NRCC – Electronic Monitoring Update
May 25, 2021

Executive Summary
The Greater Atlantic Regional Fisheries Office (GARFO) and the Northeast Fisheries Science Center (NEFSC) are working with fishermen, the New England and Mid-Atlantic Fishery Management Councils, and other partners to improve the timeliness, quality, and cost effectiveness of fishery-dependent data by integrating technology into monitoring and reporting programs. Electronic reporting (ER) allows fishermen in the Greater Atlantic Region to self-report fishery catch and other information, and electronic monitoring (EM) provides the means to expand and improve at-sea monitoring by incorporating cameras, gear sensors, and ER into fishing operations. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) is developing a new shared data system to support catch monitoring, fishery stock assessments, and other research activities, which will provide the necessary infrastructure to support and integrate ER and EM data. This will allow for continued technology expansion and future benefits as EM and ER programs expand.

I. Electronic Reporting in the Greater Atlantic Region
ER refers to all efforts to collect fishery-dependent data (i.e., data collected during fishing operations) via electronic means rather than paper reports. NMFS has made significant improvements in our ER capabilities in the Greater Atlantic Region over the past several years.

All commercial fishermen in the region have the option to submit their vessel trip reports (VTR) electronically, and in 2019 we transitioned all for-hire fishermen in the Mid-Atlantic to electronic VTRs (eVTRs). Both the Mid-Atlantic and New England Fishery Management Councils took final action at their December 2019 and January 2020 meetings, respectively, to require commercial fishermen to submit eVTRs. NMFS published a final rule approving this action in November 2020. This action will require all commercial vessels with federal permits for species managed by either Council to submit their eVTRs within 48 hours of entering port. NMFS is targeting implementation in November 2021 to allow sufficient time to provide outreach and training to fishermen. Upon final implementation of this action, NMFS will have completely transitioned to ER for all fisheries managed by the New England and Mid-Atlantic Councils, which will encompass approximately 3,300 federally-permitted vessels.

II. Electronic Monitoring in the Commercial Groundfish Fishery
EM refers to the use of technologies, such as video cameras, gear sensors, and reporting systems, to monitor fishing operations, effort, and/or catch. In 2010, NMFS implemented Amendment 16 to the Northeast Multispecies (groundfish) Fishery Management Plan (FMP) and established annual catch limits and accountability measures for the fishery. Amendment 16 also includes a requirement for groundfish sectors to implement and fund an at-sea monitoring (ASM) program and allow sectors to use EM to satisfy their catch monitoring requirements. The Greater Atlantic Region has been assisting with the development of two EM models in the Greater Atlantic Region: the audit-model and the maximized retention model.

The purpose of both the audit-model and maximized retention model programs for monitoring is to collect accurate catch information using camera systems in lieu of human at-sea monitors. Both programs operated under exempted fishing permits (EFP) issued by NMFS, which allowed for program development prior to full implementation and wide-scale adoption of EM. Participants in both programs are required to use EM systems on 100 percent of groundfish trips to record fishing operations and submit eVTRs.

Audit-Model

The audit-model EM program has operated under an EFP for the past five years and included approximately 20 participating vessels using a variety of gear types. Under the audit-model EM program, participants must record the estimated weight of all discards on an eVTR and adhere to catch handling protocols at sea to ensure collection of discard data from the video footage. In particular, participants must hold all groundfish below the minimum fish size under a camera prior to discarding them to facilitate video review by a third-party EM service provider. NMFS selects a subset of the recorded trips for audit and compares the discard data submitted by the third-party service provider to the eVTR submitted by the vessel to ensure agreement between the two data sources. Discards reported by the third-party service provider are used for catch accounting on audited trips. The eVTR is used as the basis for catch accounting on unaudited trips. NMFS adjusts the vessel's self-reported discards based on its historical reporting accuracy and precision. Collecting video footage on all trips and selecting a random sample for review after the fact provides confidence in the accuracy of the discard data reported by the vessel for all of its trips. This provides an overall increase and improvement in discard data for the fishery, while minimizing program costs.

Maximized Retention Model

The maximized retention EM program is in its fourth year under an EFP. Six trawl vessels are currently enrolled in the program, and we expect two additional vessels to join during the 2021 fishing year. Under the maximized retention model, participants are required to retain, and land all catch of allocated groundfish, including fish below the minimum size that they would normally discard. A third-party EM service provider reviews the video footage to confirm the vessel's adherence to catch retention requirements, and a dockside monitor meets the vessel at the dock to collect catch data shoreside. Because allocated groundfish are not discarded at sea under this model, comparison with the vessel's eVTR is not necessary. Maximized retention has fewer catch handling and reporting requirements and, as such, is well-suited to larger offshore vessels. These vessels typically have higher volumes of catch than vessels participating in the audit model program and cannot reasonably measure all their discards at sea. NMFS deducts quota from these vessels' sector allocations to account for all fish harvested, including fish below the minimum size. The ex-vessel price for fish below the minimum size is low compared to legal-sized fish. As such, there should be an incentive for vessels to fish selectively and target legal-sized fish. Vessels are authorized to sell catch below the minimum size as part of this program; the majority is used for bait.

