

# Electronic Monitoring for Compliance on Pelagic Trawl Vessels: Cooperative Research Plan Outline

November 15, 2018<sup>1</sup>

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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 North Pacific Observer Program (Observer Program). The Council’s EM Committee 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. In February 2018, the Council changed priorities for the EM Committee from a focus on fixed gear vessels to a focus on developing EM as a tool for meeting monitoring objectives on trawl catcher vessels in the Bering Sea (BS) and Gulf of Alaska (GOA) pelagic pollock fisheries. The EM Committee was reconstituted in April of 2018 and now includes industry representatives and participants that are stakeholders in the catcher vessel pelagic trawl pollock fisheries along with agency and EM service providers. In June of 2018, the Council adopted three monitoring objectives proposed by the trawl EM Committee after its May 2018 meeting: 1) improve salmon accounting; 2) reduce monitoring costs; and 3) improve the quality of monitoring data. A fourth objective was added by the trawl EM Committee at their meeting in August of 2018: 4) modify current retention and/or discard requirements as necessary to achieve Objectives 1-3. In June of 2018, the Council directed its trawl EM Committee to develop a cooperative research plan for 2019 and to initially focus on using EM for compliance purposes. Therefore, this cooperative research plan is focused on developing an EM program for compliance purposes on pelagic pollock trawl catcher vessels and tenders both delivering to shoreside processors with a defined retention requirement.

This document describes research plans targeted for 2019 and 2020 as well as pilot studies conducted in 2018. All research projects are aimed at collecting information to inform the development of a pre-implementation plan as well as the development of alternatives for operationalizing EM as a monitoring tool for pelagic pollock trawl catcher vessels under the Observer Program.

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<sup>1</sup> Prepared by: Julie Bonney, Ruth Christiansen, Elizabeth Figus (NPFMC), Jared Fuller, Heather Mann, and Jennifer Watson (NMFS)

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## 2 Background

In June 2013, the Council adopted a Strategic Plan for EM prepared by the agency. 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.*

Adoption of the strategic plan was followed by an implementation plan and the creation of the trawl EM Committee in 2014 (called the EM “Workgroup” at the time). EM development for pelagic trawl catcher vessels will not necessarily be identical to that of fixed gear, but key aspects may remain, including: creating the workgroup, creating this cooperative research plan, testing EM through pre-implementation and developing regulations. The process of EM development for fixed gear started with proof of concept → a pilot program → operational testing → pre-implementation → a mature program (Figure 1). This process will likely be similar for pelagic trawl catcher vessels but will also include lessons learned from both the fixed gear EMWG and the West Coast Pacific whiting fishery.

The trawl EM Committee expects EM to move more quickly for trawl vessels targeting mid-water pollock than it did for fixed gear vessels in the North Pacific. Rapid progress is expected because much is already known about the EM technology and a similar style trawl fishery in an adjacent region (West Coast Pacific whiting) is already using EM for compliance monitoring.

**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 (see Appendix A);
- how (or if) data will be used by management;
- identify costs; and,
- regulatory changes needed to implement EM for compliance monitoring.

A collaborative process between industry, agency, and the Council through all the stages of EM development promotes transparency, trust, and ensures efficient use of research dollars. The trawl EM Committee has determined its monitoring objective(s) described in the next section as a first step.

### **3 Links to the EM Implementation Plan**

This trawl EM cooperative research plan is intended to be responsive to the Alaska Region Electronic Technologies Implementation Plan ([2015 Implementation Plan](#)) and the Amendment to the Alaska Region Electronic Technologies Implementation Plan ([2018 Amended Plan](#)).

In January 2015, NMFS adopted an Implementation Plan. 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.*

In September 2018 NMFS amended the Implementation Plan to reflect the new Council priority to focus EM development on trawl catcher vessels.

The Amended Plan includes two projects that NMFS has identified as a priority for implementation that are also the focus of this cooperative research plan, including:

- full retention of salmon on CVs using EM for compliance monitoring; and,
- evaluation of alternative sampling methods for salmon.

## 4 Research Elements

At their meeting in August of 2018, the trawl EM Committee agreed the cooperative research plan should develop a set of common principles for Pollock trawl EM, with the expectation that EM be expanded to other fisheries in the future. There are differing cost incentives across areas, but a common goal could be one regulatory package with nuances for each area but strong overlap and commonality in hardware and software requirements.

