to view and classify discard events.

Vessel number	Cameras installed	Boom installed	Stern view	Rail view	Dewatering box view	Deck view	Triplex present
1	3	N	Y	Clear	Adequate	None	N
2	3	N	Y	Clear	Obstructed	None	N
3	3	N	Y	Clear	Clear	Clear	N
4	2	N	N	Adequate	Clear	Clear	Y
5	2	N	Y	Clear	Adequate	Adequate	N
6	3	Y	Y	Clear	Clear	Clear	Y
7	3	Y	Y	Clear	Clear	Clear	N
8	3	Y	Y	Clear	Clear	Adequate	N
9	3	Y	Y	Clear	Clear	Clear	Y
10	1	N	Y	Clear	None	None	N
11	3	N	Y	Clear	Clear	Clear	N

Our assessment of VTR and VMS data suggested that vessels participating in the project sailed on as many as 230 trips during the project period. This total represents a sum of VMS notifications and vessel trip reports that represent a range of vessel activity, and is an upper estimate for the number of trips sailed. The total number of trips with fishing activity that could be used for the analysis (i.e., where reviewer annotations could be compared) was 126 (hereafter referred to as trips with 'dual reviews'), which is likely a large proportion of trips with significant fishing activity. Some trips were excluded from analysis for a number of reasons, ranging from the lack of fishing activity on a trip (and thus no discard events to compare) to an incomplete data set (where the EM system was operational for only a portion of the trip). Ultimately, 126 trips were included in the analysis. Within the sample, vessels on average, completed 11.5 trips during the project period (minimum 3, max 16). In total, 32 of these complete trips (~25%) carried NEFOP observers allowing for an additional level of comparison. As detailed in the participation section (please see below), most of the trips where data were collected occurred prior to July 2017 (Figure 7 and Figure 8). There was no clear temporal pattern in the level of reviewer agreement across the study (i.e., trips where reviewers disagreed that slippage occured were not all clustered at the beginning or end of the of study period), suggesting that disagreement was likely not substantially impacted by the experience of the reviewers or by other factors related to the stage of the project. Similarly, slippage events do not appear to follow any specific pattern when the data is viewed in this way. Trips where complementary data were available from a NEFOP observer occurred across the range of trip dates, but were more prevalent at the beginning of the study.

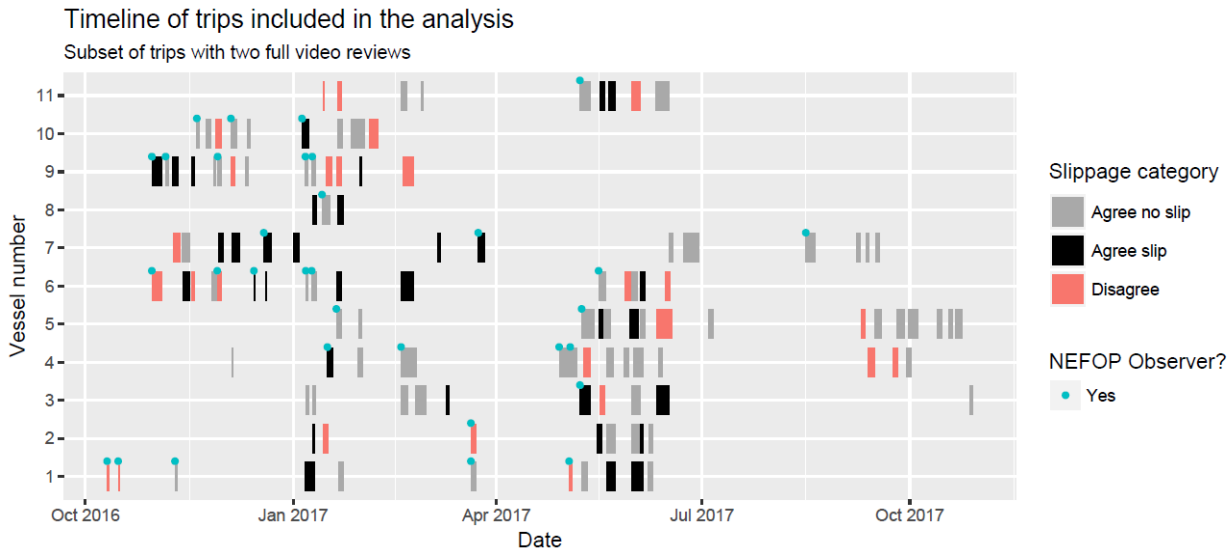

***Figure 7**: A timeline of trips sailed for each vessel that were included in the analysis. Each trip is represented by a short segment corresponding to sail and land dates. Trips with matching observer records are indicated by a blue point above their sail date (the beginning of each trip segment). Whether EM reviewers agreed that slippage occured during the trip is shown with the color of the segment. A gray segment indicates a trip where EM reviewers agreed that slippage did not occur, a black segment indicates a trip where the EM reviewer agreed that slippage did occur, and a red segment indicates a trip where reviewers disagreed as to whether slippage occurred on the trip.*

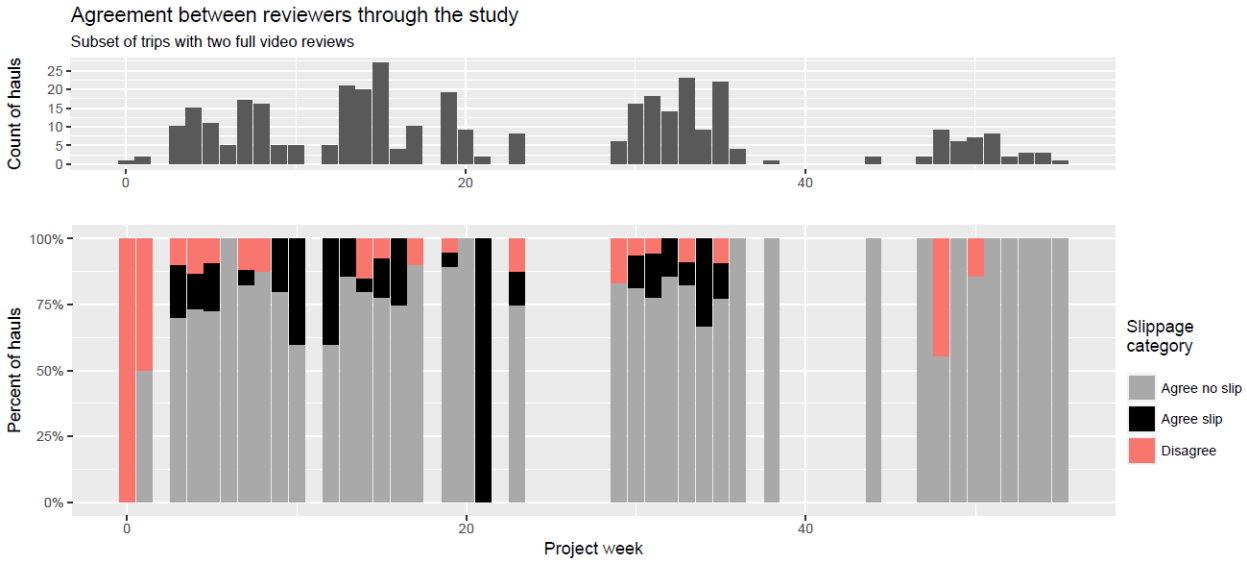

***Figure 8**: Agreement at the haul level for each week of the project. The percent of hauls during a given week of the project where EM reviewers agreed that slippage occured during the trip is shown with the color of the bar. A gray bar indicates a trip where EM reviewers agreed that slippage did not occur, a black bar indicates a trip where the EM reviewer agreed that slippage did occur, and a red bar indicates a trip where reviewer annotations disagree as to whether slippage occurred on the trip.*

Within the set of trips with dual EM reviews (both census and audit) approximately 370 hauls were completed with vessels averaging 33 hauls in the project period (minimum 12, max 52). The mean number of hauls per trip was ~3 (min 1, max 10). This mean value of hauls is very similar to the mean number of hauls per trip in recent years for this fishery (mean number of hauls from the observer data is 2.9). Although not conclusive, this suggests that fishing activities during the project were similar to those in previous years.

Over the course of the project ~902 discard event records were logged by Saltwater while ~559 records were recorded by NMFS (Table 4). The large discrepancy in event totals was mostly due to the larger number of 'discarded after being brought on board' events

identified by Saltwater reviewers conducting a more comprehensive census review. This was in part because there was a greater effort expended by census reviewers to group discard events by species instead of one event for all species in a haul. In comparison, the audit reviewers focused primarily on major discard events that occur within catch handling time intervals. Discarded finfish that could be tally counted were grouped together based on physical characteristics and consolidated into one discard event entry that included total counts. For a more complete description of the differences in review methods please see below. The total numbers of events in other categories were much closer in number, although Saltwater identified a larger number of partial release events and NMFS noted a larger number of operational discards, unknown, and other event types. The number of full releases identified by each reviewer was nearly identical, and suggests that this type of event is more easily documented by the EM systems. The more substantive differences in the number of operational discards detected by each review type (census recorded 139 while audit recorded 189) were likely driven by differences in the annotation protocol followed by EM reviewers. These differences were likely more pronounced because less emphasis was placed on aligning protocols for identifying operational discards between reviewers than for identifying partial and full release events.

Table 4: *The summary of events recorded by each review type across the entire project (all vessels combined) for the trips which dual reviews were generated. Each event category was given a priority listing of "High" or "Low" based on the project's objectives. Full release, partial release, and operational discards were identified at the haul level (totals represent essentially a sum of the number of hauls with a given event category), while other, unknown, and discarded after being brought onboard events were not summed at the haul level. Summarizing events at the haul level aided in matching and exploring discrepancies in event categorization. This table shows that there was close alignment for full release events. Alignment of partial release events was lower, as these events were often labeled as operational discards by one source. These events can be very similar in nature and difficult to distinguish from one another. Interestingly, when these event categories are summed together there is a higher level of alignment among review types (183 census and 220 for the audit).*

Discard Event Type	Review priority	Saltwater census total	NMFS audit total
Full Release (slippage)	High	15	16
Partial Release (slippage)	High	44	31
Operational Discards	High	139	189
Unknown	High	55	58
Other	Low	36	65
Discarded after being brought onboard	Low	613*	200

** Large difference in this type of event are the result of differing review methodologies (please see below).*

When the locations of discard events (a proxy for fishing activity) are compared (both between reviewers and between reviewers and NEFOP observers), it appears that there is considerable overlap in the spatial extent of the data collected (reviewer annotations tend to cluster in the same locations). Further comparisons to maps of the spatial extent of fishing in recent years[13] suggest the spatial patterns of discarding closely aligned with the distribution of fishing effort and discarding reported previously (Figure 9). This again suggests that the fishing behavior observed in the study is representative of the current fishery practices.

[13]https://www.google.com/url?q=http://s3.amazonaws.com/nefmc.org/6.160325-PDT-memo-on-localized-depletion.pdf&sa=D&ust=1516848260876000&usg=AFQjCNEJ3mns8CKl57WLR-t-PBfjpRCrCQ

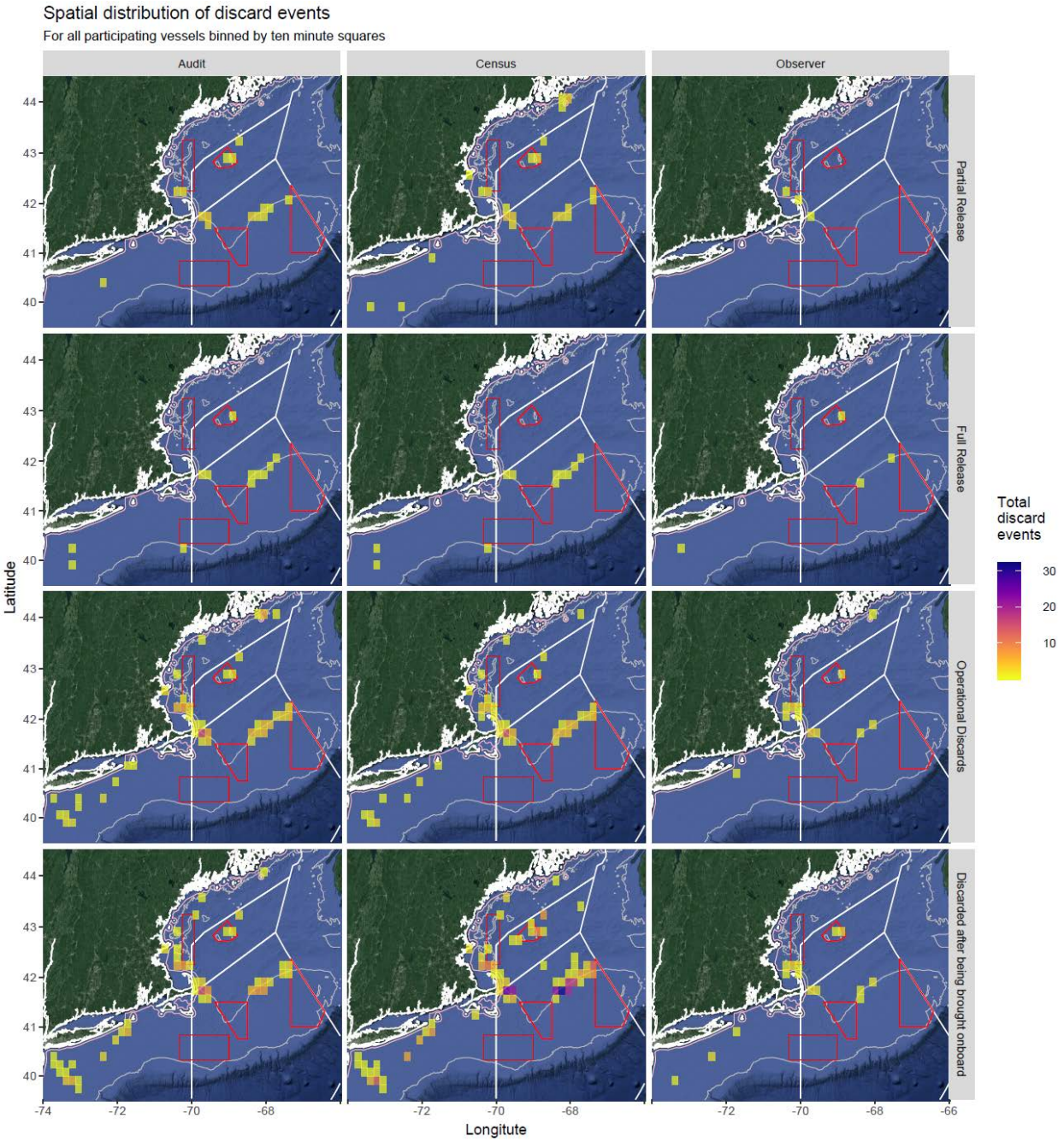

Figure 9: *The spatial distribution of events recorded by each review type across the entire project (all vessels combined) for trips with dual reviews. Heat map values represent the total number of discard events identified in each ten minute square by each reviewer. Closed areas are shown in red for reference. Borders of the current herring Management Areas are shown in white. The 50 fathom depth line is shown in light grey. Additionally, the three-nautical-mile limit is shown in pink. Two events categories (Other and Unknown) are not shown but reflect similar spatial patterns. Census and audit panels represent data from the full study while observer data represents data from the 25% study trips that carried observers (i.e., trips included in the analysis that also carried observers).*

When discard event counts are broken down by vessel (Figure 10), the largest discrepancies in categorizing discard events are again in the numbers of discarded after being brought onboard events (not shown in Figure 10) and in operational discard events. We see a relatively similar distributions of event types across vessels (full releases are uncommon while partial releases and operational discards more common). Differences among vessels in the proportions of event types are likely due to a combination of factors including the number of cameras installed, camera position, and varying catch handling practices. Number of cameras installed and placement was largely determined by study participants (Table 3), as was the decision to be fitted with booms to improve pump camera angles. Additionally, a few vessels utilized a triplex roller as part of their operations. A triplex roller is a multiple power hauling system where

the net is hauled by means of a synchronized triple roller net winch system. Use of the triplex roller allows the vessel to manipulate the net in a way that forces the fish into the cod end of the net and allows the vessel to pump more fish out of the net than if a triplex is not used. The use of the triplex may have led to differences in the way audit and census reviewers interpreted catch events. This is because vessels using a triplex should be able to pump more of the fish in the net in comparison to vessels not utilizing a triplex, meaning what would be considered an operational release on a boat without a triplex could be considered a partial release on a triplex vessel.

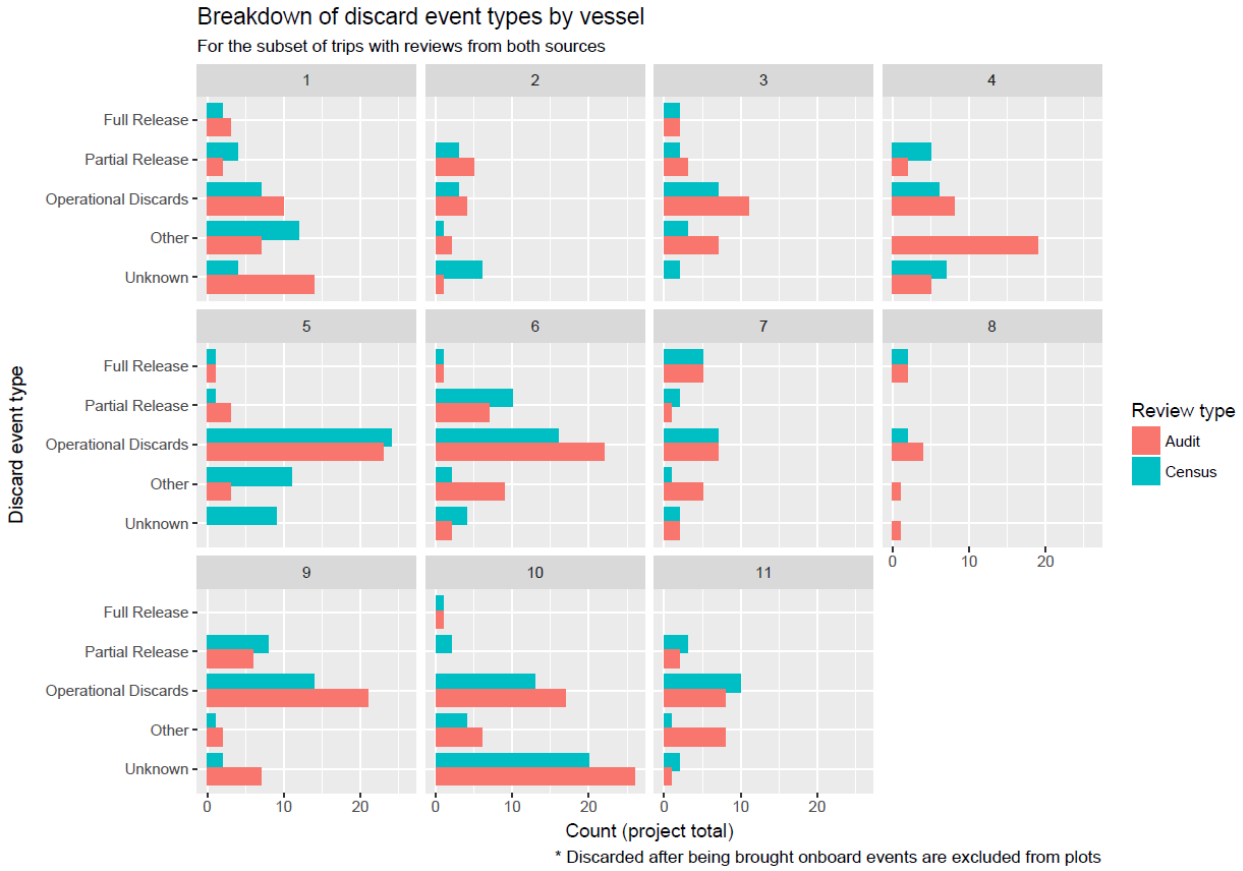

***Figure 10**: The total count of each discard type is shown for each vessel participating in the study. Colors indicate the source and type of of each discard event (whether it is from Saltwater [census] or from NMFS [audit]). The break down of events by vessel suggested that there was variation among vessels in the frequency of different event types.*

Generally, the total number of discard events increased with the number of hauls completed by a vessel (Figure 11). This was mostly driven by the most common event categories; the discarded after being brought on board and operational discard categories. This pattern of reviewers identifying larger numbers of events on trips with larger numbers of hauls (i.e., more fishing effort) is important to note when considering selection of video review rates for an operational program. Additionally, the higher number of event records created by the census review versus the audit review was correlated with the increased amount of time they spent reviewing EM footage (see the description of review methods below).

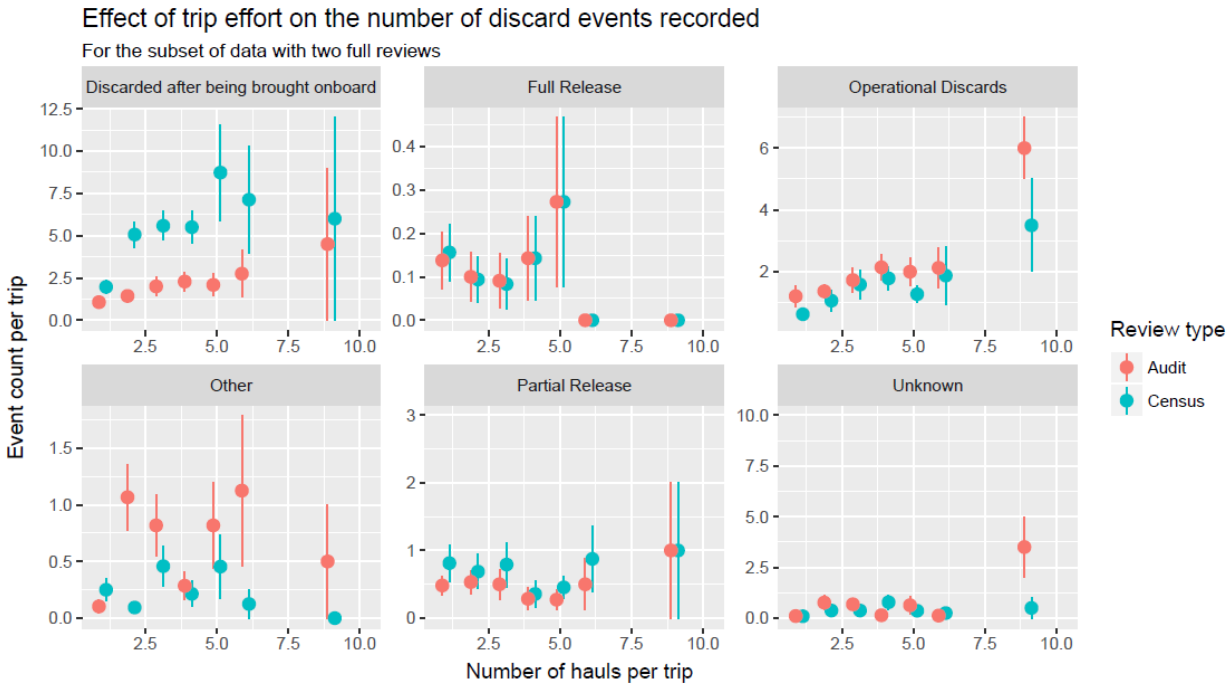

***Figure 11**: An estimate of the trip-level mean count of each discard type is shown for trips with varying levels of fishing effort (represented by number of hauls). The total number of discard events increased with the number of hauls on a trip for a subset of the event categories. This was most apparent in the common event types - operational discards and discarded after being brought on board. For the full release and partial release categories there was no clear relationship between the number of hauls on a trip and the number of events. Colors indicate the type of review (whether from a census review conducted by Saltwater or an audit review by NMFS). Points represent mean numbers of events per trip. Error bars shown represent standard errors.*

Comparison of Review Time

Data Review Sampling Design

For this project, each EM system was set to record video continuously after the first sensor indicated that fishing was taking place. Recording continued until the vessel arrived back in port to offload fish. This ensured that any discards would be detected, even those that might occur outside of a fishing event (i.e. on the steam back to port). All of the trip data was reviewed by Saltwater and an audit was performed on all trips by a NMFS reviewer. The secondary review performed through the audit assisted with the development of video annotation standards, protocols for categorizing events, and incorporated quality control measures.

Census Review

To ensure all possible discard events were documented, Saltwater reviewers were required to review 100% of the EM data (sensor and video) collected for each trip, including the time between fishing events and the steam back to port. The Saltwater reviewer also checked the EM system logs for system performance. The system performance check is completed as soon as possible after the data is received to identify any system performance issues, and hopefully resolve them prior to the vessel departing on a new trip. After the system performance check was completed, the reviewer then loaded the data into Saltwater's review software and reviewed the entire fishing trip. All of the collected video for each trip was reviewed, including all non-fishing video. Data quality was assessed, and all discard events were categorized and documented.

One of the project requirements was for the EM system to collect video continuously after the first indication of fishing activity, until the vessel returned to port. The reason for this requirement was to look for, and document, any instances where discarding occurred outside of fishing events.

Audit Review

To provide a second assessment of the video and sensor data, an audit of the trips was conducted by NMFS. This approach utilized sensor data, displayed in the EM review software, as a reviewer's method for locating sections of video that contained fishing activity. Video review was concentrated on periods when the gear was in motion (from the time the gear entered the water until the time when the gear was retrieved over the stern) and throughout all phases of catch handling. Playback speeds were increased between 8 times normal speed to 32 times normal speed during segments of video where the sensor data and GPS track suggested the vessel was not engaged in fishing activity. During audit trip review, abrupt changes in sensor output displays, such as, sensor dropouts or spikes, were also monitored to document potential system errors or gaps in video feeds that could result in lost fishing event data. If cameras malfunctioned for long periods of time, or if the system was not activated during a trip or shut down before the vessel had returned to port, VTRs and VMS records were researched to compare sail or land dates with the reviewer's estimated time entries and to verify possible data loss. In this manner, VMS and VTRs were used as resources in an effort to reduce review time. It must be noted that these resources were not used to directly influence a reviewer's evaluation of events that occurred while viewing fishing activity.

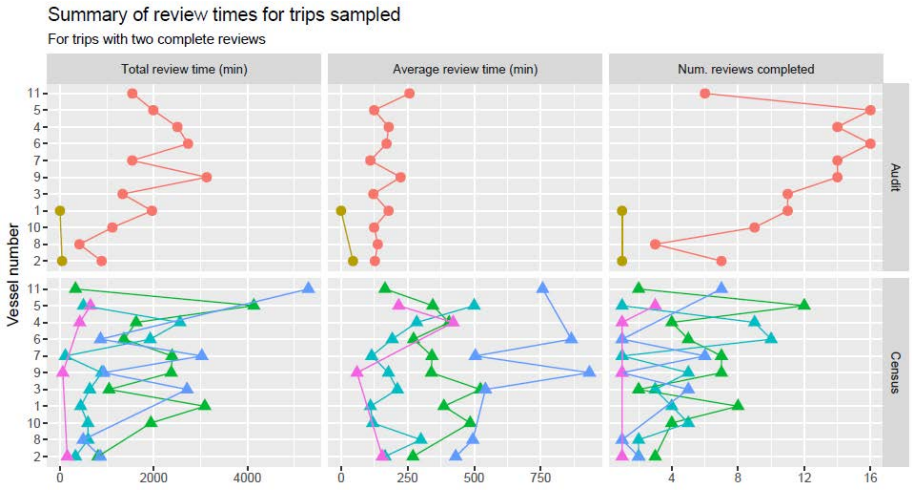

Figure 12: *Total review time, average review times, and the number of reviews for each vessel. Colors represent different reviewers and review types are shown in separate panels. Census reviews completed by Saltwater and audit reviews were complete by NMFS.*

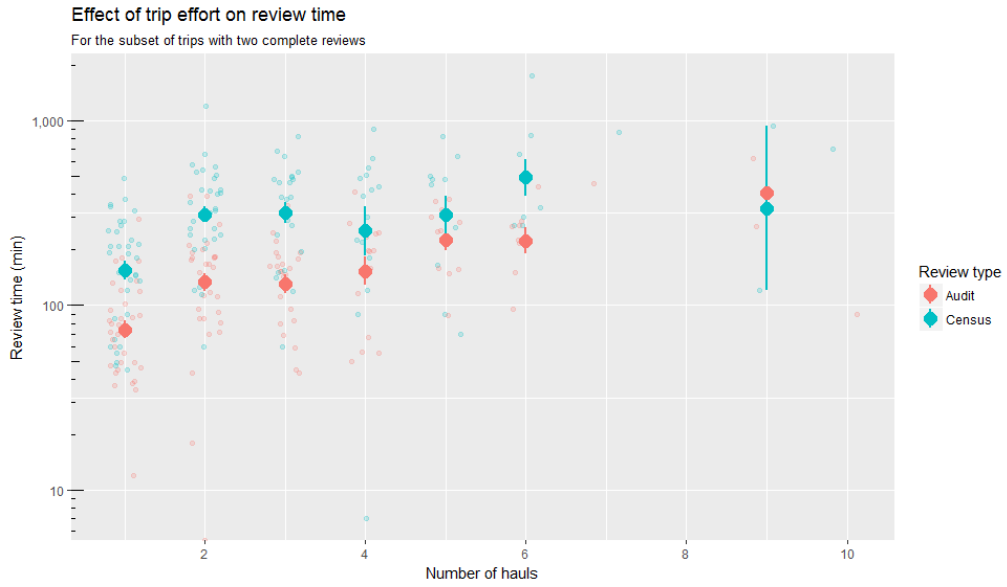

Figure 13: *The total review time for census and audit reviewers is shown for trips consisting of different numbers of hauls. Mean review times are shown as points with error bars representing standard errors. Please note the y axis (review time) is on a log scale.*

For the subset of trips where comparisons could be conducted (the dual reviews), reviewers for Saltwater conducted ~720 hrs of census review while NMFS conducted approximately ~320 hours of video audit review. Average review time for the census reviewers was 5.7 hours per trip while the average for the audit reviewers was 2.6 hours. This suggests that the audit approach to video review required about half the time of the census approach. Average review times for census approach varied among reviewers and across vessels (Figure 12). This could, in part, be driven by the sample of trips drawn by individuals, as reviewers did not review the same trips. The mean review time for the audit approach did not exhibit as much variability across vessels, with the average review time for most vessels being somewhere between 120 and 240 minutes. Some correlation was noted in average review time across review types (i.e., vessels 2 & 8 had relatively short times for both methods, and vessel 11 & 9 had long review times for both methods). This suggests that factors like fishing practices and catch processing behavior may have an impact on the time it takes a reviewer to process a trip. Preliminary analysis was conducted to determine if the number of cameras or camera placement had a direct correlation with review time, however, the information was not conclusive. On any given trip there are a number of factors (time of day, weather, vessel set up, fishing practices, reviewer experience, etc.) that can impact review time and distinguishing which of these factors has a direct impact on review time is difficult.

Explorations of the review time data also suggested that review times did not vary through the course of the study (the time a review took was fairly constant). Instead, the amount of fishing effort recorded on a trip was positively related to the mean total review time (Figure 13). This positive relationship was more pronounced in the census method but seemed to reach an asymptote near three hauls (at ~360 minutes or six hours). For the audit review the mean total review time increased almost linearly with effort (at ~60 min/ haul). There were relatively few trips in the data set with greater than 6 hauls, so it is somewhat unclear what review times might be for trips with greater than normal effort.

