

Analysis to Integrate Electronic Monitoring into the North Pacific Observer Program

Overview

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1 Introduction

The North Pacific Fishery Management Council (Council) has established an intention to integrate electronic monitoring (EM) tools into the Observer Program for vessels using fixed gear. As such, staff has begun work preparing an analysis to integrate EM as a tool in the Observer Program. The discussion paper includes the Council's adopted purpose and need statement and alternatives (Section 2 and 3), as well as a preliminary description of the components of an EM program that will be evaluated (Section 4). Section 5 highlights some questions that will be evaluated in the EM integration analysis, and Section 6 provides the proposed timeline for this amendment action.

This discussion paper was developed and refined through a Council committee, the fixed gear EM Workgroup (EMWG). In 2014, the Council appointed the EMWG to develop and refine an EM program for integration into the Council's Observer Program. The EM Workgroup provides a forum for all stakeholders, including the commercial fishing industry, agencies, and EM service providers, to cooperatively and collaboratively design, test, and develop EM systems, and to identify key decision points related to operationalizing and integrating EM systems into the Observer Program in a strategic manner.

2 Council's Purpose and Need

In February 2016, the Council adopted the following as a draft purpose and need statement for this action.

To carry out their responsibilities for conserving and managing groundfish resources, the Council and NMFS must have high quality, timely, and cost-effective data to support management and scientific information needs. In part, this information is collected through a comprehensive fishery monitoring program for the groundfish and halibut fisheries off Alaska, with the goals of verifying catch composition and quantity, including of those species discarded at sea, and collecting biological information on marine resources. While a large component of this monitoring program relies on the use of human observers, the Council and NMFS have been on the path of integrating technology into

our fisheries monitoring systems for many years, with electronic reporting systems in place, and operational EM in a compliance capacity in some fisheries. More recently, research and development has focused on being able to use EM as a direct catch estimation tool in fixed gear fisheries.

The fixed gear fisheries are diverse in their fishing practices and vessel and operational characteristics, and they operate over a large and frequently remote geographical distribution. The Council recognizes the benefit of having access to an assorted set of monitoring tools in order to be able to balance the need for high-quality data with the costs of monitoring and the ability of fishery participants, particularly those on small vessels, to accommodate human observers onboard. EM technology has the potential to allow discard estimation of fish, including halibut PSC and mortality of seabirds, onboard vessels that have difficulty carrying an observer or where deploying an observer is impracticable. EM technology may also reduce economic, operational and/or social costs associated with deploying human observers throughout coastal Alaska. Through the use of EM, it may be possible to affordably obtain at-sea data from a broader cross-section of the fixed gear groundfish and halibut fleet.

The integration of EM into the Council's fishery research plan is not intended to supplant the need for human observers. There is a continuing need for human observers as part of the monitoring suite, and there will continue to be human observer coverage at some level in the fixed gear fisheries, to provide data that cannot be collected via EM (e.g., biological samples).

The Council and NMFS have considerable annual flexibility to provide observer coverage to respond to the scientific and management needs of the fisheries. By integrating EM as a tool in the fisheries monitoring suite, the Council seeks to preserve and increase this flexibility. Regulatory change is needed to specify vessel operator responsibilities for using EM technologies, after which the Council and NMFS will be able to deploy human observer and EM monitoring tools tailored to the needs of different fishery sectors through the Annual Deployment Plan.

3 Council's Alternatives

In February 2016, the Council adopted the following alternatives be analyzed as part of the Council's EM Integration analysis. The Council may select different alternatives for different sections of the fixed gear fleet (e.g., for longline vs pot gear, or by vessel size class), or may choose multiple alternatives for regulatory implementation, but specify annually in the ADP which vessels will be using which EM program.