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 might lead to a regulatory amendment to allow the use of EM as a compliance tool on trawl catcher vessels in both the full and partial coverage categories of the Observer Program.

Key aspects of this cooperative research plan are to address the methods for obtaining information necessary for quality accounting for catch including bycatch and salmon PSC in a cost-effective manner, ensuring EM systems provide reliable data for compliance monitoring of a no discard requirement for salmon PSC, and exploring modifications that may be needed to the current retention and discard requirements.

### 4.1 Trawl EM goal and objectives

The goal of this cooperative research plan is to assess the efficacy of EM for monitoring compliance with a full salmon PSC retention requirement aboard pelagic trawl catcher vessels in the Bering Sea (BS) and Gulf of Alaska (GOA) and identify key decisions related to operationalizing EM for compliance monitoring in a strategic manner.

*To reach this goal, the trawl EM Committee identified the following objectives:*

Objective 1: Improve salmon accounting - to provide stable salmon accounting against the PSC hard cap for WGOA and CGOA pelagic pollock trawl catcher vessels as well as the PSC performance standard for BS pelagic pollock catcher vessels

Objective 2: Reduce monitoring costs

- a) 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: decrease costs for full salmon accounting

Objective 3: Improve overall monitoring data for catch accounting and compliance

- a) Explore innovative methods to account for TAC limited PSC species and bycatch species that have small TACs (MRA and PSC status) that could limit participation in a program that requires high retention of catch
- b) Explore innovative methods to account for protected species
- c) Achieve more comprehensive coverage

Objective 4: Examine current retention and discard requirements as necessary to achieve Objectives 1-3.

## 4.2 Research questions to be answered through the Cooperative Research Plan

At their meeting in August of 2018, the trawl EM Committee agreed on some key issues for initial investigation:

- determine appropriate method for recording compliance information (e.g., should the cameras be turned on 100% of the time for compliance? Will the fleet support that?);
- estimate variable costs for EM dependent on the percent of time the systems get used or reviewed;
- clarify what is meant by full/maximized/optimized retention;
- clarify agency interests in estimating salmon bycatch at area/time level versus fleet interest in understanding of individual and group accountability for salmon bycatch that is offloaded to tenders. In the Western Gulf is there value in the fleet knowing where hot tows of salmon originate?

Additional questions include:

1. Will EM systems function reliably on pollock trawl catcher vessels in the GOA and BS?
2. What level of participation is expected from the fleet (all vessels, most, some and few?)
3. What type and amounts of bycatch and PSC are encountered that must be discarded?
4. With an EM-for-compliance approach, will it be necessary to replace any information collected at-sea for catch accounting? If so, how will that be accomplished?
  - a. Logbook audit model
  - b. EM review for catch accounting
  - c. Some level of observer coverage and rate applied to EM vessels?
5. What type(s) of spatial information may be lost to the Observer Program with EM for compliance only? What may be necessary to replace the information collected at-sea for spatial biological information, marine mammal and seabird interaction? What type of resolution will be expected?
  - a. Some level of observer coverage
  - b. Vessel crew collects information
6. How will salmon accounting shoreside occur?
  - a. Increase observer coverage
  - b. EM in processors with audit of fish tickets and EM (compliance role)
7. What is the purpose of EM review for compliance only versus management purposes (i.e., catch accounting)?
  - a. What are the time lags for EM review?
  - b. What is the acceptable amount of time lag for compliance / management purposes?
8. What are the vessel costs associated with using EM versus carrying human observers (both full coverage and partial coverage)?
9. If some level of human coverage continues in the fishery for data needs, how does this impact vessel's efficiencies?
10. Other questions TBD

### **4.3 Methods**

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 defined maximized/optimized retention requirement; 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 on trawl catcher vessels, evaluate operational costs for implementation of EM technology on different types of trawl catcher vessels operating under different management regimes, identify implementation needs (e.g., people, training, infrastructure), and identify what self-reported data is required from trawl vessel operators for data validation, accountability, and compliance monitoring. 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.

## 5 Cooperative Research Case Studies

### 5.1 Phase I: Initial Testing

#### 5.1.1 Current NFWF Proposal: Bering Sea Pollock Shoreside Catcher Vessels Voluntary EM Pilot Project

*Organization:* United Catcher Boats and Mid-Water Trawlers Cooperative

*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>2</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.

