National Marine Fisheries Service
Electronic Monitoring Cooperative Research and Implementation Program

Introduction

This cooperative research program has been developed to be responsive both to the implementation of the North Pacific Fishery Management Council (Council) EM Strategic Plan, and to Senate language included in the 2014 NMFS appropriations bill, which directed NMFS to work with the small boat fixed gear fleet to implement a program designed to test the functionality of available electronic monitoring systems. Multiple research tracks are being undertaken, in order to collect information that will help inform future Council alternatives for EM to enable catch estimation.

The research tracks that are included in the program, and which are described in more detail in the tables that follow, are:

Track 1   Operationalizing Deployment of EM Systems

Track 2   Comparison of Standard EM with Observers

Track 3   Comparison of Stereo EM and Discard Chutes with Observers

Track 4   Evaluation of Logbooks and eLogbooks *(to be integrated with Tracks 1, 2 and 3)*

These research tracks were developed and refined through a series of ad-hoc industry/stakeholder meetings, public workshops, and follow-up conference calls during the fall of 2013 and spring of 2014. In April 2014, the Council established a Fixed Gear EM Workgroup as a Council committee, to allow industry, agency, and EM service providers a forum to cooperatively and collaboratively design, test, and develop EM systems that are consistent with Council goals and objectives to integrate EM into the Observer Program.

Project Goal

The overall goal of this cooperative research project is to assess the efficacy of EM (in combination with other methods) for catch accounting of retained and discarded catch, and to identify key decision points related to operationalizing and integrating EM systems into the Observer Program for fixed gear vessels in a strategic manner.

Conceptual Approach, and Integration of Research Tracks

This goal will be achieved through a) field trials testing methods to provide quantifiable image-based data from fisheries, which can be used to support discard estimation in Alaska's fixed gear fleet, and b) desktop studies and information from past pilot work in related EM programs where appropriate. This cooperative research will inform the evaluation of multiple EM program design options and consider various EM integration approaches to achieve management needs.

EM data from Tracks 1, 2, and 3 will be collected consistently, and used to assess the functionality of EM systems for catch accounting. Track 1 provides the data to assess operational costs for the implementation of any EM technology, and identifies implementation needs (e.g., people, training, infrastructure). Tracks 2 and 3 compare the effectiveness of different EM camera technologies with observer data (two kinds of standard EM cameras, and two stereoscopic cameras, one mounted on the rail, and one in a chute), and compare post-processing of the data and operational tradeoffs between the two types of technology. Track 4, which will be integrated with the other tracks, evaluates what self-reported data is needed from vessel operators for use with EM, and the benefits and tradeoffs involved in requiring an elogbook.

Data and analysis produced on costs, data quality, risk, operational procedures, and vessel compatibility will inform decisions on implementation phases, future investments in technology, and identify the combination of tools which will best meet NMFS, Council and stakeholder management objectives. These decision points will be analyzed in a regulatory amendment, and the Council's recommendation and subsequent NMFS rulemaking will result in the integration of EM options into the Observer Program.

Linkage to Council's EM Strategic Plan

The cooperative study addresses the following components of the Council's EM Strategic Plan:
- Goal II, Objective 1: Conduct scientific research to advance the science of monitoring and data integration.
    - Strategy C: Evaluate EM technologies in the 2013-14 EM project on volunteer vessels in the <57.5 ft longline and pot vessels.
        - Action: Evaluate species identification issues.
        - Action: Identify data gaps and potential solutions for species weight estimates, biological samples and rare species interactions.
        - Action: Assess the efficacy of using technology for capturing information that would quantify discard and provide spatial and temporal distribution of effort.

Analyses of the results from the cooperative study will be used to develop a suite of alternatives for the Council to choose from, to address:
- Goal III, Objective 1: Implement EM/ER technology where appropriate and cost effective to improve catch estimation and better inform stock assessments.
    - Strategy A: Implement EM as appropriate based on scientific research from goal II.
        - Action: Select EM approach.
        - Action: Analyze EM approach, impacts, cost, and benefits. Following Council action, the next step will be to initiate Strategic Plan
        - Action: Write implementing regulations,
        - Action: Implementation, roll out, outreach.