Alternative 1: Status quo - EM is not a tool in the Council's Research Plan

Alternative 2: Allow use of EM for catch estimation on vessels in the EM selection pool

Option: Require full retention of key species with associated dockside monitoring

Alternative 3: Allow use of EM for compliance monitoring of vessel operator logbooks used for catch estimation

As a potential trailing amendment to the analysis, the Council also directed the EM Workgroup to continue to evaluate the feasibility and potential cost savings associated with EM cooperatives, where a particular group of vessels would contract specifically with an EM provider to meet their monitoring needs over the course of a year. The EMWG considers that this concept shows a lot of promise for meeting the goals of the program with respect to providing cost savings, while maintaining a high level of data quality. The complexity of the Federal contracting system, however, is such that fully specifying and analyzing this alternative as part of the initial Council EM Integration analysis will likely delay initial

review on that package, and consequently delay the possibility of 2018 implementation. As a result, the Council agreed that this concept be evaluated as a trailing amendment that considers the feasibility of having either EM providers or vessel groups as the cooperative entity.

3.1 Alternative 1 – Status quo

Under the status quo, at-sea fisheries monitoring in the partial coverage category is accomplished with a human observer pool, with a flexible deployment plan that allows the Council and NMFS to make annual policy choices on which vessels qualify for different selection pools, and the selection rates assigned to each pool.

3.2 Alternative 2 – Allow EM for catch estimation on vessels in the EM selection pool

Alternative 2 would integrate EM into the Observer Program as a tool for catch estimation. Vessel operators would be required to comply with a predetermined set of operator responsibilities, and the program would be loosely modeled in the 2016 Pre-implementation Plan for longline vessels 40 to 57.5 feet length overall, although some provisions will differ.

3.3 Alternative 3 – Allow EM for compliance monitoring of operator logbooks used for catch estimation

Under Alternative 3, participants in the EM pool would be required to complete operator logbooks for key species, which would be used as the basis for catch estimation. To verify the accuracy of the logbooks, a review of the footage from EM cameras would be used to audit the operator logbooks.

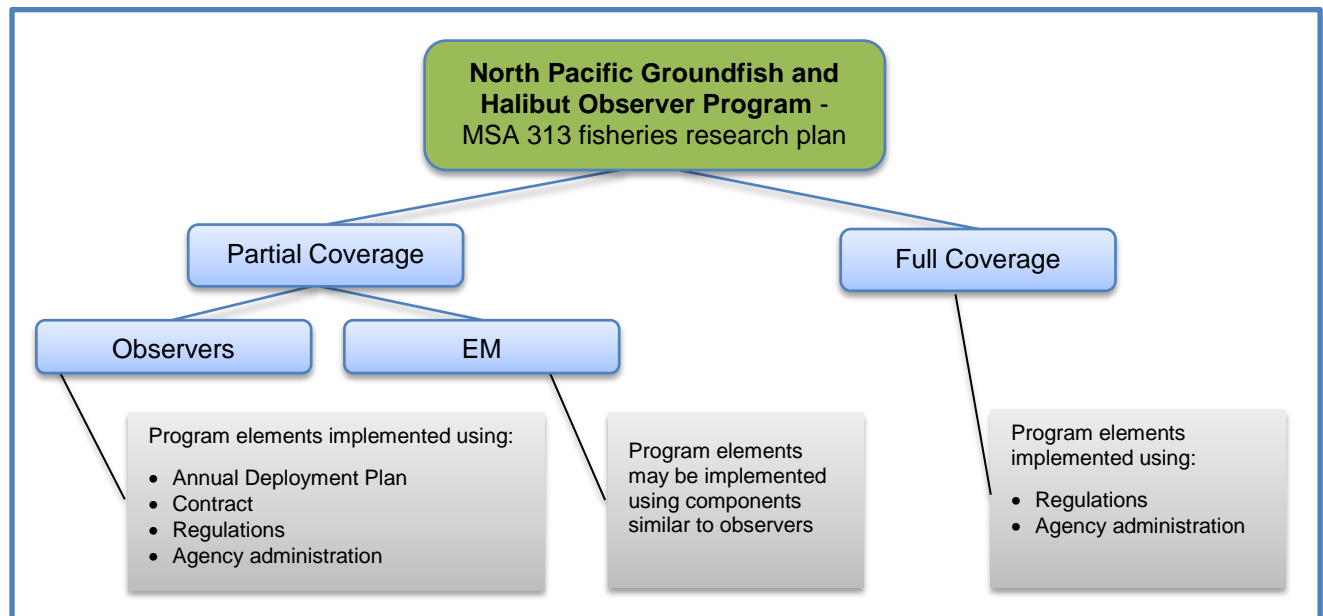
4 Components of an EM program to be considered in the EM analysis

