

Preliminary Analysis: Integrating Electronic Monitoring on Pollock Catcher Vessels using Pelagic Trawl Gear and Tender Vessels in the North Pacific Observer Program

February 2022¹

1	<i>Introduction / Background</i>	2
2	<i>Trawl EM Program Design</i>	6
	2.1 EM Program Goals and Objectives	7
	2.2 Implementation Approach	8
	2.2.1 Participation in the Trawl EM program	9
	2.3 EM System	10
	2.3.1 EM Coverage Requirements	11
	2.3.2 Vessel Monitoring Plan	11
	2.3.3 EM Function Test	12
	2.3.4 EM Equipment Malfunctions	12
	2.3.5 Maximized retention	13
	2.3.6 Catch Handling Procedures	14
	2.3.7 Logbooks	14
	2.3.8 Communications and Notifications of Deliveries for Shoreside Sampling	15
	2.4 Shoreside Processing Plant Elements	15
	2.4.1 Catch Monitoring Control Plan (CMCP)	15
	<i>Observer Equipment and Sampling Stations</i>	16
	2.5 MRAs and Trip Limits	16
	2.6 Observer Data Collection	17
	2.6.1 Coverage Requirements	17
	2.6.2 Data collection priorities	18
	2.6.3 Data Collection methods	18
3	<i>Video Review</i>	21
	3.1 Video Review Protocols	21
	3.2 Vessel Feedback Report	21
	3.3 Data Quality/Validation Considerations	24
4	<i>Catch, Bycatch, and Effort Information</i>	24
	4.1 Integrating Catch and Bycatch Data into Catch Accounting System	24
	4.2 Timeliness of EM Data	27
	4.3 Incorporating information into Stock Assessments	27
	4.3.1 Haul-Level Effort and Fishing Location Information	28
	4.3.2 Length Composition and Specimen Data	28
5	<i>Protected Species</i>	29
	5.1 Marine Mammals	29
	5.1.1 Comparison of Alternatives	32
	5.2 Seabirds	33
	5.2.1 Comparison of Alternatives	35
6	<i>Next Steps</i>	36
7	<i>References</i>	36

¹ **Prepared by:** Anna Henry (NPFMC Staff), Maggie Chan (NMFS), Josh Keaton (NMFS), Megan Mackey (NMFS), Jennifer Mondragon (NMFS), and Melanie Rickett (NMFS); **Contributing:** Steve Barbeaux (AFSC), Kelly Cates (NMFS), Anne Marie Eich (NMFS), Jennifer Ferdinand (FMA), Mary Furuness (NMFS), Wes Larson (AFSC), Bridget Mansfield (NMFS), Tom Meyer (NOAA GC), Alex Perry (NOAA OLE), and Cindy Tribuzio (AFSC)

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1 Introduction / Background

This document was developed to provide the SSC an opportunity for *preliminary review* of specific design elements of the trawl EM program prior to the development of a full *initial review* analysis, which is currently scheduled for review at the June 2022 Council meeting. This preliminary review was scheduled to introduce the program design and objectives, focusing on how data are collected and used in the Trawl EM program, because they are fundamentally different from existing observer or EM programs in the North Pacific. Specifically, this document covers the following topics: 1) General program design, 2) How data are collected and what data quality checks are used to verify self-reported information, and 3) How data are used and how this impacts existing processes for catch accounting, stock assessment, and protected species.

This document is not an early draft of a full initial review analysis. This document is formatted more like a discussion paper and less like a full analytical document. Many sections that will be included in the full initial review are not included in this document. There is no economic impact analysis, or cost estimation included in this document. A full environmental assessment and regulatory impact review will be included in the June initial review. This is not an analysis to inform managers on decision making. Decisions regarding specific, unresolved program design elements will occur at later review stages. There is no specific action or decision making associated with this preliminary review. The purpose is to provide early communication and seek feedback from the SSC regarding concerns about data types, quality, availability and priorities.