Preliminary Timeline *(subject to change)*

The focus of this cooperative research effort is to identify and resolve implementation issues associated with integrating EM into the NPGOP. It is expected to be an ongoing process with a sustained commitment to building EM capacity. EM integration may be implemented in phases upon recommendation by the Council as results warrant, with ongoing refinement of EM technology, field services, and data review elements, as circumstances warrant.

Council adopts EM Strategic Plan and establishes initial objective of at-sea discard estimation for small vessel fixed gear fleet	June 2013
Track 1 research *(integrates Track 4)*	March 2014 – October 2015
Track 2 research *(integrates Track 4)*	October 2013 – October 2015
Track 3 research *(integrates Track 4)*	October 2013 – October 2015
Council amendment process	October 2014 – October 2015
NMFS regulatory process	October 2015 – November 2016
Implementation	January 2017

Overview of research tracks

The following tables provide an overview of each of the research tracks. Sampling plan details and methods for each track are described in more detail in appendices for that track, at the end of this document:

Appendix 1:   Study design for Track 1: Operational Deployment of EM
Appendix 2:   Study design for Tracks 2 and 3: Comparison of EM systems with observers
Appendix 3:   Study design for Track 4: Evaluate logbooks, including elogbooks

Track 1 – Standard EM

Goal - To gather information to help inform decision points related to how EM can be strategically deployed, in combination with other data sources to meet management objectives associated with estimating catch composition and weight in fixed gear fisheries		
Track 1. Standard EM only	**Catch Accounting**	**Operational Program Specifications**
Research problem(s) to be solved?	Evaluate the use of standard EM to identify species, quantity (pieces or weight), and utilization	Examine different monitoring approaches using EM and other information and develop potential operational program designs
Field work to be completed	Deploy EM systems to volunteer vessels out of Homer and Sitka, and other ports including Petersburg, Seward, and Kodiak	Establish port-based infrastructure to support deployed EM systems
Time frame - start and stop	March, and continue as necessary	March, and continue as necessary
Responsible partner	AMR/Saltwater	AMR/Saltwater
Data sets to be constructed	1. Catch/effort data by species and disposition from Standard EM data. 2. Meta data on EM system performance. 3. Species/weights from selected landings.	Operational program data including metadata on EM system performance, effort requirements by program task, program cost framework.
Source data	EM raw data, length-weight data, reference data on fishery species composition, halibut release mortality information.	Catch accounting results, skipper feedback, other fishery data
Responsible partner	AMR/Saltwater/PSMFC	AMR/Saltwater/PSMFC
Analysis	1. Evaluation of species identification ability and risk assessment for species that cannot be identified. 2. Compare different methods to derive weight from piece or length data. 3. Construct methodology for discard accounting (including halibut).	1. Consider a range of possible EM-based approaches, assessing their efficacy and operational impacts. 2. Develop an EM program design to specify requirements (onboard, field support, analysis, etc.) and data standards. 3. Develop a cost framework which can be used to evaluate different monitoring approaches.
Analytical limitations	Evaluation limited to volunteer vessels in two ports. Weight estimators would come from external data sources. Deployments on vessels do not carry observers.	<60' monitoring program is new and needs may not be fully defined; cost data may not be representative.
Responsible partner for analysis	EMWG	EMWG