The Council's EM integration analysis will consider broadly the costs and benefits of a functioning EM pool as part of the Council's fishery monitoring program. Integrating EM is a complex project with many components, however, and not all of the components will necessarily be implemented in regulation. Section 4.1 provides some background on how the current partial coverage human Observer Program is implemented, and Section 4.2 describes the various components of an EM program that will be considered in the analysis. Section 4.3 orders EM program elements by implementation vehicle, and Section 4.4 illustrates the annual cycle of a functioning EM program.

4.1 Background - how the current North Pacific Groundfish and Halibut Observer Program is implemented

As EM is integrated into the Observer Program, the different components of the program may be implemented through regulation, the annual deployment plan, contracts, or administration by NMFS (Figure 1). To facilitate the discussion about how to integrate the different elements of EM into the partial coverage program, the following sections describe how elements of the current partial coverage observer category are implemented.

Figure 1 Diagram of the North Pacific Observer Program



Annual Deployment Plan (ADP)

The ADP documents how NMFS intends to assign at-sea and shoreside observers to vessels and processing plants engaged in groundfish and halibut fishing in the North Pacific. The ADP addresses the changing needs of fisheries management and stock assessment by providing a flexible design that may be adjusted annually.

Elements include:

- Defining pool of vessels and shoreside processors eligible to be selected for coverage
- Defining strata based on factors that are known prior to vessel departure (e.g. gear type, vessel size). The strata definitions can change on an annual basis.
- Describing the selection rate for the strata based on estimated effort and budget
- May include policy decisions regarding observer development to address scientific and management needs (for example, the Bering Sea Aleutian Islands Pacific cod fleet voluntarily selecting full observer coverage).

Contract

The observer provider contract supplies qualified observers to vessels in a timely fashion and provides logistical and operational support including travel to deployment locations, safety and communications.

Elements include:

- Defining the qualification requirements for observers to be hired by the contractor
- Defining observer duties and data collection requirements
- Identifying the contractor roll in the ODDS call center
- Describing the contractors responsibilities regarding logistic and operational support for observer deployment
- Requiring contractor to describe how the quality and timeliness of observer data will be ensured.
- Describing performance standards contractor must meet to be considered successful and receive a positive past performance rating.

Regulations

The Observer Program regulations describes vessel owner or operator responsibilities.

Elements include:

- Logging fishing trips
- Paying fees
- Making vessel available and carrying observers when selected for coverage
- Ensuring observers have a safe environment and are able to collect required data when aboard.

Agency Administration

Agency administration of the Observer Program ensures that observers collect high quality data, and that observer data are integrated into catch accounting system in a timely manner so data can be used for management.

Elements include:

- Training observers prior to deployment
- Providing inseason support during deployment
- Debriefing observers at the end of deployment
- Managing and disseminating data collected by observers
- Maintaining and evaluating methods to integrate observer data into catch accounting

4.2 EM components

The EM Workgroup has identified a general list of the different components that will be considered in the Council's EM integration analysis. These include:

- EM deployment design
- Participation/eligibility
- Equipment and installation
- Operation
- Data and equipment retrieval
- Retrieval of EM data and Catch Accounting
- EM data retention and storage
- Feedback Mechanisms
- Fees/Funding/Costs

The EM Workgroup has begun developing the elements of each of the EM components for Alternative 2, identifying a goal for each component, the scope of the component, and draft performance metrics for evaluating whether goals are met. Not all of the identified performance metrics would necessarily be considered in the Annual Report; some might be more appropriate, for example, for a periodic (e.g., 5-year) review of the EM program. More work will be done on developing the elements for Alternative 3 as the analysis proceeds. The Workgroup recognizes that while the components themselves will generally be parallel across the action alternatives, specific elements may differ.

