

Greater Atlantic Regional Fisheries  
Office and Northeast Fisheries  
Science Center

Electronic Technologies Progress  
Report

May 6, 2016

## **Fisheries Dependent Data Improvements**

Since drafting our Electronic Technologies Plan (ET Plan), the Greater Atlantic Regional Fisheries Office and the Northeast Fisheries Science Center have continued work on the design of a future data system that ensures more accurate, timely data collections while preserving decades of archived data. Working with The Ambit Group, a contractor brought in to assist with the system design, we are in the process of specifying technical requirements for the future system. The new system is intended to rely heavily on parts of the current system that work well, while introducing a series of improvements to how data is collected and stored.

Initial work on the new system involved documenting current and future systems, conducting a thorough analysis to determine the key problems with the current system, and designing solutions to those problems to be applied in the future. As we move into year two of design and development, we are exploring ways to track vessel landings through a unique trip identification number that is integrated throughout all of our systems (e.g., VMS, PTNS, OBERS), at automated data methods in order to reduce data entry errors, and a transition toward the acceptance of electronic vessel trip reports only. Under our current schedule, we anticipate programming components of the new system could begin over the summer, with a phased system implementation in 2018.

## **Electronic Monitoring**

The Greater Atlantic Regional Office and the Northeast Fisheries Science Center are currently developing two EM programs, one in the groundfish fishery and one in the midwater trawl herring/mackerel fishery. These fisheries have been identified as candidates for EM implementation because both the New England and Mid-Atlantic Councils, fishery participants, and stakeholders have expressed an interest in exploring EM as an alternative to other types of monitoring programs and as a means to increase coverage.

The agency has been collaborating with project partners The Nature Conservancy (TNC), the Gulf of Maine Research Institute (GMRI), and several groundfish sectors to develop and implement an EM program in the groundfish fishery. Development of a groundfish EM program began in the summer of 2014 as a tool that would use electronic monitoring as an alternative to the At-Sea Monitoring (ASM) program required by Amendment 16 to the groundfish fishery management plan. Early on, the EM program was designed to use data from EM video to verify and validate the reporting accuracy of discards on electronic vessel trip reports (eVTRs) (i.e. the audit model). In the months leading up to May 2016, interest in the EM audit model waned and resulted in a significant reduction of industry participants. In order to ensure some level of EM participation in 2016, our project partners requested a shift in concept to an EM program in which participating vessels would fish under an Experimental Fishing Permit (EFP). Under the EFP, participating vessels will use EM instead of ASM on trips that are selected for ASM coverage. The video from those trips will be reviewed in its entirety and used to identify and enumerate discards of groundfish species. The fundamental differences between the new approach and the audit model are that EM video is used as the basis of identifying discards instead of being used to validate the vessel's eVTR and that EM will be used on only those trips that are selected

for ASM coverage instead of being operational on all sector trips. It is expected that 15-20 fishing vessels will participate in the EFP during the 2016 fishing year.

In addition to the groundfish EM program, work has begun to develop and implement an EM program in the midwater trawl herring/mackerel fisheries. Funding for this program is being provided through the NOAA Fisheries Fishery Information Systems program. The herring EM program intends to deploy EM systems on the majority of the active midwater trawl fleet consisting of approximately 12 vessels. The EM video will be used as a means of monitoring compliance with discard restrictions. It is expected that vessels will begin fishing with EM systems in the summer/fall of 2016.

Electronic Reporting (ER) continues to evolve in the region as there are now five distinct eVTR applications authorized for use. eVTR continues to be an integral part of the Region's ET implementation plan because not only is it a means of modernizing a component of our data collection systems, it is also an integral part of EM programs and thus eVTR development continues to be modernized and customized. Adoption of eVTR continues to be slow and as a result, efforts are currently underway to develop more web based and smartphone applications.