Electronic monitoring (EM) on pelagic trawl pollock catcher vessels (CVs) and tenders both delivering to processing plants has been in development since 2018. After the implementation of the regulated fixed gear EM program, 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 Committee was reconstituted as the Trawl EM Committee and included industry representatives and participants that are stakeholders in the pelagic trawl pollock catcher vessel fisheries along with agency staff and EM service providers. The pollock trawl fisheries were selected by the Council due to their high volume and low discards with fewer impacts to prohibited species catch (PSC). In June of 2018, the Council adopted three Trawl EM 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 and approved by the Council: 4) modify current retention and/or discard requirements as necessary to achieve objectives 1-3.

The Trawl EM EFP program design and objectives are different from those of the existing fixed gear EM program. The fixed gear program was designed to use EM for *catch accounting* of retained and discarded catch. Fixed gear EM video review provides a census of all species caught and discarded on EM-reviewed hauls, or during EM-reviewed samples of hauls, to be used for NMFS' catch accounting and fishery management. The Trawl EM program is designed to use EM for *compliance monitoring* to ensure that catch can be sampled by observers based at processing plants. Here, compliance monitoring means the EM video would be used to verify that maximized retention requirements were followed but the EM video does not provide data for catch accounting. The data on both retained and discarded groundfish used for management would be provided by landings reports. At-sea discards are reported via logbook pages. The Trawl EM program also implements a shoreside monitoring component in the processing facilities to collect biological data, species composition information, and offload data on PSC.

Brief History of this Action

The development of the Trawl EM program has involved multiple phases as part of a cooperative research plan developed by the Trawl EM Committee as outlined in the timeline below (Table 1-1). Each phase of

the program has benefitted from a collaborative process and open communication between principal investigators (PIs), other project partners, and agency representatives.

Table 1-1 Timeline of Field work/Pre-implementation of Trawl EM program

2018	<p>Pilot Project Phase I: Initial Testing Test if utilizing EM camera systems proves operationally effective for the BS pelagic trawl pollock CV fleet for 100% compliance monitoring of catch and discards per Council and NMFS requirements.</p> <ul style="list-style-type: none"> • Collected EM footage on four volunteer pelagic trawl CVs in BS during pollock fishing while maintaining observer coverage. • Video from the camera systems was reviewed to validate the CV logbook and observer reports of all discard events that may have occurred.
2019	<p>Pilot Project Phase II: Larger Scale Test under existing requirements Two projects funded by National Fish and Wildlife Fund (NFWF), to expand EM testing to more CVs in the BS/GOA and include CVs and tenders in the Western GOA (WGOA) and Central GOA (CGOA).</p> <ul style="list-style-type: none"> • BS and CGOA-EM systems on 28 CVs to assess EM data quality, timeliness, and costs as compared to data collected by observers and those associated costs. • WGOA- EM systems on 14 CVs and two tenders to track unsorted catch from the net to the shoreside plant where species composition sampling and biological samples were taken.
2020-current	<p>Exempted Fishing Permit (EFP) EFP issued to evaluate the efficacy of EM systems and shoreside observers for pollock CVs using pelagic trawl gear in the BS and GOA.</p> <ul style="list-style-type: none"> • EFP exempts 79 CVs from regulations that currently prevent full or maximized retention of all catch, and observer coverage requirements. • Project combines EM systems that provide at-sea monitoring of CVs for compliance with fishery management objectives to achieve maximized retention, electronic reporting of catch and discard information, and shoreside observers to monitor salmon bycatch and collect catch composition and biological information at the trip level.
2021	<p>Council initiates an analysis to implement EM on pollock CVs using pelagic trawl gear and tender vessels transporting pollock catch in the BS and GOA, approves purpose and need and alternative set.</p>

At the Council’s June 2021 meeting, the PIs on the BS and GOA pelagic trawl pollock EM EFP (#2019-03)² presented an interim report on the progress of the EFP through April 2021. The EFP report highlighted that objectives are being met: maximized retention can be accomplished with limited changes in vessel activities, EM is effective in capturing at-sea discard events to support catch accounting and can capture marine mammal incidental takes, biological sampling goals can be met by shoreside observers with effective communication, and salmon bycatch accounting is improved, specifically in the WGOA pollock fishery that currently relies on estimates with large variance under status quo methods. In addition, initial comparisons in the EFP report indicated that EM can be more cost-effective than at-sea observers, especially after the initial cost of system is installed in the first year. A lifespan evaluation of the equipment as used has not yet been done. More robust cost comparisons will be included in the initial review analysis.