EM Deployment Design

Goal: Use best available information to design the EM deployment methods, including the EM selection pool, that meet policy and data collection goals.

Elements could include:

- Use the **ADP** process to define the
 - EM deployment methods and coverage rates
 - EM selection pool (the universe of vessels that can participate in EM based on, for example, vessels size, gear type, area, and/or port)
 - EM data collection goals and methods (types of data collected by EM vessels, seabird handling, depredation)
- Use the **Annual Report** for performance review and analysis of EM coverage and data
 - Representative deployment
 - Data quality
 - Achieved coverage rate and monitoring rate

Metrics to assess this goal (either annually or periodically):

- The Observer Science Committee annually reviews observer deployment, and will comment on both the EM and human observer deployment plans and develop appropriate metrics.
- Ones that are currently tracked in the 2014 Annual Report include:
 - Deployment rates for each stratum: were target sample rates achieved? Quantification of under- and over-coverage rates, non-response rates.
 - Was sampling representative? Temporally, spatially, and representative of trip characteristics (trip duration, vessel size, number of NMFS reporting areas visited, amount of landed catch, number of species in the landed catch, proportion of total landed catch that was due to the most prevalent species)
 - Adequacy of sample size – probability of selecting a sample and having coverage in each stratum and NMFS reporting area

Participation/eligibility

Goal: A pool of EM participants that are capable and committed to making EM work on their boats.

Elements could include:

- Opt-in process - NMFS to notify the universe of vessels defined by the selection pool, provide the opportunity for eligible vessels to opt-in, and select vessel that meet eligibility criteria (use ODDS?).
- Eligibility to participate contingent on
 - compliance with the *vessel monitoring plan* (VMP)
 - *option*: performance standard (low compliance rate with VMP over time or repeat problems with EM system reliability or video quality)
 - process for reviewing eligibility decisions
- Selection of vessels to carry EM during selection periods (selection can be by vessel or trip)

Metrics to assess this goal (either annually or periodically):

- Many of the metrics for this goal can be duplicated from the 'Operation' category – i.e., is there a pool of EM participants that are regularly meeting their obligations for a functioning EM system?
- Other metrics could track participation over time
 - Number of EM participants that stay in the EM program from year to year

Equipment (wiring/sensors, cameras, monitors, hard drives) and Installation

Goal: Appropriate EM equipment gets properly installed on each vessel, at the right port, and in a timely fashion with the least interruption to the fishing plan.

Elements could include:

- Option 1: NMFS contracts with service provider to provide and install equipment on each vessel (partial coverage model)
 - Specifications/performance standards for equipment would be in the contract (few, if any, regulations would be needed to specify equipment)
 - Contractor works with a vessel operator to write a VMP, which can be amended between trips working with the contractor.
 - Equipment/installation would be paid for using observer fees or other funding as available
 - Maintenance/replacement of equipment
 - Vessel operator's responsibilities to ensure contractor has all needed access and assistance (similar to 2016 pre-implementation plan) prior to and during installation.
 - Compliance monitoring and recourse if installation is not successful
- Option 2: Vessel owner contracts with service provider to provide and install equipment on the vessel (full coverage model)
 - Specifications/performance standards for equipment would be in regulations
 - Contractor works with a vessel operator to write a VMP, which can be amended between trips working with the contractor.
 - How would equipment/installation be paid for?
 - Maintenance/replacement of equipment
 - Vessel operator's responsibilities to ensure contractor has all needed access and assistance (similar to 2016 pre-implementation plan) prior to and during installation.
 - Compliance monitoring and recourse if installation is not successful
- VMP Process – need for a process for submitting a VMP to NMFS, NMFS approval of the VMP, and process for amending VMP inseason?