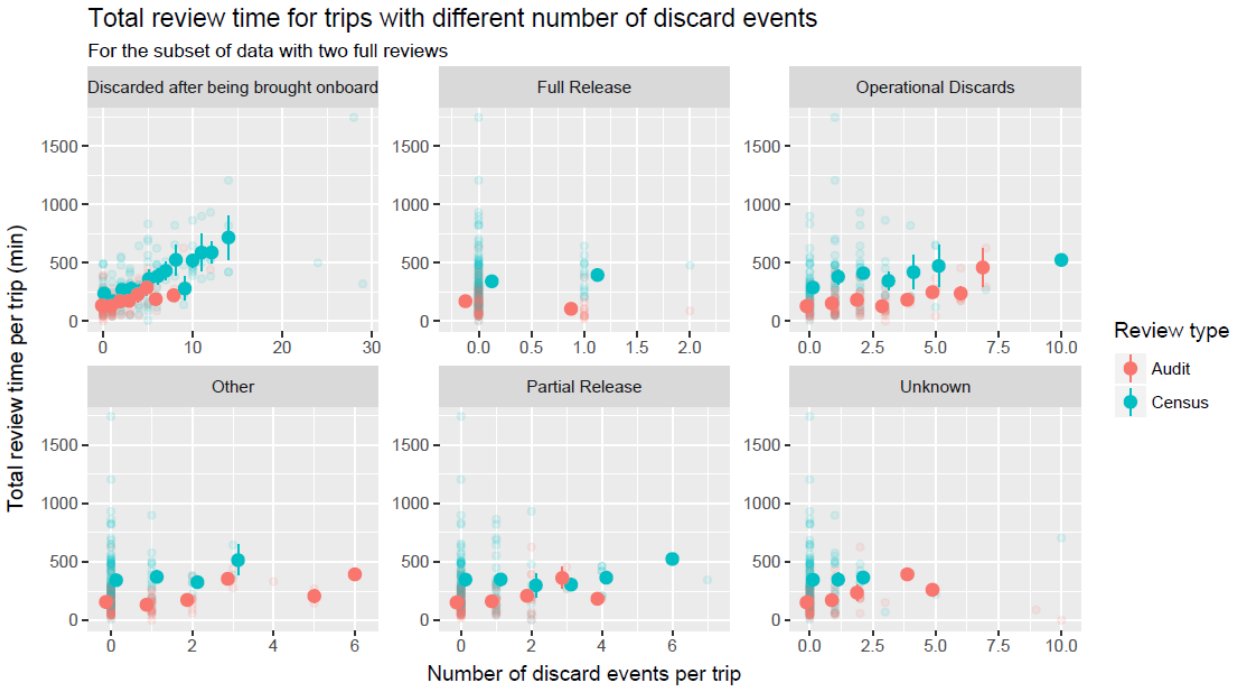

Figure 14: *The total review time (per trip) for audit (in red) and census (in blue) is shown for trips with different numbers of discard events. Opaque points represent mean values and bars represent standard errors. Slightly transparent points represent the raw data and are shown to highlight outliers. Review times tended to increase with an increasing number of events. This is most evident for the category of discarded after being brought onboard and operational discards.*

The pattern we observed of increased total review times with increased effort is likely a direct result of an increased number of discard events on trips with a larger number of hauls (fishing effort). This can be seen in the data as there was a notable increase in total review time for trips with higher numbers across most event types (Figure 14). This was especially true for the discard after being brought onboard events, which often require reviewers to count individual fish being discarded from the vessel's dewatering box and view the same portion of the trip from multiple camera perspectives. This can be time and energy intensive, as reviewers may view the footage repeatedly and may stop the footage to enter information for each event. A number of other factors also affected the total time to review including the time of day that the majority of fishing occurred and the weather that predominated. We were unable to test the effect of time of day and weather conditions, but they remain important avenues for future analyses.

One important factor driving differences in total review time between the audit and the census method was that the audit review focused on the sections of video where vessels were actively fishing. To explore how much of the total trip video this actually encompassed, we calculated the active fishing time for each trip as the summed fishing event time divided by the total trip length. We restricted this analysis to trips where active fishing occurred, as on trips with no active fishing there would be no need to review video footage. We found that in all cases, the amount of trip time that was considered active fishing effort was less than 50% of the total trip length (Figure 15). For most vessels the amount of active fishing time ranged from ~10% of the trip to ~40% of the trip with the mean being 23% of the total trip length.

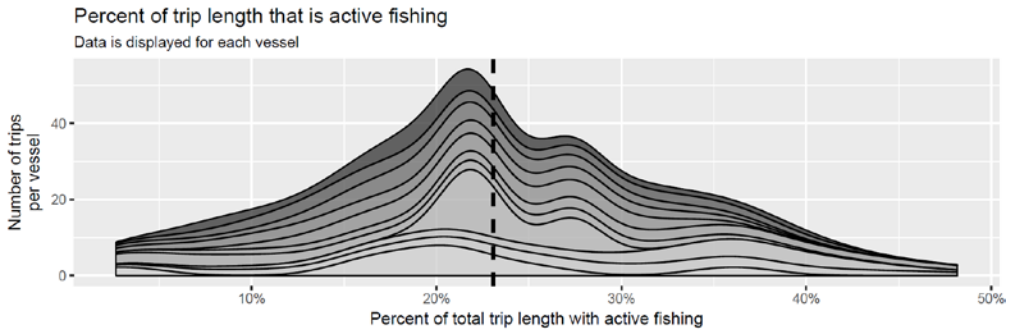

***Figure 15**: Estimates of the percent of total trip length that is active fishing time. A smoothed density estimate of the distribution is shown. Each horizontal band represents a vessel from the study. The mean value is shown as a dashed line.*

Comparison of Reviewer Annotations

Data Matching

To explore the level of agreement in discard event annotations (here annotations refer specifically to how discard events are classified by reviewers) we attempted to match events in each type of review (census and audit) and then compared the number of annotations that were matching to those that did not match. This analysis focused specifically on the event types that can be categorized as slippage (full releases and partial releases) as well as operational discards; the latter being the most difficult event type to differentiate from slippage.

In the raw data set, each event was recorded with a timestamp and a haul number. For some trips, timestamps for dual reviews were consistently offset (e.g., all of the census events occurred three hours before audit events - likely due to an incorrect time setting on the onboard computer that was resolved during the project), and the haul numbers assigned events were occasionally entered incorrectly by a reviewer (events were entered on hauls 2 & 3 by one reviewer and 3 & 4 by the other but timestamps were identical). Therefore, to ensure that these unexpected systematic differences in the timing of annotations did not cause large errors in our summaries of matching events, we first assigned events to a haul and then matched events based on the assigned haul numbers. Thus, when each reviewer had identified the same type of event on a haul, the events were deemed to be matching. This was most effective for the slippage comparison, as multiple partial release slippage events occured on a very small number of hauls (~4 out of ~40). For example, a vessel may experience gear damage and a clogged pump on the same haul which may result in two distinct partial release events. In rare cases where multiple partial release events occured on the same haul, annotations from each review type were matched by timestamp. In all cases, these events were further confirmed to be matching by plotting them, visually inspecting the plots, and reviewing the notes included for each event.

For operational discards a similar approach was followed by assigning the event to a haul and matching it to the alternate data set based on a combination of haul number and timestamp. When dual reviews differed in their annotations (e.g. one had noted a partial release and the other did not record that type of event), an effort was made to match the event with the designation assigned by the alternate reviewer. Using these dual annotations, we then summed the number events designations that agreed and those that did not agree. Hauls where neither reviewer had identified a slippage event are referred to as 'Agree no slip'. Hauls where both reviewers identified a slippage event are referred to as 'Agree slip'. When reviewers disagreed in their annotations, we refer to them as 'Disagree' and the mismatching pair of events is given. Similar designations are used for operational discards with 'op disc' replacing 'slip' (e.g., 'Agree op disc' for reviewers agreed operational discards had occured). Using these dual annotations, reviewer agreement was explored at the level of the vessel and the project (all vessels together).

Reviewer Annotation Comparison Results

At the project level, the majority of haul event designations agreed. Most of these events fell into the category of 'Agree no slip' where neither reviewer had observed an event that counts as slippage (~300 hauls). Reviewers also agreed that slippage events had occurred 41 times (26 partial releases and 15 full releases). These 'Agree slip' incidents were the second largest total when summed across vessels (Figure 16). For the subset of the slippage events that were full releases there was a high level of agreement among reviewers, with reviewers agreeing on the full release categorization on 15 of the 16 total events (94%). The disagreements included one case when one reviewer marked a full release as an unknown. Notes provided with the annotations suggested reviewers observed similar events but categorized them differently.

The type of events most commonly included in the category of 'Disagree' were those that typically consisted of one reviewer identifying a partial release while the other reviewer reported an operational discard (17 events). In practice, the difference between categorizing discards at the end of the haul as a partial release or operational discard often comes down to whether the reviewer believed there were not enough fish to pump left in the net (operational discard) or if the vessel could have continued to pump more of the fish before discarding (partial release). This situation can lead to tough decisions for reviewers as to how relatively small numbers of discarded fish can be classified, and increases the chance for disagreement between reviewers. When an observer is on board in these situations, the observer is able to ask better questions of the captain and crew to identify a reason for a release event. EM

reviewers are unable to do this and it is possible this contributed to the number of discrepancies we observed. The next most common type of disagreement was when a partial release was identified by one reviewer while the other did not report an event (five events), followed by cases where a partial release was noted by one reviewer and an unknown event by the other (four cases). These last two types of disagreement are likely due to the definition of partial release including fish that inadvertently fall into the water when a vessel disconnects the pump (to clear a clog, etc.) prior to the completion of the pumping process. This type of partial release is often difficult to identify, because as few as one or two fish could slip out and may go undetected by a reviewer or observer. In addition, fish are sometimes seen in the water (e.g. prior to a pump stop event; after the pump has been re-connected to the net) and it is difficult to determine where they came from.

When data are summarized at the vessel level there is more variation in the degree to which the two reviews align. While most vessels exhibited patterns similar to the aggregated data, there was notable variation among vessels (Figure 16). Specifically, some vessels had relatively few events of disagreement, whereas others had disagreement that was almost as common as agreement.

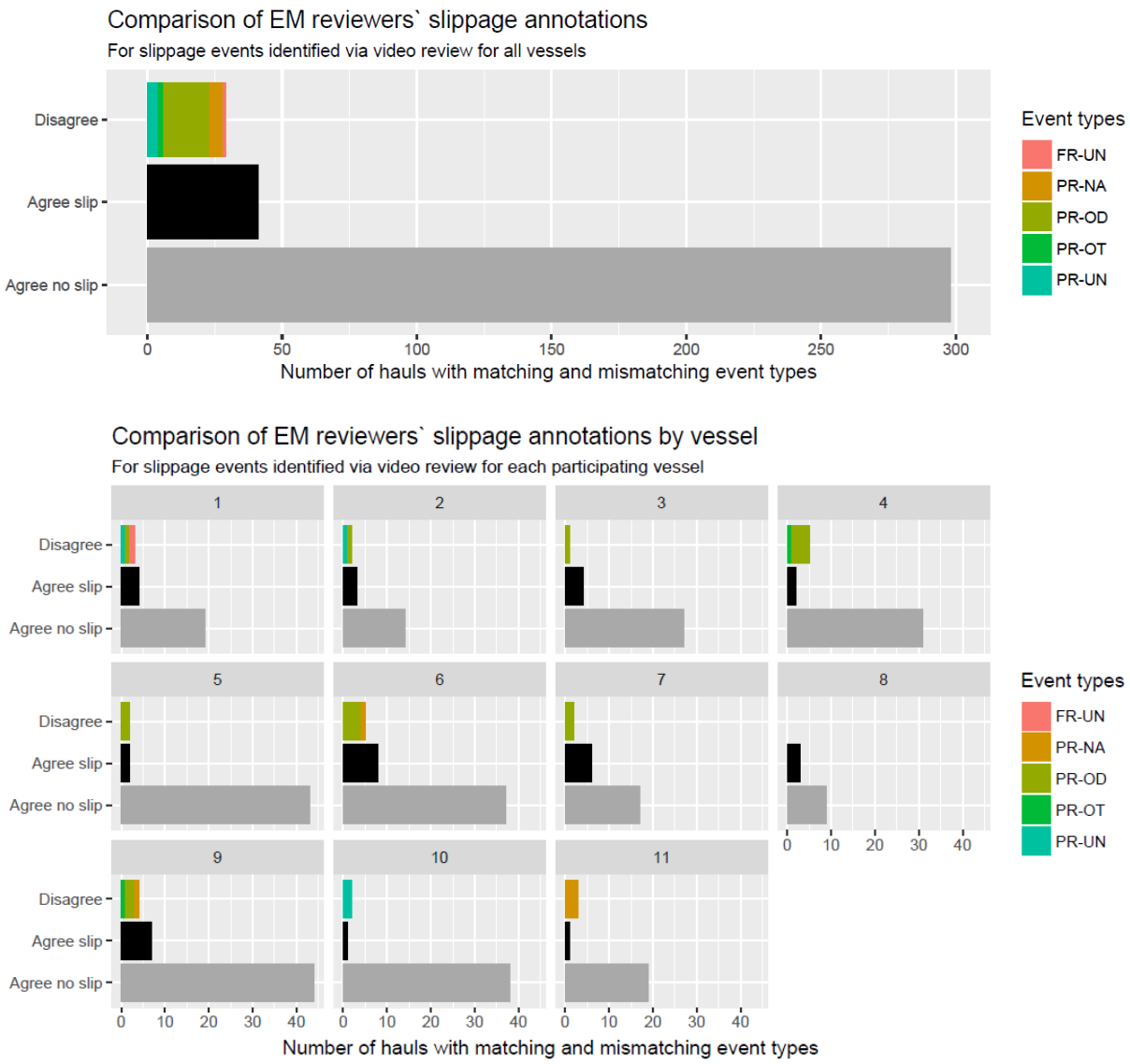

Figure 16 & 17: *Agreement for dual reviewer annotations. Counts of matching annotations for full release and partial release events (slippage events) are shown in black. Counts of matching no slippage incidents are shown in grey. Cases where only a single reviewer noted a full or partial release are shown with the remaining colors. The nature of these discrepancies are shown by the text in the figure legend. Specifically, the paired capitalized letters represent the designation by each reviewer with 'FR' indicating a full release, 'PR' indicating a partial release, 'NA' indicating no event noted by the alternate reviewer, 'OD' indicating operational discards noted by the alternate reviewer, 'UN' indicating an unknown event was noted by the alternate reviewer, and 'OT' indicating that an event requiring*

more description was noted by the alternate reviewer. Generally, reviewers agreed on the classification of event types. There was especially high agreement for cases of full releases. Agreement for partial releases was lower, and these events were commonly confused with operational discards.

The level of disagreement on these vessels is potentially driven by a combination of factors including the number of cameras deployed on a vessel (numbers ranged from 3 to 1), aspects of fishing behavior (e.g., the frequency with which a vessel detaches its pump), and the time of day that fishing occurs.

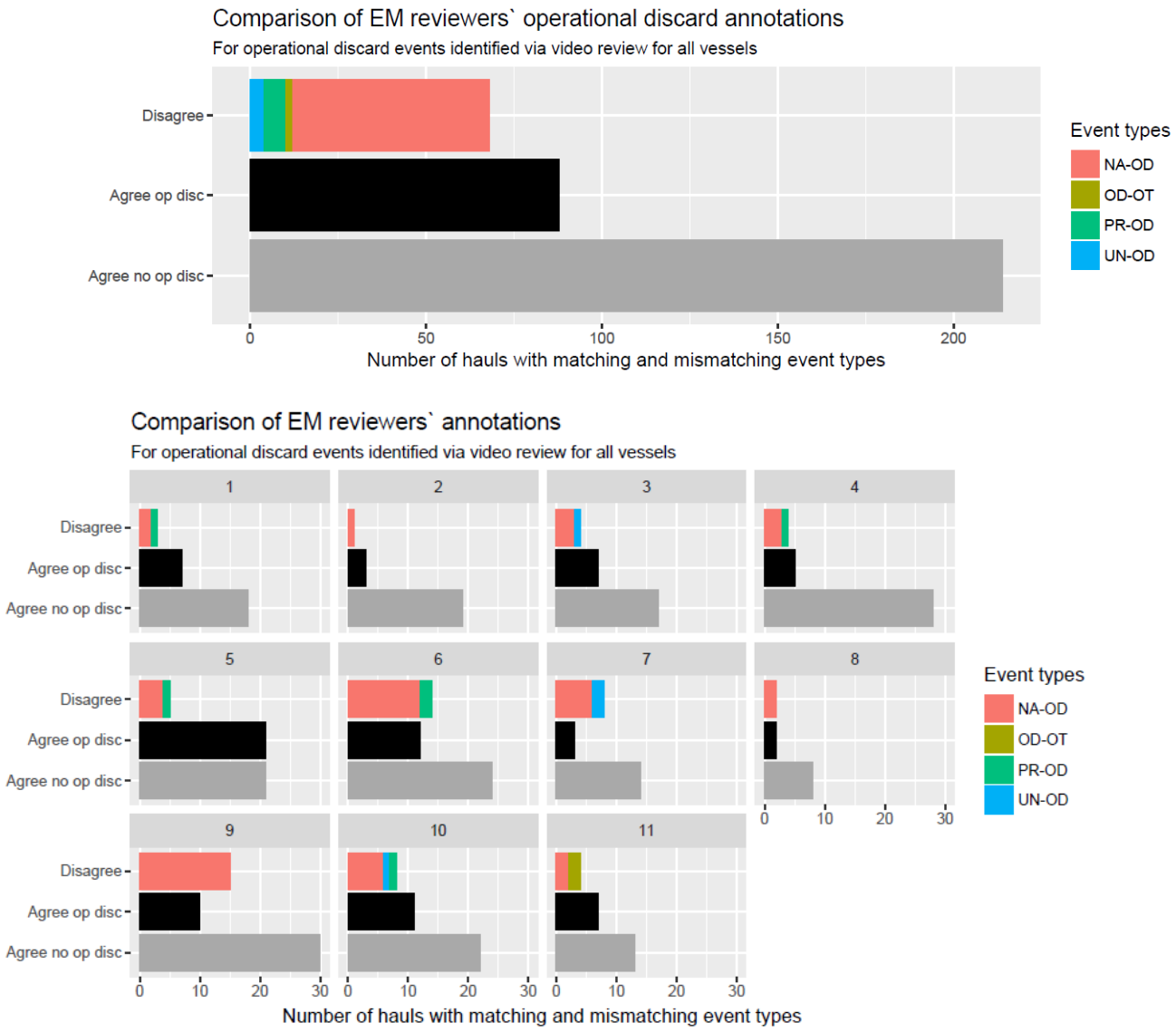

Figure 18 & 19: *Agreement for dual reviewer annotations. Counts of matching annotations for operational discards are shown in black. Counts of matching no operational discard incidents are shown in grey. Cases where only a single reviewer noted operational discards are shown in with the remaining colors. The nature of these discrepancies are shown by the text in the figure legend. Specifically, the paired capitalized letters represent the designation by each reviewer with 'FR' indicating a full release, 'PR' indicating a partial release, 'NA' indicating no event noted by the alternate reviewer, 'OD' indicating operational discards noted by the alternated reviewer, 'UN' indicating an unknown event was noted by the alternate reviewer, and 'OT' indicating that an event requiring more description was noted by the alternate reviewer.*

It was outside the scope of our project to thoroughly investigate the drivers of these differences in agreement, but the experience of the reviewing staff can help to identify factors that are likely to contribute to higher levels of disagreement on some vessels. Therefore, while we can suggest a number of these factors that reviewers reported as important and likely impacted the degree of agreement, we can't provide a ranking of their importance.

Patterns of agreement for operational discard events were quite similar with the category of 'Agree no op disc' making up the majority of events and the 'Agree op disc' making up the next largest category (Figure 18). For hauls where reviewers annotations indicate a disagreement, the most common type of disagreement was NA-OD, where one reviewer recorded an operational discard event and the other did not note an event. This made up the vast majority of 'Disagree' events, with other categories each represented by less than 5 events. Together these results suggest that reviewers using both audit and census methods agree on the vast majority of operational discard event designations, and that disagreement was mostly driven by the omission of the event type by one of the two reviewers. Breaking these data down by vessel (Figure 19), we again see a more nuanced pattern where certain vessels have very high levels of agreement (i.e., vessels 2, 3, 4, & 8) while others have more moderate levels of agreement (i.e., vessels 6 & 9). Some of these are the same vessels (e.g., vessels 2 & 8) that also had high levels of agreement in the slippage data suggesting again that vessel specific considerations such as fishing behavior and camera placements may impact the ability of EM systems to reliably detect discard events. These types of considerations should be included when developing vessel management plans for vessels choosing EM as their monitoring option.

Comparison to NEFOP Data

For the subset of trips which carried a NEFOP observer (n = 32), a similar comparison was conducted but including the event designations recorded by the human observer. At a high level, EM data review and the data collected by NEFOP observers aligned well. For example, if we focus on a comparison of the EM data from the census reviewer and the NEFOP observer we see high levels of agreement in detecting full release events (Table 5). Specifically, in all four cases where one of the sources (either EM reviewer or observer) identified a full release event, the other source detected this event (the release of fish) every time. In three out of four of these four events, both sources categorized the release events as full releases (one event was designated 'unknown' by the EM reviewer, but comments accurately characterize the event). In addition, of the ten hauls where either data source categorized a release event as a partial release, the census EM reviewer detected a release of fish on all of these occasions and correctly categorized the releases in all but one case (on one haul the census EM reviewer categorized an event as an operational discard). Together these results suggest that EM can detect and likely categorize release events important for monitoring catch retention. Interestingly, for potential partial release events the NEFOP observers seemed to detect and categorize a lower percentage of these events (although the sample size here is small), and again was better able to detect release events than to categorize them.

Table 5: *The number of release events detected and categorized by each data source that could be classified as slippage. Data from the census EM review and NEFOP data are shown. This data is for the subset of trips where a NEFOP observer was aboard (32 trips). These same events are broken down in greater detail in Table 6 with additional information from the audit reviewer.*

Event type	Census EM	Observer	Total no. of events
Full Release (detected)	4 (100%)	4 (100%)	4
Full Release (categorized)	3 (75%)	4 (100%)	4
Partial Release (detected)	10 (100%)	8 (80%)	10
Partial Release (categorized)	9 (90%)	4 (40%)	10

Taking a more nuanced view and incorporating data from both EM reviews we again see that data sources are all capable of detecting releases, but that for some events they differed on how the events were categorized. Again, for evaluating agreement we focused on hauls where a reviewer or an observer had identified slippage, and, in cases of disagreement, we note the event designation used by alternate data sources. For 87 of the 97 comparisons all three sources agreed (82 where all agreed no slippage, five where all agreed slippage had occurred, and 10 where at least one source disagreed). For four of the 10 events where at least one source disagreed, both EM reviewers agreed (EM reviewers agreed an event was a partial release or an operational discard event). For the remaining six events the observer agreed with the NMFS reviewer four times, with the saltwater reviewer once, and all three sources disagreed once.

Table 6: *A detailed breakdown of the the level of agreement among EM reviewers as well as NEFOP observers. Data represents event categorizations for slippage events on the 32 trips that carried observers and where two video reviews were available. Specifically, the*

capitalized letters represent the designation by each reviewer with 'FR' indicating a full release, 'PR' indicating a partial release, 'NA' indicating no event noted by an alternate reviewer, 'DA' indicating discarded after being brought onboard, 'OD' indicating operational discards noted by an alternated reviewer, and 'UN' indicating an unknown event was noted by an alternate reviewer. Events in the left most position belong to Saltwater Inc. reviewers, middle events belong to NMFS reviewers, and the rightmost events belong to the NEFOP observer. The number of times that each event type occurred is shown in the rightmost column.

Agreement?	Who agrees?	Coding	Census event	Audit event	Observer event	Event sum
All agree no slip	All	NA-NA-NA	NA	NA	NA	82
All agree slip	All	FR-FR-FR	FR	FR	FR	3
All agree slip	All	PR-PR-PR	PR	PR	PR	2
Two agree slip	EM reviewers	PR-PR-NA	PR	PR	NA	2
Two agree slip	EM reviewers	PR-PR-DA	PR	PR	DA	1
Two agree no slip	EM reviewers	OD-OD-PR	OD	OD	PR	1
Two agree no slip	Audit EM reviewer & Observer	PR-OD-OD	PR	OD	OD	2
Two agree no slip	Audit EM reviewer & Observer	PR-UN-UN	PR	UN	UN	1
Two agree slip	Audit EM reviewer & Observer	UN-FR-FR	UN	FR	FR	1
Two agree slip	Census EM reviewer & Observer	PR-OD-PR	PR	OD	PR	1
All Disagree	None	OD-PR-UN	OD	PR	UN	1

Because the slippage events designated by Saltwaters' census review were reviewed by the full project team we have high confidence in event characterizations in that data set. By comparing the audit EM reviewer's annotations to the group reviewed annotations, as well as the observer's, we can make some statement about the quality of the EM reviews. Using this framework it would seem that that the EM reviewers were able to identify at least as many slippage events as observers. Specifically, there are five events where the audit EM reviewer and the census EM reviewer agree with one another but not with the observer, and only one event where the observer and census EM reviewer agree with one another but not with the audit EM reviewer. It is, however, important to note that this is a relatively small sample size of events, and that EM reviewers are reviewing identical footage so we might expect a higher level of agreement between them. Another point of comparison comes from the project team reviews of the slippage events identified by Saltwater. In these sessions all slippage events identified by the census review (Saltwater) were reviewed and the original annotation were deemed incorrect by the project team in a small number of cases (~10%). Together these lines of evidence suggest that the use of EM data instead of observer data could lead to a similar number of designated slippage events, and that EM reviewers seem to have very few issues detecting full release (FR) events (only one putative full release [UN-FR-FR] event here represents a disagreement).

A closer review of the cases of disagreement highlights three key findings of this study: 1) that human observers have an ability to use their situational awareness and their access to the crew to collect some information that cameras cannot (especially the reasons specific decisions are made by the the captain and crew and catch discarded out of camera range). 2) cameras can be placed in locations that offer views unavailable to observers. 3) that often disagreement among EM reviewers did not come from their ability to detect events, but instead was a result of the way they categorized their observations.

The advantage human observers have in terms of being able to access the crew can be seen in a specific case of disagreement where the observer successfully documented a release during the observed trip and one EM reviewer did not. In this specific case, a partial release occurred underwater due to gear damage and the observer was able to determine this by talking to the captain. The observer also documented operational discards on the same partial release tow (matches both reviewer designations of operational discards).

There did appear to be cases where cameras were able to record things that observers could not because of safety considerations. For example, on one haul where both EM reviewers documented a partial release and the observer documented catch discarded after being brought onboard, the observer was unable to view the release due to safety concerns. The camera was better suited to capture the details of the event because the observer had to follow safety protocols and vacate the area where clogs were being removed from the pump mechanism. In another instance, the census reviewer documented an operational discard event, the audit reviewer noted a partial release, and observer marked the event as unknown. While all three disagreed here, the observer classified the event as unknown because he/she was unable to view the discarding event due to safety concerns and low light conditions. In this case, the area where the release was taking place was not safe for the observer because the series of clogs being removed from the pump necessitated the use of heavy equipment. Some areas are consistently hard for observers to cover like areas near the stern of the vessel and rail areas in rough weather. By providing views of these areas camera systems may help to enhance monitoring.

A common feature of the data set created by this project is that sets of events that were categorized differently among reviewers often contained a higher level of agreement in the comments describing the events than the category codes used to bin them. One example of this comes from the single disagreement that involved a full release. Here the full release was noted by the observer as all catch being released due to the loss of the vessel's net. This was also marked as a full release by the audit reviewer, but the census reviewer marked this as an unknown. In describing the event, the census reviewer clearly described the loss of the net in the comments associated with the haul, suggesting that this reviewer had observed the same event but categorized it differently due to not actually seeing fish being discarded. Another example of this is the case where the census EM reviewer and observer agreed on a partial release event but the audit reviewer labeled the discarded catch as operational discards. The observer noted the presence of a clog resulting in a small amount of released catch in addition to operational discards when the pump was disconnected. Similarly, both reviewers commented on fish in the water after the pump was removed, but one called the event a partial release and the other saw it as operational discards. This again suggests that all three entities observed the same event but that they differed in which category they thought was most appropriate. A further example of this includes an event where the audit reviewer and observer both classified discarded catch as unknown for one haul and the census reviewer classified the catch as a partial release. In this instance, the census reviewer reported catch being released when the catch was being brought onboard (potentially a tear). The audit reviewer also noted a release near the end of the haul of 'more than few thousand pounds' but marked the event as unknown. These again suggest that the fishing activity was captured by the video, but that there were differences in how they were captured by the reviewer.

A final illustrative example of the potential value of an EM system comes from inspecting another of these cases of disagreement between observers and EM systems. In this case, the census reviewer classified discarded catch on a haul where the observer and the audit reviewer classified the event as operational discards. The census reviewer noted the release after the observer recorded gear onboard and was off effort. As a requirement for this project, the EM system was configured to record continuously after engaging in fishing activity, until return to port. This requirement was to address concerns that the vessels may be discarding catch outside of hauls, when the observer may not be present on deck to witness the discard, or when an EM system set to record only during fishing activity may not be recording. During the project, the census reviewers watched all non-fishing video, allowing us to inspect the the data and describe the amount of discarding occurring outside of fishing events (a period from the time the codend touched the water until the time the gear is retrieved back on deck). Excluding discard events that immediately followed fishing events (were within ~30 minutes of the end of a fishing event) the census review documented approximately 20 instances of vessels discarding a small amount of catch. This behavior typically occurred after a haul and fishing activity was completed and were relatively rare events, occurring on roughly 5% of the total hauls. These events ranged in size from 1 to approximately 50 fish (mostly herring bodied fish, fish nk, or dogfish) being discarded out of the dewatering box or while cleaning the deck and net. There was one instance where the vessel discarded fish by pumping out of the fish hold in between hauls. The presence of these discard events leads us to propose that a catch retention camera, covering the entire deck, should be set to record the entirety of the fishing trip to capture these events.

Additional Data

Estimated Discard Weights

Although species identification and weight estimation of discarded catch was not a direct goal in this study, when possible, the audit reviewer sought to collect this information. To quantify the relative size of different types of discard events the audit reviewer (NMFS) visually estimated weights for all event types when vessel catch handling allowed the reviewer a clear line of sight to identify finfish (based on physical characteristics). There were 88 records categorized as discarded after being brought onboard and 109 operational

discard event records where the audit EM reviewer obtained a direct count of discarded fish to estimate a total weight (Figure 20). The audit reviewer visually estimated a weight for 2 out of 16 full releases and 13 out of 31 partial releases. Comparing these 4 event types, weights were estimated from ~32% of the combined full and partial releases records and ~50% of the combined events that were categorized as operational discards or catch the was discarded after being brought onboard. The audit reviewer was a former NEFOP observer and had directly observed in this fishery and was therefore utilizing his training and experience to determine visual estimated weights. This is similar to the methodology that an observer would use onboard the vessel to estimate and/or verify the captain's estimate of discard, however, in the case of EM, there is no opportunity for situational awareness or direct communication with the captain.