² The EFP application, permits, and reports can be found under the heading “Electronic Monitoring - Trawl Catcher Vessels” on the NMFS website: <https://www.fisheries.noaa.gov/alaska/resources-fishing/exempted-fishing-permits-alaska>.

The Council also received a report from the Trawl EM Committee at the June 2021 meeting and reviewed a draft set of alternatives developed by NMFS and Council staff. The Council adopted the following purpose and need statement and approved three alternatives to analyze to implement a regulated Trawl EM program, as included in the draft alternatives document and recommended by the Trawl EM Committee.

Purpose and Need

In June 2021, the Council adopted the following statement of purpose and need:

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 fishery monitoring program for the groundfish fisheries off Alaska. While a large component of this monitoring program relies on the use of human observers, the Council supports integrating electronic monitoring and reporting technologies 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, and available when needed, and obtained in a cost-effective manner.

The Council and NMFS have been on the path of integrating technology into the fisheries monitoring systems for many years, with electronic reporting systems in place, and operational EM in some fisheries. An EM program for compliance purposes on pelagic pollock trawl catcher vessels and tenders both delivering to shoreside processors will obtain necessary information for quality accounting for catch including bycatch and salmon PSC in a cost-effective manner, and provide reliable data for compliance monitoring of a no discard requirement for salmon PSC. This trawl EM program has the potential to advance cost efficiency and compliance monitoring, through improved salmon accounting and reduced monitoring costs.

Regulatory change is needed to modify the current retention and discard requirements to allow participating CVs to maximize retention of all species caught (i.e., minimize discards to the greatest extent practicable) for the use of EM as a compliance tool on trawl catcher vessels in both the full and partial coverage categories of the Observer Program and meet monitoring objectives on trawl catcher vessels in the Bering Sea (BS) and Gulf of Alaska (GOA) pelagic pollock fisheries.

Alternatives

At the same meeting in June 2021, the Council adopted three alternatives and two options (which apply only to Alternative 3) to be analyzed as part of the Council's EM Integration analysis. The alternatives are designed to meet the purpose and need for this action.

Alternative 1: No Action - EM would not be implemented and catch monitoring would be provided by at-sea observers.

Alternative 2: Electronic Monitoring is implemented on pelagic trawl pollock catcher vessels and tenders delivering to shoreside processors in the Bering Sea and Gulf of Alaska.

Alternative 3: Electronic Monitoring is implemented on pelagic trawl pollock catcher vessels delivering to shoreside processors and not on tenders.

Option 1: Bering Sea

Option 2: Bering Sea and Gulf of Alaska

Depending on the Alternative and option selected by the Council, up to three separate fisheries may be included in this action: 1) CVs delivering to shoreside processing plants in the BS, 2) CVs delivering to shoreside processing plants in the GOA and 3) CVs and tenders delivering to shoreside processing plant in the WGOA. While CVs may participate in multiple fisheries, under current regulations, these fisheries operate distinctly and are therefore treated separately to more specifically describe potential impacts within the alternative structure.

The BS inshore pollock fishery has a cooperative fishery management structure (American Fisheries Act) with allocations internal to the cooperative for individual vessel pollock and Chinook PSC allocations. This fishery is required to have 100% observer coverage under a pay-as-you-go cost model. The salmon bycatch (PSC) is determined by identifying to species and counting each individual salmon at the shoreside processing plant. Receiving processing plants also have observers to assist with this data collection. Shoreside processing plants and CVs work together to maximize fish quality for the marketplace with strict delivery schedules and CV rotations. It is not uncommon for CVs to have some significant wait time between trips, which increases the number of days in which the vessel pays for an observer while not harvesting or delivering. A subset of these CVs participate in the Pacific coast whiting fishery and due to their participation in that fishery, already have operational EM systems on board.