Metrics to assess this goal (either annually or periodically):

- Frequency of equipment or installation-related video image quality issues (e.g. poor camera angles, condensation)
- Number of critical failures
- Locations of EM service and installation ports or outport service compared to start/landing ports of EM vessels, and denied requests for outport services
- Average length of time for installation and repairs

Operation

Goal: Each vessel operator maintains a functioning EM system throughout the fishing trip and there is a good process for maintaining quality control and addressing equipment failures.

Elements could include:

- Vessel operator's responsibilities in the operational plan, part of the VMP
- Types of responsibilities include stable power supply, function tests, breakdown, hard drive capacity, video quality, catch handling, effort logbook – all from 2016 EM pre-implementation plan, others depending on information gathered during pre-implementation.
- Flexibility to address non-critical equipment malfunctions while at-sea

- Critical EM system malfunction, vessel must remain in port for up to 48 hours for repairs, vessel released if repairs can't be fixed within 48 hours. Malfunction must be fixed prior to departing on subsequent trips
- First trip quality control and electronic record - recommended
- Dockside observer to verify EM data or collect data that cannot be obtained from EM

Metrics to assess this goal (either annually or periodically):

- Frequency of EM system (overall and after initial trip)
- Frequency of operator-related video image quality issues (e.g. water spots, dirty camera lens)
- Completeness of operator requirements – effort logbook, IPHC logbook, fish ticket
- Completeness of duty of care requirements – function tests, continuous power
- Appropriate catch handling – all discards at control points, handling within camera view
- Consistency with seabird goal requirements – mitigation devices used, extended presentation
- Enforcement/compliance metrics could be tracked also; examples from the Annual Report include:
 - Number of compliance reports
 - Non-compliance trends, by category
 - Number of enforcement actions

Data/Equipment Retrieval

Goal: EM equipment with data returned to NMFS timely and in good condition.

Elements could include:

- Transmit hard drives/data to NMFS/contractor
- Un-install equipment
- Coordination with contractors (schedules, ports, etc.)

Metrics to assess this goal (either annually or periodically):

- Time lag between last EM trip and equipment retrieval
- Frequency of equipment replacement (by system part – sensors, cameras, CPUs, etc.)

Retrieval of EM data/ Catch Accounting

Goal: Extract data from EM system and integrate data into the catch accounting system in a timely manner so that data can be used in management.

Elements could include:

- Methods for video review
- Method for integrating EM data into catch accounting
- Methods for certifying video review entities
- Methods for other types of data (seabird handling, depredation)

Metrics to assess this goal (either annually or periodically):

- Time lag for when EM trips occur and when data is available to CAS, by target fishery

EM data retention and storage

Goal: Retain data from EM systems in an appropriate format.

Elements could include:

- Retrieval for compliance
- Do Federal record requirements apply?

Metrics to assess this goal (either annually or periodically):

- Need to figure out first what the appropriate format should be, and the length of time for keeping different types of data.

Feedback Mechanisms

Goal: All participants have the opportunity to provide feedback to address problems and improve the EM Program.

Elements could include:

- Feedback from vessel operators on performance of providers
 - exit survey
- Feedback on performance of vessel operators (equipment maintenance, data quality)
 - score card
- Feedback on NMFS management of EM Program
- Feedback from OLE and GCEL on compliance/enforcement actions

Metrics to assess this goal (either annually or periodically):

- More thought needed - variety of mechanisms available to participants to provide feedback?
Complaints from people leaving the EM program about inadequate communication?

Fees/Funding/Costs

Goal: Use Observer Program fees or other sources of funding to pay for the EM equipment, installation, and maintenance.