Track 2 – Standard EM with Observers

Goal - to assess the feasibility of using electronic monitoring to sample and estimate catch by piece count in the fixed gear AK groundfish and halibut fisheries. **Track 2. Standard EM with observers**	
Research problem to be solved?	The main goal of this research is to provide field-tested methods to provide quantifiable image-based data from fisheries that can be used to support discard estimation in the fixed gear fleet operating in the North Pacific.
Field work to be completed	Deploy camera systems to vessels to collect hook specific catch of fish species using EM and at-sea samplers.
Time frame - start and stop	June 2014 through June 2015
Responsible partner	NMFS and PSMFC
Data sets to be constructed	Hook-specific catch of fish species on the fishing gear from 1: EM imagery and 2: at-sea samplers. Trip effort data.
Source data	1. At-sea observer, 2. EM Video data, 3. e-log, 4. Gear sensors and GPS
Responsible partner	NMFS and PSMFC
Analysis	1. Compare species identification between Observer and camera-based monitoring. 2. Compare discards and discard rates between Observer and camera-based monitoring 3. Collect data to help inform relative efficiency, cost and potential bias of the two discard estimation methods 4. Evaluate reliability and the timeliness for data to be available for management of the two discard estimation methods.
Analytical limitations	The sample size of up to 4 vessels may not be adequate to ensure a representative sample across the fleet. Experimental costs may not reflect actual operations.
Responsible partner for analysis	NMFS and PSMFC

Track 3 – Stereo EM with Observers

Goal - to assess the feasibility of using electronic monitoring to sample and estimate catch by weight in the fixed gear AK groundfish and halibut fisheries.

Track 3. Stereo camera EM with observers

Research problem to be solved?	The main goal of this research is to provide field-tested methods to provide quantifiable image-based data from fisheries that can be used to support discard estimation in the fixed gear fleet operating in the North Pacific.
Field work to be completed	Deploy camera systems to vessels to collect hook specific catch of fish species using EM and at-sea samplers.
Time frame - start and stop	June 2014 through June 2015
Responsible partner	NMFS and PSMFC
Data sets to be constructed	Collect hook-specific catch of fish species on the fishing gear using EM and at-sea samplers.
Source data	1. At-sea observer, 2. EM Video data, 3. e-log, 4. Gear sensors and GPS
Responsible partner	NMFS and PSMFC
Analysis	1. Compare species identification between Observer and camera-based monitoring. 2. Compare discards and discard rates between Observer and camera-based monitoring. 3. Compare precision of estimates between Observer and camera-based monitoring. 4. Collect data to help inform the relative efficiency, cost and potential bias of the two discard estimation methods. 5. Evaluate reliability and the timeliness for data to be available for management of the two discard estimation methods.
Analytical limitations	The sample size of 5-10 vessels may not be adequate to ensure a representative sample across the fleet Experimental costs may not reflect actual operations. Reliability and system performance may not be representative of actual operations.
Responsible partner for analysis	NMFS and PSMFC

Track 4 – E-Logbooks (to be integrated with Tracks 1, 2 and 3)

Goal - to determine the self0reported data needed to estimate catch in the fixed gear AK groundfish and halibut fisheries **Track 4. Logbook, including elogbooks**	
Research problem to be solved?	Determine what self-reported (fishery dependent) information is needed and the timelines and accuracy of these data. Objectives: 1. Identify minimum fields that are needed from logbooks to complement EM catch estimation and serve agency needs. 2. Evaluate the efficiency gains of elogs versus paper logbooks. 3. Indenitfy QC procedures and automation methods for improving data accuracy. 4. Determine fishermen friendly attributes that could be incorporated into logbooks.
Field work to be completed	Incorporate logbook components into tracks 1-3
Time frame - start and stop	May 2014 - June 2015
Responsible partner	NMFS
Data sets to be constructed	Location and effort data, by set and by vessel. Sensor data.
Source data	1. paper logbooks, with data entry by technicians post-fieldwork; 2. elog; 3. Gear sensors and GPS
Responsible partner	NMFS, IPHC, PSMFC
Analysis	1. Self-reported logbooks data (paper and elog) and sensor data will be analyzed to evaluate efficacy in determining set and haul positions 2. Evaluate if sensor data can be used to automate entry of set and haul positions in elogbook, and efficiency gains.
Analytical limitations	TBD
Responsible partner for analysis	NMFS, IPHC, PSMFC