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<sup>2</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.

List of Participating Vessels:

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

Project Outcomes: TBD

## **5.2 Phase II: Larger Scale Test under existing requirements**

### **5.2.1 Current NFWF grant proposal for WGOA and how it will answer the research questions**

Project Title: Current NFWF Proposal: Implementing EM in the Western Gulf of Alaska Trawl Catcher Boat Fleet and Associated Tenders (submitted by the Aleutians East Borough on behalf of the Peninsula Fishermen’s Coalition and catcher and tender vessel operators of the Western Gulf of Alaska)

Project Abstract: Accurate discard data is essential for fishery managers to administer catch limits, including a “hard cap” for salmon in the Western Gulf of Alaska (WGOA). Trawlers that fish in the WGOA are some of the smallest in Alaska, fishing with small crews in remote areas. Under the current monitoring plan, under 60’ pollock trawlers are monitored by observers on selected trips (approximately 20% of trips), and counts of salmon bycatch are extrapolated from observer basket samples. Industry, NMFS, and the NPFMC are interested in improved monitoring of this fishery due to concerns over salmon accounting, observer safety, and the cost of onboard observers.

In June 2018 the NPFMC identified EM for compliance monitoring in the WGOA pollock fishery as one of their top five priorities. This project will place EM systems on catcher boats and associated tenders so that unsorted catch can be tracked from the net to the shoreside plant where full counts of discards and biological samples will be taken. Catch handling protocols will be defined with NMFS to ensure quality data capture. Data will be collected on 100% of the trips, and system performance will be tracked. Findings from this initial trial will be shared with all stakeholders and will support further development of EM implementation in Gulf of Alaska fisheries.

Project Activities:

1. Engage stakeholders in developing an implementation plan for testing EM in the WGOA fishery. Conduct outreach and coordinate volunteers (catcher vessels and tender vessels) so that unsorted catch can be monitored from the CV to the plant. Coordinate with NMFS on conducting census counts of salmon bycatch in the plant.
2. Install EM systems and develop Vessel Monitoring Plans to monitor compliance with retention regulations for participating catcher boats and tenders. Work with industry and NMFS to define approved catch handling procedures. Track EM system performance and data quality and provide both remote and in-port servicing of the EM systems as needed throughout the project.
3. In collaboration with NMFS develop protocols for EM data review and transmission. Review EM data and provide feedback reports to NMFS and individual vessels after each trip. Refine protocols for integrating EM data into the NMFS database.
4. Develop and test tools to increase the efficiency of data management including tools to reduce the cost of EM data review, provide satellite reporting, and ensure the verity of EM data. Track costs

and provide information to assist in determining how EM can most effectively be deployed in this fishery.

5. Provide regular updates to the trawl EM Committee, the Council, and industry members on project performance.

Expected Project Outcomes:

1. An EM deployment plan and compliance monitoring protocols are developed and tested for WGOA catcher vessels and tenders in 2019.
2. At least 10 catcher vessels and two tenders volunteer to test EM systems during the 2019 fishing year. CV volunteers are matched with tender volunteers as appropriate so that catch can be monitored from the boat to the plant. Vessel monitoring plans are completed and approved for all vessels. Protocols for catch handling are developed, EM system performance is good, and compliance monitoring of retention regulations proves to be reliable.
3. Protocols for EM data review are developed, and review is completed in a timely manner. Open source software is used to review data, and templates specific to the pollock fishery are developed. Timely data review and feedback memos enhance industry “buy-in” and NMFS understanding of the data. Protocols for data transmission ensure a secure chain of custody and allow for integration of EM data into NMFS’ database.
4. A cost-effective model for data management includes local data review and integrating observers into the EM program broadens the infrastructure for long term EM implementation in Alaska. Tools to reduce review time are developed and tested. Costs to implement EM are tracked and reported to assist in development of cost-effective deployment of EM in the WGOA.
5. Project results are communicated to industry members, the trawl EM Committee, and the Council and support further development of EM in Alaska.