Elements could include:

- Alternative mechanisms to fund EM equipment purchase
- Alternative mechanisms to fund EM equipment installation and maintenance
- How fees are used?
- How to achieve efficiencies and cost savings?
- Costs include equipment purchase, ongoing installation/maintenance, equipment replacement, NMFS management/infrastructure

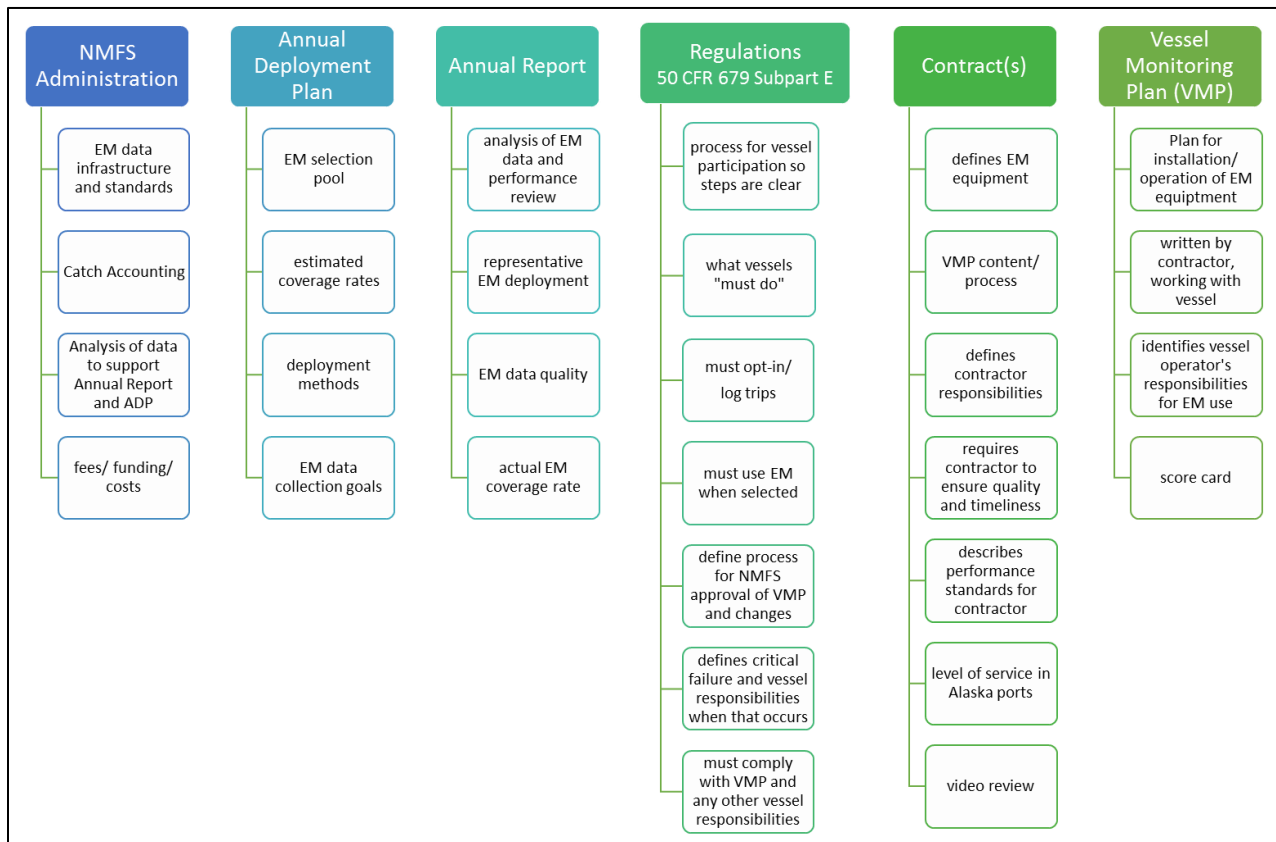
Metrics to assess this goal (either annually or periodically):

- How much of the program is paid for through the observer fee or other funding sources

4.3 Implementation vehicles for EM components

Each of these components will be implemented through the various available implementation vehicles, as discussed for the human observer program under Section 4.1. These include the regulations, the Annual Deployment Plan (and Annual Report), the EM service provider contract(s), and agency administration. An additional vehicle for the EM Program is the Vessel Monitoring Plan, which defines the placement of EM equipment onboard each individual vessel, and sets out operator responsibilities for maintaining EM equipment and fish handling practices conducive to camera monitoring. Figure 2 provides a preliminary assessment of how the different pieces of the EM program fit together under each of these implementation vehicles.