**Northeast Fisheries Science Center Supplemental Information**  
**for the Greater Atlantic Regional Fisheries Office and Northeast Fisheries Science Center**  
**Electronic Technologies Progress Report**  
**May 9, 2016**

## **Electronic Monitoring**

The Northeast Fisheries Science Center (NEFSC) has continued to evaluate the performance of electronic monitoring (EM) as a component of catch accounting systems. As an alternative to at-sea monitors in the New England groundfish fishery, electronic vessel trip reporting (eVTR) was initially proposed as a vehicle for reporting discards, with validation by EM. The NEFSC reviewed the quality of third-party video data analysis of monitored trips in fishing year 2015. Staff performed an initial audit of video data to substantiate the data reported by video data processors. Although preliminary results indicate good agreement in some cases, neither third party nor Center analysts could reliably and/or regularly identify hake or flatfish species from video data. These data will be further analyzed to evaluate the accuracy of EM discard weight estimates, which are based on lengths of individual fish observed through video. (Although EM provides direct observations of numbers discarded, weight must be estimated indirectly.) Work to determine the appropriate rate of video review and criteria for validation of eVTR discard estimates has been delayed due to technical difficulty encountered by partners when linking eVTR and EM data.

In fishing year 2016, the model changed from 100% continuous logbook and video reporting on all trips, from which subsamples would be drawn, to 100% sampling of a subset of trips, covered at the same rate as at-sea monitors are deployed. Under this Experimental Fishing Permit (EFP), it is not clear that eVTR data collection will be required. However, we will continue to audit video data collected under this program, and expect to determine appropriate rates of video review and criteria for validation of eVTR discard estimates as data become available.

Work to date has enabled the development of quality control performance standards for EM service providers. The NEFSC will continue to develop business rules and performance standards for an operational program based on results of the EFP.

In support of improved catch accounting and compliance monitoring in the midwater trawl herring/mackerel fisheries, a herring EM program has been funded by NOAA Fisheries to deploy EM systems on herring vessels to monitor compliance with discard restrictions. EM video will be used to record catch that is pumped overboard or record if the trawl bag is “slipped.” The Center has developed contract specifications for EM service providers to begin work in the summer of 2016, and solicitation of vessel participation is underway. This project would facilitate development and implementation of the Industry-Funded Monitoring (IFM) Omnibus Amendment by testing and refining an EM program for the Atlantic herring and mackerel midwater fisheries.

## **NEFSC Northeast Cooperative Research Program**

The NEFSC's Cooperative Research Program has approached the development of fisheries technology as providing tools that both collect scientific information to complement observer sampling and fulfill federal trip reporting requirements, while also providing incentives and reports for the individual fisherman to improve the efficiency of their operations. This approach includes applications for understanding species habitat partitioning for bycatch avoidance, and a better understanding of species presence/absence in relation to bottom temp and depth. Electronic reporting systems should enable fishermen access and ownership of their data. If this information is useful and interesting, it is much more likely that they will make efforts to report thoroughly and accurately.

## **FLDRS System and Electronic Vessel Trip Reporting**

The Fisheries Logbook Data Recording System (FLDRS) was developed by the Cooperative Research program to collect more detailed fishery-dependent data than is required by current Vessel Trip Report regulations. The software package is capable of collecting information on fishing effort and catch (kept and discarded) on a haul-by-haul basis, and is integrated with a vessel's GPS, vessel monitoring system, and depth sounder feeds. This more detailed information is crucial for advancing fisheries science and management. FLDRS is an approved eVTR application.

Because the FLDRS electronic logbook system can be used either in a scientific haul-by-haul mode or a sub-trip mode that collects only the aggregated data required for electronic Vessel Trip Reports (eVTR), FLDRS has become a very useful tool for electronic vessel trip reporting, accounting for > 6,000 eVTR trip reports in each of the past 2 years.

The Cooperative Research Study Fleet now has 35 vessels from Hampton, NH to Wanchese, NC, in the groundfish, small mesh (squid, herring, and mackerel) and scallop dredge fisheries to collect this information for every fishing effort. In addition to these Study Fleet vessels that report eVTR via FLDRS, for the past two years, Cooperative Research and other Northeast Fisheries Science Center staff have been collaborating with fishing industry and academic partners, including the Garden State Seafood Association, the North Atlantic Clam Association, Rutgers University, the Coonamessett Farm Foundation, and Cornell University Cooperative Extension, to expand and support eVTR in the Northeast and mid-Atlantic. Field staff support from Cooperative Research has been leveraged with funds from the Pacific States Marine Fisheries Commission to expand eVTR to provide participating vessels with laptop computers, FLDRS software, integration of vessel electronics, and training stipends for captains using the software.