**5.2.2 Current NFWF grant proposal for BS/GOA and how it will answer the research questions**

Project Title: Implementing Electronic Monitoring for Pollock Trawl Catcher Vessels in the Bering Sea and Gulf of Alaska (submitted by United Catcher Boats, Alaska Groundfish Data Bank, and Alaska Whitefish Trawlers Association)

Project Abstract: Electronic monitoring systems will be deployed on 31 catcher vessel participants in the Bering Sea and Gulf of Alaska pelagic pollock trawl fisheries for compliance monitoring and will include 13 existing and 18 new EM systems. Deploying and testing these systems is an essential first step towards implementing EM to improve data quality, timeliness, and cost-efficiency for salmon PSC accounting and detecting and quantifying any discards in these maximized retention fisheries. EM will be used to monitor compliance with retention regulations in the pelagic pollock trawl fisheries delivering shoreside. Federal regulations require that all salmon caught incidentally in directed pollock fisheries be retained and that any discards be recorded in logbooks. Accurate mortality data of salmon for PSC accounting and pollock for BS and GOA stock assessments are vital for conservation and management. Currently, fisheries data are collected by human observers (on vessels and in processing plants) - this project will assess EM quality data, timeliness, and costs as compared to data collected by human observers and those associated costs.

*Project Activities:* Electronic monitoring data obtained under a compliance monitoring approach do not feed into catch accounting management systems. Instead, EM utilized under this approach is typically used to support data collection through other methods, including industry self-reported data combined with the use of EM to verify compliance with record keeping and reporting requirements. To this end, participating vessels will have camera systems and a third-party contractor will review video footage after landing to validate compliance with discard requirements. This will be used in conjunction with a comprehensive dockside-monitoring component to generate salmon PSC estimates during offload.

1. Engage Stakeholders in developing and testing EM on 31 pelagic pollock catcher vessels and sustain stakeholder engagement with the trawl EM Committee and Observer Program throughout the process while working towards trawl EM implementation.
2. Install 18 EM systems on pelagic trawl catcher vessels (6 BS only vessels; 6 GOA only vessels; 6 BS-GOA crossover vessels) and develop 31 Vessel Monitoring Plans.
3. Review data collected through EM systems, monitor and evaluate project performance, and assess cost efficiency of EM systems.
4. Actively communicate EM results to stakeholders and the North Pacific Fishery Management Council.

*Expected Project Outcomes:*

1. A total of 18 vessels will be equipped with fully integrated EM Systems including video cameras, associated sensors, and vessel logbooks suitable for compliance monitoring.
2. A total of 31 participating vessels will have individual Vessel Monitoring Plans.
3. Proper functionality of the EM systems throughout the project will be ensured through continual monitoring and timely communication between vessel operators, the project team, and the EM provider.
4. The costs to employ EM systems on different size pelagic pollock trawl vessels, operating in different areas and under different fishery management plans, will be documented and better understood. This information will help stakeholders and the Council better understand how EM can most effectively be employed in the pelagic pollock fisheries.
5. EM compliance throughout the project will be monitored and ensured. This will include specific focus on the 300,000 pound trip limit in the Gulf of Alaska and the way in which the regulatory trip limit affects the efficacy of EM.
6. Stakeholders, including industry members, NMFS, and the Council, will be informed via regular updates about project performance, outcomes, and next steps.

### **5.3 Phase III: Larger Scale Test under existing requirements**

1. Identify levels of observer coverage (between 0 and < 100)
2. What retention requirements might need to change? Maybe just identify that this is some of what gets answered under Phase II
3. Innovative Salmon Accounting methods?
4. Other ideas?

## 6 Timeline and Milestones

Year	Fieldwork / Pre-implementation Timeline
<b>2018</b>	Collect EM footage on a handful of trawl CVs during pollock fishing.
<b>2019</b>	Install & operationalize EM on a large variety of trawl pollock CVs in both the GOA and BS.
<b>2020</b>	Develop an Exempted Fishing Permit to exempt vessels from certain regulations (i.e. observer coverage, discard requirements)
<b>2021</b>	

**Appendix A. Discard White Paper**

TBD

**Appendix B. Data Streams Paper**

TBD

## Appendix C. Vessel list annotated by vessels that have different methods for storing catch

This is a work in progress [It will be helpful to know the difference between the different colored highlights and the stars. In other words, what are the differing types of CV operation categories that we can specifically identify?]

