

## **Strawman Trawl Electronic Monitoring Cooperative Research Outline**

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### **Introduction**

<This document is meant to spur thought about the question: What is/are the EM Committee’s overarching goal(s) for trawl EM and how will ongoing research help the Committee to achieve that goal? **Please read this and make comments or edits, add or delete things as you see fit. Please pay special attention to the sections highlighted in yellow. We will use this document as a starting point for our August meeting discussions under Agenda items 5 and 6.>**

The North Pacific Fishery Management Council (Council) has established an intention to integrate electronic monitoring (EM) tools into the North Pacific Observer Program (Observer Program) for trawl catcher vessels. The Council’s EM Committee (EMC) 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 that are consistent with Council goals to integrate EM into the Observer Program. In February 2018, the Council changed priorities for the EMC from a focus on fixed gear vessels to a focus on developing EM use on trawl catcher vessels in the Bering Sea (BS) and Gulf of Alaska (GOA). In April 2018, the Council reconstituted membership on the EMC to reflect this transition.

In June of 2018, the Council adopted three monitoring objectives proposed by the EMC after its May 2018 meeting. These objectives include: 1) improve salmon accounting; 2) reduce monitoring costs; and 3) improve the quality of monitoring data. The Council appreciates these are preliminary objectives which may be amended or added to in the future. **In June of 2018, the Council also directed its trawl EM Committee (EMC) to develop a cooperative research plan for 2019. The Council intends to first develop a program to focus on EM for compliance purposes with a full retention requirement, and then develop EM to be used for catch estimation.**

This document splits apart potential future catch accounting EM for trawl CVs from the clear and present goal of developing EM for compliance and full retention. A key aspect of upcoming work is a need to address how to adapt existing EM technology to the diverse trawl CVs in our region (especially the diversity in BS pollock CVs).

**This document describes** multiple research projects currently underway (during 2018) as well as future research targeted for 2019 and 2020. All research projects are aimed at collecting information to inform the development of a pre-implementation plan and the development of alternatives for integrating EM as a monitoring tool for trawl catcher vessels under the Observer Program. Research projects described in this document were developed and refined through the trawl EMC. A cooperative research plan will include analytical and field work projects to address:

- Research and development of EM technologies
- Deployment of EM systems
- Infrastructure to support EM implementation
- Analyses to support EM implementation issues and decision points

## What are Trawl EM Goals?

To guide development of an EM program for trawl catcher vessels, the EM Committee discussed objectives in May 2018, which were adopted by the Council in June 2018 (excerpt from EMC Report, June 2018):

**Objective 1:** Improve salmon accounting

- a. Through shoreside monitoring; this is a key GOA issue, and the EMC envisions addressing pollock before expanding to other trawl fisheries

**Objective 2:** Reduce monitoring costs

- b. Develop cost efficiencies and free up money for other priorities
  - i. Partial coverage: free up money for use elsewhere; perhaps savings if decreases fee [by shifting how funds are spent in the partial coverage category]
  - ii. Bering Sea full coverage: saves money for industry

**Objective 3:** Improve monitoring data (broader version of Objective 1)

- c. Focus on choke species (including PSC) and protected species (e.g., seabirds)
- d. Achieve more comprehensive coverage

Discussion about tentative trawl EMC objectives also included discussion about incentives for EM that exist in different areas, including:

- BS pollock (decrease costs for salmon accounting)
- WGOA pollock/cod (stable salmon accounting against PSC cap; small vessel observer hardship for long tender trips)  
CGOA (stable salmon accounting against PSC cap)

Groups have already started to work in these areas, but the Council remains interested in a diversity of approaches. The objectives, workplan, and timing may be different for different projects.