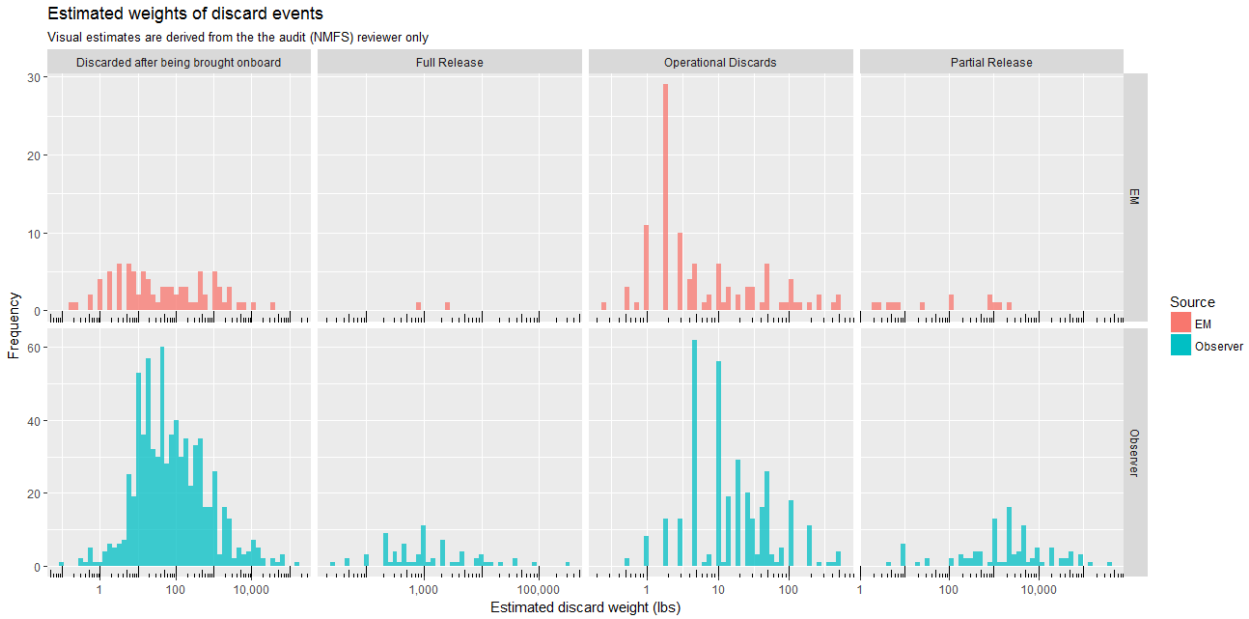

Figure 20: *The distribution of estimated weights (in lbs) associated with each type of discard event. Estimates were conducted by a single experienced reviewer from NMFS and only in cases when conditions favored estimation (shown in red). These include incidents where species were picked from the grate of a dewatering box, where catch was discard in bulk after being brought onboard, or release in the water in view of the cameras. For reference the distributions of weights associated with each type of discard event are show in blue. These values were estimated by NEFOP observers in coordination with vessel captains on trips between 2010 and 2017. Please note the x axis is on a log scale and the x axis extent varies among event types.*

This represents a subset of the events and was not compared to estimates of weights generated by an observer. Estimates were generated by the same reviewer in all cases to ensure a measure of consistency. Both of the weight estimates generated for full release events in this study were larger (1000s of lbs), whereas partial release events tended to be smaller (generally 10s to 100s of lbs). Operational discard events also tended to be smaller (10s of lbs). Somewhat surprisingly, events characterized as catch discarded after being brought onboard could on occasion be quite large (on par with full releases and the largest partial releases). This set of events spans a range of discard events. Including incidents where a large number of dogfish were picked off of the dewatering box grate and discarded by crew members. Or, situations where the catch overflowed equipment onto the deck and was washed overboard. Additionally, a vessel can also pump unwanted catch such that it flows onboard briefly then overboard. In doing so the vessel has technically made the catch available to the observer and thus avoided a slippage event. Taken together we believe this suggests that EM may be correctly categorizing the largest and most important discard events (i.e., full releases) as agreement among reviewers and between EM reviews and observer data was high for this this type of event.

Interactions with Protected Species and Individual Animals

The census reviewer also catalogued interactions with protected species and larger individual animals (designations derived from the NEFOP program). These annotations could be associated with haul events or sightings that were incidental. Generally, less of an emphasis was placed on identifying these events (compared to catch retention). There were also limited guidelines for how the species

of animals being identified should be recorded. Here we present this information to give a sense of the diversity of species that were encountered during the project.

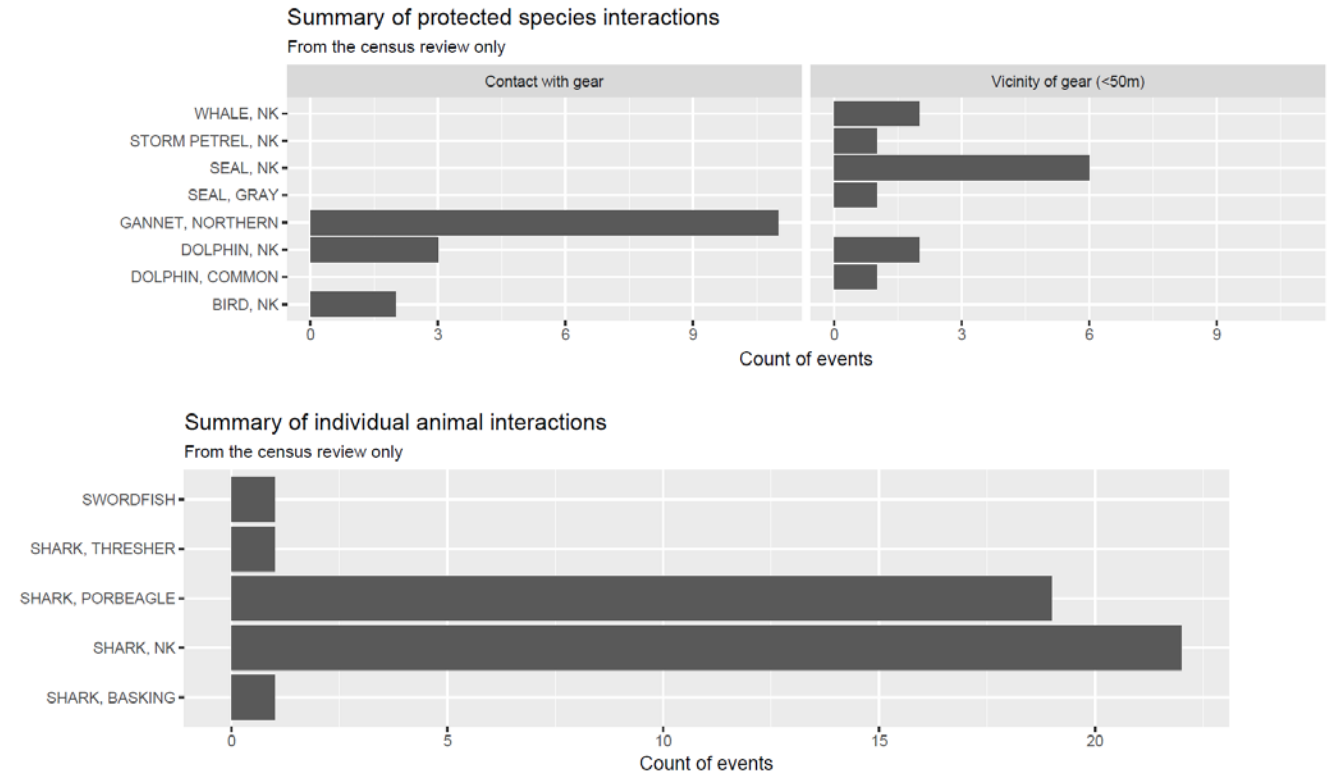

***Figure 21 & 22**: **21**) The breakdown of protected species interactions noted by reviewers for the set of trips with dual reviews. Total numbers of records recorded by the census reviewer.). **22**) The breakdown of individual animal interactions noted by reviewers for the set of trips with dual reviews. Total number of records recorded by the census reviewer.*

V. Cost Drivers

There are multiple cost drivers that impact the cost and long-term viability of operational EM programs. Cost drivers include the number of vessels participating and their locations, how much data needs to be reviewed and stored, and for how long. One of the objectives of this project was to identify the cost drivers that would impact implementation of an operational EM program in the midwater trawl herring/mackerel fishery. To that end, Saltwater tracked costs over the duration of the project (17 months) differentiating between one-time startup costs (SU) and ongoing (OG) program implementation costs. Actual costs are considered proprietary and, as such, are not being presented in this report. NEFOP and GARFO will use the information and discussion in this section to help refine its prior cost estimates for the NEFMC, vessel owners, and other stakeholders who are considering whether EM should be an option for monitoring the herring fishery. The information will also be used to inform future NEFOP projections. This report identifies multiple cost drivers, how they relate to monitoring objectives, and how they might impact long-term program costs. This information is provided to help inform future program design in a way that meets required monitoring objectives and optimizes the use of resources.

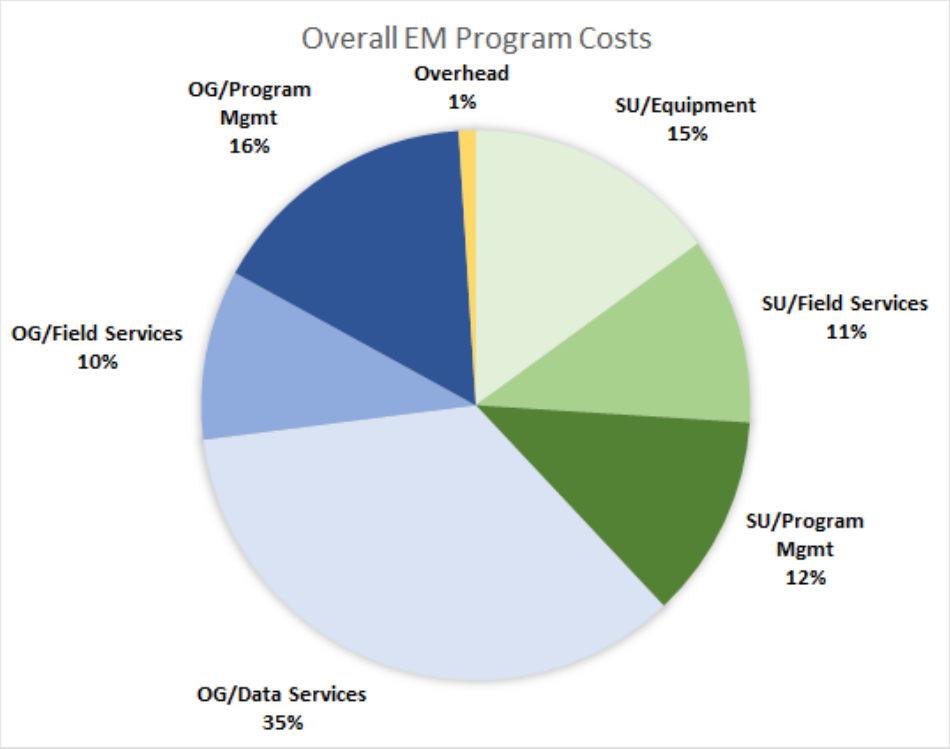

Figure 23: *Overall EM program costs broken down into startup costs (SU) and ongoing (OG) costs by category.*

Start-Up Costs

Equipment: EM system, procurement, shipping, handling, assembly, QC

One of the main start-up costs of any EM program is the cost of the equipment. How an EM system is setup is largely determined by the data collection requirements of a monitoring program and the size and configuration of the vessels to be monitored. The size and configuration of vessels determines the length of wire runs and mounting options, the number of cameras to be deployed, and whether additional supports (e.g., booms, swing arm mount, etc.) are required.

The vessels in the herring-mackerel fishery are relatively large (80'- 150'), and required long wire runs and typically three cameras. No major adaptations were required of Saltwater's standard EM system to meet the requirements of the program. On some vessels, power support such as an uninterruptible power supply (UPS) was required to ensure clean, consistent power to the EM system.

The lead time required to procure EM equipment and shipping costs can affect the cost of EM programs. All of the components of Saltwater's EM system are off-the-shelf and commercially available; the longest lead time for ordering is about 6 weeks. Saltwater maintains an inventory of supplies on the East Coast that allowed us to meet the project and boat schedules for equipment installation

in a timely manner without having to pay rush order or shipping charges. When booms were required, vessel operators helped identify local shops for fabrication or made them themselves. Saltwater's EM system met the technical requirements developed by NEFSC *(Appendix 8)*, and no adaptations were required. To meet particular data needs, Saltwater developed and tested new data acquisition software during the course of the project.[14]

Another variable that impacts the cost of EM equipment is the decision of whether to lease or purchase the systems. Under this contract, NMFS requested a lease for the duration of the project.[15] Leasing versus purchasing equipment could affect costs since most long-term leases end up costing more than a one-time purchase. If, however, industry were responsible for the cost of the equipment, a long-term lease could lower the initial start-up cost.

Field Services (Start Up): Installs, Outreach, Vessel Assessments, Operator Training & VMPs

Factors that can impact the cost of installs include outreach and scheduling, vessel and technician locations, technician recruiting and training, and the time required to carry out the work. From our experience, outreach and scheduling is considerably more time consuming in a voluntary EM program. When EM is either mandatory or an approved alternative to observer coverage, vessels operators are motivated to make sure they schedule the installs in a timely manner. In a voluntary program, recruiting and scheduling can be quite time consuming.

The location of vessels and the location and availability of skilled EM technicians also affects installation costs. Prior to starting the project, Saltwater had one experienced EM Tech/Data Reviewer based in New England. For this project, we recruited and trained an additional EM Tech, who was also cross-trained to carry out data review in our Massachusetts office. Initial technician training is done in the office, but much of the training is hands on with the trainee working in partnership with an experienced EM Tech. This likely increased the time required to complete some of the installs, but resulted in two fully trained local techs available to provide ongoing support for the duration of the project. Because they were both locally based, travel costs were minimized.

Employing techs as part of Saltwater's EM team ensures they are available when needed, and this work is their first priority. They also develop an understanding of project goals, a commitment to customer service, and intimate knowledge of our system. In our experience, this is not the case when working with local marine technicians. They typically have many regular, repeat customers who have priority, and many also have limited experience working with EM technology. The exception to this has been in locations where Saltwater has a large number of boats carrying our EM system. In those instances, local marine technicians have been able to provide timely, quality service.

When it comes to the installation of EM systems, Saltwater has learned over time that every EM system install is a custom job. While many aspects of the job are consistent (e.g. what components need to be installed, how they are configured), the decision of where and how they are installed depends on the vessel's size, fishing practices, and set up. Having clear guidance from NMFS about data collection needs is critical to successful equipment installs Saltwater technicians worked closely with NMFS staff and vessel personnel during each install. The technicians also completed a VMP on each vessel that documented EM system overview, operator responsibilities, catch handling practices/locations, install configurations, camera views, and program contacts.

When a vessel owner or operator is available during an install, it can reduce the time it takes to complete the install. Saltwater typically requires a vessel operator's presence during an install to help determine where system components should be installed, and so vessel operators can receive training on the program objectives and the operation and care of the EM system.

Program Management (Start Up): Project planning, data fields, protocols, recruiting, training and office equipment

At contract award, Saltwater already had a small, local office in Gloucester, MA with an experienced Project Manager and EM Technician on staff. We were able to easily expand the office space and recruit additional EM Techs and Data Reviewers. One recruitment and retention strategy that we believe has a significant impact on both costs and quality of service is to recruit EM staff

[14] Saltwater tested new software that uses geofencing to trigger video recording. This can limit recording so it is only triggered when vessels are in regulated areas, which can reduce the amount of data collected, which can impact costs related to data storage and review.

[15] Saltwater agreed to transfer the EM systems to the participating vessel owners for a nominal fee at the end of the project, if they were interested. Otherwise, the systems were/will be uninstalled.

from the pool of experienced at-sea observers and/or portside monitors. Observers come with a demonstrated understanding and appreciation of data quality, integrity and confidentiality, and experience working directly in the fishing industry. For this project and others we found no shortage of qualified applicants for EM Tech or Data Reviewer positions, and had excellent retention rates (which saves on repeat training costs). We also cross-trained our EM Techs in data review, which aids data quality, keeps the job more interesting, and makes the best, most efficient use of our human resources.

A significant start-up cost for this program and many EM programs is the time required to determine review protocols and decide on the data fields to be incorporated into a database. In an operational EM program, it is important to ensure all of the data collected by the EM system can be compared to, and potentially integrated with, existing observer and portside monitor data streams. The development of the review protocol and templates took quite a bit of time, but most of the associated cost involved is a one-time startup cost. Because the template for review protocol had to be identical for all trips, changes made to the protocol after the project was underway meant that some data had to be re-reviewed, which increased ongoing costs.

Saltwater's data review software is template driven, so changes to the data fields required additional time to both create and adjust the template to capture the required data for this fishery. Saltwater does not charge software licensing fees, which can be a significant ongoing cost in other EM programs.

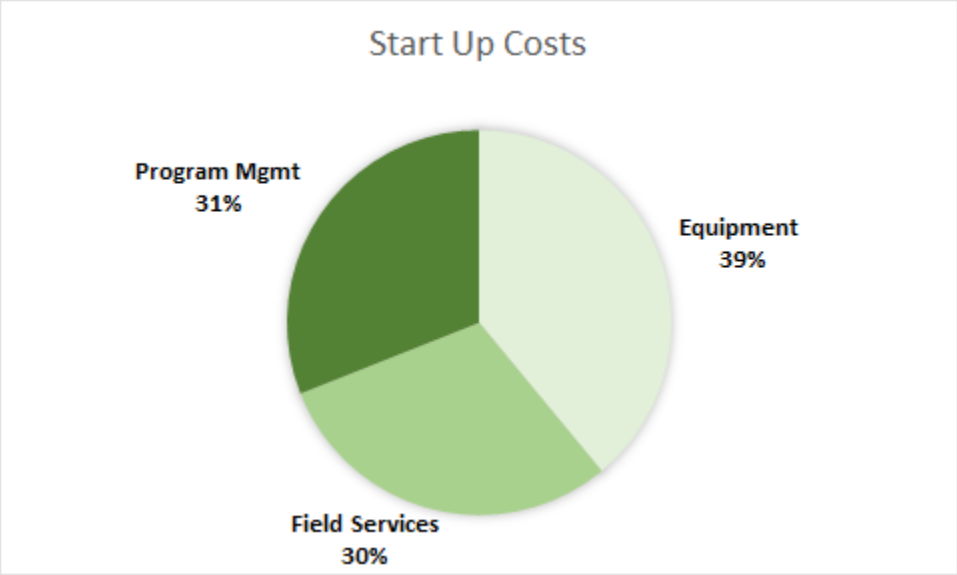

Figure 24: *EM Project Startup costs broken down into categories: Program Management, Equipment and Field Services.*

Ongoing Costs

Once a system has been installed, ongoing equipment costs are for maintenance and replacement of systems. Our experience is that the components of an EM system vary in their lifespan. The most expensive component, the control box, is estimated to have at least a 5 year lifespan. Because the project was so short (12 months of system deployment), equipment maintenance did not represent a significant cost driver. Maintenance costs were minimized due to Saltwater's local supply of critical components. Over time, equipment maintenance and parts replacement costs will increase. However, in our experience the associated labor costs are more significant (approximately 4:1) than the cost of equipment and supplies.

Field Services/Technical Support: Remote and field tech support, travel costs associated with tech support, replacement equipment and supplies.

When having a fully functioning EM system is a requirement, field services are a significant cost driver in a long-term program. Saltwater has worked in multiple EM programs that have challenged us to find the most efficient way to provide cost-effective technical support. Our experience ranges from providing over 4 years of support to over 100 vessels fishing up and down the Atlantic Coast in the HMS pelagic longline fishery, to serving small boats fishing in Alaska in remote ports that are not connected to the road system and are only accessible by boat or plane.

A key component to efficient field services is an emphasis on remote support and encouraging vessel operators to become involved in the care and operation of the EM system on their boat. Ideally, this starts with instructing the operator and engineer from each vessel on EM system usage during the install, and providing an illustrated reference guide to the EM system. A second piece is a strong system of remote support including an established 800 call-in number, which is answered by trained technical staff who are able to troubleshoot problems with vessel operators. Technical staff who understand the boats and the EM equipment can help solve many problems without travelling to the port. Finally, timely system performance checks and data review allow problems that affect data quality to be identified and resolved early. Under this contract Saltwater was responsible for the data review which created a very tight feedback loop between the data and tech support. Problems which affected data quality, like a camera out of focus, could be identified and resolved in a timely manner.

Another set of costs that are often included under *Field Services*--and can be a significant cost driver-- are those related to data retrieval. In many programs, HDDs are retrieved in person from vessels by the EM service provider. This can be a significant cost, especially if data needs to be submitted after every trip. For this project, vessel operators were asked to mail all of their hard drives of data (HDDs) to Saltwater's Massachusetts office where the data was copied and archived. Vessel operators were supplied with extra HDDs, protective boxes, and pre-paid USPS flat rate mailers. Data was submitted after every trip. Due to the short duration of the trips in this project, an average of only 12% of the 1 TB of available data on each HDD was used. For in-season management, data submissions after each trip may be necessary, which allows for timely review of system performance. Costs could be decreased if reporting requirements were to allow for weekly or monthly retrievals.

Over the course of the project, data was collected from 192 trips. Three of the most active vessels were located near the Massachusetts office. While the cost of doing in person data retrievals was still higher than mailing data even for these 3 local vessels, we believed it was a good opportunity to work more closely with these vessels and get more feedback and buy in from the vessel owners and operators for this project. Hard drives from 122 trips were retrieved by a Saltwater EM Tech, with the remaining 68 trips being mailed in by vessel owners or operators. No HDDs were lost or corrupted. For a long-term program, we estimate the cost of mailing HDDs to be about 10% of the cost of in-person retrieval, indicating a large cost savings associated with the mailing of data. Because data retrieval required only minimal field service for this project, the data transmission costs (mailing supplies, postage, etc.) are included in "*Data Services*".

Under the current proposed monitoring alternatives, there will also be a portside monitoring component. At this time, it is not known to whom the portside monitoring cost will fall, but will most likely be the vessel owner/operator. As this was not part of this pilot project, we are unsure what these costs would be, but it is likely they would be in line with the costs outlined in the Environmental Assessment for the IFM Amendment (link can be found on MAFMC website at http://www.mafmc.org/briefing/june-2016) and with those determined in the cost comparison report on the NEFOP Electronic Monitoring website https://www.nefsc.noaa.gov/fsb/ems/. As a potential cost savings, it would be possible for the portside monitors to be cross trained as an EM technician and/or data reviewer to allow for more efficient and flexible staffing.

Data Services: HDD retrieval and shipping, data processing, data checks, review, storage, data audits.

A key constraint to effective EM implementation in many fisheries is the cost of data review. Operational implementation of EM requires not only collecting hours of video and sensor data, but also the ability to efficiently extract from that data the meaningful information needed to manage a particular fishery. Saltwater has developed open-source review software that integrates video and sensor data for efficient data review and analysis. Many EM service providers charge a per-seat, annual licensing fee to use their review software. Saltwater does not charge licensing fees for the use of this software. The primary cost drivers under *Data Services* -- and perhaps the most significant cost drivers overall-- are the level of review required (e.g. 100% of trips vs. 10% of trips), the amount and type of data stored, and how long the data needs to be stored.

The amount of data collected and level of review required is determined by fishery managers and reflects their monitoring goals and data requirements. Under this contract, Saltwater reviewed 100% of hauls and 100% of the trips. The primary objectives of the review process were to identify and classify discard events of any type, document whether any fish remained in the net/cod end after pumping, and identify instances where the catch did not come onboard after a fishing event (e.g. gear issue, fish pumped to another vessel, etc.). For each trip, a data summary report was produced and provided to NMFS to incorporate into their database. NMFS was

also trained in review and provided copies of the data and review software which allowed them to audit the reviewed trips. Overall, data review costs represented approximately 52.5% of the ongoing program costs. Costs could be reduced in an operational program by setting requirements to review of only a subsample (e.g. 50%) of the haul or trip footage and data collected. Data storage can also be a major cost driver for EM program implementation. Under this contract, Saltwater was required to store all of the collected video and sensor data for three years. Saltwater's approach to this requirement has been to store redundant copies of all of the data on a local server (NAS). As requested, additional copies of data sets were made for NMFS for audit purposes. Once data review was complete on a volume of data, our Program Manager transferred the complete data sets to cloud storage, where it will remain for the 3-year contract period.

Another key factor that affects the overall cost of data service is the amount of data to be stored. When the SOW for this contract was written, NMFS provided estimates of how many trips would occur in a year and how many days of data would be collected. The actual amount of data collected was considerably less due to various factors that will be addressed in section IV.[16] Nevertheless, our projected estimate of the cost of storage is less than 3% of the overall cost of this project.

There is still some uncertainty as to what EM data is required by NMFS to be stored. This determination will impact the costs of storage. There is discussion nationwide among fishery managers, industry and EM service providers about whether all collected video and sensor needs to be archived, or if storing the data summaries that are extracted during the review process is enough. There are major cost implications of storing video files, whereas the cost of storing the extracted data, which is comparable to the data submitted by an observer, is exponentially less. Each trip summary report is approximately 9 KB, which would be a total of 0.00171 GB for all 192 trips in this project. In contrast, the total amount of video and sensor data collected and stored is nearly 37,000 GB. There are multiple options between these two extremes. For example, saving only short clips or stills of interest, or saving only reviewed trips (assuming less than 100% of trips are reviewed).

Program Management: Oversight of all staff, coordination and communication with all stakeholders, fiscal oversight, all reporting activities.

For a project of short-duration (17 months) it is difficult to distinguish start-up from ongoing costs. Program management costs included weekly conference calls and other communication with the NMFS team and industry, coordination and oversight of all tech support, and oversight of all data management and review activities. We tracked these costs for the duration of the project, and primarily used the date of the activity to determine whether to categorize it as a start-up or ongoing cost.

Based on this approach, program management costs represented 26% of the ongoing project costs. This was higher than we would project for full program implementation, based on our experience with other long-term EM programs (e.g. the Atlantic pelagic longline EM program). One of the main reasons the costs were higher was the extensive level of communication and coordination between NMFS and Saltwater and additional flexibility that was incorporated into the study design to address issues as they were presented, which was necessary to ensure that details that will affect full implementation were worked out during this trial phase.

[16] The reasons for the smaller amount of data during this project period need to be kept in mind when designing any future program.

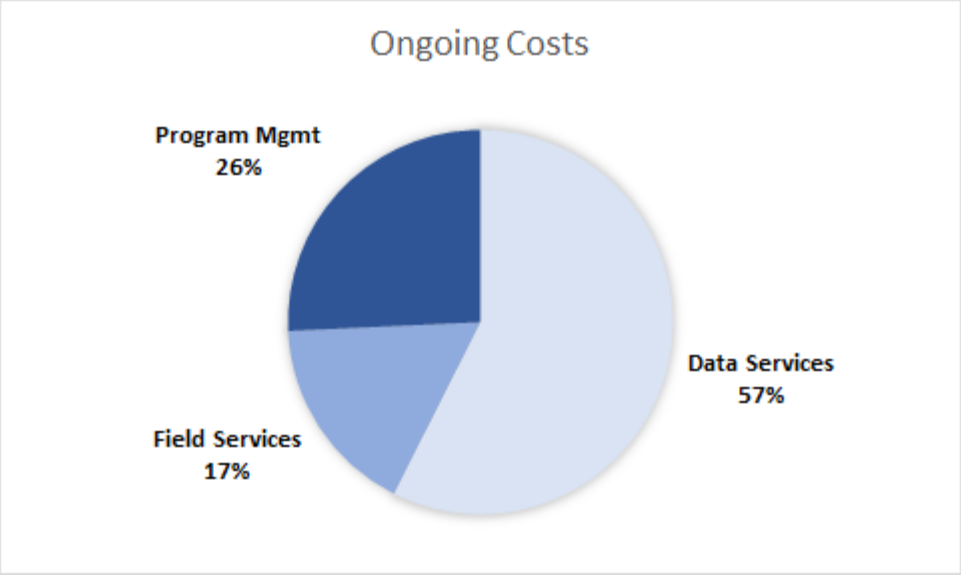

Figure 25: *Ongoing EM implementation costs broken down into categories: Program Management, Field Services and Data Services.*

VI. Lessons Learned/Recommendations

Implementation

System Components

The EM system was easily incorporated into the herring fleet vessel platform (e.g. space, power). The systems did not negatively impact fishing operations and had no effect on other vessel electronics.

During the course of the project, we determined that the hydraulic pressure sensors and rotation sensors used to trigger video recording were not ideal for this particular fishery. While we were able to successfully trigger video recording with these sensors in most instances, multiple vessel owners recommended that the system be triggered with an electric sensor. On pair trawl trips, sensors on the hydraulics and third wire or winch only activated cameras on the vessel whose net was being towed, so the cameras were not activated on the pair vessel. This was generally only an issue for the first haul, since most pairs alternated which boat towed the net after each haul, and cameras continuously recorded for the duration of the trip after first being triggered by sensors. Also, since the hauling/ pumping vessel was the only one with fish, this did not impact our ability to recognize or characterize fishing events or discard events. The only impact was the loss of video data from the pair vessel, which could offer complementary perspectives of fishing activity. Saltwater did develop and test software to trigger recording using geofencing, which was successful and would resolve this problem.

System Use & Reliability

Overall, the EM systems installed on vessels for this project performed well and collected information useful to fishery managers. Data was collected on 192 trips. Of these 192 trips, full video and sensor data was collected for 61% of the trips. The 39% of the trips that were incomplete, include trips where the EM system was not powered on for a portion of the trip (most often turned on when already on or near fishing grounds), as well as trips where there was an issue with the EM system (see figure 26 for breakdown of missing data). Only 4% or 2 of the incomplete trips were missing the entire trip's data. The other 96% of the incomplete trips contained data that could be reviewed.

EM system issues are often classified as critical and non critical issues. Critical issues include issues with one or more essential cameras, the power supply, main computer, or the monitor. Non-critical issues are issues with sensors or a non-essential camera. During this project, 3 critical issues occurred, resulting in lost data. Since this was not an operational program, these vessels were allowed to continue fishing until the service provider could resolve the issue. In some cases, the system issue was discovered during the data review process, or the vessel was not available for service and therefore the vessel often had completed one or more trips before the issue could be addressed, leading to more system down time than would occur in an operational program where the vessel operator would be required to report a system issue as soon as it occured. The reasons for missing data is shown in the figure below.

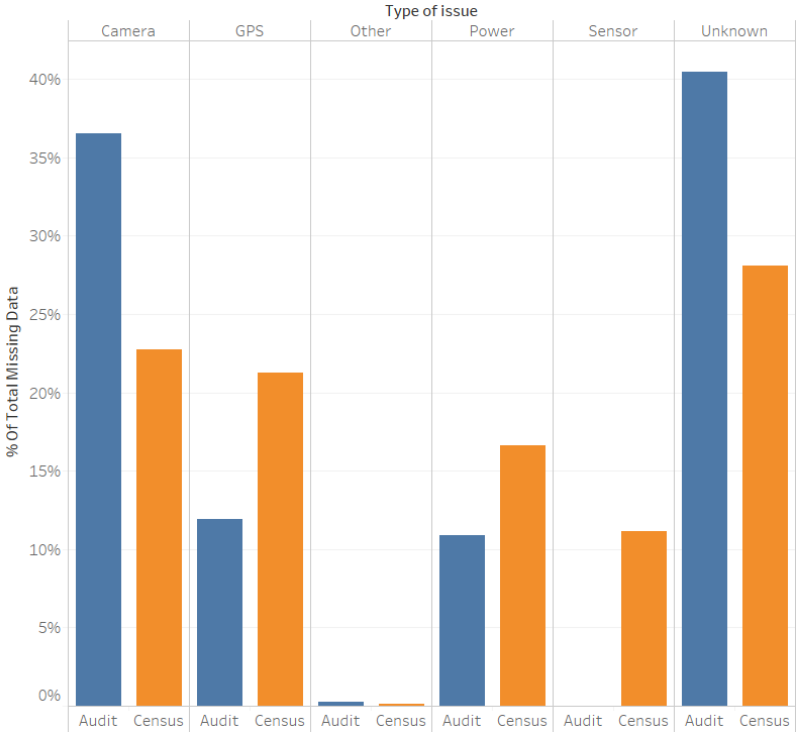

Figure 26: *Gaps in the collected trip data were documented by the reviewers. Reasons for missing data were categorized into 6 Categories: Camera Issues, GPS Issues, Power Issues, Sensor Issues, Other and Unknown. Camera issues include times where one or more of the cameras was down. Issues categorized as unknown included times where the EM system was turned off by the crew at any point during the trip, or when the reviewer was unable to determine the cause of the data gap.*

Power loss to the EM system occurred occasionally, mostly in the form of system restarts. EM system restarts were short and usually resulted in 1-3 minutes of system down time. Uninterruptible Power Supplies (UPS) were installed on most vessels at the time of install to ensure the EM system would remain powered unless the vessel lost power for a significant amount of time. One vessel had an issue with the main computer freezing, resulting in lost data for 3 trips.