Operationalizing Electronic Monitoring for Groundfish Sectors

NMFS has worked extensively with the industry stakeholders participating in the EFPs to develop electronic monitoring programs that meet sector monitoring requirements and address implementation challenges. In December 2019, NMFS notified the New England Fishery Management Council of its intent to expand EM and incorporate it into the fishing years 2021-2022 sector operations plan approval process. NMFS provided guidance for sectors to assist them in developing EM programs that met the standards set forth in the Amendment 16 implementing regulations. Eight sectors included an EM component in their fishing years 2021-2022 sector operations plans for consideration. NMFS approved the sectors' proposed EM programs and as of May 1, 2021, the member vessels enrolled in these sectors may choose to use either ASM or the EM audit model to meet monitoring requirements, and the EM audit model will no longer be implemented under an EFP. There are currently 22 active sector vessels using EM to meet monitoring requirements.

A small subset of vessels is expected to continue to use the maximized retention EM model and continue to operate under an EFP for fishing year 2021 (May 1 through April 30). This model has been under development for three years, but participation has been limited and the program is still in active development.

Amendment 23 to the Northeast Multispecies Fishery Management Plan

The New England Fishery Management Council adopted Amendment 23 to the Northeast Multispecies Fishery Management Plan at its September 2020 meeting. The measures adopted in the amendment include higher levels of monitoring (i.e., 100 percent, contingent on available funding) and specific approval of both the EM audit-model and maximized retention model as optional tools to meet monitoring requirements. This may advance the adoption of EM in the region as it removes the current disparity between human and EM coverage levels. The preliminary Amendment 23 Final Environmental Impact Statement was recently submitted to NMFS for review. NMFS is in the process of reviewing the document for consistency with all applicable laws, including the Magnuson-Stevens Fishery Conservation and Management Act. If approved, we will develop implementing regulations through notice and comment rulemaking. The target date of implementation of approved monitoring measures is May 1, 2022. NMFS will continue to follow the sector operations plan process described above to approve EM programs, and will incorporate any approved changes from Amendment 23 into the process.

III. Electronic Monitoring in the Atlantic Herring Fishery

In 2013, the Mid-Atlantic and New England Fishery Management Councils initiated a joint omnibus amendment that would allow industry-funded monitoring (IFM) in all of the fishery management plans managed by the Councils. The IFM types that the amendment considered for the Atlantic herring and Atlantic mackerel fisheries included observers, ASM, EM, and portside sampling.

In order to provide the Councils with more data on the utility of using EM to verify catch retention and track discarded catch, NMFS conducted an EM pilot study in 2016-2017 on herring and mackerel vessels fishing with midwater trawl gear. At its April 2017 meeting, the Mid-Atlantic Fishery Management Council voted to postpone action on the joint amendment until after a 2016-2017 midwater trawl EM pilot study was completed. However, the New England Fishery Management Council selected preferred alternatives and recommended that NMFS consider the amendment for approval at its April 2017 meeting. Therefore, the joint amendment became the New England IFM Omnibus Amendment, with proposed measures applying only to New England Council-managed FMPs. The Mid-Atlantic Council has yet to take further action on EM within its jurisdiction.

The New England Fishery Management Council adopted the New England IFM Omnibus Amendment at its April 2018 meeting. This amendment implemented a new IFM program in the Atlantic herring fishery and established a 50-percent coverage target for ASM and EM aboard vessels issued a Category A or B herring permit. The Region intends to administer an EM and portside sampling EFP during IFM years 2021 and 2022 (April 1, 2021 - March 31, 2023). The IFM implementation date has been delayed and is expected to start on July 1, 2021. Top priorities are (1) collecting additional information about how to most effectively and efficiently administer an EM and portside sampling program for the herring fishery, (2) collecting information on the use of EM and portside sampling for herring vessels fishing with other gear types, (3) evaluating the utility of EM and portside sampling to monitoring fishing in Groundfish Closed Areas, and (4) facilitating the implementation of a permanent EM and portside sampling program for herring vessels to meet their IFM requirements. A total of six mid-water trawl herring vessels have selected EM and portside as their monitoring option for the inaugural year of the IFM.

IV. Additional Applications of Electronic Monitoring in Support of Science and Management

Database Infrastructure Development

With the anticipated expansion of EM in the Northeast, a new database and Application Programming Interface (API) were designed at the NEFSC to facilitate the use of EM for additional purposes, such as estimating stock abundance to inform assessment models. The API has been designed to be dynamic, capable of accommodating multiple fisheries and programs, and to align with our data modernization initiatives. For example, the API will support the herring industry-funded monitoring program and can be adapted to new fisheries opting for EM technology. The API was designed using open source software

and is easily accessed by common software tools, allowing for our API's schema and rules to be readily understood by software developers and fishery biologists, which should remove barriers for new software providers to compete for EM work in the Greater Atlantic Region.