**A completed cooperative research plan will be a collaborative and coordinated effort to reach the Council's trawl EM goals. The overall goal of EM trawl cooperative research is to develop EM on trawl catcher vessels in multiple ways, working to ensure that each project stage builds from previous stages. This will include designing a robust program to use EM (in combination with other tools) for compliance monitoring and catch accounting of retained and discarded catch on trawl vessels. Findings are expected to identify key decision points related to operationalizing and integrating EM systems into the Observer Program for trawl catcher vessels in a strategic manner. Information from the 2018/2019 research projects will be used to identify procedures to test EM in an operational mode for monitoring compliance with a full retention requirement from a group of trawl vessels (in 2019). In future years, using EM for catch accounting on trawl vessels will be explored as well.**

## The Cooperative Approach to EM Development

In 2013, a strategic plan was prepared by the agency, followed by an implementation plan, and the creation of the EMWG in 2014. The arc of EM development for trawl will not necessarily be identical to that of fixed gear, but key aspects may remain, including: creating the trawl workgroup, creating some type of research plan, testing EM through pre-implementation and developing regulations. The progression process of EM development for fixed gear started with proof of concept → a pilot program → operational testing → pre-implementation → a mature program (Figure 1). In May 2018, the trawl EM Committee agreed to begin working from the cooperative approach to EM development.

**Figure 1. Stages of EM Development**

Programmatic Development	EM Program Stage	Logistical Development
<ul style="list-style-type: none"> <li>• <b>Scale</b> - A few volunteer boats</li> <li>• <b>Data use</b> - Demonstration</li> <li>• <b>Management pathway</b> - undetermined</li> <li>• <b>Costs</b> - unknown</li> <li>• <b>Typical timeline</b> - 1-2 years</li> </ul>	<p><b>Proof of Concept</b></p> <p><i>Goal: Adaptive development of new technologies</i></p>	<ul style="list-style-type: none"> <li>• <b>EM Hardware</b> - Custom construction</li> <li>• <b>Vessel responsibilities</b> - Limited/informal</li> <li>• <b>Review software</b> - Under development</li> <li>• <b>EM Acceptance</b> - Unknown</li> <li>• <b>Data review protocols</b> - Under development</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Scale</b> - a few volunteer boats</li> <li>• <b>Data Use</b> - Program design</li> <li>• <b>Management pathway</b> - Initial management objectives defined</li> <li>• <b>Costs</b> - Gathering cost data</li> <li>• <b>Typical timeline</b> - 1-2 years</li> </ul>	<p><b>Pilot Program</b></p> <p><i>Goal: Standardized testing</i></p>	<ul style="list-style-type: none"> <li>• <b>EM Hardware</b> - System Components defined</li> <li>• <b>Vessel Responsibilities</b> - preliminary responsibilities defined</li> <li>• <b>EM Acceptance</b> - initially positive</li> <li>• <b>Review software</b> - Standardized and ready for initial testing</li> <li>• <b>Data review protocols</b> - Preliminarily defined</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Scale</b> - A diverse portion of the fleet</li> <li>• <b>Data Use</b> - Fishery demographics used to enhance program design</li> <li>• <b>Management pathway</b> - Management objectives approved by Council</li> <li>• <b>Costs</b> - initially promising, now independently evaluated</li> <li>• <b>Typical timeline</b> - 1-2 years</li> </ul>	<p><b>Operational Testing</b></p> <p><i>Goal: Independent evaluation under operational conditions</i></p>	<ul style="list-style-type: none"> <li>• <b>EM Hardware</b> - Commercially available</li> <li>• <b>Vessel Responsibilities</b> - Preliminary Vessel Monitoring Plan (VMP) process</li> <li>• <b>EM Acceptance</b> - Mixed</li> <li>• <b>Review software</b> - Independent evaluation under operational conditions</li> <li>• <b>Data review protocols</b> - Defined</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Scale</b> - All EM candidate vessels</li> <li>• <b>Data Use</b> - Gap analysis + limited use for fisheries management</li> <li>• <b>Management pathway</b> - Protocols for using EM data nearing completion</li> <li>• <b>Costs</b> - Start-up costs funded, long term costs-effectiveness deemed sustainable. Refinements to reduce costs being tested.</li> <li>• <b>Typical timeline</b> - 1-2 years</li> </ul>	<p><b>Pre-Implementation</b></p> <p><i>Goal: Building scale/ finalizing program design</i></p>	<ul style="list-style-type: none"> <li>• <b>EM Hardware</b> - cost effective and commercially available</li> <li>• <b>Vessel Responsibilities</b> - Defined in VMP</li> <li>• <b>EM Acceptance</b> - Growing</li> <li>• <b>Review software</b> - Commercially available and cost effective</li> <li>• <b>Data review protocols</b> - Defined</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Scale</b> - All EM candidate vessels</li> <li>• <b>Data Use</b> - Data routinely used to meet management objectives</li> <li>• <b>Management pathway</b> - Operational</li> <li>• <b>Costs</b> - sustainably funded, cost effective and decreasing</li> <li>• <b>Typical timeline</b> - 3-4 years</li> </ul>	<p><b>Mature</b></p> <p><i>Goal: Productive use of EM data</i></p>	<ul style="list-style-type: none"> <li>• <b>EM Hardware</b> - Cost effective and commercially available</li> <li>• <b>Vessel Responsibilities</b> - VMP feedback process operational</li> <li>• <b>EM Acceptance</b> - Mostly positive</li> <li>• <b>Review software</b> - Commercially available and cost effective</li> <li>• <b>Data review protocols</b> - Defined</li> </ul>