Figure 2 Preliminary assessment of EM components, organized by implementation vehicle



4.4 Illustration of a functioning EM program

Figure 3 provides the cycle of the EM program, once implemented. The Annual Deployment Plan will identify selection pools, deployment, and coverage rates for EM as well as human observer pool participants, on an annual basis. Once the draft ADP is released, vessels wanting to participate in the EM selection pool(s) will have a time period to opt-in for the upcoming year, and NMFS will then select vessels to carry EM for all or part of the year, depending on the deployment model selected in the ADP. Once a vessel has been identified to carry an EM unit for part or all of the year, the contracted EM service provider will contact the vessel to ensure that the EM system is correctly installed, and to create a Vessel Monitoring Plan (VMP) detailing the vessel operator's responsibilities with respect to the EM system. Vessels will proceed with their fishing activity, following the guidelines of the VMP. The frequency and

manner of data retrieval will be determined in the VMP, and equipment will be retrieved as necessary at the conclusion of a vessel's fishing activity or selection period. Data will be sent for review, and archived as appropriate. The reviewed data will be uploaded to the Observer database and made available to Catch Accounting, for inseason fishery monitoring. At the conclusion of each year, the Observer Annual Report will evaluate the performance of the EM deployment model as part of its overall review of the partial coverage program, and this information will be used to make improvements to EM deployment in future Annual Deployment Plans.

Figure 3 Annual EM cycle



5 Questions to be evaluated in the EM integration analysis

The Council's purpose and need for this action identifies that it is intended to provide a viable monitoring alternative for a particular segment of the groundfish and halibut fleet, which continues to provide the high quality, timely, and cost-effective data needed to support management and scientific needs. The bullets below provide a preliminary indication of how the quality of monitoring data from EM will be assessed in the analysis, and also how to assess whether the EM program is meeting the fleet's needs as intended by the Council.

Quality of monitoring data

Council's purpose

Design an EM program for discard species that can provide information needed for management and stock assessment purposes

Evaluation

- Many of the metrics provided in the PSMFC report directly address this need. Some of these include the following:
 - Completeness of video coverage by haul/trip
 - Frequency of EM system failures (video/sensors/software)
 - Frequency of EM system failures after initial trip
 - Reliability of video image quality
 - Proportion of catch with known disposition
- Some metrics are specific to paired data – rockfish species ID compared to dockside monitoring in 2015; IPHC EM datasets compared to human observer counts
 - Reliability of species identification for all species
- Some metrics rely on data studies about the precision associated with estimations based on available EM data
 - Impact of only identifying to species group for difficult to distinguish species pairs (SR/RE, shortspine/longspine thornyhead, arrowtooth/Kamchatka)
 - Impact of converting EM piece counts to weight of discard estimations
- Gap analysis – are there enough EM participants to cover the areas for which data is needed
- EM removals in the context of total removals of that species

Fleet uptake

Council's purpose

Provide an EM monitoring option as a viable alternative for vessels that have difficulty accommodating a human observer, where deploying an observer is impracticable, or to obtain at-sea data from a broader cross-section of the fixed gear groundfish and halibut fleet.

Evaluation

- is EM field support capacity (installation/repair service, training/review) available in the locations accessible to those vessels that have difficulty accommodating a human observer, or where deploying an observer is impracticable?
- does the program attract sufficient additional participants to amortize the costs of infrastructure?