Over 80 industry members in fisheries for squid, mackerel, herring, flatfish, monkfish and sea scallop are now equipped to report via eVTR. This collaborative effort also includes developing and testing a new eVTR software system for the clam industry (eCLAMS), as well as testing equipment for wireless data transmission of eVTRs from selected Northeast dock sites. FLDRS electronic logbook and eCLAMS software packages are available for free for any industry member, but funding is required to help cover the costs of laptops, software training, and field

support for continued industry transition to eVTR. Some limited funds for this purpose have been awarded to the Cooperative Research program for 2016, but longer-term support for the transition to eVTR has not yet been identified.

Cooperative Research and NEFSC DMS has continued to develop FLDRS dynamic data elements which can be turned on or off to record information including but not limited to trip costs, gear modifications, damage to gear, designated access areas, and individual fish measurements. These capabilities can be used for targeted studies with any vessel using FLDRS in haul-by-haul mode and is providing essential data for the collaborative development of catch and bycatch avoidance models that more efficiently and cleanly harvest quota allocations. The value of the information the system provides to collaborators is providing incentives for accurate catch reporting.

### **Integration of Electronic Monitoring and Electronic Vessel Trip Reporting**

In an effort to integrate EM and eVTR appropriately, the Northeast has developed draft EM Summary Data File Technical Specifications to standardize information provided by EM service providers. The Data File Technical Specifications document was developed in coordination with the EM Equipment Specifications (draft) document and both were supplied to EM service providers.

In the case of the herring project, integration of EM with ER will be addressed independent of funding. Staff in the Fisheries Sampling Branch and Cooperative Research Program will be collaborating to better integrate EM and ER systems as the project progresses. A separate cooperative research initiative has installed laptops and temperature-depth probes along with the FLRDS logbook reporting on 11 of 12 boats by the end of May, 2016. Eight of the vessels have been reporting tow level data for two years, and this activity leverages collaboration with MA-DMF, SMAST, and NEFSC habitat and oceanographic modelers to rapidly integrate vessel reports, observer and dockside monitoring for bycatch avoidance and hotspot mapping in near real time.

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## **Appendix: Scientific and Management Applications of Electronic Vessel Trip Reporting Tools for Industry Data Collection on Environmental Factors to Improve Fisheries Assessments and Oceanographic Models**

NEFSC Cooperative Research also supported the development of an affordable wireless temperature-depth probe system that records ocean bottom temperatures. This information is a major gap in oceanography data and is important to advance bycatch avoidance strategies and refine stock assessments.

Integrating environmental factors in fisheries science requires understanding how environmental factors vary both at fine and broad scales. Current ocean circulation models contain biases due to inaccurate measurements and uncertainty in estimating ocean mixing processes. Thus it is critical to compare and correct model estimates using real observations. Updated models can then provide more accurate estimates for assessment and management.

The Study Fleet has shared more than 4 million bottom temperatures with modelers from the Northeast Fisheries Science Center, University of Massachusetts School for Marine Science and Technology, Rutgers University, and the Mid-Atlantic Regional Ocean Observation System to help improve oceanographic models. This data also helped develop a thermal niche model that resulted in changing the reference points used in the 2014 butterfish assessment, which led to an increase in the fishing quota, and was applied in the 2015 stock assessments for bluefish and scup.

### **Real-Time Data Collection and Transmission**

NEFSC Cooperative Research, along with a grant from NOAA's Advanced Sampling Technology Program, and funds from the North Atlantic Regional Team, is supporting the development and testing of low-cost methods for real-time telemetry transmission of data through efforts with collaborating scientists in the NEFSC's Oceanography Branch. Real-time data transmission can allow the data to be used immediately, and can allow for quick feedback that can be used by fishermen to fish more selectively and avoid bycatch.

The technology being developed by NEFSC oceanographers combines modifications to ocean drifter transmitters and the recently developed wireless temperature depth recorders. As fishermen haul gear with the wireless temperature sensor attached, an onboard computer automatically sends time, latitude and longitude, and average temperature and depth for the tow to the GLOBALSTAR satellite system. Within minutes, the data arrives at the lab in Woods Hole, which posts it on a website for the participating fishermen and collaborating scientists.