For each of the stages in Figure 1 the trawl EM Committee needs to determine:

- how many vessels might be involved;
- how (or if) data will be used by management;
- how to identify costs; and,
- what the timeline may be.

The overall idea is to go through the stages of EM development using a collaborative process between industry, agency, and the Council. This process promotes transparency, trust, and ensures efficient use of research dollars. This all starts at the EM Committee with the determination of monitoring objective(s), which was completed in May. The next step is drafting this cooperative research plan.

## Research Elements

The goals and objectives of trawl EM cooperative research may be achieved through: 1) field trials testing methods to provide data from fisheries which can be used to support compliance monitoring on trawl vessels with a full retention requirement and/or catch accounting; and, 2) analysis of information from these field trials and past EM research where appropriate. This cooperative research will inform evaluation of multiple EM program design options and consider various EM integration approaches to achieve management needs. Research will: assess the functionality of EM for compliance monitoring and catch accounting on trawl catcher vessels, evaluate operational costs for implementation of EM technology on different types of trawl catcher vessels, identify implementation needs (e.g., people, training, infrastructure), and identify what self-reported data is required from trawl vessel operators for data validation, accountability, compliance monitoring, and catch accounting. Information produced on costs, data quality, risks, operational procedures, and vessel compatibility will inform decisions on implementation phases, future investments in technology, and the combination of tools that will best meet NMFS, Council, and stakeholder objectives for EM on trawl vessels.

## Linkage to EM Strategic Plan and Implementation Plan

Trawl EM cooperative research should be responsive both to the Council's Strategic Plan for Electronic Monitoring/Electronic Reporting in the North Pacific (Strategic Plan) and to the Alaska Regional Electronic Technologies Implementation Plan (Implementation Plan).

Where there aren't currently links, the EM Committee should explain why. The EM Committee may choose to recommend that the Council request NMFS update its Strategic Plan. Potential linkages to the 2013 Strategic Plan have been described below.

## EM Strategic Plan

In June 2013, the Council adopted a Strategic Plan for EM. The document provides a vision for integrating electronic technologies into the North Pacific fisheries-dependent data collection program:

**Vision:** A future where electronic monitoring and reporting technologies are integrated into NMFS North Pacific fisheries-dependent data collection program, where applicable, to ensure that scientists, managers, policy makers, and industry are informed with fishery-dependent information that is relevant to policy priorities, of high quality, available when needed, and obtained in a cost-effective manner.

This cooperative research plan 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 D: Provide support to partners in cooperative research, and industry volunteers.
    - Action: Assist in providing technical support and guidance to fishing industry and other constituent research initiatives (e.g., two 2012 NFWF grants, EFPs).