There were also camera connectivity issues on two vessels that caused the video feed to cut out intermittently. The main cause of the issue was related to the high level of strong vibrations in the area of the stationing of the cameras, and the camera's sensitivity to those vibrations. In response to this issue, a vibration resistant camera was sourced but Saltwater was unable to test it because both vessels experiencing this issue were no longer participating in the project by the time the cameras were ready to be deployed. During the course of the project, camera issues resulted in a loss of video on one or more cameras for 3.46% of the total trip time in the project. Of the camera down time, only 5.08% occurred during a haul.

For each fishing event, the reviewer assessed the overall quality of the video. Because the template only allowed us to enter data for one camera, the poorest camera was used for this assessment and comments were entered describing what the issue was and which cameras were affected by the issue. Examples include low light, water droplets on lens, snow on lens, glare, and condensation inside camera. The imagery rated poor was still usable to detect discard activity but made it very difficult to discern individual fish or speciation. In cases where one camera had poor image quality, the other cameras, installed in areas with different exposure to the elements or lighting conditions, could be used to help the reviewer categorize discard activity. Future iterations of the review template would allow for the reviewer to enter video quality for each camera. The video quality criteria are defined in Appendix 9.

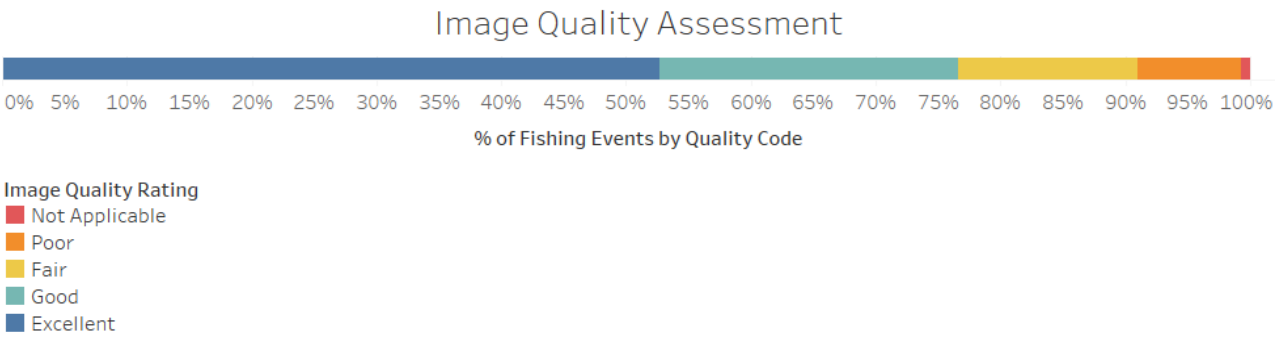

Figure 27: *Using video quality criteria as described in Appendix 9, EM reviewers rated video quality for each fishing event. Overall, 53% of the collected video was rated as Excellent and 24% was rated as Good. Only 8% was rated as poor. Not Applicable includes hauls where video was not available for the haul and therefore image quality could not be assessed.*

Compliance

Overall, vessel operators reported that the system was easy to operate. They were responsible for turning the system on at the beginning of the trip and off only upon return to port. Video and sensor data was collected for the duration of the trip. Project participation peaked in Quarter 3. Low initial usage could be attributed to the learning curve of a new system, or the requirement for the captain to remember to manually turn the EM system on when departing for a trip. In operational programs, the vessel operator is required to be present during the install for training and EM system certification. This certification is a way for the EM service provider to document full system function at the time of the install, and ensure that the vessel operator has a clear understanding of the project objectives and their responsibilities with regards to operating the EM system. This ensures that the person who will be responsible for operating the system clearly understands the requirements and expectations and has an opportunity to ask questions and see how everything works first hand. During this project, the vessel operator was not always available during the install, and the EM service provider trained the available vessel representative. During the project, a number of vessel owners reported that the transfer of knowledge from owner/manager present at install to captain/crew did not always take place. This led to dampened participation early in the project, which improved greatly after the first feedback meetings in early March.

One system-related factor that may have resulted in suboptimal participation was occasional unintended recording caused by operation of the hydraulics. Many vessels use their hydraulics when pushing away from the dock, which often triggered the EM system to start recording. This caused some unnecessary video recording during the steam to the fishing grounds. In some cases, this made the crew uncomfortable, and also resulted in more video data to review and store. This occurred on approximately 15% of trips. To mitigate this, we asked the crew to wait until just after they had left the dock before turning on the EM system. Unfortunately, the captain and crew are often very busy at this time and occasionally forgot to turn on the EM system until later in the trip, resulting in missed opportunities to collect data. Saltwater tested new software towards the end of the project that incorporated the use of geofencing (which doesn't trigger recording until the vessel has left the port box regardless of sensor readings) to eliminate this unintended recording. The new software and port boxes are described later in this report.

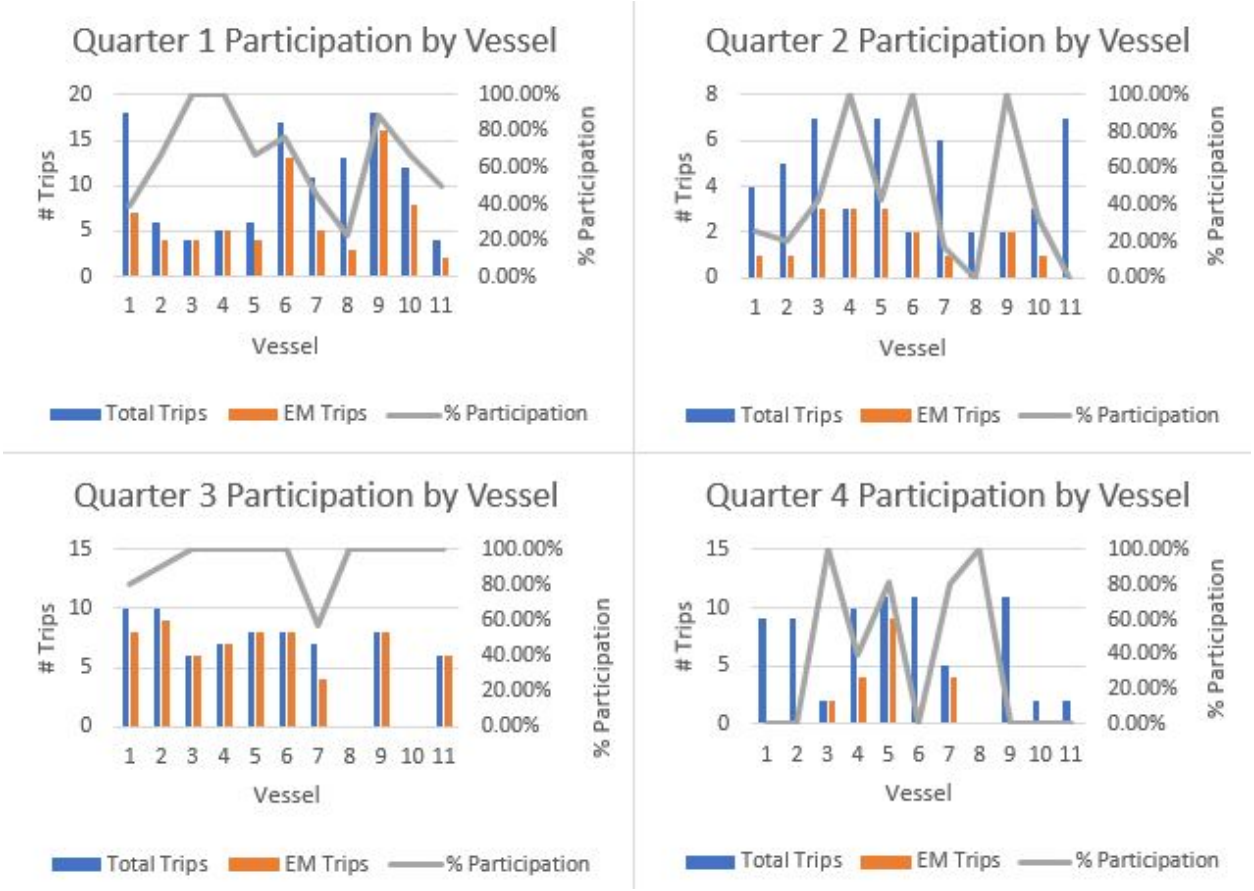

***Figure 28**: Project Participation was tracked by Quarter. For this project, Quarter 1 was November 1, 2016 - January 31, 2017, Quarter 2 was February 1, 2017 - April 30, 2017, Quarter 3 was May 1, 2017 - July 31, 2017 and Quarter 4 was August 1, 2017 - October, 31, 2017. Total number of MWT herring trips declared by each vessel shown in blue. Total declared trips includes trips with no fishing activity. Number of trips where EM data was collected shown in orange. Project participation improved after the first round of feedback meetings at the end of Quarter 2 but dropped significantly in Quarter 4.*

Part of the challenge of any EM program is determining the best camera angles to capture necessary data. During the vessel assessments and after review of the first few trips from each vessel, Saltwater and NMFS determined there were 4 views that would be necessary for an operational compliance program. For participating vessels, there were four locations where discards could likely occur; 1) at the pumping location, 2) at the dewatering box, 3) from the deck through the scuppers (if there was any spillover out of the chute or dewatering box) and 4) at the stern where the net was brought back on board. The full deck view camera also proved helpful to allow the reviewer the ability to see when the vessel was setting out the net and hauling it back. It was determined that cameras should be installed in a way that captures all 4 possible discard locations, which would in most cases require 3 or 4 cameras depending on the layout of the vessel. This configuration would maximize the ability of EM reviewers to determine the source of any discard. After initial trip review, It was discovered that optimal placement for the pump-view camera could be achieved by installing a boom on the side of the vessel onto which the camera could be mounted. Of the eleven vessels that volunteered for the project, five agreed to have booms installed and to carry three cameras (the number requested in the approach); three vessels agreed to carry 3 cameras but did not want a boom, two carried two cameras, and one vessel carried only one camera. The number and location of cameras have a significant impact in the ability of the reviewer to view and accurately categorize discard events. This project was entirely voluntary and therefore the project team was respectful of the concerns and input of the study participants on items such as the number of camera and locations of cameras, which had to be agreed to by the vessel operators. Information learned through the varying numbers of cameras installed and placement was instrumental in developing recommended standards for an operational program.

When discard event types were classified as unknown, it was generally due to poor camera angles. Thus if slippage occurred, a reviewer could not determine whether it was slippage (i.e. full or partial release), another type of discard event (e.g. operational discard), or

potentially something else entirely. If the objective of an operational program in this fishery is to capture and properly identify all discard events, and not just slippage, each of the participating vessel's camera setups would need to be optimized in some way. The most common adjustment would be the addition of a boom arm to achieve an unobstructed view of the pumping activity and determine source and type of clog. Many of the vessels would also likely need a camera mounted on the aft gantry facing forward to capture discards from the aft side of the chute and dewatering box that were obscured from cameras in this study by the machinery on deck.

Saltwater and NMFS staff did provide regular feedback to vessel owners and operators and provided data and/or data summaries to them from their vessels upon request. Because participation was voluntary, any procedural feedback provided to vessel owners and captains by outreach staff was purely informational.

One of the concerns of the fleet about using EM for their monitoring choice was the uncertainty of what would happen if they wanted to fish and there was an issue with the EM system. In current operational programs, if the issue is noticed prior to departing for a fishing trip, the vessel owner should try to troubleshoot remotely with the assistance of a certified EM technician. If remote troubleshooting is unsuccessful and the EM service provider cannot get a technician to the vessel prior to the vessel's preferred departure date, the vessel may fish for one trip but the system must be fixed prior to departing on a subsequent trip. If the system malfunction is discovered at sea, remote troubleshooting should be performed, but if unsuccessful, the vessel may continue to fish on that trip, but may need to trigger the cameras to record manually or follow other directions given by the EM service provider. Upon return to port, the vessel may not depart on a fishing trip until the issue is resolved. In the HMS fishery, flexibility and communication between NMFS, the vessel owners, and the EM service provider has led to almost zero lost fishing time in the 2 ½ years since implementation.

Incentives to Participate

The primary incentive noted for fleet participation in the project was to examine whether EM would prove to be more cost effective than at-sea monitors for this fishery. Because industry members would fund any additional monitoring efforts in this fishery, the cost-effectiveness of EM is of particular interest. Some operators also believed that EM could be used to counteract negative perceptions of the fishery through a monitoring source deemed indisputable. Additional reasons to participate can be found in the exit interview summary *(Appendix x*).

Project participation was voluntary, and all of the eleven active vessels that fish predominantly with midwater trawl gear agreed to take part. In other fisheries, voluntary participation in EM projects has been as low as ten percent. While the project began with eleven vessels, by the fourth quarter of the project, only five boats were actively participating.

There were multiple reasons mentioned for this high level of attrition. When vessel attrition was first beginning at around the midway point of this project, NMFS asked participants what incentives would promote their continued participation in the project. They primarily responded that they wanted access to fishing in groundfish closed areas. Groundfish closed area access for midwater trawl vessels is otherwise predicated upon selection for observer coverage, and with very low coverage levels over the course of this project, vessels were largely prohibited from these areas. Some vessels operators were disappointed when NMFS was unable to offer access to closed areas with the EM system onboard as an incentive, which may have contributed to the reasons for withdrawal.

In addition, several industry members indicated that frustration with poor fishing was a leading factor in their decision to stop participating. Others stated that the fishing crews were frustrated about the inequity in monitoring and fishing restrictions between their vessels and other fleets that prosecute the herring fishery (i.e. purse seine, bottom trawl) who have less restricted fishing effort. As their frustration built over the course of this study, some of captains and crew refused to activate the EM systems. Finally, some study participants were disappointed that footage from one vessel was used in prosecution of a criminal case. They felt they were misled on how EM footage in this project would be used, and were disappointed that footage collected through voluntary participation was used as evidence in a criminal case. Several owners/operators noted that this contributed heavily to their decision to stop participating.

Data Management & Review

Saltwater's review software uses templates that are tailored to each fishery. These templates are electronic forms that allow EM reviewers to use drop down menus and other structured forms to categorize events recorded by the EM system. Because this project was a first attempt at using EM to collect data in these fisheries, it was difficult for NMFS and Saltwater staff to accurately predict the most efficient way to process the data to meet monitoring and reporting requirements. The project team worked together to identify the necessary data fields and design a template to capture the required data. NMFS staff designed a database that allowed for data comparisons between EM viewers and observer data collected by the NEFOP. After the start of the project, it became apparent that the template would need to be revised to better capture fishing events (duration vs. single point events) in a more meaningful way. Unfortunately, each time a template is modified, all the previously analyzed data must be reprocessed using the newest template. Consequently, Saltwater reviewers had to spend significant amounts of time updating information, which increased data review times.

For future projects, it will be highly important for NMFS and project staff to agree on a template through a trial phase before implementation into an operational program. In addition, EM service providers would benefit from the development of standards in regards to data format, constraints, integrity, acceptable output, and software requirements provided by the Government.

Data Retrieval

Allowing vessel operators to mail EM data resulted in cost savings and logistical simplicity over technician recovery. During the project, the biggest disadvantage of this approach was that it didn't allow for a face-to face opportunity for vessel operators to report any concerns or ask any questions about the EM system, or for technicians to verify that systems are being operated as requested. This resulted in some system issues going undetected until video review, when the reviewer checked the system performance on the drive. But by the time an issue was discovered during review, the vessel had often already departed for the next trip. In an operational program, this would not be an issue since the vessel operator will be required to run a system function test prior to departing for a trip, and also report any system issues to the service provider immediately. The owners reported that having to maintain, track, and mail the HDDs after each trip was onerous, and due to the short duration of the trips, oftentimes only about 12% of the drive's 1 Terabyte storage space had been used. A few captains/owners cited hard drive availability as a limiting factor for the feasibility of the hard drive mailing method as well.

In this project, three of the participating vessels were located near the Saltwater office. Since these vessels were so close, it made more sense for a technician to stop by the vessel when the vessel owner notified Saltwater of the vessel's return from a fishing trip. This allowed the technician a chance to check system function and make more frequent adjustments to the EM system as needed. Hard drives were collected in person from other participating vessels during vessel feedback meetings and service calls.

During the first month of the project, there were some concerns about the potential of data getting lost in transit. By using tracking numbers for all hard drives mailed, Saltwater was able to track hard drives to determine their location.

Data Processing Times

As mentioned above, revisions to the reporting template meant that any data processed under an older version of the template had to be re-reviewed, which led to some delays in data processing.

Another factor that impacted data processing and review time overall was that the project design assumed that the data from each trip would be sent in within 48 hours of the vessel returning to port.. Occasionally though, Saltwater received HDDs with data from multiple fishing trips because the vessel owners either did not have time to mail the drive before leaving port again or forgot to switch to a new drive at the completion of a trip, or forgot to mail in the drive. Having multiple trips on a single HDD meant that the earlier trips on the drive could not be reviewed in a timely manner and feedback on protocol issues was delayed.

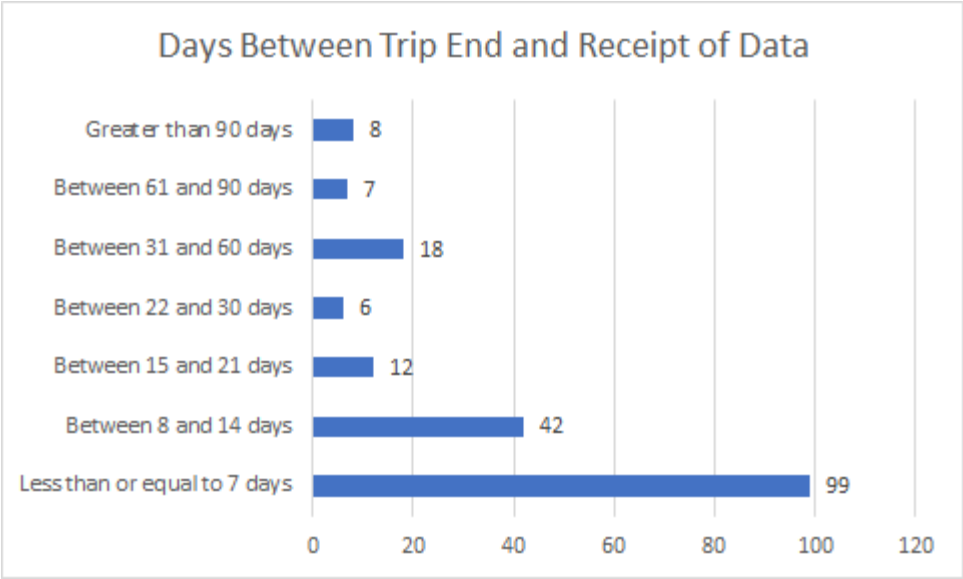

***Figure 29**: Of the 192 trips where data was collected, 99 trips were received within 7 days of the end of the trip, 42 trips were received between 8 and 14 days, 12 trips were received between 15 and 21 days, 6 trips were received between 22 and 30 days, 18 trips were received between 31 and 60 days, 7 trips were received between 61 and 90 days and 8 trips were received more than 90 days after the trip ended.*

At the start of this project, Saltwater was working on creating the next version of onboard data acquisition software. During the installations and early months of data collection, vessel owners reported erroneous recording prior to fishing or at the dock and suggested different sensors to trigger recording. Saltwater shared this feedback with the software development team. In early October 2017, the new software was deployed on one of the participating vessels in this project to test out some of the new capabilities. The system received a major overhaul to how the software operates resulting in a more robust, reliable, and extensible framework. While the majority of changes are unseen modifications to the overall coding, the most notable changes come from the modular nature of the stack which allows for new pieces to be developed and deployed in an ongoing manner. As a result, the more fisheries that utilize and make new modules for the software, the more all fisheries with the system deployed will be able to tie into those additional functions. One such example is for port boxes to be utilized to eliminate unwanted recording when the vessel was in port and using hydraulics or winches (efficiencies in cost and storage). Port boxes use the system's GPS location to determine if a vessel falls within a specific set of known locations and it then tells the software that within this particular zone to behave a certain way. For this fishery it would mean hydraulic triggers while the vessel is using them at the dock a cause of spurious recordings. This will allow the vessel operator to leave the EM system on at all times and removes the burden of turning the system on and off when leaving for, or returning from, a fishing trip.

The new software can also accommodate many different kinds of sensors, hardware, and system add-ons. Another example of tested capabilities of the new software was the implementation of multiple configurable recording triggers. This means that video resolution and frame rate can be changed on an individual camera basis as well as depending on fishing activity. This allows for the collection of high resolution video at a high frame rate to be captured during fishing activity while reducing resolution and frame rate during non-fishing activities such as in between tows and when steaming back to port. It is critical for many discard compliance EM programs that video is recorded for the entirety of the fishing trip to ensure discards are not occurring outside of fishing events. This results in a large amount of video data that needs to be reviewed and stored. With the new software, during non fishing activity, the EM system can be set so that only one camera, such as the deck camera, is recording, and at a lower resolution. Since fishing activity makes up, on average, 23% of the entire trip, the amount of storage space used for a trip can be reduced by up to 70% using this method while still capturing all of the required data. The remainder of the software changes are related to the code development itself. These were not as visible to the end-users but the testing resulted in better performance and reliability.

Modified Catch Handling

At the end of fish pumping, most vessels detach the pump from the net and then slacken lines to rotate the entire net aft beyond the stern to straighten the net before reeling the gear back onto the net drum. The net retrieval process commonly occurs while the vessel is moving forward at speeds of 2 to 5 knots. There are often fish remaining in the net that are subsequently released outside of the range of the camera. In these situations, the EM reviewer was sometimes unable to classify the type of discarding event observed between partial release or operational discards if they did not have a good view of the contents of the net prior to the discard event. In an operational EM program, it is likely the crew would need to bring the cod end fully into view of one of the cameras prior to releasing the catch, and they would need to release the cod end near the stern of the vessel to allow a reviewer to discern if fish were released from the net. This is similar to existing requirements laid out in Amendment 5 to the Atlantic Herring Fishery Management Plan. The plan states that vessels are required to provide observers visual access to the net/codend and any of its contents after pumping has ended, including bringing the codend and its contents aboard if possible.

Even when catch was brought on board, it was often difficult for the EM reviewer to discern whether fish removed from the dewatering box were discarded or retained if they were removed from the camera view. If an observer was on board, they filled their sample baskets and often took them out of camera view to do their sampling. With many of the current camera views, the EM reviewer was unable to determine if the fish removed from camera view were discarded or retained. While this was not an objective of the study, it was something we were interested in trying to document. This holds true for fish such as haddock, that must be retained by the vessel. If the crew sorted haddock out of the catch going into the fish hold, they often put them aside in a basket or bucket. This basket or bucket was generally taken out of view of the camera, so the EM reviewer was unable to determine the end disposition of those particular fish. In an operational program, EM-friendly catch handling specification should be established so catch set aside by either observer (for sampling) or crew (for sorting out bycatch) can be clearly determined.

Individual vessel monitoring plans (VMPs) which serve as a comprehensive strategy for discard documentation, installation and maintenance, protocols for data storage and transfer, and other important information regarding a vessel's specific EM system would be the governing tool to help facilitate required protocols. The VMP would define roles and responsibilities, incorporating all monitoring elements (portside, ASM, NEFOP, EM, etc.) to ensure cohesion and cooperation in support of data collection. Issues identified with observer interference, EM reviewer mis-categorization of discard events, vessel operator responsibilities for reporting critical and non-critical equipment failures, and vessel activities that complicate video review could be mitigated with firm protocols documented in the vessel's VMP.

Distinguishing Between Discarding Events

During this project, an attempt was made to use many of the same data fields as the observer program. While this worked for many fields such as setting and hauling events, it was more difficult in situations where the event is defined using situational information, such as ability of the vessel to pump more fish, and is not black and white. Using EM it was often difficult to determine if a discard was operational or a partial release due to the difficulty for the reviewer to determine if a vessel is capable of pumping more of the fish using EM video. The lack of input from the captain/crew in the situations was also a challenge. An operational discard is defined as fish that are discarded at the end of a haul when the vessel is unable to pump the remainder of the fish. Since each vessel is different and some use mechanical methods such as a triplex roller, which in theory allows vessels to pump more of the fish, the determination of whether a vessel "could" have pumped more fish at the end of the haul was difficult and subjective.

There were many examples that needed group review to determine how to classify the discard event. It was also difficult to determine the reason for a slippage event. On observed trips, if a vessel slips the net, the observer is required to document the reason for the discard. It is easy for the observer to get this information from the vessel operator. EM reviewers do not have the ability to collect this information, which resulted in a classification of "unknown" as the reason for discard. One idea proposed by both NMFS and vessel operators was to modify the EM software to allow the vessel operator to make an entry for any discard events directly into the trip data. If the vessel operator could enter the reason for discard and the approximate quantity of fish discarded, this would make a date/time and location annotation at the point the vessel operator makes it. This entry would then be available to the EM video reviewer when they open the trip data. Saltwater is looking into adding this capability to the new data acquisition software.

Methods To Address Undetected Discard Events

There are three main types of data that aid the reviewer in detecting discard events; location data, sensor data, and video data. Locations data are important to show the location and speed of the vessel, and may indicate whether a vessel is engaging in fishing activity. Sensor data is important to show rotation of the third wire and hydraulic pressure. Rotation sensor data would indicate setting or hauling of gear and hydraulic sensor data would indicate that the hydraulics are being used. These sensor data indicate gear activity and would key the reviewer to potential discard events. However, since vessels may discard fish at any time, all video data must be reviewed carefully in order to identify discard events, once fishing activity begins.

Camera framing must be established such that all discard events can be viewed remotely by the reviewer. Common views for discard events are; the stern view where the net is hauled back to the boat and back on board, the pump side view where the net is connected to the pump, and the dewatering box, chutes and deck view where the larger fish are sorted from the catch. Sometimes fish are also sorted from the chutes or fish may overflow from the fish holds while the crew fills the holds with water. These areas need to be captured by the cameras to ensure most or all of the discard events will be detected. Although all discard events may not be captured, proper camera placement can minimize the number of missed events.

Although every effort is made to capture all discard events, some may not be detected or a discard source may not be seen. During this project, there were a few times where fish were seen floating in the water near the vessel, but the reviewer was unsure where they came from. This occurred most often when reviewing video from the vessel with only one camera installed (at the stern of the vessel). It is likely the fish seen in the water were discarded from the dewatering box, but since there was no deck camera or dewatering box camera, the reviewer was unable to positively identify the source of the fish and as a result may have documented the event incorrectly. In cases like these where a discard source cannot be confirmed, the reviewer commented as much as possible about the apparent source and nature of the discard.

There were also times where the vessel would finish pumping and release the codend far behind the vessel. In cases like this where the reviewer could not determine if there any fish in the net prior to the codend being released, it was assumed there was no discard. Because an operational EM program would involve consequence measures for vessels that slipped catch (i.e. 15 mile move-along, exit groundfish closed areas for the remainder of that trip), there would likely need to be catch handling protocols, such that the reviewer could see the contents of the codend prior to release, or that the codend would be released close to the stern of the vessel to ensure that discards can be properly documented.

Fish Disposition Categorization For Fish Not Brought On Board

Of the fish that were discarded before being brought on board, reviewers were asked to determine the reason for the discard. The discard disposition codes were based on the current codes in the observer manual. While some categories like operational discards and no market, were similar between reviewers, a couple of categories had less agreement. The majority of these discard events with disagreement between reviewers, occured when the pump was detached from the net or during a pump stop event. Since it is often difficult to see a clog inside the pump, the audit reviewer was cautious and marked these events as reason not specified, while the census reviewers considered fish released from the net during a pump stop event to be due to a clogged pump. When compared to the observer data, the alignment for operational discards showed alignment but the observer was able to utilize codes like regulations prohibit any retention; poor quality due to gear damage; gear damage prevented capture and no market, reason not specified much more accurately since they are able to gather this information from the captain or crew or by being more situationally aware of what is going on.

Since this was not a primary focus of the project, less effort went into defining these events, leading to inconsistent categorization of discard dispositions. In a fully implemented EM program, discard disposition categories will need to be well defined as they pertain to EM to ensure consistency across all reviewers.

Applicability To Other Greater Atlantic Fisheries

There are many aspects of this EM program that are applicable to other fisheries in the Greater Atlantic region. As described in previous sections, the program relied on a collaborative relationship between NMFS staff and the EM service provider, Saltwater Inc. The group collaborated on outreach and industry engagement, data management and review, and in implementing ongoing program

improvements. Regularly scheduled meetings and the active participation of multiple NMFS staff representing different agency offices is something that other programs could benefit from, especially during the startup phase.

The EM system and software used for this program can be easily adapted for use in other fisheries. While each fishery has different monitoring objectives, the basic functions of the EM system of collecting sensor data for the duration of the trip, and triggering video recording as required, can be applied in any of the region's fisheries. The quality of data collected depends to some degree on monitoring requirements, with catch accounting potentially requiring higher frame rates and resolutions than compliance monitoring. In this project, when the cameras were installed in Saltwater's preferred locations, reviewers were able to accurately identify some catch and bycatch species from the video data. This is a promising indication of the potential applicability of the EM system for catch accounting in this and other trawl fisheries.

Another transferable feature of this project was the integration by Saltwater of observers into the EM team and the cross-training of EM technicians and data reviewers; all of the EM technicians were current or former fishery observers, with background and training in this fleet's fishing operations, and all were also trained to do data review. This creates a very flexible and responsive workforce that translates into cost efficiencies because people can switch tasks as demand requires. This approach would also work well if there were an added portside monitoring requirement. Because all of the technician/reviewers were current or former fishery observers, it would be relatively easy to add portside monitoring duties to their job duties.

This program relied on third party data management and review, with all of the collected data submitted to the EM service provider, Saltwater Inc. and reviewed by their staff. Although the original program design stipulated that NMFS conduct an audit of the data, NMFS staff ultimately reviewed all of the data. However, the approach of having a primary review by the EM provider with an audit by NMFS for quality assurance worked well and could be applied to other fisheries. The timeliness and quality of review carried out by Saltwater consistently met program needs. Giving the service provider immediate access to the data helped with the early identification and resolution of any system problems that might affect data quality. There are also efficiencies to be gained by having contractors rather than government employees carry out data review, especially when they are cross trained and/or working on multiple EM contracts. Finally, this program has elucidated a range of legal questions regarding the accessibility of EM data through public requests through the Freedom of Information Act (FOIA). Proprietary vessel data collected through an EM program (including EM footage) that is managed and stored by an EM service provider is not subject to the same FOIA requirements as data held by NMFS.