Bottom temperatures from more than one thousand hauls have been telemetered in the first year of the project. Fishermen can immediately view their data to make connections between ocean bottom temperatures and catch composition, thus better targeting certain species and minimizing bycatch. Fishermen can also report catch information and other data at a fraction of the cost of commercial ship-to-shore transmission. Additional sensors are being developed, including some that report directly to a smartphone instead of a shipboard computer.

**Table 1. EM Program Cost Template for reporting program costs and cost share. Include FTE and contractor costs.<sup>1</sup>**

Camera-based Electronic Monitoring	Total Cost	% Government cost share?	% Industry cost share?	NMFS budget line (e.g., FRM, catch shares, NOP, etc)
Planning (technical system design, vessel monitoring plans, support system design)		\$355,000*		
Specifications setting		X		
Technical software system design QA/QC, metadata, integration		X		
Commercial off- the shelf/3 <sup>rd</sup> party developer option				
Regulation development and implementation		X		
<b>Hardware</b>				
Camera(s)				
Sensors				
Media/storage				
Government IT infrastructure		X		
Software, database dev., software licenses		X		
<b>Field Support</b>				
Installation				
---Labor				
---Wiring, connections, etc				
Training (labor, materials, travel)				
Maintenance/Repair/Replacement				
Help Desk				
<b>Data Communications &amp; Reporting</b>				
At sea				
Shoreside				
Government IT infrastructure		X		
Data Retrieval				
Data Validation		X		
Data Analysis		X		
Software				
---development				
---license				
Labor				
System maintenance				
<b>Data Storage/Archiving</b>				
On board				
On shore		X		
Government IT infrastructure		X		
Other (specify)				

<sup>1</sup> Provide reference for the program, including brief description and a citation to the implementing rule

**Table 2. ER Program Cost Template for reporting program costs and cost share. Include FTE and contractor costs.<sup>2</sup>**

E-logbook Monitoring **	Total Cost	% Government cost share?	% Industry cost share?	NMFS budget line (e.g., FRM, catch shares, NOP, etc)
<b>System Development &amp; Maintenance</b>				
Specifications setting		X		
Technical software system design QA/QC, metadata, integration		X		
System maintenance		X		
Commercial off- the shelf/3 <sup>rd</sup> party developer option				
Data storage / archiving				
<b>Hardware and Infrastructure</b>				
CPU, GPS, etc.				
Telecommunications Satellite, cellular, (specify)				
Government IT infrastructure		X		
<b>Field Support</b>				
Installation				
---labor				
---Wiring, backup power, connections, etc.				
Training (labor, materials, travel)				
Data validation				
Maintenance/Repair				
Help Desk				
<b>Data Communications &amp; Reporting</b>				
At sea				
Shoreside				
Government IT infrastructure		X		
Data Retrieval				
Data Validation		X		
Data Storage		X		

\* The Greater Atlantic Region electronic monitoring (EM) program costs represented here are the costs associated with the development and implementation of an EM program in the groundfish fishery. The EM program is being used as an alternative to the required At-Sea Monitoring program required under Amendment 16 of the groundfish fishery management plan. Video from EM will be used to identify and enumerate discards of groundfish species with the resulting data set being used for Annual Catch Entitlement accounting. The majority of costs associated with the EM program including EM service provider contracts, system hardware and sensors, maintenance and support, have thus far been borne by NGOs and which the details have not been shared with the agency and thus are not reflected in this cost template. Agency costs reflected in this template represent agency personnel costs and are rough estimates based on estimates of time individual staff members contribute to the program factored by their compensation costs. The individual line items where agency staff have contributed time are marked with 'X'.

<sup>2</sup> Provide reference for the program, including brief description and a citation to the implementing rule

\*\* The Greater Atlantic Region's electronic reporting (ER) program has been evolving since prior to 2011 when ER was first authorized for use. The ER program has been designed to support electronic reporting application development by external developers and due to the proprietary nature of those applications, no cost information is available. Individual line items where agency staff have contributed time but where detailed cost information is unknown are marked with 'X'.