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:

- **FIRST → Goal III, Objective 2:** Implement EM/ER technology where appropriate and cost effective to enhance compliance monitoring.
  - Strategy B: Expand use of EM in compliance applications
    - Action: Evaluate EM for compliance monitoring in shoreside pollock fisheries (see page 16 of the Strategic Plan).
- **SECOND → 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.

Are there other Goals, Objectives, or Strategies in the existing Strategic Plan that align with the trawl EMC? What do you think should be added? For example:

- **Goal IV, Objective 1:** Learn from the experience of others.
  - *Strategy X (not in the Strategic Plan): Work to expand EM program for trawl catcher vessels in the North Pacific Observer Program using lessons learned from the EM Workgroup between 2014 and 2018.*
    - *Action: Meet with fixed gear members of the EM Workgroup to learn how they carried out EM program planning, pre-implementation, and implementation.*
    - *Action: ?*

## Electronic Technologies Implementation Plan

In January 2015, NMFS adopted an Implementation Plan

(<https://alaskafisheries.noaa.gov/sites/default/files/akremerimplementationplan.pdf>). The document:

...provides information about the specific EM/ER initiatives that are currently being undertaken to work toward implementing our [NMFS's] vision where electronic monitoring and reporting technologies are integrated into NMFS North Pacific fisheries-dependent data collection program where applicable.

NMFS will update its Electronic Technology Implementation Plan at the direction of NMFS HQ in 2019. An interim update to the Implementation Plan was completed in 2018 to reflect the new Council priority to focus EM development on trawl catcher vessels <Updated information will be presented by NMFS AKR at the meeting>.

The Implementation Plan includes a list of Alaska fisheries suitable for implementation of EM and ER. The list includes five trawl catcher vessel fisheries <add fishery characteristics as appropriate (discard rules, MRAs, PSC limits, etc.)>:

- BSAI pollock trawl CV (AFA) catch share fishery
- CGOA rockfish trawl CV catch share fishery
- BSAI Pacific cod trawl CV non-catch share fishery
- GOA pollock trawl CV non-catch share fishery
- GOA non-pollock trawl CV non-catch share fishery

## Integration

**A key focus of the trawl EM cooperative research approach is to identify and resolve implementation issues associated with integrating EM on trawl catcher vessels into the Observer Program.** Implementation issues will be evaluated in a Council analysis. A resulting analysis is expected to lead to a regulatory amendment to allow the use of EM as a compliance and catch accounting tool on trawl catcher vessels in both the full and partial coverage categories of the Observer Program. The analysis may consider whether a regulatory amendment might specify technical requirements for EM, whether the Council and NMFS may use the Annual Deployment Plan process to deploy EM and/or observers to the trawl vessels in the BS and GOA, etc.

The Council and NMFS would not be able to use the observer fee, currently collected from vessels participating in the partial coverage category of the observer program, to support deployment of EM on trawl vessels until the regulations are changed. EM development is expected to be an ongoing process, with a sustained Council 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. **The EM Committee needs to develop and approve a timeline for fieldwork and pre-implementation of EM.**

Year	Fieldwork / Pre-implementation Timeline
2018	
2019	
2020	
2021	

### Example preliminary timeline of Council decision points:

- **April 2018** – Council reconstitutes EMC to reflect a new focus on developing EM for trawl catcher vessels
- **December 2018** – Review and approve the 2019/2020 Cooperative Research Plan to develop EM for use on trawl catcher vessels.
- **2019** – ?
- **2020** – ?