Saltwater's EM review software is template driven and open source, which allows it to be easily adapted to the requirements of each fishery. Open source software also invites collaboration, which will hopefully lead to efficiencies and cost savings in the review process—which is the most expensive part of most, if not all, EM programs

VII. Conclusions

This project set out to determine if EM could be an effective tool for detecting and categorizing discard events on midwater trawl vessels and to develop a framework for EM implementation in this fishery. We determined EM could successfully detect full release events to a high degree of accuracy (94%) and likely highly effective for identifying smaller releases. It was more challenging to categorize these smaller releases as either partial releases or operational discard events. Interestingly, in cases where audit and census reviewers categorized these events differently their notes often described similar events. This leads us to believe that better definition of the two events with regards to EM, and perhaps greater standardization among reviewers, could help to eliminate these discrepancies.

EM system installation varied among vessels and allowed us to evaluate the effectiveness of each unique configuration and determine the ideal camera setup to capture all discard activity in this fleet. We determined three to four cameras, capturing the four areas where discarding occurs, would be required in an operational EM program. The EM system deployed in this fishery performed well and captured high quality data throughout the project with very few system performance issues.

Two review methodologies were used to determine efficacy of quantifying and categorizing discard events in this fleet. An audit approach that focused primarily on fishing events as indicated by sensors installed on the vessel and a census approach that looked at all video captured during each trip. Preliminary results show that the audit method of review is comparable to the census review and would be a more cost effective model for implementation.

Multiple cost drivers impact the costs of full EM program implementation. Data services, which include data management, review and storage, were found to be the most significant. A key start-up cost for this program and many EM programs is the time required to decide on the data fields to be incorporated into a database and determine review protocols. In an operational EM program, it is important to ensure all of the data collected by the EM system can be compared to, and potentially integrated with, existing observer and portside monitor data streams. Data goals impact system install decisions as well as data management, review and reporting costs.

While video footage was intended to only initially be used to verify retention of catch for portside sampling, the New England Council also recommended that EM would be used to verify compliance with slippage restrictions, reporting requirements, and a requirement to move 15 nautical miles following any slippage event. Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling portside.

Initially, video footage would not be used to identify species, or estimate the amount of catch released if a haul were slipped. The New England Council may expand the uses of video footage to include species identification or quantification of released catch in the future, if footage proves useful for these purposes.

This project helped determine the critical factors necessary for full EM implementation in this fishery. There is still work to be done to determine the level of review and catch handling protocols that would be necessary to adequately monitor this fleet, but preliminary results show that an EM and portside program could be used to meet the information needs for management of this fishery.

VIII. ACKNOWLEDGEMENTS

This project was funded by a grant through the NOAA Fishery Information Systems Program and National Observer Program, and through the NMFS GARFO and NEFSC Offices. We thank our colleagues Nichole Rossi, Sara Weeks, Dan Luers, Carrie Nordeen and Corinne Endres for their contributions to this report. We thank Joan Palmer and Sandra Bernstein for their tireless work on building a database and uploading all of the project data. We would also like to express our gratitude to all of the vessel owners and operators for volunteering and participating in the project as well as providing valuable feedback. Several Saltwater staff contributed to this project including: Jared Fuller, Mark Hagianis, Adam Cook, Mark Seramur, Alan Perzanowski and Sam Moore. We are also thankful to Eric Torgerson, Chordata Ltd, for his assistance with the further development of the onboard software and data review software used in this project.

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X. Appendices

Appendix 1: Discarding Event Descriptions

An objective of the study was to determine if EM reviewers could identify and characterize discard p; events in the midwater trawl herring fishery. NEFOP observers trained to provide at-sea coverage in the high volume fisheries classify discard events into three categories: 1) Catch discarded after being brought on board 2) Slippage, categorized as the partial or full release of catch 3) Operational Discards. Video reviewers utilized this classification structure throughout the EM project. Reviewers documented discarding events by selecting a lead descriptor that most accurately categorized the type of event witnessed during the trip review (Table 7). Discard event records were collected at the haul level in the software. Additional discard event data obtained by reviewers included identifying the camera view(s) that collected the footage, and providing comments and a catch disposition code for comparison to observer data when applicable.

Below is the regulatory definition of slippage in the Atlantic herring fishery followed by definitions for each discard event and examples that illustrate the differences between categories.

Table 7: *Discarding event descriptors used by EM video reviewers to distinguish slippage from other discard scenarios.*

Operational Discards	Partial Release	Other
Discarded after being brought onboard	**Full Release**	**Unknown**

Federal regulations (50 CFR 648.02) define slippage in the herring fishery as follows:

"*Slippage in the Atlantic herring fishery means catch that is discarded prior to it being brought aboard a vessel issued an Atlantic herring permit and/or prior to making catch available for sampling and inspection by a NMFS-approved observer. Slippage includes releasing catch from a codend or seine prior to the completion of pumping the catch aboard and the release of catch from a codend or seine while the codend or seine is in the water. Fish that cannot be pumped and remain in the codend or seine at the end of pumping operations (operational discards) are not considered slippage*."

As described above, a slippage event can *currently* occur only on a trip with a NMFS-approved observer on board. However, if EM is approved by the New England Council, the definition of slippage will be expanded to include all trips that are sampled, regardless of whether that sampling is performed by an observer or ASM while a vessel is at sea or by a portside sampler when the vessel returns to port. Thus, when a vessel monitoring with EM/Portside is notified (vessel will be notified before a trip begins) that it will be portside sampled at the end of a trip, any partial or full release (as described below) will be considered slippage.

Operational Discards: Operational discards in the Atlantic herring fishery means small amounts of fish that can not be pumped onboard and remain in the codend or seine at the end of pumping operations. Leaving small amounts of fish in the net at the end of pumping activity is operationally discarded catch. For example, fish that remain in the net and pump intake system after the majority of the catch has been pumped onboard the vessel. Operational discards are often the result of fish that collect and become lodged in the net meshes or area surrounding the the net and pump connection; or fish that cycle back through the hose and out of the pump into the water. It must be clear to the video reviewer that pumping ended because the captain and crew determined that they had successfully emptied the contents of the net onto the vessel. Events categorized as operational discards represent only a small portion of fish that could not be pumped on board.

Full Release: A slippage event defined as the release of the entire contents of the net back into the water. In general, slippage events (partial or full releases) may be intentional or unintentional. An unintentional slippage event classified as a full release would be gear damage resulting in the vessel losing the entire contents of the haul before the pump is attached or operated. A full release that is intentionally carried out can be the result of mechanical failure, low volume of fish captured during the tow, or an

overabundance of undesired species in the net (such as dogfish), among other bycatch. A captain's decision to slip the entire contents of the net can also be impacted by weather and/or safety concerns.

Partial Release: A slippage event that is characterized by the release of a portion of catch from net or components used to pump catch into the vessel's holding tanks. In order for a reviewer to classify a discard as a partial release, pumping activity must have begun and a portion of the catch must have been transferred onboard. A partial release often occurs when the vessel's crew perceives there is something blocking the pump because there is little or no fish entering the dewatering box. Clogs or twists in the net often necessitate lifting the pump from the water while it is still attached to the net. From this vantage point, the crew will then decide whether the pump must be disconnected from the net. Pump removal or adjustments can result in the release of catch into the water. Because these discarded fish are not brought onboard and made available to the observer for sampling, this is considered a slippage event (partial release). Other examples of a partial release/ slippage events occur when the vessel holds are full and unable to take on more catch, or when gear damage or mechanical failure result in the release of catch that the captain intended to pump onboard. In these situations, the vessel may start pumping fish from the net but end up releasing part of the catch prior to bringing it on board.

Discarded after being brought onboard: Prior to going into the holding tanks, the catch is pumped from the net into a dewatering box that leads catch through a system of chutes and a sorting grate, or dewatering box, where bycatch can be removed by the crew and set aside or immediately thrown overboard. Examples of bycatch species sorted at the dewatering box include dogfish and haddock. Regulations require vessels to retain haddock but other bycatch may be discarded while sorting. If the species composition is not satisfactory, the crew can operate the pump to transfer fish onboard and simultaneously block catch from entering a holding tank but this action is driven by market and rarely occurs. Any fish that land on the deck due to such actions as while the gear is being reeled over the stern or fish that overrun the dewatering box or chutes that are not retained for market, are classified by observers and EM reviewers as catch items discarded after being brought on board.

Other: Video reviewers assigned "Other" to discard events when fish were collected in baskets or taken out of camera view individually and deemed retained by crew based on regulations.

Unknown: Discard events that could not be classified during video review were logged in the review software as "Unknown". These events commonly involved situations where catch handling occurred out of camera view for extended periods of time, or instances when fish were observed in the water near the vessel or gear but the point source of entry into the water could not be determined from the video data.

APPENDIX 2: EM STUDY OUTREACH SHEET

Electronic Monitoring:
Atlantic Herring and Mackerel Project Information Sheet

The National Marine Fisheries Service (NMFS) is evaluating the utility of Electronic Monitoring (EM) in the Atlantic herring and mackerel midwater trawl fisheries. Saltwater Inc. has been contracted by NMFS to provide and install EM units on up to 12 commercial fishing vessels in the Northwest Atlantic. The purpose of the project is to evaluate the utility of EM for catch monitoring on midwater trawl vessels. Work from this project will help inform the implementation of the Industry-Funded Monitoring (IFM) Omnibus Amendment and the development of future EM programs. This 16 month project is currently underway and will run through December of 2017.

For more information or questions regarding Electronic Monitoring in the Atlantic herring and mackerel fisheries please contact:
Dan Luers
(978) 282-8457
Daniel.Luers@noaa.gov or
Nichole Rossi at (508) 495-2128
Nichole.Rossi@noaa.gov

Goals

- Deploy and test an EM program in an operational setting, allowing analysis and adjustment of EM program requirements, and development of business practices to support an EM program.
- Evaluate the utility of EM for monitoring catch retention and identifying discard events in the Atlantic herring and mackerel midwater trawl fisheries.
- Additional goals include familiarizing the fishing fleet with EM, gaining industry input on EM operations, and refining industry and NMFS EM cost estimates.

How Electronic Monitoring works, what it records, when it records:

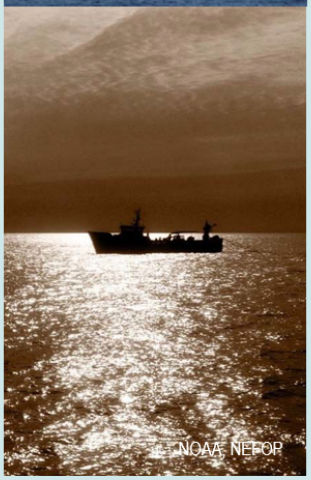
- EM consists of multiple cameras, a control box, a user-interface (monitor), a GPS receiver, and two sensors (hydraulic and rotation)
- Cameras begin recording when the sensors are triggered by the drum rotation or hydraulic pressure transducer; cameras target the vessel's deck and waters surrounding the vessel, including where the codend is pulled to the surface and pumping occurs.
- Camera views are focused only on the areas of the deck where catch handling occurs (i.e., net reel, pump, dewatering box, etc.)
- Cameras are set up to turn on when gear is first deployed, remain on for the duration of every trip, and turn off once the vessel returns to port
- 100% of EM footage collected on every trip would be reviewed
- The system does **NOT** record audio

EM Video Camera

How are the data stored and transferred to Saltwater?

Data are stored on a hard drive inside a control box (hard drives can hold up to a month's worth of data) and handled as confidential data. Vessel operators will mail the hard drives to Saltwater. Vessels operators will receive training on how to remove and mail their hard drives before their first fishing trip. Mailing hard drives is easy for the vessel and cost effective for the program.

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service



Who owns the data collected during the project?

The data will be the property of the government. Data collected are subject to the same data confidentiality regulations as observer data. Vessel owners may request copies of video collected aboard their boat.

Would data gathered in this project be used in management of the fishery?

The data will only be used to inform the utility of EM as a means of monitoring the fishery. It will not be used to monitor catch, catch caps, or compliance with existing regulations during this project.

Who owns the equipment?

Saltwater will supply all necessary equipment, and will remove all equipment at the end of the project. At the completion of the project, vessel ownership of the equipment or a lease agreement with Saltwater is possible, but should be discussed between Saltwater and vessel representatives.

Will I have to take a NEFOP observer once EM equipment has been installed on my vessel?

There would be no additional NEFOP coverage associated with this project, but if your vessel is selected for NEFOP coverage, you would be required to carry an observer and operate the EM system on the same trip. Data from trips with both NEFOP coverage and EM would be compared to evaluate the effectiveness of EM.

When do I have to turn on the EM System?

The EM system would need to be turned on for every declared Atlantic herring or mackerel trip. The EM system will be on for the duration of a trip, but the cameras will not be triggered to start recording until gear is first deployed and then cameras will stop recording when the vessel returns to port.

Will the vessel incur any EM costs during this project?

NMFS is responsible for equipment, data retrievals, data reviewing, data storage, and EM provider overhead costs. Vessels requiring power upgrades to accommodate the EM system are responsible for those costs.

What happens if the EM equipment is not working properly and I want to leave on a trip?

Participating vessels are acting in a voluntary capacity and, therefore, will not be prevented from fishing if the EM system malfunctions. Vessels will be required to report all system failures to Saltwater and allow Saltwater access to the vessel to fix the issue.

Would vessels be required to modify fishing practices/effort or be subjected to additional regulations during this project?

No, the objectives of this project are to evaluate the utility of EM for catch monitoring, and to educate the fleet in EM technology. It is important for vessels to fish in a normal manner to determine if EM can capture the elements necessary to monitor the fishery (e.g. catch retention, discard events).

Atlantic Herring (*Clupea harengus*)

For moreinformationorquestionsregardingelectronic monitoring on Atlantic herring or mackerel vessels visit www.nefsc.noaa.gov/femad/fsb/ems or contact: Dan Luers by phone: (978) 282-8457 or email: Daniel.Luers@noaa.gov or Nichole Rossi (508) 495-2128 at Nichole.Rossi@noaa.gov

U.S.DepartmentofCommerce|NationalOceanicandAtmosphericAdministration|NationalMarineFisheriesService

APPENDIX 3: VESSEL REFERENCE SHEET

Install Requirements

You have agreed to carry an EM system that is being provided by Saltwater. In order to install the system on your vessel, there are certain requirements that are described below.

1. The EM system needs to tie into stable 12v DC power in your wheelhouse. Please provide us with details of your power and ready a switch in your wheelhouse panel for us to wire the System to. This switch will need to remain on during the entirety of your fishing trips, so please be mindful of the location you prepare. The power consumption for the system is on par with a pair of incandescent light bulbs. If you have a preferred type of monitor you may purchase one, otherwise a **10"** flat screen monitor will be provided. The system needs to be placed in a secure, dry area which can be readily accessed for data retrieval.

2. To check hydraulic pressure, a sensor will be installed on the pressure side of the hydraulic line in-line on the reel to determine hauling events. Due to the sensitive nature of fishing gear, the vessel will be responsible for installing and securing the hydraulic fittings

3. A rotation sensor and a magnet will need to be fastened to your deck reel.

These wire runs from the sensors will return to the computer in the wheelhouse. Please plan a safe route for your boat. This may mean the wire will need to go through your deck. Our techs can create this entry, or if you prefer you can do it yourself. Please let us know if you will be switching gear periodically.

4. The cameras must have proper field of view to monitor all retained catch, processing, and discards. If there is any fixed gear that is not being used during the time of monitoring that may move and obscure the camera fields, please fasten, move, or let us know about these potential obstructions.

5. We will work with the crew to install wheelhouse components, deck components, and wire runs in order to achieve the necessary placement. These will be done in such a way to be minimally invasive, allow data acquisition, and provide ease of maintenance and removal.

Operator Responsibilities

System Function Test
Prior to leaving port, the vessel operator must turn the system on and conduct a system function test. If the system function test identifies a malfunction, the vessel operator should contact Saltwater immediately to resolve the issue. A Saltwater technician will determine if the malfunction is critical or noncritical. A critical malfunction is one that prevents the data collection objectives from being achieved. If the malfunction is critical, Saltwater will make every effort to resolve the issue remotely or send a technician to resolve the issue as soon as possible.

Equipment malfunction at sea
In the event of a system malfunction at sea, the skipper should report the problem as soon as possible, preferably as soon as it occurs so a technician can attempt remote support and meet the vessel upon return to port to resolve issue if necessary.

EM System Power
The EM system must be turned on and recording data (e.g., GPS and sensors) continuously from the start of the fishing

trip until the vessel returns to port.

Catch Handling
The vessel operator will be responsible for ensuring all catch is handled within view of the cameras. All discards must be done in view of the rail camera.

Video Quality
The vessel operator will be responsible to check the monitor before each haul and to wipe water and slime off the camera lenses as needed to maintain video quality.

Hard Drives
Upon completion of a trip, the vessel owner must send in the drive(s) that contain the data from that trip within 24 hours of returning to port. This must be done after every trip. Prior to departing for a fishing trip, the vessel operator must have adequate hard drive storage to record the entire trip. The vessel operator must carry one or more spare hard drives as backup.

EM System Components

A minimum of two cameras will be installed to record video of fishing activity. The video is recorded on a small, rugged computer called the (EMU) Electronic Monitoring Unit). Three sensors may also be installed—a GPS, a hydraulic pressure sensor, and/or a reel rotation sensor. Data from the sensors is collected as a way to track fishing effort—when and where gear is set and hauled. This data is collected by the Sensor Processing Unit (SPU.)

The complete system will be comprised of the cameras, the EMU and SPU, the GPS/Hydraulic/Rotation sensors, a keyboard with touchpad, and a monitor that will show a live feed whenever the system is turned on and indicate when it is recording video. Depending on the fishery, recording may be continuous or triggered by fishing events.

All of this hardware is designed to work together to monitor fishing effort and collect video data required by NMFS to allow for accurate catch accounting.

You can tell what the EM system sees, what the system is recording, and how the system is functioning by using the keyboard and monitor. At the beginning, end, and during each trip you will have different responsibilities, which are described in this guide.

Feedback, questions, and comments on the system are a part of improving its use and function. Please contact us at 1-800-770-3241.

,

The EMU, SPU, and a camera.

System Operation & Skipper Duties

This section describes what the skipper and/or designated crew member must do to power up the system and ensure that the EM system is working while the vessel is fishing.

Powering Up Before Your Trip Starts

1. Before you leave the port, power on the system at the breaker or switch where the system was installed.
2. Wait approximately 2-3 minutes for the system to power on. You should see lights and hear a series of beeps from the EMU (the larger green box).
3. Turn the monitor on. You will see a series of screen changes while the system boots.
4. The system is on once you see the live views from your cameras and the relevant system information on the display.

System Check

Prior to departing for a trip, the vessel operator must perform a system function check. Please carefully follow these steps.

1. Go to the monitor and look at the screen.
2. On the screen you will see the view from the cameras installed on your vessel.
3. Look at the images from the cameras. Make sure they look right (the cameras are looking in the right direction, there is nothing blocking the view, they are clean).
    - ○ You can make the live camera windows larger by clicking on the camera image you want to enlarge. It can be made smaller by clicking it again.
    - ○ If there is slime or salt on the lens, use a **clean wet soft cloth** to wipe it clean. The plastic can scratch, so be careful not to damage it.
    - ○ If there is anything blocking the view, move that object. DO NOT MOVE the camera.
4. Read the GPS, pressure sensor, and hard drive % filled on the screen. The drive will fill ~99% and jump to the next one if necessary. The drives should fill at a constant rate on days you're hauling back.
5. Click "System Check" to log that you have performed your daily check.

Manual Recording - If the system is not recording as intended, use the **"Manual Record"** button to start a manual recording.

If you encounter any problems, please write them down and call Saltwater EM team at 1-800-770-3241**.**

Shutting Down the System

If you need to power off the system for any reason (sleeping with the boat shut down to prevent battery drain, switching generators, or shutting off at the dock) simply power off the unit. If your installation has a switch, please use it as instructed.

End of Trip Duties

Data Retrieval - End Trip

At the end of each trip you will need to *end the trip to stop recording*, and remove the data that has been collected on the Hard Drive in the EMU and mail it to Saltwater**.** To do this, follow these instructions.

1. Click on the ***"End Trip"*** *icon* on the computer. **This is essential to stop trip recording.**
2. It will ask if you are sure; click yes **only** if you are done with your trip.
3. You will be shown the of serial number(s) of the Hard Drive you are to remove. Ensure to **accurately write the unique portion of these down.**
4. Click **"OK**" and wait for the system to **shut down -** the screen will turn gray/black**.**
5. Power off the system the system switch/breaker.
6. Look at the EMU and you will see two small labelled boxes with two thumb screws coming out of each. These are the Hard Drives that store the data.
7. **Match** the portion of the serial number you have written down with these labels
8. Carefully unscrew the spring loaded thumb screws from the drive you have matched and pull gently to remove the Hard Drive caddy. It will come all the way out and will have a flat, silver rectangle in it. That is the Hard Drive.
9. Place the whole device (Hard Drive and caddy with thumb screws still attached) into the provided **protective mailing box and bubble mailer**.
10. Repeat steps 6-9 with the other drive. **ONLY IF** you were presented with two separate serial numbers from the Data Retrieval program.
11. Please fill out the included form with vessel identification and a return mailing address and include with the hard drive in the protective hard drive mailing box provided by Saltwater. *An unidentified drive may delay the drives' return!*
12. Take this package and mail it using the **pre-paid postage label**.

Preparing for the Next Trip

1. The Saltwater technician will have left you with two new Hard Drives (installed in caddies), or you will have received them via mail from Saltwater.
2. You will put the new hard drives into the EMU in the slots where you removed the other ones.
3. Be sure the caddies are facing the right way. The Hard Drive and EMU should both be in the up orientation.

EMU and hard drive in caddy in their "up" orientations.

4. Carefully slide the caddy in until you feel a click. Hold it in place and screw the thumb screws in by hand. (DO NOT use a screwdriver. This will strip the screws).
5. Power on the system.
6. Turn on the monitor.
7. Look at the screen to check that the new Hard Drives are working. If they are working you will see their names and a Hard Drive use percentage.

If you have any additional questions please call 1-800-770-3241.

APPENDIX 4: TRIP FEEDBACK FORM

VIEWER FEEDBACK FORM

Vessel Name:	**Hard Drive #:**
Review date:	**Reviewed by:**

Summary:

This document is designed to capture the details necessary to provide more timely feedback to the vessels (on an individual basis) to maximize obtaining high quality, useful, data. This will be facilitated by adhering to 3 principles:

1. Be timely. The form should be quick to fill out. *It is only filled out when there are problems that need fixing.* One form is filled out per hard drive to streamline the process, and comments can be made to indicate the span of trips or temporal nature of a problem to let techs know if its constant or intermittent

2. Consider root causes. The problem is not that the fisherman is blocking the view of pumping; it is that pumping is not visible. This gives us the option of moving the camera or the fisherman or both, depending.

3. Let them see what you see. It is possible that the person filling out this form will not be the person on the boat, so a picture will go a long way to describing a problem. There is a spot to paste a screen grab for a reason.

If a problem occurs across several trips or hauls on a single hard drive (very likely) then only fill out one feedback form and fill in the range of trip (trip number plus date) or haul numbers.

This form will be printed or saved to a laptop and taken down to the boat where problem solving will take place, hopefully with the assistance of the participating captain. If a solution is not obvious, then giving the parameters of what is needed will allow that interaction to proceed regardless.

CAPTAIN/CREW:

System test not performed before the trip. ☐

Comments:

EM system not powered up upon leaving the dock. ☐

Comments:

Catch pumping outside of the expected pumping area (eg. not on starboard side). ☐

Comments:

Identification of catch utility impaired by crew position/action. ☐

Comments:

VESSEL SETUP:

<u>System performance</u>

One or more cameras or sensors are not functioning during the trip (determined by looking at the thumbnails for the video files).

☐

Comments:

Gaps in imagery data are present during fishing events. ☐

Comments:

Image quality impedes the identification of species or utility. ☐

Comments:

Camera angles

- Catch discarded in the water during/after the pumping process, view insufficient ☐

  Comments:

- Catch discarded from the deck during/after the pumping process, view insufficient ☐

  Comments:

- Blind spots on deck that require additional video coverage. ☐

  Comments:

DEWATERING BOX:

Clear view of crew picking fish at grate ☐

Comments:

Catch items held up to camera for ID* (pilot basis) ☐

Comments:

OTHER
Any outstanding feedback items not covered in the above sections

Comments:

DECISION TREE
(Changes in infrastructure should be proposed before changes in fishing practices)

1. Proposed changes in infrastructure:

2. Proposed changes in fishing practices:

3. Parameters to guide decision making for changes proposed above.

SCREEN GRABS

Appendix 5: Quarterly Summary Form

Atlantic Herring/Mackerel EM Project
Summary of EM Data Collection

Dear Fishing Vessel Owner,

Below you will find a summary of the EM data collected from the Fishing Vessel from Quarter x. Included in the summary are all declared herring/mackerel trips by the vessel during this quarter, total EM video data collected, and several metrics for evaluating your vessel's performance during the quarter. Note that during the first quarter of an EM project, we expect to see an adjustment period on the part of the captain and crew.

The vessel's captain and crew operated the EM system according to project guidance for x% of the trips. It is important to turn the EM system on when you leave the dock and keep it powered until you return to the dock.

We will continue to provide feedback in a timely manner via the feedback forms as data on each hard drive received from the vessel are processed. We plan to provide feedback via email/phone calls with regular (optional) in person meetings.

If you have any questions or concerns regarding this evaluation or the overall project, please contact:

Nichole Rossi (NMFS) at 508-495-2128 or Nichole.Rossi@noaa.gov

Morgan Wealti (Saltwater) at 907-406-3040 or Morgan.wealti@saltwaterinc.com

Sincerely,

NMFS & Saltwater

Trip Number	Trip Start Date	Trip End Date	Total Sea Days	Data Collected (Hours)	Trip Start/End Recorded	% EM Data Collected During Trip	Hauls Recorded	System Check	Maintenance

Notes:

Responsiveness:

Appendix 6: Vessel Participant Exit Interviews

Between October and December 2017 project staff conducted final outreach meetings with representatives from each vessel. A total of 11 exit interviews were conducted by project staff. The following section documents the exit interview questions and summarized participants responses.

Why did you decide to participate in the EM Study?

The majority of interviewees responded that they were interested in applying EM in an operational setting to test functionality of equipment and evaluate system performance at sea. Owners wanted to assess the pros and cons of the technology for future business planning. Overall, vessel participants acknowledged a need to gain hands-on experience with EM in the event that the technology is approved as a monitoring option for the fleet. Although vessel managers and owners made up the majority of those interviewed, several of the captains who were interviewed expressed similar opinions regarding the need to test EM. Some participants hoped that participation in the project could change what they believed was an unfair public perception of high bycatch rates. Members of the fleet also hoped that active involvement in the study would help build higher levels of trust in the NEFOP observer data that has been collected from the fleet for many years.

Has field support for your vessel been sufficient during the study?

Participants agreed that field support was sufficient over the course of the project, however, several managers and operators discussed issues with the hard drives that were used to collect and store data. Representatives from the vessels commented that during busy fishing periods when there was less than 24 hours between trip deployments, it was difficult to find the time to package and ship hard drives through the mail. In several instances, captains complained that they were not given an adequate number of replacement hard drives during quarter 2 and that spares were mailed to incorrect addresses. The vessel manager did confirm that Saltwater was responsive to correcting the issue immediately. In a separate case, a vessel manager received new replacement hard drives that were not formatted properly. Another manager said there were delays in technicians resolving issues with onboard systems at the beginning of the study. However, this participant further noted ongoing improvements were made as captains and company personnel became more familiar with operating the equipment. Remote port locations (i.e. Maine, New Jersey etc.) and vessels transiting seasonally between multiple ports and states such as New Jersey, Massachusetts, and Maine were recognized by project participants as the main factors that delayed EM technician response time when onsite support was needed.

Have you had any major issues with equipment? Do you feel it is reliable?

The majority of the participants did not report any major issues with the equipment during the study, however two separate system issues were discussed by representatives at their exit interviews. One vessel manager stated that he had recurring issues with the live camera feed displays on one of his trawlers throughout the project. The captain and engineer explained that the system locked up and had to be rebooted during many trips. There were also times when they could not determine if the system was actively recording footage. Another vessel experienced similar issues with the wheelhouse monitor freezing up but the problem was resolved by Saltwater after two trips. Equipment malfunctions on individual vessels were infrequent and generally occurred early in the project. One vessel owner wondered what would happen under a mandatory program if EM systems froze up or cameras stopped working. *Would vessels be required to terminate their trip, if they were already engaged in fishing?* He believes the fleet should have an opportunity to review proposed regulations of a mandatory EM program before business decisions are made.

Are you satisfied with reports that are provided to your vessel regarding the progress of the study?

Several vessel managers stated that they did not always have an opportunity to review the content of the report thoroughly but the majority of participants agreed that the quarterly reports were satisfactory and feedback was provided in a timely manner. Another vessel manager commented on Saltwater's professionalism and that their staff always took the time to address his questions and keep him updated with project developments. In a future operational setting, one vessel owner stated that the fleet would expect EM trip reports to be processed in a similar time frame as the observer data that is sent to owner/operators after each trip. The current timeline for processing data release requests for vessel owners and captains is 2 to 3 weeks after an observed trip.

What kind of data would you like to see in the final report?

The main topics of interest in the final report are cost analysis data of EM compared to other monitoring options proposed by the NEFMC and the opportunity to evaluate cost drivers associated with IFM options. Several participants expressed interest in comparing the total time spent actively fishing with the total time transiting and searching for fish. Additionally, industry members hope the report gives an honest and detailed appraisal of EM's performance during the study. They anticipate a thorough examination of the capabilities and limitations of EM as a monitoring tool for documenting fishing activity, discard events, and more specifically an EM reviewer's level of accuracy and consistency when identifying and comparing slippage (partial and full releases) with other discard events. Some participants are interested in the analysis of how multiple reviewers labeled discarding events. Several interviewees posed similar questions in the comparison of the census and audit model review findings: *What level of agreement and consistency will there be between 2 video reviewers in identifying operational discards compared to slippage? Is it possible for reviewers to identify certain fish to species level?*

Are there improvements you would like to see (hardware, software, logistics)? What were your top two challenges with the EM system or project in general?

There were many suggested improvements that participants shared during the exit interviews. Key improvements presented were: a) remote transmission of trip data rather than mailing or EM technician pickup; b) consolidating vessel monitoring and EM into one software package; c) requirement that EM software be activated/deactivated by port boxes (geo-fencing) to eliminate human error; and d) the use of electric current to activate the system rather than hydraulic pressure and rotational movement of winches.

Some participants believed there was a lot of unnecessary data collected as a result of cameras being triggered for prolonged periods while a vessel was in port. Participants felt space on drives was wasted as a result of mailing in hard drives after only one fishing trip. Several owners and operators felt that mailing hard drives on a per trip basis was excessive and they would have preferred an option to complete three or four trips before submitting data. A minority of participants responded that the the system was easy to use and only required plugging the system in and making sure the unit had a hard drive.

Participants said that when problems occurred, dealing with system issues between trips added challenges to their shoreside tasks. Some participants stated that EM does not deliver the real time catch estimates that an observer can provide to captains, and that on some trips observer catch estimates are highly valuable sources of information. Another challenge cited was captain and crew turn over. A manager stated that instructing new captains and engineers on operation of the system and trip data submission was somewhat time consuming, often resulting in errors because it took time for new operators and the crew to adapt to the additional tasks.