Vessel Name	Whiting	Pelagic Pollock Gulf	Pelagic Pollock BSAI
Adamant		Yes	
Advancer		Yes	
Alaska Dawn		Yes	
Alaska Rose			Yes
Alaskan		Yes	
Alaskan Defender*			Yes
Alaskan Lady		Yes	
Aldebaran			Yes
Alsea			Yes
Alyeska			Yes
American Beauty			Yes
American Eagle			Yes
Anita J			Yes
Anthem		Yes	
Arctic Explorer*			Yes
Arctic Fury	Yes		Yes
Arctic Ram		Yes	Yes
Arctic Wind		Yes	Yes
Arcturus			Yes
Argosy			Yes
Auriga*			Yes
Aurora*			Yes
Bay Islander	Yes	Yes	
Bering Defender*			Yes
Bering Rose			Yes
Bristol Explorer*			Yes
Cape Kiwanda		Yes	Yes
Cape Reliant		Yes	
Cape St. Elias		Yes	
Caravelle		Yes	
Caitlin Ann			Yes
Celtic		Yes	
Chellissa	Yes	Yes	
Chelsea K*			Yes
Collier Brothers	Yes	Yes	Yes

Columbia		Yes	Yes
Commodore			Yes
Courtney Noral		Yes	
Dawn		Yes	
Decision		Yes	
Defender *			Yes
Defender 2 *			Yes
Destination*			Yes
Dominator			Yes
Elizabeth F		Yes	Yes
Enterprise		Yes	
Equinox		Yes	
Evie Grace		Yes	
Excalibur	Yes		
Excalibur II		Yes	Yes
Fierce Allegiance *			Yes
Gladiator			Yes
Gold Rush		Yes	Yes
Golden Dawn			Yes
Golden Pisces			Yes
Great Pacific *			Yes
Grumpy J	Yes		
Half Moon Bay		Yes	Yes
Heather Margene		Yes	
Hickory Wind		Yes	Yes
Icy Mist		Yes	
Jamie Marie	Yes		
Just in case		Yes	
Karen Evich		Yes	
Lady Joanne		Yes	
Lady Lee Dawn		Yes	
Laura		Yes	
Leslie Lee	Yes	Yes	Yes
Lisa Melinda	Yes	Yes	Yes
Majesty		Yes	Yes
Mar Del Norte		Yes	
Mar Pacifico		Yes	
Marathon	Yes	Yes	
Marauder		Yes	
Margaret Lyn			Yes
Marcy J		Yes	Yes

Mark 1	Yes		Yes
Messiah			Yes
Michelle Renee		Yes	
Miss Berdie	Yes		Yes
Miss Courtney Kim		Yes	
Miss Leona		Yes	
Miss Sarah		Yes	Yes
Miss Sue	Yes		
Morning Star 2 *			Yes
Muir Milach	Yes		Yes
New Life		Yes	
Nichole		Yes	
Nordic Fury			Yes
Nordic Star	Yes		Yes
Northern Defender			Yes
Northern Patriot			Yes
Northern Ram	Yes	Yes	Yes
Northwest Explorer *			Yes
Ocean Explorer *			Yes
Ocean Hope 3		Yes	Yes
Ocean Hunter	Yes		Yes
Ocean Leader			Yes
Ocean Storm		Yes	
Oceanic			Yes
Pacific Challenger	Yes	Yes	Yes
Pacific Explorer *			Yes
Pacific Fury			Yes
Pacific Future	Yes		
Pacific Prince *			Yes
Pacific Ram	Yes	Yes	Yes
Pacific Star		Yes	
Pacific Storm		Yes	
Pacific Viking			Yes
Patricia L			Yes
Pegasus	Yes		
Perseverance	Yes		
Predator	Yes		
Primus		Yes	
Progress			Yes
Providian			Yes
Raven	Yes		Yes

Rosella		Yes	
Royal American			Yes
Royal Atlantic			Yes
Sea Clipper	Yes		
Sea Mac		Yes	
Sea Storm	Yes	Yes	
Sea Wolf			Yes
Seadawn	Yes		Yes
Seeker	Yes		Yes
Shawna Rae		Yes	
Sovereignty			Yes
Starfish			Yes
Starlite			Yes
Starward			Yes
Stella		Yes	
Storm Petrel			Yes
Sunset Bay		Yes	Yes
Temptation		Yes	
Tern		Yes	
Topaz		Yes	Yes
Traveler	Yes		Yes
Vanguard		Yes	Yes
Viking			Yes
Viking Explorer		Yes	Yes
Walter N		Yes	Yes
Western Dawn	Yes		Yes
Westward 1			Yes