The GOA pollock trawl fishery is managed as an open access fishery and the fleet is diverse and can be divided into several distinct groupings. Some GOA pollock CVs also participate in the BS AFA pollock fishery and/or the Pacific whiting fishery, some CVs deliver to shoreside processing plants, and some CVs deliver to tenders. CVs that participate in the GOA pollock fishery are in the partial coverage category for monitoring. Trawl CVs that fish in the WGOA are some of the smallest in Alaska, fishing with small crews in remote areas. Under the current monitoring plan, pollock trawl CVs less than 60 feet length overall are monitored by observers on randomly selected trips. The observer collects all their data at sea, and salmon bycatch information are expanded from species composition samples. Many of these smaller CVs deliver to tenders in the WGOA regulatory area with Chinook salmon PSC accounting based on at-sea species composition samples, not counts at the plant. At-sea sampling for rare species such as salmon can result in highly variable estimates.

The alternatives approved for analysis by the Council, including the no action, status quo alternative (Alternative 1) provide a reasonable range of alternatives for the Council to consider in their recommendations to NMFS. The Council initially indicated an interest in including all CVs and tenders in the BS and GOA in a regulated program (Alternative 2), similar to the approach taken in the EFP. Analysis of Alternative 2 will provide a thorough review of the potential effects of such an approach. Analysis of Alternative 3 will allow detailed consideration of the elements necessary to implement an EM option in two different pollock fisheries (CVs in the BS and GOA) but not on tenders. Analysis of the status quo, Alternative 1, will provide a basis to compare the potential effects of Alternatives 2 and 3 to the baseline. As a whole, analysis of these three alternatives will provide the Council with a more thorough understanding of the various complexities and unique characteristics of these fishery groups and the potential effects of implementing EM in any one or combination of those fishery groups. The Council also recognized that there are some significant logistical and operational challenges in implementing EM. If the analysis identifies that one group of CVs or tenders is having unanticipated difficulties in addressing those logistical challenges and data are not available to proceed with a regulated program for a given group, these challenges could continue to be examined and addressed through an EFP without slowing implementation for the remainder of the program.

The implementation timeline is for the regulated Trawl EM program to begin in January 2024, as noted in the draft timeline below.

Table 1-2 Draft Timeline for Trawl EM

Target Dates	Meetings / Deliverables
January / February 2022	Coordination of 2022 EFP, Preliminary Review by SSC of Trawl EM program design
March / May 2022	Continued work by staff on analysis of Trawl EM alternatives
May/June 2022	Trawl EM committee meeting, Council Initial Review of Trawl EM analysis
October 2022	Council Final Review of Trawl EM
October 2022 – March 2023	Development and publication of proposed rule for the Trawl EM program and associated shoreside observers
March – June 2023	Development and publication of final rule for Trawl EM program and associated shoreside observers (Target Final Rule in June 2023)
January 2024	Trawl EM – Regulatory Program Begins

2 Trawl EM Program Design

The Trawl EM program is primarily designed to be a compliance monitoring program, based on how the CV pollock fishery operates and the established goals of the NPFMC and NMFS. A compliance monitoring approach uses EM tools to enable and/or improve regulatory compliance monitoring and provide independent information to inform agencies if industry is complying with specific regulations related to retention and discard requirements. The EM data obtained under the compliance monitoring approach do not directly feed into catch accounting or stock assessments. Instead, EM used in this approach is used to support data collection through other methods (e.g., observers or industry self-reported data). This program uses both observers and industry reported data (verified through video review) to support catch accounting and allow for collection of unbiased data by a trained fishery observer at the processing plant during delivery of catch.

The Trawl EM compliance monitoring approach is similar to the West Coast Trawl EM program in the Pacific whiting (hake) fishery. The type of catch handling that would be required to identify discards to species is not practical at the large volumes on pollock trips, therefore maximized retention would be required to ensure that catch can be documented by shoreside processing plants and that unsorted catch can be provided to shoreside observers before being disposed of or processed. This allows for non-biased data collection necessary for catch accounting and stock assessment to be collected at the trip level by observers at the processing plant.

Vessel operators are responsible for recording catch and discard data. Retained catch is weighed on certified scales at shoreside processing plants and discards from the vessel logbook are recorded into Elandings. This allows total catch to be debited from accounts in the catch accounting system.