A benefit of the new EM platform is streamlining EM reporting for third-party EM service providers, while also creating one cohesive dataset for management and science to use as applicable from the EM program, such as estimating discards in a fishery. A better understanding of fishery removals should help improve estimates of overall stock abundance. EM integration will leverage the new API structure, facilitating the process of incorporating EM data into the current infrastructure. This shared system will reduce redundancies and improve the use of all fishery catch and monitoring data.

Advances in Machine Learning Applications

Automated-image classification via machine learning is an emerging technology that has the potential to improve video review, which would further lower the costs of EM. The NEFSC is collecting images from its biannual bottom trawl survey to build a groundfish image library. The image library will serve as a training tool for EM machine learning applications that could result in data analysis efficiencies and lower program costs for the industry.

From this work, we will determine if this technology can estimate fish size and identify fish species to the level needed by managers and scientists. We will use results from this project to develop recommendations for how to move this technology from the scientific survey setting to fishing vessels. The goal is to develop an algorithm that could be used in open source software products to annotate EM footage. In the audit program, these tools could potentially collect species and weight information as the crew are handling catch under view of a camera before being discarded. In the maximized retention model, these tools could help with monitoring adherence to catch retention requirements. Both models, in fact, could reduce the amount of video collected by using activity recognition tools (e.g., detection of crew on deck). This technology will help make EM programs more cost-effective by reducing data analysis, transmission, and storage costs, which are the largest cost components in most programs. Furthermore, the development of these technologies is expected to improve the accuracy of catch reporting and monitoring and improve fishery stock assessments, while expanding the use of EM to monitor fisheries.

V. Procedural Directives

In May 2013, NMFS issued the Policy Directive on Electronic Technologies and Fishery Dependent Data Collection (Policy Directive; 04-115; updated May 7, 2019), which provides guidance on the implementation of electronic technology (ET) solutions in fishery-dependent data collection programs. The procedural directive encourages the consideration of ET to complement and/or improve existing fishery-dependent data collection programs to achieve the most cost-effective and sustainable approach that ensures alignment of management goals, data needs, funding sources, and regulations. In addition, it directed each region to develop an ET implementation plan establishing a regional vision for developing, integrating, and implementing ET. The plans include regional priorities, Council actions, and research and development efforts, as well as challenges and barriers, and funding information. The original ET implementation plans were developed and submitted in 2017 and updated bi-annually through 2017. In 2019, the policy directive was reissued to reflect progress towards ET implementation and the regions were tasked with developing new ET implementation plans, which were submitted in early 2021.

Following the release of this procedural directive, NMFS published three procedural directives intended to help the adoption and implementation of ET.

Procedural Directive on Marine Recreational Information Program Electronic Reporting Technologies (Policy Directive; 04-115-01; effective November 28, 2016)
This directive committed NMFS' Marine Recreational Information Program (MRIP) to developing electronic reporting and expanding its use to improve the quality and timeliness of recreational fisheries catch and effort data. It also committed to exploring a variety of uses for ER in MRIP, including the integration of technologies into new and existing data collection designs, and supplemental uses for ER data.

Procedural Directive on Cost Allocation in Electronic Monitoring Programs for Federally Managed U.S. Fisheries (Policy Directive; 04-001-02; effective May 7, 2019)
This directive directs NMFS to work with Councils and other stakeholders to develop a plan that transitions certain costs to the fishing industry, when allocation of monitoring costs between the agency and industry is deemed appropriate and approved under applicable law and regulations. The procedural directive explains the categories of costs associated with EM programs and how these costs should be allocated between NMFS and the fishing industry. According to the procedural directive, NMFS is responsible for the administrative costs of an EM program (e.g., monitoring program performance), while the fishing industry is responsible for the sampling costs (e.g., video processing). This procedural directive applies to operational programs, but it does not apply to programs operating under EFPs or as small-scale pilots.

Procedural Directive on Third-Party Minimum Data Retention Period in Electronic Monitoring Programs for Federally Managed U.S. Fisheries (Policy Directive; 04-001-03; effective April 3, 2020)
This directive provides guidance to industry regarding minimum data storage requirements for a third-party monitoring program. According to the policy directive, Video footage held by a third-party provider must be retained for a minimum period of one year following completion of NMFS' year-end data reconciliation process. All EM data submitted to the agency (e.g., for use in catch accounting) are considered Federal Records and must be retained for a period of 5 years, consistent with National Archives and Records Administration requirements.

Draft Procedural Directive on Information Law Application for Data and Supporting Guidance for Electronic Monitoring Programs for Federally Managed U.S. Fisheries
This procedural directive is still under development. Once finalized, it will provide guidance on the application of Information Law to raw EM data that is made and retained by NMFS, or a third-party in EM programs. This guidance would inform NMFS, Councils, or third-parties, which include agency contractors and recipients of federal financial assistance (e.g., grant or cooperative agreement), and industry-funded EM service providers. The information in this procedural directive would be used in the development of new, and adjustments to existing EM program requirements through regionalFMPs and FMP amendments, regulatory amendments, and other related fisheries management actions. This procedural directive would also provide additional guidance and clarification on how NMFS would manage access and use of EM data within the agency and by its partners.