Participants still believe there are many unknowns with regards to how an EM program would operate and some owners would be reluctant to commit to EM based solely from their experience in the study. For example, there is a clear understanding among the fleet regarding the requirements and enforcement penalties associated with the observer program, but there has been no corresponding guidance or information shared with the herring fleet regarding proposed requirements and enforcement actions associated with EM regulations.

Were there any alternative uses of EM (e.g. safety, docking) that you found useful?

Most participants stated that the system was not used for any other purposes. There was one operator that said he used the stern camera view in the wheelhouse periodically but the camera placement was adjusted at one point, and it no longer provided the full width of the stern. Alternative uses for EM that were shared during interviews included EM as a resource for insurance claims or legal actions and a potential method to monitor safety and deter certain crew behavior.

Did you or the crew have any concerns (privacy, safety, etc.) with having EM systems onboard? Did the project measurably relieve or reinforce these concerns?

All interviewees responded that from the outset of the project there were various levels of concern expressed throughout the chain of command on individual vessels, mainly in regard to the amount of footage that would be collected. Several participants stated that captains and crews had difficulty acclimating to the cameras at first while performing their work and that others were entirely uncomfortable with the project, believing that EM was intrusive. There were also similar discussions about access and use of EM data between vessel crews and owners. Crew members did not know what parties had access to the footage or how the data was

being used and/or stored. Most of the participants commented on the criminal case that was built around EM video data and they referenced that incident as a turning point in the study. Discomfort with the project and concerns with how the data could be used against vessels greatly increased as some industry members felt it was wrong to use video from a voluntary study as evidence to prosecute. It is clear that the project sparked a heightened awareness for participants and a need to review further information and regulatory guidance issued by NMFS. Specifically, the fleet has significant concerns regarding EM data and how it will be utilized and managed in the future and what entities will have the authority to access the data.

Did you have a clear understanding of the goals for this project and your responsibilities? Could you explain what they are?

The majority of those interviewed commented that they had a clear understanding of the goals of the project and their responsibilities. While owners and vessel managers understood their responsibilities, some admitted that maintaining the willingness of their crews and captains to participate in a voluntary study was at times difficult. Several vessel managers felt that multiple cameras were unnecessary and that there seemed to be a shift in the project goals and objectives during the study. In particular, vessel managers raised concerns regarding the use of a dewatering box camera because the frame often captured a significant amount of deck space and compromised the privacy of the crew. They noted that catch released at the dewatering box would not be classified as slippage and therefore did not always agree to camera angle set up by technicians during the primary installation.

Do you feel that EM could sufficiently meet monitoring needs (slippage monitoring)?

Most participants agreed that EM could effectively monitor slippage events. At quarterly meetings with vessel representatives, clips of video from their vessel(s) were reviewed. Demonstrations aided first quarter meetings by allowing project managers to illustrate the level of video quality and propose requests for installing booms on vessels to improve the camera angle and video quality collected from pump view cameras. At the conclusion of the project, some vessel managers agreed that EM could meet the needs of monitoring slippage in the herring fishery but they shared similar opinions that equipment maintenance and vessel support would prove EM a more costly source of monitoring. These managers also pointed to the fact that there has not been a practical analysis of costs related to a portside sampling program for the herring fishery. One representative stated that EM was not capable of monitoring slippage. The vessel manager stated that EM would need to be part of a larger program with improved technology and greater vessel support from an EM provider company in order to meet the needs of monitoring slippage.

Slippage regulations are met with contention from members of the midwater trawl fleet. Ideally, participants would like regulators to revisit definitions of slippage in the herring fishery, most importantly partial release documentation by observers in the herring fishery. Industry members do not like how slippage is defined and categorized. One participant cited that the definition originated in the tuna fishery as a description for high grading. The definition for slippage was then transferred for regulatory use in the herring fishery where high grading does not occur.

If EM is approved, are you considering it as your IFM monitoring choice? Why or why not? If you haven't decided, what further information will you consider in making this decision?

Vessel managers and owners concluded that cost would be the main factor in their decision to select EM as a monitoring option for their business. Captains that were interviewed stated that they would back the owners IFM decision. Without further details on projected costs or examples of regulatory changes and incentive options, the majority of the participants indicated that they will chose at-sea monitoring instead of EM. Captains and crews are more familiar and comfortable with human observers. They prefer the direct interaction with an observer coupled with the ability to witness how sampling methods are being carried out first hand. EM can not give haul level assessment of species composition or weights whereas NEFOP observers can provide catch estimates and species composition to the captain and crew as necessary.

Industry members strongly believe that EM will be cost prohibitive due to the portside program requirements. There is a consensus that EM needs to be more user-friendly for captains and personnel that oversee shoreside operations. In addition, participants that offload catch from a single trip at multiple ports and do not have offices centrally located

believe effort and costs to coordinate with the EM facilitator and portside sampler would be impractical for their business interests. This group of participants firmly concluded that they are not ready to choose EM unless the costs are significantly less than at-sea monitors.

What would incentivize you to use EM over other options?

Cost comparisons between at-sea monitoring and EM coupled with portside monitoring will be the leading factors for vessel owners in deciding what program they will choose. Items that would incentivize the selection of EM by participants would be the flexibility to access closed areas with EM in addition to trips where vessels are randomly assigned a NEFOP observer. Owners cited variable and dropping coverage of the fleet by NEFOP observers as a result of SBRM analysis used to assign sea days to the fleet each year. Some participants posited that EM should allow vessels to fish all access areas because in an operational program they assume captains would be required to operate cameras on 100% of their trips. One captain stated that the entire fleet would choose EM if it gave vessels year-round access to groundfish closed areas. Several participants believe that without guaranteed access to closed areas, there will be no real incentives for the fleet to use EM. A vessel manager stated that there have been increased regulations and restrictions placed on the fleet in the last 10 years and that EM could become a beneficial monitoring source for all stakeholders by providing consistent, regular access to fishery dependent data while granting increased fishing opportunity for the fleet. Participants also stated that there are many unknowns with EM that regulators have not discussed, and that they would be uncomfortable choosing this technology over human at-sea monitors until further details have been published for comment and review. Overall, participants expect that their hands-on experience with EM will be influential in management plans as well as show a common willingness to work with stakeholders.

APPENDIX 7: VESSEL MONITORING PLAN

2016/2017
Atlantic Herring & Mackerel Midwater Trawl Program
Vessel Monitoring Plan

This Vessel Monitoring Plan (VMP) describes how an Electronic Monitoring (EM) system is specifically configured on a vessel and how fishing operations on that vessel will be conducted to effectively monitor fishing activities to document catch. The 2017 VMP was developed to meet the objectives of the 2016/2017 Atlantic Herring and Mackerel Electronic Monitoring Project.

The data collection goal of 2017 EM cooperative research is to develop EM so that the data can be used for catch accounting of discarded catch. Work from this project will help inform the implementation of the Industry-Funded Monitoring (IFM) Omnibus Amendment and the development of future EM programs.

This is a living document that may be updated throughout the project. Feedback is always appreciated.

Table of Contents

VMP Date and Version 2

Vessel Summary 2

EM System Overview 2

Operator Responsibilities 3

Each Trip 3

Each catch handling event (haul or set) 3

Trip End 3

Equipment Malfunctions 4

Equipment Malfunction in Port 4

Equipment Malfunction at Sea 4

Appendix A – Vessel Installation Details 5

Appendix B – Guide for Vessel Operator 9

Appendix C – EM Program contacts (who to call) 22

VMP Date and Version

VMP Submission Date:	**2016/10/17**
VMP version number:	2017.02

Vessel Summary

Vessel Name:	
Vessel ID:	
Home port:	
Primary landing port(s):	
Gear type(s) to be used:	Midwater Trawl-Single
Vessel Owner name:	
Address:	
Email:	
Phone number(s):	
Vessel Primary Point of Contact: (if different from owner)	
Address:	
Email:	
Phone number(s):	

EM System Overview

- Your vessel is equipped with an electronic monitoring system, consisting of cameras, GPS, gear sensors, user interface, and control center.
- The system will record GPS and pressure sensor data while powered.
- Video will be collected from rail, stern and deck cameras during hauling and catch processing.
- For this pilot project, the EM system will record 24/7 from when the gear is first set until the system is turned off when the vessel returns to the dock.
- More specific information about your EM system is provided in *Appendix A - Vessel Installation Details*.

Operator Responsibilities

Your vessel is part of a volunteer pilot project. Please turn your EM system on as soon as you leave the dock and turn off when you return to the dock. System operation details are included in this VMP under the Vessel Operator Responsibilities section in Appendix B.

Each Trip

- **Confirm Hard Drive Storage Space**: The vessel operator must ensure that the system has adequate storage to record the entire trip. The vessel operator must carry one or more spare hard drives, sufficient to record the entire trip, as a back-up.
- **Power**: Maintain uninterrupted electrical power to the EM unit while the vessel is underway.
- **Function Test**: Prior to leaving port, the vessel operator must turn the system on and conduct a system function test following the instructions provided in *Appendix B – Guide for Vessel Operators*. If the function test identifies a malfunction, the vessel operator must follow the troubleshooting guidelines listed in *Appendix B – Guide for Vessel Operators*.

Each catch handling event (haul or set)

- **Prior to each catch handling event**, the vessel operator should:
    - Verify that all cameras are recording and all sensors and other required EM system components are functioning as instructed in *Appendix B – Guide for Vessel Operators*.
    - Check the monitor and verify that the camera views are consistent with the images provided in *Appendix A - Vessel Installation Details*.
    - Clean camera lenses to maintain video quality. Video quality will be reported in the trip summary report.
- **Catch Handling**:
    - To effectively meet the goals of the study, we suggest the following catch handling procedures:
        - The vessel operator is responsible for ensuring all catch is handled within view of the cameras as defined in the camera descriptions and deck diagram in *Appendix A - Vessel Installation Details*.
        - At the completion of pumping, that the codend be brought in view of the camera to enable reviewer to see if there are any fish left in net.
        - If pump is clogged, the contents of the clog should be discarded in view of the camera.

Trip End

- **Within 2 business days after each EM selected trip, ensure that the hard drive is mailed** to the contact provided in *Appendix C – EM Program Contacts*. If doing back to back trips and cannot mail drives when in port, it is okay to wait until after the next trip to send in the drives.
- Along with the hard drive, include vessel name, mailing address where replacement hard drives should be mailed, trip dates and whether an observer was on the vessel during this trip.

Equipment Malfunctions

***Since this is a pilot project, at NO point during this project will a vessel be required to stay in port or return to port due to EM system malfunction.**

Equipment Malfunction in Port

If the function test identifies a malfunction, the vessel operator should follow the troubleshooting guidelines listed in *Appendix B – Guide for Vessel Operators*. **If this does not resolve the issue, the vessel operator should contact the EM service provider immediately. The EM service provider will determine if the malfunction is critical or non-critical based on the EM Workgroup definitions.**

- **Non-Critical Malfunction**: If the malfunction cannot be repaired in a timely fashion, the vessel operator may depart on the scheduled trip, but must follow the service provider's instructions to trigger video recording manually. Please call the service provider and make arrangements for them to service the vessel upon return from this trip.

- **Critical Malfunction**: A critical malfunction prevents the data collection objectives from being achieved. A Saltwater technician should be available to service the vessel within 48 hours of notification of the malfunction. Since this is a voluntary program, the vessel should notify the service provider if they will be departing for a fishing trip before they are able to service the vessel, but may proceed without the system malfunction being repaired. The vessel operator should follow the service provider's instructions for this next trip and run the EM system if advised to do so as the system will still likely be collecting valuable data even with one component down.

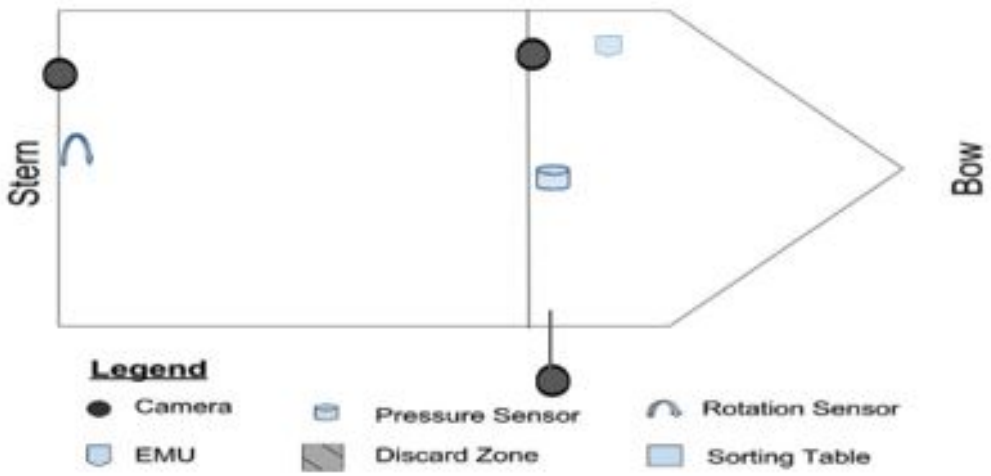
Equipment Malfunction at Sea

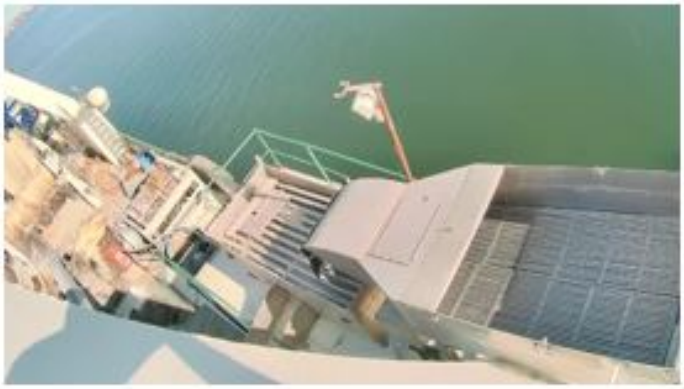
- If the system passed the function test prior to leaving port, and remains continuously powered during the trip, the vessel operator is NOT required to return to port in the event of a breakdown.
- Follow the instructions provided in *Appendix B – Guide for Vessel Operators*.
- If the malfunction cannot be resolved following the troubleshooting guide and/or with remote support, the vessel operator should continue to run the system with all functional parts, and contact the service provider immediately (from sea if possible) to assist with scheduling service at the time of landing.
- Any malfunctions should be fixed prior to departing on subsequent trips.

Appendix A – Vessel Installation Details

Vessel Name:	
USCG Vessel ID:	
Gear Type:	Midwater Trawl
Vessel Satellite Phone:	
Skipper Name:	
Skipper Phone:	
Skipper Email:	
Alternate Contact:	
Alternate Phone:	
Alternate Email:	

Vessel Diagram



Camera Name:	Camera 1	Camera View
Location:	Port side front gantry	
View:	Dewatering box and sorting grate	
Aim:	Stern	
Hardware:		
Resolution/FPS:	720 @ 15 fps	
Recording Trigger:	Pressure and rotation	
Run On Time:		
Recording Exceptions:		

Camera Name:	Camera 2	Camera View
Location:	Starboard side front gantry	
View:	Starboard rail	
Aim:	Stern	
Hardware:		
Resolution/FPS:	720 @ 15 fps	
Recording Trigger:	Pressure and rotation	
Run On Time:		
Recording Exceptions:		

Camera Name:	Camera 3	Camera View
Location:	Port side rear gantry	
View:	Aft rail/stern	
Aim:	Stern	
Hardware:		
Resolution/FPS:	720 @ 15 fps	
Recording Trigger:	Pressure and rotation	
Run On Time:		
Recording Exceptions:		

Appendix B – Guide for Vessel Operator

Saltwater's EM system consists of 2-3 cameras, a small, rugged computer (Control Box), computer software, monitor & keyboard, a GPS receiver, a hydraulic pressure sensor, and a magnetic rotation sensor.

The cameras begin recording when gear is retrieved. Recording is triggered by changes in hydraulic pressure, which is monitored by the sensor installed on the hydraulic line, or the rotation sensor, which monitors the line drum or warp winch. The cameras are on a timer, and are set to record for a specific amount of time after gear is hauled. Data from the sensors is collected continuously as a way to track fishing effort—when and where gear is set and hauled

The EM system does **NOT** record audio.

CONTROL BOX

The Control Box is a ruggedized computer that holds the system software and stores all of the recorded video and sensor data. It must be installed in the wheelhouse in a secure, dry area that can be easily accessed for data retrieval. The Control Box must tie into clean, stable 12v DC power or AC power.

Control Box with two hard drive bays

All of the data is stored on two removable hard drives. The data stored on the hard drives in the Control Box in encrypted and protected with a password. This means that no one can view the recorded video without the right software and password.

All of the components of the system are powered through the Control Box. The power consumption for the system is similar to two incandescent light bulbs (less than 60 watts). Wires will need to be run from the Control Box to the sensors and cameras.

PRESSURE SENSOR

The EM system uses hydraulic pressure to track fishing activity and trigger video recording. In order to do this, a sensor will be installed on the pressure side of the hydraulic line to determine hauling events.

DRUM ROTATION SENSOR

A magnetic drum rotation sensor is also used to track fishing effort and trigger the cameras. The system software can distinguish the direction of the drum rotation, which allows us to trigger recordings of retrievals only (and not sets).

DIGITAL CAMERAS

Saltwater's uses internet protocol (IP) digital cameras with an ingress protection rating of IP67, which means they are designed for water immersion up to 1meter for up to 30 minutes. Each camera is capable of capturing high-resolution imagery (1920 x 1080) at a rate of up to 30 frames per second. Cameras must be installed with a proper field of view to monitor all retained catch, processing, and discards. There will be two or three cameras installed on each vessel participating in this project: one to capture close-up images of the deck at the dewatering station, a second camera aimed at the water line to capture images of pumping activity and a third camera capturing the stern where the net is brought on board.

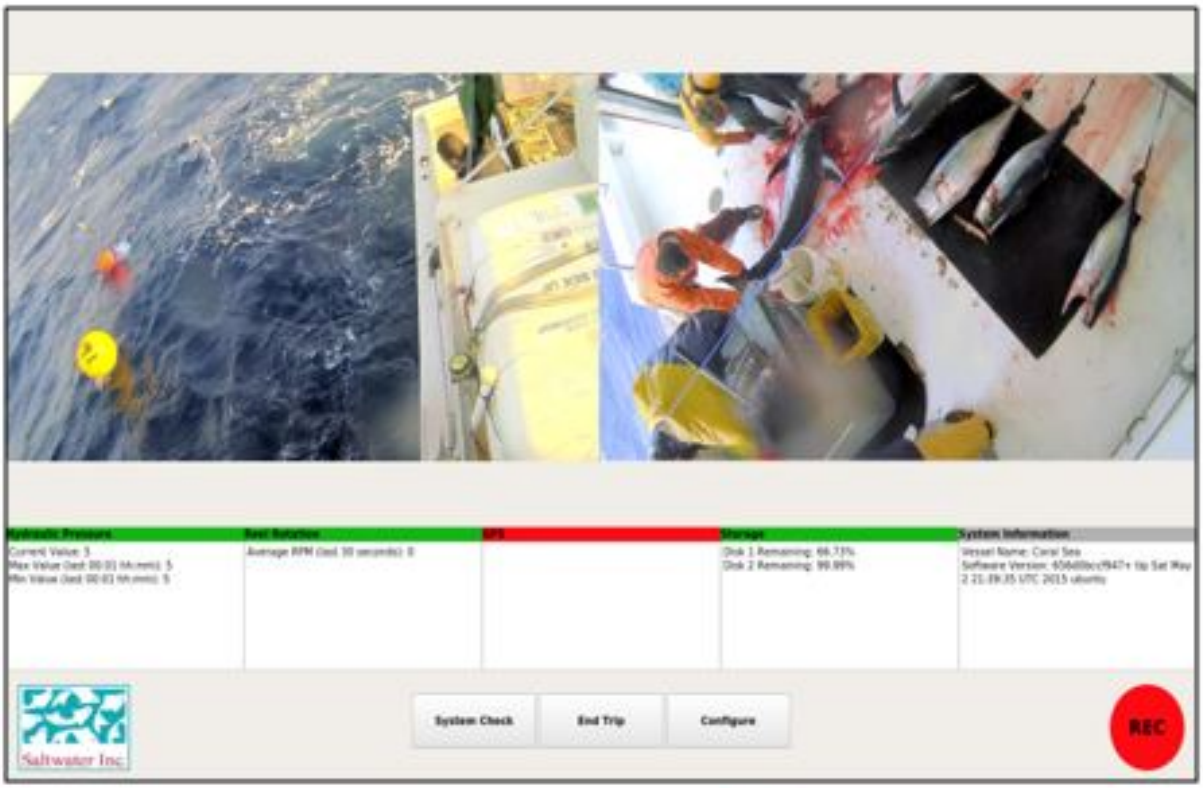
EM camera installed on a fishing vessel

MONITOR & KEYBOARD

A monitor with waterproof keyboard allows vessel crew to see live camera feeds 24/7, view what is being recorded in real-time, and run system checks as required. Our user interface is designed to provide a clear, simple way to confirm that all system components are operating correctly, and determine which hard drive has data and needs to be retrieved. The monitor and keyboard must be installed in the wheelhouse, in a dry location, that is clearly visible and easily accessible to crew.

USER INTERFACE

The following image shows an example (*from a pelagic longline vessel*) of what you will see on the monitor. This image shows two camera views, the status of the sensors, the amount of space available to store data, and basic system information. A green bar indicates that component is functioning properly. In this example the red bar indicates a problem with the GPS.



NOTE: When the system is recording, you will see the red "REC" symbol in the bottom right corner.

At the beginning, end, and during each trip you will have different responsibilities, which are described in the next section, ***Vessel Operator Responsibilities***

The following are step-by-step instructions on how to run the EM system on your vessel, how to check system function, and how to retrieve data.

POWERING UP THE EM SYSTEM

To run the EM system, you must power on the system at the start of each trip. This means the EM system should be powered on when the vessel leaves the dock and should remain powered until the vessel returns to the dock. Please follow these steps.

1. Power on the system at the breaker or switch where the system was installed.
2. Wait approximately 2-3 minutes for the system to power on. You should see lights and hear a series of beeps from the Control Box.
3. Turn the monitor on. You will see a series of screen changes while the system boots.
4. The system is on once you see the live views from your cameras and the relevant system information on the display.

CAMERA CHECK

One or two days before you plan to depart on a trip you should check the cameras and run a System Function Check. Please follow these steps.

1. Power up the system.
2. Once the system is on, check the monitor to make sure the views are clear of obstructions, and there is no slime or salt on the camera lens.
   - You can make the live camera windows larger by clicking on the camera image on the monitor. It can be made smaller by clicking it again.
   - If there is slime or salt on a lens, use a ***clean, wet, soft cloth*** to wipe the camera lens clean. Although the camera case is durable, the plastic lens cover can scratch, so do not clean it with anything abrasive.
   - If there is anything blocking the view, move the object. ***DO NOT MOVE*** the camera.
3. Once you are done checking the cameras, please run the System Function Check.

EM SYSTEM FUNCTION CHECK

You should run this check one or two days before each trip to make sure there are no problems with the system. You must also run it at the start of each trip.

1. Power up the system.
2. Once the system in on, locate the three tabs at the bottom of the screen: **System Check, End Trip,** and **Configure**.

3. Use the touch pad to click on "**System Check**". This can be done by simply tapping the touchpad when the cursor is over the tab or using the mouse "*left-click*" button next to the touchpad.
4. After you have done this, a new window will appear showing that the system check has been logged.
5. Click "**Okay**"

6. If you see all **green** on the status bars, that means that they system is **good to go.**

- **If you see RED on the status bar, there is a problem with that component. Please call the Saltwater EM team at 1-800-770-3241 as soon as possible.**

END OF TRIP & POWERING OFF THE SYSTEM

NMFS considers the end of the trip to be when you tie up at the dock.
At the end of each trip, you will need to power off the system to end recording and avoid draining the vessel battery. Follow these steps.

1. Look at the monitor.
2. Click on the tab that says **"End Trip"**. ***This is essential to stop trip recording.***

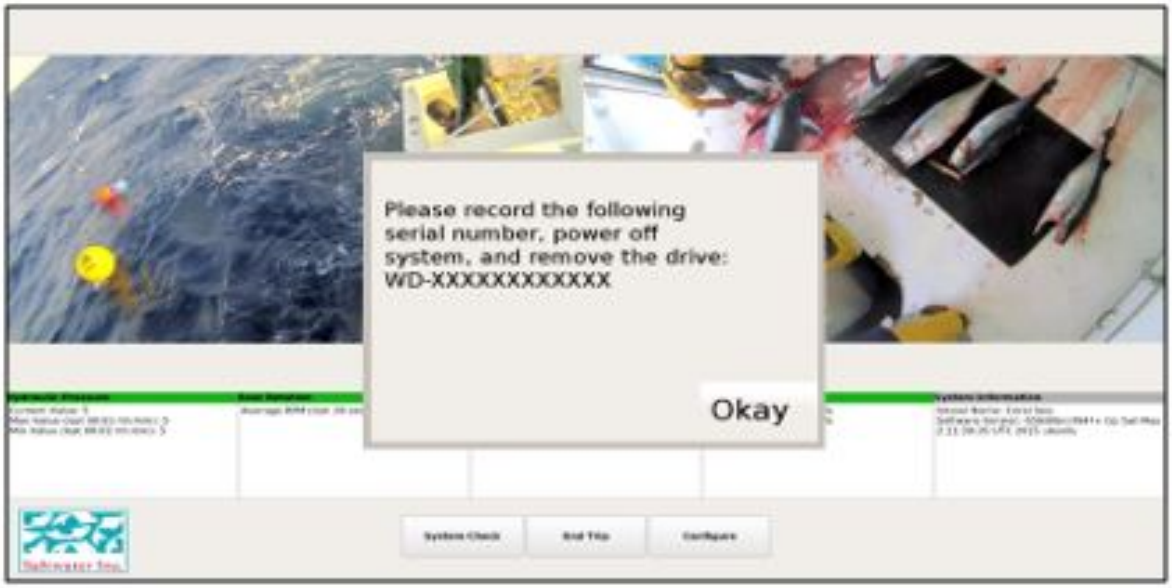
3. You see an image on the screen asking, "*Are you sure?*"; click yes **only** if you are done with your trip.
4. If you do ***not*** need or want to retrieve data at that time, simply power off the system at the switch or breaker,
5. If you ***do*** want to retrieve the data, leave the power on and follow the next set of instructions.

***If you need to shut off the system during a trip for some reason (vessel engine troubles, switching generators), simply power it off at the switch.**
Do *not* hit "End Trip". Remember to power it back on as soon as you are up and running again.

DATA RETRIEVAL

Video and sensor data is stored on removable hard drives in the Control Box. Within two days after every selected trip data needs to be retrieved and sent to Saltwater's office in Gloucester, MA. If doing back to back trips and you cannot mail the drive, it is okay to leave in system and mail in after subsequent trip. Please follow these steps.

1. Power up the system (if it is not already on).
2. Click on the "**End Trip**" tab.
3. You will be shown the serial number of the hard drive(s) you should remove.



4. Carefully ***write down*** this number. (If both serial numbers are shown on this screen, it means they both have data and you will need to remove and send in both drives).
5. Click **"Okay"** and wait for the system to ***shut down*** - the screen will turn gray/black**.**
6. Power off the system at the switch or breaker.

* **BE SURE** the system is powered off before you remove the hard drive.

7. Look at the Control Box. You will see two small, labeled boxes with two thumbscrews on each. This is where the hard drives are stored.

Control Box showing hard drive bays and location of serial numbers and thumbscrews.

8. **Match the serial number you have written down with the serial number on the hard drive.**
9. Carefully unscrew the spring-loaded thumbscrews on that drive caddy.
10. You will feel the drive caddy release. *(*Do ***not*** try to remove the screws*)*.
11. Pull gently to remove the caddy. The caddy will come all the way out. It will have a flat, silver rectangle in it. That is the hard drive. (Do ***not*** remove the hard drive from the caddy).
12. Place the whole device (hard drive caddy with thumb screws still attached and hard drive) into the **protective mailing box** provided by Saltwater**.**

* If both hard drive serial numbers were shown when you ended the trip, remove the second drive by repeating steps 10-12. Put **both** drives in one mailing box.

Hard drive caddy with hard drive inside

MAILING THE HARD DRIVE

1. Place the mailing box into a **Pre-paid USPS bubble mailer** that has been provided by Saltwater.
2. Fill out the form with vessel identification information. Place this form in the mailer with the hard drive.
3. Take this package to a US Post Office and mail it before your next trip.
4. Postage is pre-paid.

PREPARING FOR THE NEXT TRIP

After you send in the hard drives from your trip, you will need to put new hard drives in the EMU before your next trip. We recommend you do this right after removing a hard drive. Please follow these steps.

1. You will be provided two replacements hard drives during the install.
2. Locate the new hard drive.
3. Make sure the caddy is right side up. You can tell it is in the right position if the serial numbers on the outside of the caddy are right side up. You will also see a printed white label on the drive as shown in the image above.
4. Push the drive into place until it is flush.
5. Carefully slide the caddy and hard drive into the EMU until you feel a click.
6. Hold the caddy in place and screw the thumbscrews in by hand. (**DO NOT** use a screwdriver. This will strip the screws).
7. Power on the system.
8. Turn on the monitor
9. Click in "**System Check**."

10. If the hard drive has been properly installed, "**Storage**" will be green on the status bar and there will be two disks listed: *Disk 1* and *Disk 2*.
11. Once you have correctly installed the new drive (s), you can power off the system at the switch or breaker.

Many problems can be solved by turning the system off and then restarting it. If that does not resolve the issue, use this guide to help. If the problem persists, call Saltwater Technical support.

Problem	Check	Corrective Action
EMU not powering on	Lights on EMU	If lights are not on, check power source. There is no "on/off" switch on the EMU.
	Power at switch and/or breaker	Turn on power at switch and/or breaker
	Loose connections	Ensure all connections are tight
System does not start/ No display	System is beeping constantly	Call Saltwater Technical Support
	System is stuck on "American Megatrends" or Purple "EM System Screen"	Restart machine by turning power off/on at switch and/or breaker. If that does not work pull both hard drives and restart. If functional, probable dead/corrupted drive. Call Saltwater Tech Support.
	System goes black after post (possible white cursor)	Restart machine by turning power off/on at switch and/or breaker. If that does not work pull both hard drives and restart. If functional, probable dead/corrupted drive. Call Saltwater Tech Support.
Monitor not powering on	Power on monitor	Turn monitor on by pressing power button on monitor
	Connections	Pull out VGA, put back in, and tighten fasteners.
Monitor not showing video	Connections	Pull out VGA, put back in, and tighten fasteners.
	Video mode	Press A/V mode button to cycle to VGA
One or both cameras are not detected	System Check	Click "System Check" to refresh cameras, or power system off/on at switch and/or breaker.
	Connections	Re-plug connections at unit, coupler, or camera.
	Power	Check brick for 48v power light on small green power adapter (two lights). If lit, please check connections are tight and there is still no power, call Saltwater Technical Support.
"Weirdness on screen"	System software loaded improperly	Turn system off/on to reboot at switch and/or breaker. If problem persists call Saltwater Tech Support.
Status bar for "Storage "showing red or yellow, "Disk Remaining: Not Present"	Hard drives in EMU	Pull out hard drive caddies and reinstall. Make sure the drive "clicks" into place. Tighten thumbscrews.
	Hard drives formatted incorrectly	Call Saltwater Tech Support
	Hard drives full - Percent remaining is 1% on each drive	New hard drives required
Status Bar for "Sensors"	Connections	Check SPU USB, sensor wires, sensor

showing red		connections.
	SPU Unplugged	Plug back in and restart at switch and/or breaker. System must restart to reconnect to SPU.
	Improper software configuration	Call Saltwater Tech Support
Status bar for "Hydraulic Pressure" is red and pressure reads "309.xx", less than zero, or other value	A sensor has blown and shorted	Call Saltwater Tech Support
Hydraulic Pressure sensor readings are not changing during fishing	Connections	Call Saltwater Tech Support
	Sensor location	Make sure sensor is on the pressure side of the gear used for hauling, outside of any bypasses, and behind any relief valves as not to blow a sensor.
	Sensor Damaged	Sensor will often read 4.7+ if there has been damage to the sensor. Sometimes this can even read as triple digits or "Invalid Reading." Call Saltwater Technical Support.
Status bar for GPS showing red	System just booted up	Wait 3-5 minutes to see if GPS locks on
	Connections	Check GPS wire is properly screwed into the back of the EMU. Trace wire for any damage.
	View of sky	Move or re-stick GPS unit to get clear view of the sky. Call Saltwater Tech support if issue persists.
System not recording	Software Configuration problem	Call Saltwater Tech Support.
	Sensor not triggering recording	Call Saltwater Tech Support.
	Hard drive problem	Follow hard drive portion of guide.
System records for incorrect length of time	Configuration	Call Saltwater Tech Support.
	System lost power recently	System will start recording if there was an intermittent power loss during the last recording. It will record for one clip length
	Sensor Issue	See sensor section
System records at boot	System lost power recently	System will start recording if there was an intermittent power loss during the last recording. It will record for one clip length
	Failsafe Record	This is a failsafe setting in the software. Contact Saltwater Tech Support. This is a non-critical issue and should stop after one clip length.