EM video systems are used to record fishing activity to allow for verification with the regulations necessary to support trip-level sampling by an observer. That observer sampling provides catch accounting and stock assessment information. When catch is being offloaded to a tender or a processing plant, it allows opportunities to CV crew to sort and discard catch. Therefore, EM systems are designed to capture all areas of the CV where catch is transferred and could result in discards. EM systems provide video imagery that can be used by video reviewers to verify compliance of retention requirements and verify that amounts of unavoidable or allowable discards by the CV crew are recorded and that the

estimates are accurate. All CVs have camera systems and reviewers watch a subset of footage after landing to validate the logbook reports of discards.

Another important aspect of the Trawl EM Program is a comprehensive processing plant observer component where species identifications are verified, catch composition and biological data are collected and PSC amounts are verified during offload. This compliance monitoring approach has been shown to perform well when combined with maximized retention and a strong shoreside monitoring component.

2.1 EM Program Goals and Objectives

In its ‘Electronic Monitoring for Compliance on Pelagic Trawl Vessels Cooperative Research Plan’ (approved December 2018) the Council adopted the following overarching objectives for EM:

- Goal 1. Improve salmon accounting – to provide stable salmon accounting against the PSC hard cap for WGOA and CGOA pelagic trawl pollock CVs as well as the salmon PSC performance standard for BS pelagic trawl pollock CVs.
- Goal 2. Reduce monitoring costs – to develop cost efficiencies and free up money for other priorities (i.e., EM coverage in the GOA pollock fishery could allow for an increase in observer coverage/days for other fisheries in the partial observer coverage category) as well as provide a more cost-effective monitoring alternative to 100% human observer coverage for the BS shoreside CVs.
- Goal 3. Improve overall monitoring data for catch accounting and compliance – to explore innovative methods to account for bycatch species that have the potential to limit participation in the pollock fishery, which requires high retention of catch; to explore innovative methods to account for protected species; and to achieve more comprehensive coverage.
- Goal 4. Examine current regulatory retention and discard requirements as necessary to achieve Objectives 1-3 – given existing Improved Retention/Improved Utilization (IR/IU) and Maximum Retainable Amount (MRA) regulations, the proposed EFP will assess the viability of a full/maximized retention pollock fishery coupled with a dedicated shoreside monitoring component as a potential future fishery management option.

The Council has also developed a list of program elements from the draft alternatives document³ to be included in the analysis, understanding that new elements may be added and current elements may be modified in the future. The Council recognized the success of the collaborative approach of the EFP team and encouraged the continuation of this team to address complex issues as they arise in the analysis. Table 2-1 identifies the objectives for the different components that have been identified for the Trawl EM program.

Table 2-1 Trawl EM Program Components and Objectives

Trawl EM Program Components	Objective
1. EM Deployment Design	Use best available information to design the EM deployment methods, including the EM selection pool, which meet policy and data collection goals.
2. Participation	A pool of EM participants that are capable and committed to making EM work on their vessels.
3. Maximized Retention	Ensure that catch can be documented by shoreside processing plants and that unsorted catch can be provided to shoreside observers.

³ Included in the June 2021 Council agenda under item C2: <https://meetings.npfmc.org/Meeting/Details/2104>

4. Equipment and installation	Appropriate EM equipment (wiring/sensors, cameras, monitors, hard drives) are properly installed on each CV, at the correct port, and in a timely fashion, with the least interruption to the fishing plan.
5. EM Operation	Each CV operator maintains a functioning EM system throughout the fishing trip and there is a process for maintaining quality control and addressing equipment failures.
6. Data and equipment retrieval (i.e. Hard drives with raw video data)	EM equipment with data returned to NMFS timely and provides useable imagery and metadata.
7. EM data	Extract and integrate data from EM system in a timely manner so that data can be used to verify self-reported information.
8. EM data retention and storage	Retain EM data (video and data derived from video review) in an appropriate format.
9. Feedback mechanisms	All participants have the opportunity to provide timely feedback to address problems and improve the EM Program.
10. Fees/ Funding/ Costs	Use cost recovery and/or Observer Program fees or other sources of funding to pay for the EM agency costs such as video review.
11. Catch logbook	Each CV operator maintains an accurate logbook with discarded catch of key target and bycatch species.
12. Integrate data for Catch Accounting	Incorporate self-reported data on at-sea discards into the Catch Accounting System in a timely way so that the data can be used for management; use data from EM as verification.
13. Observer sampling	Enable observers to collect trip-level catch composition and biological data at processing plants.
14. Salmon Accounting	Enable accurate accounting of salmon in processing plants.