6 Timeline for EM Integration analysis

Under the current best-case scenario timeline, the Council is scheduled for initial review of an analysis to integrate EM in October 2016, with final action following in December. Under this timeline, regulations would be prepared in 2017, and the integrated program would be implemented for the 2018 fishing year. Table 1 lays out concurrent timeframes for EM fieldwork and pre-implementation since the beginning of this Council effort in 2014, through eventual implementation in 2018. The EM fieldwork and pre-implementation that occurs before EM is implemented into the monitoring program has to be financed with independent funding sources, currently a combination of Federal funding and a National Fish and Wildlife Foundation grants. Once EM is implemented, the partial coverage observer fee will be used for both human observer coverage and EM deployment. Table 2 provides a more detailed rendering of the milestones between Council final action, scheduled for December 2016 under the best case scenario, and implementation in 2018.

Table 1 Best case timelines for EM fieldwork, Council process, and Observer Annual Deployment Plans

Year	Fieldwork / Pre-implementation (Pre-Imp)	Council process, regulations	Observer Program/ Annual Deployment Plan (ADP)
2014	<i>Fieldwork</i>	<i>EMWG develops 2015 Cooperative Research Plan (CRP), discusses alternatives for analysis</i>	<i>Oct – 2015 ADP places 10 vessels that are participating in EM research into the no selection pool</i>
2015	<i>Feb – SSC reviews CRP Jan-Jul – operational longline, stereo camera, pot cod field research</i>	<i>Feb – SSC, Council review CRP Oct – propose a 2016 Pre-Implementation plan to Council</i>	<i>Oct – 2016 ADP proposes all EM Pre-Imp vessels in no selection pool</i>
2016	<i>Jan-Dec – Pre-implementation on 53 longline vessels 40-57.5'. Jan-Apr – pot cod field work Jan-Jul – Stereo camera research on 3-5 longline and pot vessels</i>	<i>Oct – initial review for EM analysis to integrate EM into observer program. Dec – final action on EM analysis</i>	<i>Oct – 2017 ADP proposes all EM Pre-Imp vessels in no selection pool</i>
2017	<i>Jan-Dec – Second pre-implementation year for longline vessels >40', and proposed pre-implementation for pot vessels. Potential research on other technology.</i>	<i>Jan-Aug – Develop proposed and final regulations for integrating EM, hold MSA-required hearings in AK, WA, OR</i>	<i>June – Annual Report provides prelim analysis on allocating observer fee between observer and EM deployment Oct – 2018 ADP allocates funding to observers and EM deployment</i>
2018	Integrated observer/EM monitoring program		

Table 2 Detailed implementation timeline and milestones, under a best case scenario

Month	Milestone	Comments
December 2016	Council final action	
March 2017	Publish proposed rule /notice of availability of FMP Amendment	
April/ June 2017	Public comment period and hearings	60-day comment period and hearings requirements are in MSA 313(c)
June 2017	Annual Report to Council presenting NMFS's recommended EM selection pool for upcoming year (2018).	The EM selection pool is the universe of vessels that can participate in EM based on, for example, vessel size, gear type, area fished, port.
June/ August 2017	Write/review Final rule Approve FMP Amendment	Assumes 1 month GC review, which is less than the average review time.
August/ September 2017	Write ADP ; review by OAC, Plan Teams	
	Final rule publishes before September 1	30 day cooling off period required before it is effective. Effective October 1, at the latest
	Contract(s) awarded	(estimate)
October 2017	Council reviews draft ADP	ADP includes the EM selection pool, an EM selection rate, etc., based on analysis of costs, partial coverage budget, selection pool size, etc.
	NMFS announces EM opt-in period and the defined EM selection pool	
	Vessel opt-in period	Opt-in using ODDs.
December 2017	Final ADP , with EM selection pool, EM selection rate, etc.	
	Start Vessel Monitoring Plan and installation process	
January 2018	NMFS starts selecting vessels for EM coverage	