PRIMARY CONTACTS

SALTWATER INC. TECHNICAL SUPPORT

Morgan Wealti (Project Manager) 907-406-3040 or Morgan.wealti@saltwaterinc.com.

Mark Hagianis (Technical Services) 907-885-8290 or Mark.hagianis@saltwaterinc.com.

Use this number to:

- Report problems or ask questions about the EM System
- Ask about Vessel Operator Responsibilities including catch handling and effort log
- Request assistance with data retrieval and shipping
- Schedule service
- Report the end of fishing.

Hard drives should be mailed to:

Saltwater Inc
PMB # 326
127 Eastern Ave
Gloucester, MA 01930

NMFS

If you have any questions or concerns regarding the Atlantic Herring and Mackerel Project or Omnibus Amendment, please contact:

Dan Luers (978) 282-8457 or Daniel.Luers@noaa.gov

Nichole Rossi (508) 495-2128 or Nichole.Rossi@noaa.gov

APPENDIX 8: NMFS/NEFSC EM SYSTEM SPECIFICATIONS

National Marine Fisheries Service
Northeast Fisheries Science Center
Fisheries Sampling Branch

April 22, 2016

Electronic Monitoring System Specifications

Background

Electronic Monitoring (EM) technologies hold promise as data collection resources and could be used as a monitoring tool by integrating the system with other data collection programs. The Northeast Fisheries Science Center (NEFSC) conducted a collaborative four-year study (in 3 phases) from 2010-2014 with Archipelago Marine Research, Ltd. and 13 participating fishing vessels. The goal of the study was to investigate the utility of EM to observe fishing behavior and monitor catch allocations in the Northeast Multispecies Fishery.

Information presented in this paper was based on NEFSC's data collection with EM systems, and incorporates information obtained through numerous EM service providers. The purpose of this paper is to inform implementation planning activities in the consideration of developing EM standards in an operational program.

Electronic Monitoring System

EM systems are designed for the automated collection of fisheries data while vessels are at sea. They collect high-frequency sensor data and closed-circuit television (CCTV) imagery during fishing or related activities which are then reviewed post-trip to provide data needed for fisheries management, compliance, and/or science. EM systems typically consist of a control center, a user interface (monitor and keyboard), a suite of sensors (GPS receiver, hydraulic pressure transducer, drum rotation sensor, etc.) and waterproof armored-dome CCTV digital cameras. Suitable technological alternatives (e.g., fast frame photographic systems) that are capable of meeting data needs may be accepted if approved by NMFS.

Electronic Monitoring Data Needs

EM system features are determined by program needs and objectives. Program needs will dictate the specific features an EM system must have in order to meet defined objectives. The objectives listed below are not an exhaustive list, but rather, a synopsis of program goals used throughout the study period.

- Identify, count, and assign a catch disposition (kept or discarded) for individual catch items,
- Obtain an estimated length per catch item (required to obtain a weight estimate),
- Obtain an estimated weight per catch item, species, or species group by haul
    - Individual fish, volumetric weight, scale or tote weight, etc.
- Monitor fishing activity (as defined by program needs),
- Monitor regulatory compliance (as defined by program needs), and
- Verify area fished.

The purpose of this paper is to identify specific product features needed to meet primary objectives for fisheries management data. Product features presented in this report include those identified during the NEFSC study as an example of characteristics that may be needed for a catch share monitoring program. Additional product features may be needed for an operational program or will vary depending on the program data needs and objectives.

- Distinguish and identify commercially important species and/or common bycatch in the Northeast Multispecies Fishery.
- Maintain a running count of individual fish during a trip by species (trip duration estimated 1-15 days total).

- Provide a length estimate for each discarded item by species.
- Provide weight estimates (derived from length measurement) by species on a haul basis incorporating standardized length-weight regressions generated by the Northeast Fisheries Science Center.
- Monitor fishing activity, including; catch sorting, discarding, transit, towing gear, hauling gear, setting gear, and stowage of kept fish.
- Verify area fished through means of GPS data that corresponds to still shots, video clips, or video streams.
- Activate recording activity through the use of sensors or other means (e.g, manual, etc.).
- Store data for retrieval by or transmission to NMFS or approved vendor.
- Meet data confidentiality standards of the Magnuson-Stevens Act.
- Meet chain of custody and data integrity needs for enforcement purposes.

Functional Requirements

An EM system consists of two major elements; hardware and software. The proposed specifications are based on the general EM program objectives included above for a catch share monitoring program. Incorporating more defined objectives (i.e., data timelines or turnaround, volumetric measurements, etc.) may negate or alter some of the specifications listed below. The standards below are set as minimum requirements, as advancements in technology improve these standards may be amended. Specifications listed in this document as "preferred" are not required.

Hardware

I. General

- Hardware should be adaptable and transferrable in application to enable deployment on a variety of fishing vessels (size, gear, target species).
- Hardware should be easily maintained by the vessel crew and spare parts readily available in close proximity to the vessel port.
- Hardware, including but not limited to wires, cameras, control box, and sensors, shall be adequately shielded to prevent radio frequency interference (RFI) with Vessel Monitoring System (VMS) units (http://www.nmfs.noaa.gov/ole/docs/2015/040815_noaa_fisheries_service_type.pdf).
- All vessel electronics need to work together simultaneously.

II. Power

- Ability to run off DC or AC power supply, inverters, or generators.
    - Power draw should be minimal (with 8 digital cameras, a maximum of 120 watts).
    - Power wires should be resistant to damage, water, weather, sun, etc.
    - Provide safeguards to retain data in the event of electrical failure or power spikes.
    - Vessels interested in using EM should note the power requirements of the system.

III. Vessel Data Storage

- The system should have sufficient data storage capacity to store all video and sensor data for an entire month (minimum of 500 gigabytes storage capacity). Each frame of stored image data should record a datetime stamp in the specified format[1].
    - Data storage hardware should be resistant to damage and data loss.

[1] Datetime: values are represented as a ten-digit number in the format YYMMDDHH24MI. YY = two digit year, MM = two digit month, DD = two digit day of the month, HH = two digit hour using 24 hour clock, MI = two digit minutes. All values are two digits padded with zeros. Full datetime must be a ten-digit numeric value. Dates and times should be determined based on local time on the fishing vessels at the time of fishing activity.

- The system must include a means of removing data from the EM unit, such as;
    - At least two external USB ports,
    - Removable storage device (e.g., hard drive) approved by NMFS or,
    - Other approved means of transferring data approved by NMFS.

IV. Cameras and Review

- Cameras (number of cameras will vary by vessel and program needs) should be enclosed in a waterproof armored-dome. Cameras should have a minimum IP rating of 66.
- Cameras should be capable of point-to-point or point-to-multipoint transmission (not openly transmitted) on all monitors.
- All cameras within a system should operate in synchronization for review and analyses purposes. Synchronized playback should occur with a 10 second timeframe.
- Cameras should be capable of operating continuously to meet data needs.
- Each camera should be easily surface mounted on vessels and provide manually adjustable viewing positions.
- Each camera should be compatible with a range of fixed focal length lenses to enable swapping of lenses or have varifocal lenses to achieve monitoring goals.
- Cameras must provide the option to produce still images for enhanced species identification and measurement.
- Cameras must be able to be triggered to record fishing, catch handling, transiting or any other vessel activity.
- Camera resolution must be a minimum of 1,280 x 720 (720p) for enhanced identification and measurement during video review. Resolution must be sufficient to discern individual fish (detect, count, and identify to species level) from distance. NMFS strongly encourages the use of higher resolutions than those described above whenever possible.
- Each camera must record at a speed of no less than 15 unique frames per second when the use of a video monitoring system is required.
- Some manufacturers use proprietary compression formats that require the use of proprietary software in order to view the video sequence or images. Use of such software can prevent or hinder law enforcement from viewing or otherwise accessing these images. If such software is used, then steps must be taken to ensure that law enforcement will be able to access them when needed.
- Cameras must have sufficient fields of view to observe all areas where fish could be sorted, processed, and discarded.
- Cameras must have auto-iris capabilities and produce color footage with the ability to revert to black and white video output when light levels become too low for color recognition.
    - Cameras must be capable of functioning during low light conditions to account for nighttime fishing activity. "Functioning" is defined as allowing video reviewers to count, identify, and measure individual fish and otherwise account for fishing activity and catch handling.
- Monitors should be appropriate to the vessel size and power supply, such that the monitor size is sufficient for the captain and EM technician to access and evaluate the EM system performance before, during, and after a fishing trip. Power draw by the monitor should be such that it will not overburden the vessel's power supply. The video monitor must:
    - Display all cameras simultaneously;
    - Operate at all times, including when fish are handled or sorted; and
    - Be securely mounted and readily accessible to the EM technician and captain and crew.
- If required, measurement grids (discard chute, sorting table panel, etc.) should be designed and tailored to each gear type and vessel size, compatible with common species caught by the vessel.

- Measurement grids should be capable of calibration (through the EM software) to ensure data accuracy and precision.
    - Discard chutes should have a continuous flow of water across their surface at a speed which is conducive to identification, counting, and measurement of catch.
    - Grids should be constructed of a material that allows catch to flow smoothly, without snagging.
    - Grids should be fixed in place during fishing activity and be resilient to standard vessel motions.
    - Grids should be of an appropriate size and shape and not impede or hamper normal fishing practices.
- All components (including cameras, sensors, control box, and wiring) of a robust system must be capable of starting up and functioning during extreme weather conditions (temperatures in the Northeast range from -7 to 29 degrees Celsius) wherever and whenever groundfish vessels are actively fishing. The Northeast groundfish fleet includes a number of small boats with semi-enclosed wheelhouses. Spray, condensation, cold, and heat occasionally enter the wheelhouse on these vessels. Weather conditions include:
    - Extreme heat, freezing rain/spray, ice, snow, fog, and hail.
    - Waves ranging from spray inducing chop to damaging large waves.
    - Violent pitching or rolling.

V. Sensors

- The system must include a minimum of at least two sensors to trigger camera recording (one main sensor may be used to trigger recording but a second sensor is required as a back-up in case the primary sensor fails).
    - Sensors may include a hydraulic sensor, drum sensor, motion triggered sensors, or other means of triggering cameras (must be approved by NMFS).
    - Sensors must be compatible with standard vessel equipment.
- The system must include an independent GPS unit to produce track of vessel transit and fishing activity.

VI. Preferred Features

- The system should have electronic reporting capabilities and the option to link with eVTR software.
- Hard drives should be durable drives that are able to withstand postal mailing.
- Hard drives should be pre-formatted for ease of use and to allow the captain to exchange hard drives readily.
- Regular system upgrades as technology advances.

Software

I. EM Data Review

- The software must include basic video and navigation functions (at a minimum: record, start, stop, bookmarking, play, synchronized playback, standard viewing capabilities copy and save functions, etc.).The system must output video files to an open source format or, if custom or licensed-based software is used, access to data must be supplied (server, licenses, etc.) to the government for data processing purposes throughout the duration of program.
- Software should include the ability to accomplish the below functions;
    - Assess video quality based on standard requirements including but not limited to; complete sensor data (if applicable), camera functionality, presence of video gaps (missing or incomplete), clarity of images (are cameras dirty, focused, covered by salt

spray, etc.), sufficient camera angle to monitor catch, species identification, and sufficient view of catch handling practices, etc.
    - Allow reviewers to identify each species caught or at minimum store images of unknown species for later identification and inclusion in the catch record.

II. Security

- Data encryption or tamper evident features (video and sensor).
- Software must be secure, have the ability to lock and protect data, and detect if the EM system was tampered with at any point during a fishing trip (tamper evident).

III. Compatibility

- Software must be compatible with:
    - Personal Computers (PC);
    - Windows-based operating systems; and
    - Internet Explorer and other commonly used browsers.
- Software must produce data in a file format such as .xls, or .xml that is compatible with an Oracle database.
- The system must use commercially available software or provide proprietary licenses.

IV. Pre-trip System Check

- Software must include a pre-trip assessment of the EM system to indicate all components are functional prior to trip start.

V. Data Validation

- Software must include the ability to verify a complete trip (complete EM trip is defined as a trip where video was recording 100% of the time, trip start to trip end).
- Software shall be capable of producing data elements outlined in the NOAA Fisheries Greater Atlantic Regional Fisheries Office Electronic Monitoring Summary Data File Technical Requirements[1];
    - Software shall include identifying datetime stamps[2], location, vessel name, and permit number, and a GPS unit to facilitate review.
    - Software shall utilize datetime stamp and sensor data to determine number of hauls and haul begin time for the trip (video data may be used to verify haul begin time).
    - Software shall capture and document all system failures and image or sensor data gaps resulting in data loss.
- Sensor data shall display vessel track, fishing start/end locations and times, transit locations and times, and provide a complete record of all fishing activity during a given trip.
    - Sensor data shall display data from the GPS as well as power to the EM system, and sensors used to trigger recording.

VI. Shoreside Data Storage

- System data and video footage should be stored by the provider for 3 years after collection and must include sufficient data backup features to protect data.

[1] Document outlines file format, security, submission protocol, and file structure for EM summary reports.
[2] Datetime: values are represented as a ten-digit number in the format YYMMDDHH24MI. YY = two digit year, MM = two digit month, DD = two digit day of the month, HH = two digit hour using 24 hour clock, MI = two digit minutes. All values are two digits padded with zeros. Full datetime must be a ten-digit numeric value. Dates and times should be determined based on local time on the fishing vessels at the time of fishing activity.

VII. Data Output

- Software shall be capable of producing data elements outlined in the NOAA Fisheries Greater Atlantic Regional Fisheries Office Electronic Monitoring Summary Data File Technical Requirements[1];

VIII. Preferred Features

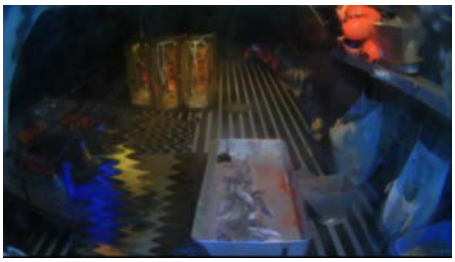
- Automated species ID, automated measurement, and automated weight estimate.
    - Software should be able to incorporate additional species for automated processing.
    - Able to handle automated ID of multiple fish at a time (i.e. not single file fish fed down a chute), multiple fish orientations, weather conditions, light conditions, etc.
- Remote transmission of EM data within 24 hours of vessel landing.
- Software must be easily modified to incorporate regional preferences.
- The system should be portable between platforms (fishing vessels) where peripherals (cameras, sensors) are static and core components (computer, software, discard chute) are transferred.
- The system should have electronic reporting capabilities and the option to link with eVTR software.

[1] Document outlines file format, security, submission protocol, and file structure for EM summary reports.

Appendix 9: Image Quality Assessment

EM Video Quality Assessment

For each fishing event, the reviewer assessed the overall quality of the video. The video quality criteria are defined as follows:

	Excellent. The imagery was very clear providing excellent views of fishing activities, including speciation and discards. Focus was very good; light levels were high and all activities were readily discernible. This imagery could be classified as 'imperceptible'.
	Good. The imagery was clear, providing good views of fishing activity, but not all discards were discernible. Focus was good with slight blurring or light conditions. All activities were discernible. This imagery could be classified as perceptible but not annoying.
	Fair. The view was acceptable, but there may be some difficulty assessing discards. Moderate blurring or slightly darker conditions hamper, but do not impede analysis. This imagery could be classified as slightly annoying.
	**Poor.** The imagery is difficult to assess. Imagery is somewhat blurred or impeded by low light or glare conditions making enumeration and speciation of fish very difficult. This imagery could be classified as annoying. Document the problem using the code in the Poor Quality Code field.

Appendix 10: Data Release Form

Trip Data Release Form

PAPERWORK REDUCTION ACT STATEMENT: The information provided on this form will be used to ensure that the data for a specific trip is not provided to a person who does not have authority to obtain that data under the confidentiality requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Marine Mammal Protection Act (MMPA). Meeting those confidentiality requirements are critical for collecting information that is used in analyses that support the conservation and management of living marine resources and that are required under the MSA, the Endangered Species Act (ESA), the MMPA, the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), Executive Order 12866 (EO 12866), and other applicable laws. The public reporting burden for this form is estimated to average 2 minutes per response, including the time for completing, reviewing, and transmitting the information on the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to: Amy Martins, National Marine Fisheries Service, Northeast Fisheries Science Center, Fisheries Sampling Branch, 166 Water Street, Woods Hole, MA 02543-2266. Providing the requested information is required to deliver the copy of the trip to the requested location and to release the trip data. The information on this form will be kept confidential as required under Section 402(b) of the MSA (18 U.S.C. 1881a(b)) and regulations at 50 C.F.R Part 600, Subpart E. Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number. This is an approved information collection under OMB Control No. 0648-0593 through 10/31/2018.

Policy for Data Requests of NMFS Observer-Obtained Information

1. The only individuals who may request and receive data include: the owner(s), or the captain acting as an authorized representative for the owner(s), of a vessel participating in the National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) Observer Program. No other individuals may be issued any data under this policy.
2. Any data request must be submitted in writing on a form letter which may be obtained from a NMFS Observer, or the address below. Two signatures are required on this letter: that of the individual requesting the data, and that of the individual releasing the data. All letters must then be returned to the following address:

   Chief, Fisheries Sampling Branch
   National Marine Fisheries Service
   Northeast Fisheries Science Center
   166 Water Street
   Woods Hole, MA 02543-1097

   Any questions or other requests relating to data release should also be directed to the above address.
3. It should be understood that upon release of the requested data, the recipient then becomes responsible for it.
4. The individual signing the letter as the "releasor" must issue the information in compliance with this policy.
5. Data may not be released upon an oral request, or without first completing and signing the authorized release letter mentioned above.
6. Field diaries do not meet the specifications of releasable data under the policy. No field diaries may be copied for, or reviewed by, vessel owners or captains.
7. Release of data for trips in which more than one vessel participated (*i.e.,* pair trawl trips) may only occur if both vessel owners or captains complete and sign data release letters.
8. Any requests for historical data (*i.e.,* data that an observer has already mailed in) should be forwarded to the address above.
9. All letters should be completed in pen, not pencil.

OMB Control No: 0648-0593
Expires on: 10/31/2018

NMFS FISHERIES OBSERVER PROGRAM
TRIP DATA RELEASE FORM

Request Date_____/_____/_____

Observer Trip ID # _____

Vessel Name _____

USCG Doc # _____

Date Landed_____/_____/_____

_____ _____

PRINT Name Signature

PRINT Mailing Address:

☐ Captain
☐ Owner

_____

_____

_____

Copies Released By:_____Date_____Edited? Yes_ No___

(For NMFS Office Use)

▼ TEAR AT PERFORATION AND RETAIN BELOW SECTION FOR YOUR RECORDS ▼

The data you receive may be preliminary and not yet completely reviewed.

Observer Trip ID # _____

Date Requested _____

Mail Request To:
Chief, Fisheries Sampling Branch
National Marine Fisheries Service
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1097

Questions or Comments:
Gina Shield
508-495-2139

Appendix 8

Cost Analysis of Electronic Monitoring Pilot Project

Prepared by the Greater Atlantic Regional Fisheries Office
with Consultation from Saltwater Inc. Staff

Executive Summary

In the final report on the EM pilot study, Saltwater Inc. (Saltwater) provided information on cost drivers for EM, but the actual costs they incurred were deemed proprietary and could not be shared. Thus, NMFS used Saltwater's final report to analyze costs for this project and scale them to estimated industry costs for an operational EM program. Saltwater provided input and validation on the accuracy of these estimates. This analysis estimates that industry costs per vessel in year 1 will likely be around $11,482, or $287 per monitored fishing day. However, several contingencies (i.e. purchasing new equipment, new service provider, additional data review and storage requirements) could drive these costs up to an estimated $39,482 ($987/day). In year 2+ (i.e. every year after year 1), industry costs are projected at $11,845 per vessel ($296/day), but could approach $19,012 ($475/day) in several scenarios (i.e. shorter than anticipated equipment life, additional data review and storage requirements). Because vessels would face minimal monitoring costs on trips with no fishing effort (no deployment of gear), the above cost estimates may be reduced by an estimated $1,200 per vessel per year ($30 per day).

Assumptions/estimates

In order to estimate the cost that a vessel will incur over the course of a day or a trip, certain assumptions must be made about fleet size, fishing effort, SBRM observer coverage, etc. For fleet size, we assumed that 11 vessels participate in the midwater trawl fishery, and that each of these vessels chooses to monitor with EM/portside. We used this estimate because this is the number of active vessels that participated in the midwater trawl fishery in 2017, as well as the number of active participants in the EM study conducted in 2016 and 2017. Although several other vessels are permitted to participate in this fishery and other boats could enter it, we elected to use 11 vessels because it best represents recent effort. If less than 11 vessels participate in EM monitoring, this could result in increased per vessel costs.

For fishing effort, we assumed that each vessel would fish for herring on 100 days over the course of the year. Fishing effort varies widely among midwater trawl vessels, with some vessels fishing far more and some fishing far less than 100 days. This estimate is based on recent effort across the fleet for what the average vessel would be expected to fish over the course of a year.

SBRM observer coverage varied widely from 2015-2017, with assigned fleet coverage days ranging from approximately 45-450 days per year (roughly equating to 5-45% coverage). Because the SBRM coverage rate is based on bycatch rate and cannot be predicted in advance, we speculatively estimated that coverage rates would be 10%. Although this estimate is not as low as coverage levels in 2015 and thus doesn't represent a maximum cost to industry, it does represent a "high

middle" estimate of costs that industry can expect in a given year, while not vastly underestimating costs in very low SBRM coverage years.

In total, we estimate that each of the 11 vessels will fish 100 days each year. Since the New England Council chose a coverage target of 50% combined SBRM and IFM coverage, vessels can expect coverage on 50 days. Of those 50 days, we estimate that SBRM (not covered by industry) will cover vessels on 10 of those days (10% of 100 fishing days). Thus, each vessel is expected to assume industry costs for 40 days of IFM coverage each year. Yearly and daily costs in this report are therefore based on 40 IFM coverage days per year. All references to "cost per day" in this document are per monitored day. Thus, the daily cost multiplied by 40 days is equal to the yearly cost.

Cost Analysis

Saltwater's final report on the EM Project outlined cost drivers in the pilot project. Costs were broken down into two categories; startup costs and ongoing costs. The amount of expenses in each cost category are diagrammed in Figure 1. Because Saltwater received $995,000 of funding for this project, this was the starting point from which we began to scale costs for an ongoing EM monitoring program. Details of how costs were scaled are outline in the sections below and in Table 1 (at the end of the document).

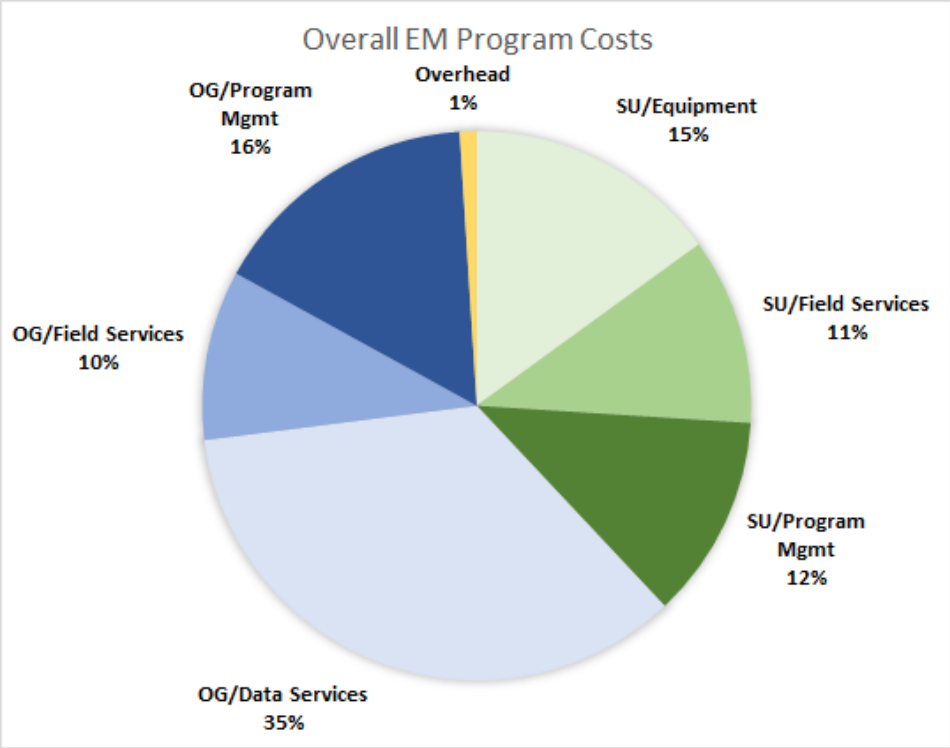


Figure 1: *Overall EM program costs broken down into startup costs (SU) and ongoing (OG) costs by category (from SWI Final EM Report).*

Overhead

Overhead costs are projected to remain relatively constant from year to year. For the pilot project, overhead costs were approximately 1% of project expenditures. While 1% of overall costs is a reasonable estimate for a large operational EM program, we believe this estimate is about half of that necessary for a small-scale program involving only a few vessels. There are minimum overhead costs that would be necessary independent of the number of vessels in the program. Given the small number of vessels enrolled in an EM monitoring program, we estimate overhead costs at $2,500 per year, which equates to approximately 2% of overall costs. Saltwater verified that this was a reasonable estimate.

Year 1 Costs-Best Estimate

Startup Costs/ Equipment

At the beginning of the EM pilot project, each of the 11 herring midwater trawl vessels were outfitted with EM systems by Saltwater. Saltwater agreed to transfer ownership of these systems to the vessels at a reduced rate (estimated to be $1,000 per vessel). As such, vessels opting to take ownership of these cameras will have startup equipment costs of an estimated $1,000 per year ($25 per monitored fishing day). Since the majority of vessels have these systems already installed, the estimate of $1,000 is the "best estimate" for the fleet.

Several vessels in the project opted to be outfitted with less that complete (1 or 2 camera) systems which would need to be enhanced to meet the requirements of an operational program. In addition, there are latent vessels/permits that have not been outfitted with EM systems that could choose to re-enter the herring midwater trawl fishery and would be required to purchase new equipment if they chose to monitor with EM. For vessels requiring complete EM systems, costs are estimated at $10,000, resulting in an estimated $9,000 yearly (225$/day) increase in cost over the best estimate. Vessels with partial systems already installed would face only a portion of these costs, dependent on the equipment needed to meet IFM EM requirements.

Startup Costs/ Field Services

Startup field service costs include costs for installation of EM equipment and costs to get these systems into compliance with upcoming IFM regulations. Because EM systems are installed on most of the vessels in the fleet, these costs are expected to be relatively minor. Vessels may have the option to sign a contract with a service provider to cover costs associated with system activation, warranty, and ensuring system compliance with IFM regulations. A contract of this nature will cost vessels an estimate of $1,000 per year ($25/day). Since the majority of vessels have EM systems already installed, $1,000 per vessel is the best estimate for the fleet.

As mentioned above, vessels that were not previously outfitted or fully outfitted with complete EM systems would face increased costs if they chose to monitor with EM. For vessels requiring installation of complete EM systems, costs are estimated at $3,500, resulting in an estimated $2,500 yearly ($63/day) increase in cost over the best estimate. Vessels with partial systems already installed would face only a portion of these field service costs, dependent on the equipment needed to meet IFM EM requirements.

Startup Costs/ Program Management

Startup program management costs are those costs for a service provider that are associated with starting a herring EM monitoring program, which will putatively be borne by vessels. These include cost to obtain office space, hire and train adequate staff (project manager, EM technicians, reviewers, etc.), and establish review protocols and templates. Since most of the midwater trawl vessel are outfitted with Saltwater cameras, and Saltwater established a program during the pilot program, the best estimate of cost for startup program management is $0.

If a vessel chose a different service provider, startup program management costs are estimated at $10,909 per vessel ($273/day). This cost is based on Saltwater's startup costs in the final report on the EM pilot project. This is likely a high-end estimate because it assumes that the new service provider has no infrastructure in place and must establish a completely new program. Service providers already established in midwater trawl fishing areas and those with experience in EM may offer substantially reduced costs.

Ongoing Costs- Program Management

Ongoing program management costs include oversight of the EM program, communication with NMFS and the industry, oversight of tech support, data management, and review activities, and oversight of other general program practices. In the final report, Saltwater estimated the ongoing program management costs made up about 26% of all ongoing costs, although this was higher than they would envision for an ongoing management program. While a large operational EM program would likely expect program management to be 8-10% of the overall cost of a program, the small EM program being developed for the midwater trawl fishery would require a higher percentage. With relatively few vessels enrolled in an EM monitoring program, we estimate program management costs to be $20,000/year. This equates to approximately 16% of overall costs. Saltwater verified that this was a reasonable estimate.

Ongoing Costs- Field Services

Ongoing field service costs include field tech support and travel costs associated with tech support, replacement equipment, and supplies. Because the EM study was only a 16-month project, it was difficult for Saltwater to discern between "startup" and "ongoing" field service costs. Saltwater estimated that the costs for field services is generally about four times greater than the cost of equipment (after the initial installation). Therefore, we estimate the total yearly cost to the fleet for ongoing field services at $29,000. These costs are not expected to vary appreciably between year 1 and any subsequent year.

Ongoing Costs- Data Services

Data services includes retrieval and shipping of hard drives, data processing, data checks, review, and storage. Data service costs in the pilot project accounted for about 52.5% of ongoing costs and 35.5% of overall costs. Data service costs are driven by the cost of video review, which Saltwater

estimates to account for about 90% of these costs. Saltwater also provided information indicating that each trip required an average of about 6.5 hours to review and 8.5-9 hours to complete analysis, storage, etc. Given that the average trip over the course of this project was about 3 days, this indicates that each day at sea is estimated to take about 3 hours to review, analyze, and store.