2.2 Implementation Approach

Each of the components of the Trawl EM program would be implemented through various available implementation vehicles. These include regulations, the Annual Deployment Plan (and evaluated in the Annual Report), the EM service provider contract (or grant), the Vessel Monitoring Plan (which defines the placement of EM equipment onboard each individual CV, and sets out operator responsibilities for maintaining EM equipment and for fish handling practices conducive to camera monitoring), and NMFS administration. Figure 2-1 provides an assessment of how the different pieces of the EM program fit together under each of these implementation vehicles. The numbers in parentheses correspond to the fourteen EM program components identified in Table 2-1 above.

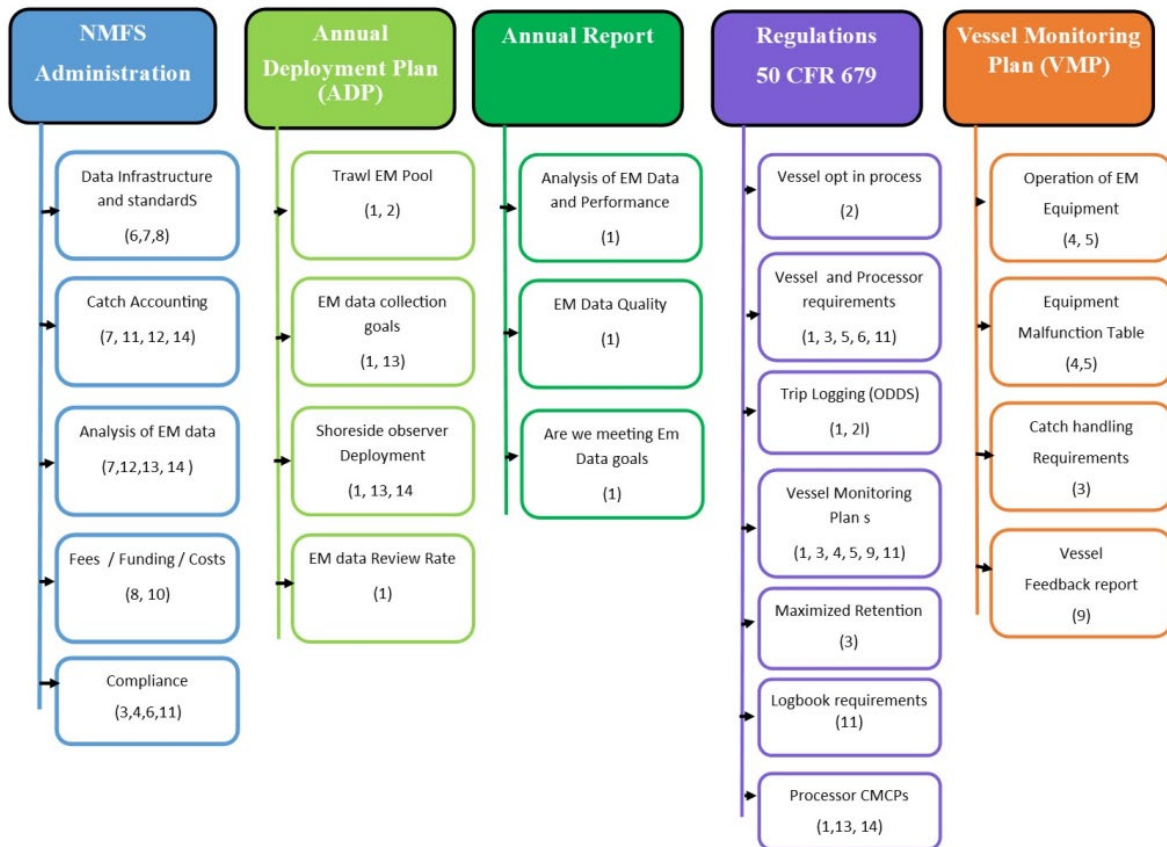


Figure 2-1 EM Program Components and Implementation Approaches

2.2.1 Participation in the Trawl EM program

Eligibility to participate

Eligibility provisions for CVs to participate in the EM selection pools allow any harvester that meets the criteria to choose to request to opt-in to the Trawl EM selection pool as described in the ADP on an annual basis, if they are willing to adhere to the provisions of the Trawl EM program. Participation in Trawl EM selection pool would be voluntary.