## Overview of cooperative and parallel research projects

The various research projects that have been initiated by the EMC and by others to inform Council decision points for ultimately moving toward implementation of EM on trawl catcher vessels are summarized below. **<The EM Committee needs to discuss how to ensure that research projects and EM development stages build on one another across all trawl catcher vessels in the North Pacific.**

**What is each project doing?**

**What are the goals of each project?**

**How do the ongoing projects fit together?**

**KEY QUESTION: How will the EM Committee make sure that different project and developments do not work in opposition or contradiction with one another?>**

Project proposals initiated by the EMC (with funding sought from NFWF) in 2018 include:

**<To be discussed at the EM Committee meeting August 23-24>**

**There are several other EM projects underway in Alaska and on the west coast, which are not strictly part of this cooperative research plan, but whose results may influence the Council's eventual EM implementation discussion. A summary of these projects is provided below:**

### **Project Title: West Coast Whiting**

Organization: Midwater Trawlers Cooperative

Award Amount: N/A

Matching Contribution: N/A

Grant Period: N/A

**Project Abstract:** Under an Exempted Fishing Permit sponsored by Midwater Trawlers Cooperative and United Catcher Boats, the majority of the West Coast whiting fleet has been utilizing electronic monitoring systems in lieu of observers since 2015. In 2011 National Marine Fisheries Service (NMFS) implemented a catch share program for the West Coast Trawl Groundfish fishery. Observer coverage averaged about \$500/day per vessel. In 2015 and 2016 the EM EFP participants fished approximately 3,525 days and saved approximately \$1.45 million dollars using the EM systems versus what they would have spent using observers.

Under the current program EM participants are required to complete detailed logbooks and the logbook is the primary catch reporting device for the program. The EM system is then used to audit the logbook and ensure proper recording of all discards. Video is generally reviewed within two business days for whiting trips. The video is 100% reviewed to check for compliance with EFP rules and to collect discard weights and piece counts for comparison to logbooks.

There are still some issues to be ironed out with respect to operational discard definitions, 3rd party review, video storage, and who should have access to the video. The industry has been able to work cooperatively with NMFS, NMFS OLE, PSMFC, the EM provider and each other to develop and refine the program over time

**Project Title: Bering Sea Pollock Shoreside Catcher Vessels Voluntary EM Pilot Project**

Organization: United Catcher Boats and Mid-Water Trawlers Cooperative

Award Amount: N/A

Matching Contribution: N/A

Period: Bering Sea Pollock B Season 2018

**Project Abstract:**

This voluntary project is being conducted to help inform whether utilizing EM camera systems proves operationally effective for the Bering Sea pollock catcher vessel (CV) fleet for 100% compliance monitoring of catch and discards per Council and NMFS requirements. It is anticipated that the voluntary video data being collected by the vessels participating in this pilot project will help lay a foundation and inform future discussions and direction on EM development for trawl CVs. Ultimately, BS pollock CVs are hopeful that the use of camera systems (in lieu of human observers) and EM data will serve compliance monitoring purposes required for individual accountability of catch and bycatch by accurately capturing discard events (i.e., whether a discard has occurred), the amount of discard (i.e., estimated volume in weight), and any rare events (e.g., large animals, gear failure) that may occur.

Fishing operations (area fished, effort, gear used) are not expected to change under this pilot project; current fishing strategies and practices are expected to continue. Vessels fishing in the Bering Sea pollock fishery will have 100% observer coverage, per regulation, while simultaneously operating the EM systems currently aboard their vessels.

On-board Camera Operations: Under this pilot project, vessels will employ their EM systems for the entirety of all trips taken during the 2018 Bering Sea pollock B season<sup>1</sup>. The vessel captain will be responsible for keeping the electronic monitoring system continuously powered during the entirety of those trips selected to be recorded; for regularly cleaning the camera to ensure sharp image resolution; for conducting periodic inspections of the system components and conducting regular system checks to ensure the EM system is performing properly; for ensuring that camera view areas are adequately lit during night operations; for immediately recording if the EM system stops performing; and for maintaining contact with the video review service provider for data retrieval. For those trips which are recorded, a participating vessel's captain will record the date, set time, depth, time of net retrieval, latitude and longitude, an estimated amount of catch, and an estimated amount of discards in the vessel logbook as is currently required. In addition, the vessel logbook shall contain sections for the captain to record any EM system concerns or malfunctions. For a recorded trip, the EM camera system will be powered on at the dock before leaving with the cameras triggered by hydraulic pressure sensor once a set is initiated. The cameras are to remain on when the vessel returns to port throughout the entirety of the offload.