The cost drivers Saltwater included in the final report were based on review of 100% of footage collected, and often involved review of trips multiple times for testing/quality control purposes. In this analysis, we tried to scale costs accordingly. In an ongoing program, saltwater found that a review of data only around the haulback of gear (audit review) cost about 46% of what it would cost to review of all footage (census review). Because this was a pilot project, all footage collected must be retained for three years, which Saltwater estimated to add an additional 5% to expected ongoing data storage costs. We estimated that ongoing data service costs would be reduced in an operational program by an additional 15% by eliminating multiple reviews of data (to develop templates, QA/QC, etc.) and in efficiencies gained through experience with this study.

Thus, since our estimate is that EM coverage would apply on 40% of trips, the estimate cost per vessel is $4,800 ($120/day). This is calculated as such: $355,000 (data services cost in EM pilot) * 0.46 (cost of audit rather than census review) * 0.85 (correction for multiple review of EM footage) * 0.95 (correction for storage of all data from study) = $52,800 per year /11 vessels = $4,800 per vessel/year.

Year 1- Possible Cost Increases

Census Review (100%) of Footage (Rather than Audit Review)

The EM final report estimated that an audit review required about 46% of the time and cost necessary to do a census review. Because review of footage makes up an estimated 90% of ongoing data service costs, we estimate that census review would add an estimated $5,071 to yearly monitoring costs per vessel ($127 per day), resulting in an estimated total EM yearly costs per vessel of $16,553 ($414 per day). Since the Council elected for the audit review model, these additional costs would not be incurred in years 1 and 2, but could be incurred in subsequent years if the Council chose higher monitoring rates during the 2-year reanalysis of IFM.

New Service Provider /Equipment

The best estimates for this report assume that vessels would employ the previously installed EM systems (from the EM project) and use the service provider that provided equipment in future monitoring. We used this as the best estimate because: 1) the majority of vessel already had full EM systems onboard the vessel and would have minimal startup costs, 2) the vessel's EM equipment is compatible with the service provider's equipment, and 3) the service provider has established a footprint (including review protocols, staff, office space) that may allow them to initially operate cheaper than a competitor.

However, there are cases where vessels may choose other service providers. Several vessels involved in this study did not have a full suite of EM system components installed, and would face additional costs in coming into compliance with a monitoring program. It is possible that some vessels were not happy with the EM study service provider, and would be willing to pay more for a service provider that better suits their needs. It is also possible that latent vessels (with inactive permits) or new vessels choose to re-enter/enter the fishery, and would require installation of all new equipment. This would result in greater startup costs for the vessels.

If a vessel required a completely new system, we estimate that this would cost $10,000 for the equipment plus an additional $3,500 for installation costs. Since the best estimate for year 1 costs for equipment/installation was $2,000, this purchase/install of all new equipment would cost a vessel $11,500 over the best estimate.

If a vessel chooses to monitor with a new service provider, they may face costs above those for equipment/installation. We estimate that new service providers may need to establish infrastructure, hire staff, establish data management/review protocols, etc. These costs would likely be borne by vessels choosing to monitor with this service provider. Based on startup program management costs for the EM study, we estimate these costs to be about $10,909. These costs would likely vary greatly by service provider, and could be mitigated by increasing the number of vessels monitoring with that service provider, thus spreading some of these costs across vessels.

When combined, a vessel requiring new equipment/installation and a new EM service provider could face costs of $33,891 for the first year of monitoring ($847/day), which is $22,409 more per year ($560/day) than the best estimate for year 1 monitoring costs. After year 1, monitoring cost estimates would be the same for all vessels.

Storage Costs

Saltwater estimated that the overall costs of storage in this project was approximately 3%. However, at a national level, NMFS headquarters is currently developing a retention schedule for EM footage, which will inform what EM footage/data needs to be retained and stored, and for how long. Therefore, we currently have no guidance as to what this retention schedule will include, and what the ongoing costs for data storage will be. However, based on the Saltwater report, we expect that these costs will range from negligible up to $13 per day. If the policy requires only retaining of summary footage/data and footage/data that contains events that may need to be reviewed in the future, these costs would be negligible. If the policy requires that all footage from every trip be retained, these costs are estimated to be $520 per vessel per year ($13 per day). There are multiple options that would likely result in costs between these two extremes, which could include retaining data only around halls, retaining only reviewed trips, etc.

<u>Year 1- Most Expensive</u>

The most expensive estimate is calculated by taking the best estimate and adding in each of the "possible additional costs" (census review, new equipment/service provider, increased data service costs). If a vessel were required to pay all of these increased costs, their total year 1 monitoring

cost would be $39,482 ($987 per monitored day). This is an estimated $28,000 higher per year ($700 per day) than the best estimate. This cost would only occur if all of these things occurred: 1) the Council/NMFS decided to require a census review of all footage (as noted above, the Council did not choose this option for implementation, but this does not preclude them from doing so in the required 2-year review), 2) the vessel required/opted for brand new equipment/installation and a new service provider, and 3) NMFS headquarters determined that 100% of footage collected must be stored.

Year 2+ Costs-Best Estimate

Year 2+ cost estimates are what we estimate for every year after year 1. Year 2+ cost best estimates mimic those for year-one in most categories. The only categories with different methods to calculate year 2+ costs (vs. year 1) were for "equipment costs" (replacement) and "field services" (equipment replacement). Based on the EM final report and conversations with Saltwater, we estimate that half of the equipment onboard a vessel will degrade and need replacing every five years. We use this estimate because different components of the installed EM gear will degrade at different rates, depending on the gear's durability, exposure to elements, etc. For this reason, it is likely that some equipment onboard (e.g. exposed camera) may be replaced several times before other pieces of equipment (e.g. wire runs). We felt the estimate of system "half-life" was a more appropriate method to estimate equipment replacement costs, and estimated that the best half-life estimate for the equipment was 5 years.

Equipment (replacement)

Purchasing all of the components of an EM system was estimated to cost $10,000 per vessel. Since we estimate that the vessels will have to replace half of that equipment every five years, vessels are expected to pay $1,000 each year in equipment costs ($10,000 divided by 2 (half of the equipment) divided by 5 (years)). This estimate is equivalent to the estimated equipment costs for year-1 for transfer of equipment from Saltwater to the vessels.

Field Services (equipment replacement)

Field Services for equipment replacement would involve costs associated with installing and replacing EM system equipment as it failed. For an ongoing program, Saltwater estimated that the cost of field services (including ongoing field service costs and equipment replacement service) would be four times the cost of the equipment itself. As such, we estimate that the total yearly cost for field services would be $44,000, and that $15,000 of those yearly costs would be associated with replacing EM system components.

Year 2+- Possible Cost Increases

Census Review

As in year 1, requiring census review vs. audit review would cost each vessel an additional $5,071 per year ($127 per monitored day).

3-year equipment life

As detailed above, our best estimate is that half of the EM equipment will need to be replaced every five years. However, given that these vessels have not been monitored with a long-term EM program, and that costs will vary by vessel, we provide here an estimate of additional costs if we assume that 50% of the equipment would need to be replaced every 3 years (rather than 5). With a 3-year half-life, vessels would face an average increase in costs of $1,576 per year ($39 per monitored day).

Increased Data Storage Requirements

As in year 1, the retention schedule being developed by NMFS headquarters could require data storage costs of up to $520 per vessel per year ($13 per monitored day).

Year 2+- Most Expensive

In year 2+, the most expensive estimate is calculated by taking the best estimate and adding in each of the "possible additional costs" (census review, 3-year equipment life, increased data service costs). If a vessel were required to pay all of these increased costs, their total year 2+ monitoring cost would be $19,012 ($475 per monitored day), which is an increase of $7,167 per year ($179 per day) over the best estimate. The "most expensive" estimate would only be incurred if all of the following occurred: 1) the Council/NMFS decided to require a census review of all footage (may occur in 2-year review, see above note), 2) the equipment on the vessel requires replacement more frequently than anticipated (half of equipment every 3 years), and 3) NMFS headquarters determined that 100% of footage collected must be stored.

Possible Cost Reductions- All years

No Fishing Days

EM systems have been set up to trigger collection of footage/data upon deployment of gear for the first time on each trip. In cases where no fishing occurs (gear is not set) for an entire trip, there would be no footage or sensor data recorded (and no fish to portside sample), thus resulting in minimal monitoring costs for that trip. Observer data for 2015-2017 indicates that about 25% of observed trips result in no fishing effort. While we are not certain if this is representative of all trips or only observed trips, 25% is our best estimate for the percentage of trips with no fishing effort. If 10 of the estimated 40 monitored trips (25%) have no fishing effort, this would result in a reduction in monitoring cost (from the above estimate) to the vessel of $1,200 per year ($30 per sea day). Thus, we estimate monitoring costs at $10,282 – $38,282 per year ($257-$957 per day) in year 1 and $10,645-$17,812 per year ($266-$445 per day) in year 2+.

Cost Reductions Associated with Greater Fishing Effort

Many of the costs associated with an EM monitoring program include infrastructure, overhead, and program management costs to the service provider, which are then passed on to the vessel (Table 2). These costs are generally upfront and must be paid regardless of the number of trips monitored. After these costs are paid off by the industry, the majority of expenses are for reviewing, analyzing,

and storing data from each trip, which accounts for a fraction of the total cost. As such, the costs to the vessel per trip over the course of a year may be reduced by having greater fishing effort.

Table 2: Fishing Effort vs. EM Monitoring Costs

Costs	Per Boat Per Day (20 days/year)	Per Boat Per Day (40)	Per Boat Per Day (60)
Overhead	$11	$6	$4
Ongoing Program Mgmt	$91	$45	$30
Ongoing Field Services	$132	$66	$44
Ongoing Data Services	$120	$120	$120
Equipment (replacement)	$50	$25	$17
Field Services (equip Repl.)	$68	$34	$23
	$473	**$296**	**$238**

Comparison of EM industry costs based on the number of days a vessel is monitored each year. Because many costs are not dependent on the number of trips a vessel takes, they can be spread out across all trips for that year. Thus, per trips costs are estimated at $473 if 20 monitored days each year (50 total sea days), $296 if 40 monitored days each year (100 total sea days), and $238 if 60 monitored days (150 total sea days).

Portside Sampling

The EM study did not involve any element of portside sampling. Therefore, the analyses contained in this report are taken directly from analysis performed in the (updated) Environmental Assessment of the IFM Amendment. The IFM Amendment estimates that the midwater trawl herring fleet will catch about 50,000 mt of herring each year. At a projected monitoring cost of $3.84 per metric ton, the midwater trawl fleet will incur portside sampling costs of approximately $96,000 per year. Based on 11 vessels requiring 40 additional monitored days each year, this would result in costs of $8,700 per vessel ($218/ monitored day).

The cost for portside sampling will vary based on yearly catch. As a high-end estimate, if the herring fleet captured the entire yearly quota (104,800 mt), and midwater trawlers captured 75% of that fish, it would cost the fleet an estimated $121,000, or $11,000 per year per vessel ($275/day). If the herring fleet captured their low for the last 5 year period (49k mt/2017) and midwater trawl vessels captured 75% of this fish, it would cost the fleet and estimated $56,500 per year, or $5,100 per vessel per year ($128/day).

Thus, portside sampling costs per vessel are expected to range between $5,100 and $11,000 per year ($128-$275/day), with a best estimate of $8,700 per year ($218/day).

Summary: Combined EM and Portside Costs

Year 1

Per vessel costs for year 1 of EM range between $10,232 and $39,482 ($257-$987 per monitored day). The best estimate per vessel for EM coverage is $11,482 ($287 per monitored day), which does not include the costs for any equipment/installation. Portside sampling costs are expected to range between $5,100 and $11,000 per vessel per year ($128-$275 per monitored day), with a best estimate of $8,700 per year ($218 per monitored day). Thus, combined EM and portside sampling costs are expected to range between $15,332 and $50,482 ($385-$1,262 per monitored day), with a best estimate of $20,182 per vessel per year ($505 per monitored day).

Year 2+

Per vessel costs for year 2+ of EM range between $10,645 and $19,012 ($266-$475 per monitored day). The best estimate per vessel for year 2+ EM coverage is $11,845 ($296 per monitored day). Portside sampling costs are expected to range between $5,100 and $11,000 per vessel per year ($128-$275 per monitored day), with a best estimate of $8,700 per year ($218 per monitored day). Thus, combined EM and portside sampling costs are expected to range between $15,745 and $30,012 ($394-$750 per monitored day), with a best estimate of $20,545 per vessel per year ($514 per monitored day).

Table 1: Cost Breakdown for Year 1 and Year 2+

Estimate of Costs: Year 1										
	Best Estimates				Census Review (100%)		New Contractor/Equipment		Most Expensive: Census Review/New Contractor/New Equip, Data Storage 5% Data Services Costs	
Category	Cost	Percent of Total	Per Boat/Year (11)	Per Boat Per Day (40)	Per Boat (40 trips)	Per Day/ Census Review	Per Boat	Per Day	Per Boat	Per Day
Overhead	$2,500	1.98%	$227	$6	$227	$6	$227	$6	$227	$6
Ongoing/Program Mgmt	$20,000	15.84%	$1,818	$45	$1,818	$45	$1,818	$45	$1,818	$45
OG/Field Services	$29,000	22.96%	$2,636	$66	$2,636	$66	$2,636	$66	$2,636	$66
OG/Data Services	$52,800	41.81%	$4,800	$120	$9,871	$247	$4,800	$120	$10,391	$260
Startup/Equipment	$11,000	8.71%	$1,000	$25	$1,000	$25	$10,000	$250	$10,000	$250
SU/Field Services	$11,000	8.71%	$1,000	$25	$1,000	$25	$3,500	$88	$3,500	$88
SU/Program Mgt	$0	0.00%	$0	$0	0	$0	$10,909	$273	$10,909	$273
Total Costs	**$126,300**	**100.00%**	**$11,482**	**$287**	**$16,553**	**$414**	**$33,891**	**$847**	**$39,482**	**$987**
Cost Added (above best estimate)					**$5,071**	**$127**	**$22,409**	**$560**	**$28,000**	**$700**

Estimate of Costs: Year 2+

	Best Estimates				Census Review		3yr equipment life		Most Expensive: 3yr and Census Review, Data Storage 5% Data Services Costs	
Category	**Cost**	**Percent of Total**	**Per Boat (11), Based on 5yr Equip. Life**	**Per Day (40), 5yr Life**	**Per Boat If Census Review (100%) of all trips (5yr/40)**	**Per Day/ Census Review**	**Per Boat (11), Based on 3yr Equip. Life**	**Per Day (40), 3yr Life**	**Per Boat**	**Per Day**
Overhead	$2,500	1.92%	$227	$6	$227	$6	$227	$6	$227	$6
OG/Program Mgt	$20,000	15.35%	$1,818	$45	$1,818	$45	$1,818	$45	$1,818	$45
Ongoing/Field Services	$29,000	22.26%	$2,636	$66	$2,636	$66	$2,636	$66	$2,636	$66
Ongoing/Data Services	$52,800	40.52%	$4,800	$120	$9,871	$247	$4,800	$120	$10,391	$260
Equipment (replacement)	$11,000	8.44%	$1,000	$25	$1,000	$25	$1,667	$42	$1,667	$42
Field Services (equip. replace)	$15,000	11.51%	$1,364	$34	$1,364	$34	$2,273	$57	$2,273	$57
SU/Program Mgt	$0	0.00%	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs	**$130,300**	**100.00%**	**$11,845**	**$296**	**$16,916**	**$423**	**$13,421**	**$335**	**$19,012**	**$475**
Cost Added (above best estimate)					**$5,071**	**$127**	**$1,576**	**$39**	**$7,167**	**$179**

Final Estimates

		Best Estimate		High End Estimate	
Cost Estimates	**Fleet**	**Per Vessel/ Year**	**Per Vessel/ Sea Day**	**Per Vessel/ Year**	**Per Vessel/ Sea Day**
Year 1	$126,300	**$11,482**	**$287**	$39,482	$987
Year 2+	$130,300	**$11,845**	**$296**	$19,012	$475

Note that final estimates do not include possible per-vessel cost reductions ($30/day and $1,200/year) due to "no fishing" trip.

Appendix 9

Mid-Atlantic Fishery Management Council
800 North State Street, Suite 201, Dover, DE 19901-3910 Phone: 320-674-2331 | FAX: 320-674-5399 | www.mafmc.org Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman | Christopher M. Moore, Ph.D., Executive Director

March 24, 2015

Dear_____,

As you are most likely aware, the National Marine Fisheries Service in conjunction with both the New England and Mid-Atlantic Fisheries Management Councils is developing an omnibus action that would allow the Councils to implement industry-funded monitoring within their respective jurisdictions. The Amendment will also consider specific coverage levels for the Atlantic mackerel and Atlantic herring fisheries. Please see http://www.mafmc.org/actions/observer- funding-omnibus for further information.

Preliminary analyses of economic factors related to the alternatives currently being considered for the herring and mackerel fisheries have highlighted the need for more detailed information about the cost of fishing in these two fisheries. It is important that the degree to which the cost of industry-funded coverage reduces the profitability of fishing for different types of vessels be understood and described in the Environmental Assessment. The current analyses use fishing cost information collected by the Northeast Fisheries Observer Program but the type of costs collected and the coverage on herring and mackerel vessels are limited.

Thank you for agreeing to fill this information gap by completing the attached survey. This survey is being administered by the MAFMC. The survey will ask you a number of questions about your annual fishing costs. Responses to the survey are completely confidential, as required by law. Once you complete the survey please return it using the enclosed stamped envelope. The survey should take no longer than one hour to complete. Responses to the survey are voluntary, but by completing it, you will be helping the Councils understand how the policies currently being considered affect you.

If you have any questions about how to complete the survey please contact Jason Didden (302-526-5254 or jdidden@mafmc.org). Thank you in advance for your participation!

Sincerely,

Christopher M. Moore, Ph.D., *Executive Director MAFMC*

Completed surveys should be mailed to:

Jason Didden

Mid-Atlantic Fishery Management Council 800 North State Street, Suite 201

Dover, DE 19901-3910

Herring and Mackerel Vessel Annual Cost Survey for 2014

Thank you very much for participating in this important survey!

The questions in this survey relate to the following vessel only:
[**Vessel name**]
Coast Guard Documentation or State Registration Number: **[12345678]**

Your responses and participation in this survey are
CONFIDENTIAL

Photo credit: Lisa Colburn, NOAA Fisheries

Completed surveys should be mailed to:
Jason Didden
Mid-Atlantic Fishery Management Council
800 North State Street, Suite 201

General Instructions:

- **This survey is about your costs in 2014 for the vessel identified in this survey.** In your answers, include combined costs for all state and/or federal fisheries for this vessel in 2014, including costs incurred while the vessel was inactive.

Please note that all responses are completely confidential.

Section A: Vessel Information

This section is only about the vessel identified in this survey. **All costs requested are for 2014.**

1. Ownership type for this vessel (*check one*):

- ☐ Sole proprietorship
- ☐ General partnership
- ☐ Limited partnership
- ☐ C Corporation
- ☐ S Corporation
- ☐ Limited Liability Company (LLC)
- ☐ Other _____

2. Number of owners, including yourself: _____

3. Was this vessel acquired from a previous owner or was it bought new (*check one*)?

- ☐ Acquired from a previous owner
- ☐ Purchased New

4. In what calendar year did you become the owner of the vessel? _____

5. What port did this vessel operate from most of the time during 2014?

_____

Section B: Repair/Maintenance/Upgrade/Improvements Costs

6a. Was this vessel hauled out in 2014 for any reason? (Possible reasons include regular repair and maintenance, emergency haul-out, long term storage, etc.)

☐ Yes
☐ No [please go to 6c]

6b. What were the haul-out costs in 2014, including taking the vessel out of the water and any transportation? *(Do not include any repair/maintenance costs – we'll ask you for them in question 7.)*

Haul out cost in 2014: $ _____

6c. How often do you usually haul-out this vessel?

☐ Every year Every
☐ other year Every
☐ _____years
☐ Every____months
☐ Other (please describe) _____

7. What were your repair/maintenance and upgrade/improvement costs for this vessel in 2014? Include the cost of any tools and equipment you may have purchased. If you did not have any expenses in 2014, then check $0.

We know that these kinds of costs may vary significantly year to year. However, ***this survey is about 2014 expenses only.***

$_____ ☐ $0

If you are able to provide a breakdown of these total repair/maintenance and upgrade/improvement costs, please do so in the following table. Otherwise, skip to question #8.

7.	***Do not include vessel haul-out costs reported above in question 6b.***
Expense Category	**Repair/Maintenance/Upgrades/Improvements, 2014**
Propulsion Engine (such as engine, drive train, exhaust/cooling systems)	$_____ ☐ $0 **Description:**
Deck Equipment/ Other Machinery (such as winches, haulers, generators, hydraulics, compressors, reels, pumps)	$_____ ☐ $0 **Description:**
Hull (such as frame, deck, wheelhouse, keel, steering, rigging, fish holds, fuel tanks)	$_____ ☐ $0 **Description:**
Fishing Gear (such as codends, nets/panels, dredges, buoys, highfliers, doors, pots/traps, cables)	$_____ ☐ $0 **Describe Upgrade/Improvement:**

Section C: Vessel Related Costs

8. For each expense category listed in the table below, ***please enter the total amount spent in 2014 for this vessel (and average per day cost for crew and hired captain)***. If you did not have an expense in 2014, then check $0.

Mooring/Dockage Fees for this vessel in 2014 including upkeep expenses): $ _____ $0	**Permit and/or License fees** for this vessel in : $ _____ $0
Vessel insurance premium in 2014 for this vessel (premium paid for either hull or P & I insurance): $ _____ *Number of months insured:* _____ $0	**Quota or DAS lease payments** in 2014 for his vessel (if non-monetary payments were paided to obtain quota or DAS, please estimate the value of those non-monetary payments): $ _____ $0
Total payments to crew and hired captain in for this vessel only: Crew: Annual $_____Avg per day_____ Hired Cpt: Annual $_____Avg per day_____ (**Do not include** what you earn when you are the captain) $0	**Crew benefits** for this vessel in 2014 (the cost to you, as the vessel owner, for providing retirement benefits; health, life, or disability insurance premiums; and unemployment insurance for your crew and hired captain): $ _____ $0
Vessel Activity/Quota Monitoring Cost for this vessel in 2014 (such as observer or dockside monitoring cost):	**Other costs** for this vessel in 2014: *Describe*: _____

$_____	$_____
☐ $0	☐ $0

Section D: Operating Costs

7. **For each expense category listed in the table below**, ***please enter the total amount spent in 2014 for this vessel, including all payments made by you and/or the crew. Also please enter the average cost per day.***
    - If nothing was spent in a category, please check $0.
    - *We are aware that these kinds of costs may vary significantly from year to year.* ***Please bear in mind that this survey is about 2014 expenses only.***

Fuel/oil/filter for this vessel in 2014: Annual $_____ Avg per day_____ $0 ☐ I Don't Know	**Food and Drinking Water** for this vessel in 2014: Annual $_____ Avg per day $_____ $0 ☐ I Don't Know
Ice for this vessel in 2014: Annual $_____ Avg per day_____ $0 ☐ I Don't Know	**Carrier vessel fees** for this vessel in 2014: Annual $_____ Avg per day $_____ $0 ☐ I Don't Know
Fresh Water for use in this vessel in : Annual $_____ Avg per day_____ $0 ☐ I Don't Know	**Communication Costs** for this vessel in 2014 such as cell phones, radio, VMS etc.): *o not include office phone use.* Annual $_____ Avg per day $_____ $0 ☐ I Don't Know
General Fishing Supplies for this vessel i n 2014 (such as knives, picks, hooks, bags, ties, lobster bands, rags, tape, ks/rings, lines/twine, etc.): Annual $_____ Avg per day_____ $0 ☐ I Don't Know	**General Crew Supplies** for this vessel in 2014 (such as gloves, boot liners and foul-weather gear): Annual $_____ Avg per day $_____ $0 ☐ I Don't Know
Catch Handling Costs for this vessel in (such as auction, lumping,	**Other Costs** for this vessel in 2014: *Describe*:_____

grading, shipping and sales rep): Annual $_____ Avg per day ☐ $0 ☐ I Don't Know	 Annual $_____ Avg per day $_____ ☐ $0 ☐ I Don't Know

Section E: Typical Crew Payment System

10a. Did you hire a captain for the majority of this vessel's trips in 2014, or were you the captain for most trips?

- ☐ Mostly Owner-operated
- ☐ Mostly Hired Captain
- ☐ Other _____

10b. On average, how many crew were on this vessel when it went out in 2014? DO NOT COUNT YOURSELF OR THE CAPTAIN.

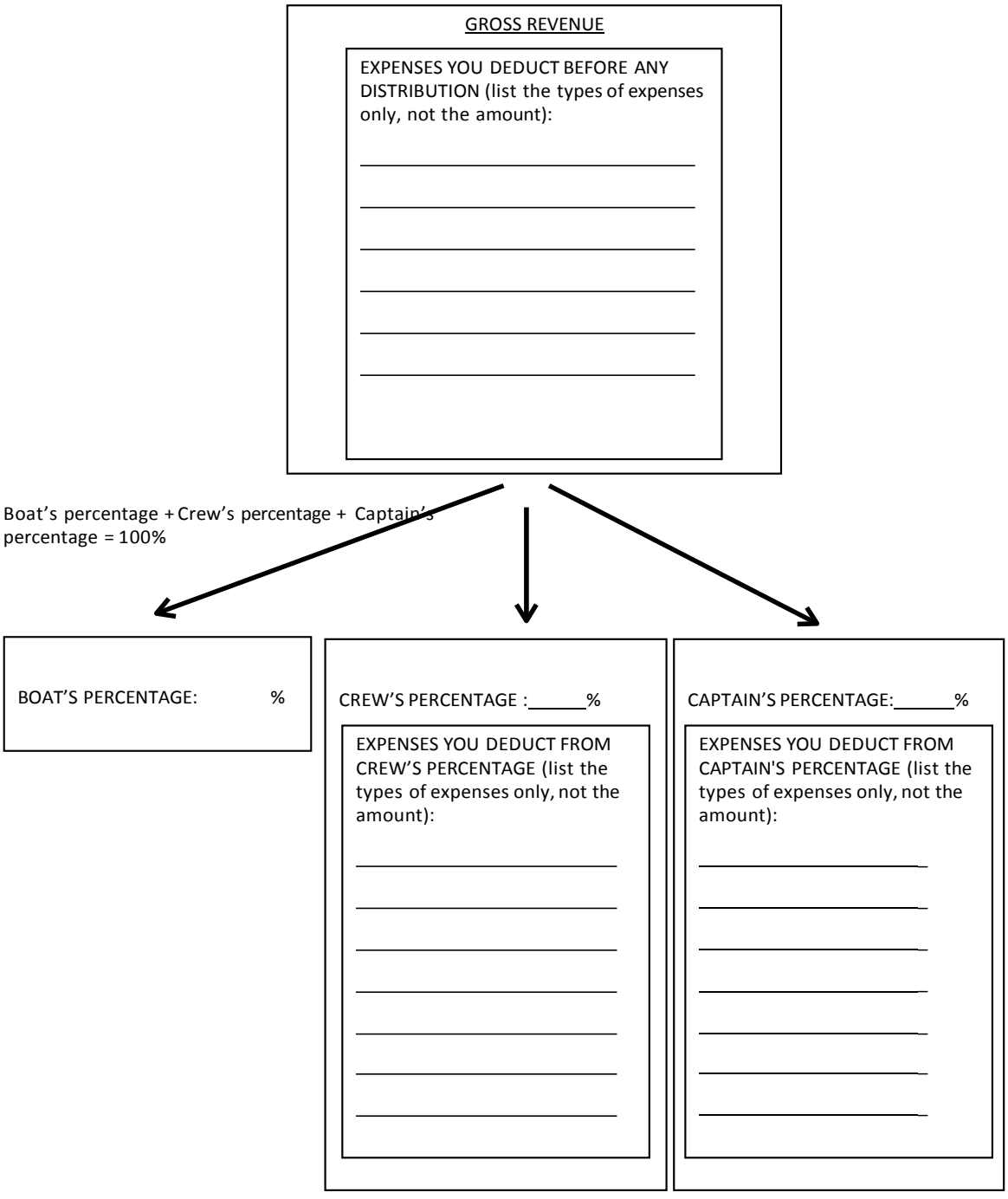
_____ Average number of crew members, not including you or the captain, in 2014

- **If you answered 0 (you had no crew in 2014), SKIP TO QUESTION 11**
- **If your answer was > 0 (you had crew in 2014), please CONTINUE WITH QUESTION 10c**

10c. Please use the diagram on the next page to list the types of expenses that were normally taken out of gross revenue, crew's share, and captain's share in 2014.

You do not need to list the dollar amounts. Just list the *types* of expenses deducted (for example: "fuel" "ice" "food").

NOTE: If the diagram below is not appropriate for your settlement system, please describe your system on the next page.



If the diagram displayed on the previous page is not appropriate for your crew payment, then please describe your crew payment system in the space below:

10d. Please list the *types* (not the cost) of items crew members purchase for themselves.

Examples include: “food on day boats”, “foul weather gear”, “gloves”, etc.
(These expenses would NOT be included in the diagram above.)

Section F: Overall Business Cost

11a. Including the vessel listed in this survey, how many vessels did your fishing business operate or maintain in 2014?

_____vessel(s) operated or maintained in 2014

11b. For each expense category listed below, please enter the amount spent for either <u>all your vessels</u> or <u>just this vessel</u> in 2014. Indicate by checking the appropriate box.

If you did not spend anything on that expense category in 2014, please check $0.

<u>Workshop/Storage Expenses</u> for 2014 (such as gear shed rental and workshop expense):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Office Expenses</u> for 2014 (such as office supplies, office rer home office, office utilities (such as electric, heat, etc.), post photocopying, computer and office phone use, excluding **<u>communication costs</u>**):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Business Vehicle Usage Costs</u> for 2014 (for fishing business related purposes only; such as number of miles the vehicle was used for business multiplied by a standard mileage rate):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Business Travel Costs</u> for 2014 (such as cost of lodging, travel, and transportation for business associated travel **<u>excluding business vehicle costs</u>**):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Association Fees Paid</u> in 2014 (such as co-operative, fishing organization, sector fees and union dues):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Professional Fees Paid</u> in 2014 (such as settlement, accounting, and legal fees):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Principal Paid on Business Loans</u> for 2014 (enter only payments made, ***not*** amount owed):

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Interest Paid on Business Loans</u> for 2014:

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Taxes paid (income, property, etc.)</u> for 2014:

☐ $ ☐ ☐

$0 for all vessels for this vessel only

<u>Non-Crew Labor Services</u> for 2014 (such as night watchman, shore engineer, and office secretary):

$_____

Describe: _____

Section G: Other Costs and Earnings

12. Did you have any other costs in 2014 that we have not asked about in this survey? If so, please list them below. (Please do not report your personal costs).

Other costs for the identified vessel only:

Cost	Description of other annual costs incurred in 2014
$ _____	_____
$ _____	_____

Other costs for your entire business:

Cost	Description of other annual costs incurred in 2014
$ _____	_____
$ _____	_____

13. Please record the total gross revenue from all activities generated by this vessel in 2014. *(Note: Although we collect revenue information from the dealer reporting system, this question is for cross-checking our record in order to improve our overall data quality.)* **:**

Gross revenue from commercial trips: $_____

Gross revenue from non-commercial trips (e.g. charter trips): $

_____

_____

☐ $0 (this vessel was inactive during 2014)

14. In the following table, Please record the number of days this vessel spent in each fishery in 2014. Be as specific as possible in the fishery description noting things such as gear type, target species, fishing region, etc.

Fishery Description (gear/species/region)	Number of Days in 2014

Thank you for your response! Please use the space below for comments.