Factors that may affect eligibility to participate in the Trawl EM program, include, but are not limited to:

1. Actions leading to data gaps such as repeat occurrences of dirty cameras affecting video review.
2. Non-compliance with program elements such as discarding of catch, including PSC.
3. CV configuration or fishing practices that cannot provide the necessary camera views to meet data collection goals.

If the CV owner disagrees with NMFS’s determination that its CV should, or should not, be in the Trawl EM selection pool, the CV owner would have the right to appeal NMFS’s determination pursuant to 15 CFR Part 906.32 During the pendency of the appeal, NMFS’s initial determination would remain in effect.

NMFS would establish an annual opt-in/opt-out process in Federal regulations for participating CVs. All CVs would be required to use ODDS to opt-in to the Trawl EM selection pool by the annual deadline of November 15. NMFS would notify the CV owner through ODDS of approval or denial to place a CV in

the Trawl EM selection pool, based on the above eligibility criteria. Participating CVs, approved by NMFS would be required to register trips in ODDS as described below:

Trip Registration in ODDS

Trip registration in ODDS for CVs participating in the BS is not currently required because these CVs are part of the full coverage category. Registration in ODDS is required for CVs participating in the GOA as these CVs are part of the partial coverage pool and fish for other species with other gear types. Following partial coverage regulatory requirements, participating CV operators are required to register a trip in ODDS and indicate whether they are going on a Trawl EM trip or a partial coverage trip. Under the regulated trawl EM program, trip registration via ODDS may be required by all participants, including CVs in the BS. Registration in ODDS by all vessels in the Trawl EM selection pool would assist in tracking trawl EM compliance, analysis of EM use in the Annual Report, assist in coordination and communication with shoreside observers, and reduce regulatory confusion.

GOA trawl CVs sometimes use more than one gear type or target multiple species in a trip. The pre-implementation program only authorized the use of EM for pelagic trawl trips targeting pollock. Expanding beyond pollock was not within the scope of the EM EFP. Therefore, to allow flexibility based on species targeted and gear types used, participating EM CVs have been able to opt-in to EM on a trip-by-trip basis under the EFP. The flexibility to opt-in on a trip-by-trip basis needs to be re-evaluated as the regulated Trawl EM program is developed. It is difficult to predict CV activity and effort in the ADP, and this measure creates more uncertainty in these estimates. Additionally, this created confusion for shoreside observers tracking which specific trips from an “EM CV” was an EM or partial coverage trip. Therefore, NMFS may explore options to limit this flexibility including restricting opt-in to an annual basis.

2.3 EM System

EM systems include four primary components; cameras, sensors, the control center that records the data onto the hard drives, and the hard drives that can be removed and sent for data review. Typical EM camera setups include three cameras that are placed to show all areas of the deck and eliminate blind spots. Additional cameras are placed as necessary to meet data needs and accommodate unique CV setups. The EM system integrates data from a suite of sensors, including GPS, hydraulic pressure, and drum rotation monitors to determine set and haul positions and collect effort data.

The WGOA pollock fishery operates differently from the Central GOA and BS pollock fisheries. CVs in the WGOA tend to be smaller and most are less than 60 feet length overall. Some CVs in the WGOA use tender vessels to support fishing and delivery of catch. Tenders can also be used in a subportion of the CGOA; however, the CVs using those tenders are from the WGOA. One specific component of the Trawl EM EFP was to test EM systems on tender vessels. EM systems were designed for tender vessels to monitor offloads and ensure unsorted catch only from EM vessels is delivered to the processing plant where it can be sampled by shoreside observers. As a processing plant may not know which tenders will be deployed until shortly before a season begins, predicting which tenders to install EM systems on was challenging. This unique problem was solved through innovation by the Trawl EM partners. Saltwater Inc. developed and tested a low cost, mobile EM system that can be quickly deployed by tender operators.