Post-trip Transmission and Video Review: Upon completion of a recorded trip by a participating CV, normal logbook information transmissions to NMFS (via the existing shoreside catch monitor) will be conducted. In addition, EM video data, along with copies of both the vessel and observer logbooks, will be transmitted to the Pacific States Marine Fisheries Commission (PSMFC) for review via similar methods utilized during the Pacific Whiting fishery. PSMFC will review 100% of the EM video data taken. Video from the camera systems will be used to validate the vessel and observer logbook reporting of all discard events that may have occurred.

**List of Participating Vessels:**

- F/V Bering Rose
- F/V Leslie Lee
- F/V Nordic Star
- F/V Sea Dawn

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<sup>1</sup> The F/V Bering Rose is the single vessel participating in the pilot program that will have had their EM camera system operating during the 2018 Bering Sea pollock A season. This vessel will also have their video data reviewed separately.

**Project Title: Improving Chinook Salmon Bycatch Estimates for the Gulf of Alaska Trawl Fleet:  
Alternatives addressing accuracy, cost, and timeliness**

Organizations: FishNext Research (Craig Rose); Alaska Groundfish Data Bank; AFSC FMA Division; NMFS  
Alaska Region-Sustainable Fisheries; Alaska Pacific University

Award Amount: (S-K) \$183,382

In-Kind Contribution: \$49,603

Grant Period: 2018-2019

**Project Abstract:** Compare four methods for sampling salmon bycatch at the Kodiak plants receiving rockfish deliveries. 1) at-sea sampling (status quo) 2) observer sampling of entire deliveries, 3) observer sampling of large portions of deliveries, and 4) plant accounting (fish tickets) with performance audited with electronic monitoring (EM) at the plants.

**Project Update (Aug 2018):** Fieldwork for year one started May 7 and ended June 12. Briefly, of the 80 rockfish deliveries (over 16M lbs) to the four participating plants (Star of Kodiak, ISA, APS, and Ocean Beauty), 51 were 100% monitored for salmon by the project's samplers at the sorting belt (~64%): 16 at Star of Kodiak, 13 at APS and 11 each at OB and ISA. There is complete or partial video from all 80 deliveries. The video reviewers at APU are reviewing the video to detect salmon. There were 167 Chinook salmon and 126 non-Chinook salmon (all chum except for one pink salmon) landed in the 80 deliveries. An additional 95 "marked" Kings were introduced into the 51 sampled offloads (1, 2 or 3 kings per sampled delivery) for a total of 388 salmon for the video reviewers to find.

Lessons learned from this year (2018):

- Sampling large portions of the deliveries was deemed not feasible at any of the plants due to operational set-ups and the time costs. Instead, hopper weights and time intervals between hopper dumps were collected to simulate "partial" sampling.
- Missing or poor video: need to determine cause and how to avoid next year.
- Video collection from Network Video Recorders (NVR's): need to simplify the process – too labor intensive.
- Although nearly all the salmon were detected by samplers, the exceptions need to be examined.
- "Marked" salmon were essential to the project especially in a year of very low salmon bycatch.

The project will continue in 2019 (start May 1) and will include all the plants, including Global if they are participating in the RP and Pacific Seafood. Also, Craig Rose will be in Kodiak this fall to introduce salmon into some pollock deliveries to further test the EM systems installed at Trident and APS.

**Project Title: F/V Bering Rose**

Organization:

Award Amount:

Matching Contribution:

Grant Period:

**Project Abstract:**

**Project Title: F/V Karen Evich**

Organization: Saltwater

Award Amount:

Matching Contribution:

Grant Period:

**Project Abstract:**

**Project Title: The chute camera: Developing an automated tool to measure halibut bycatch onboard trawlers**

Organization: AFSC; UW; FishNext Research; Alaska Groundfish Data Bank

Award Amount:

Matching Contribution:

Grant Period:

**Project Abstract:**