An example of the tender EM set-up is below in Figure 2-2.

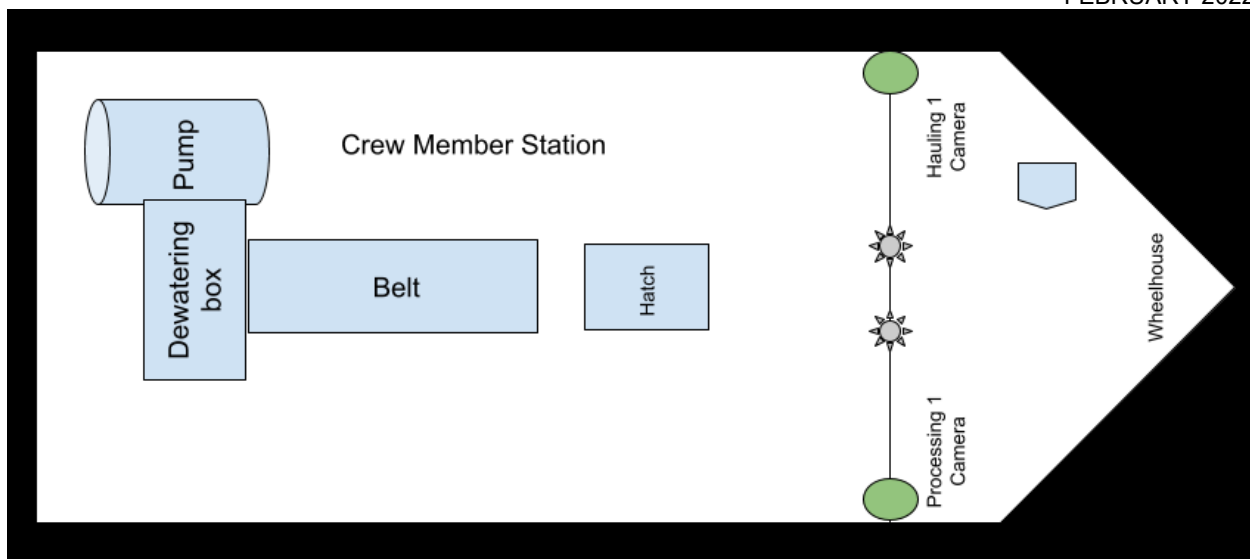


Figure 2-2 Tender EM Set-up

The EM Service provider, the NMFS Alaska Region, and the Alaska Fisheries Science Center (AFSC) Fisheries Monitoring and Analysis Division (FMA) met and specifically discussed the tender operations. EM review of tenders focuses on the transfer process between the CV and the tender. No discards should occur during this transfer; however, during EFP operations, discards were observed on tender vessels suggesting these systems can capture the data necessary for compliance monitoring. EM vendors, EM reviewers, and agency staff reviewed tender video that was collected to intentionally look for blind spots

Vessel Elements

2.3.1 EM Coverage Requirements

CVs participating in the Trawl EM Program will be required to operate their EM systems on every Trawl EM trip. The CV operators will ensure video recording is initiated two hours prior to deploying fishing gear on a Trawl EM trip and/or prior to transfer of catch onto a participating tender vessel. EM cameras would be required to be operational and recording as established in the vessel monitoring plan (VMP).

Currently the VMPs require cameras to be recording until completion of offload. As a result, the EM system captures offload activity. Several things were learned from offload observations that increased data quality of catch information. During the 2020 A season, large amounts of sharks were being caught. The offload review indicated that some of these sharks were removed from the hold but were not weighed or recorded. This was an unknown data gap that was immediately addressed through education and outreach by NMFS and the EFP PIs to plant managers and CV operators. In addition, one of the goals of the Trawl EM program is to improve accounting of salmon PSC. The offload period is a time when discards of Chinook salmon have occurred; therefore, offload data are valuable to verify precise accounting of salmon PSC data. NMFS plans to define a sampling plan to review offload data, which could include random selection of EM trips to review offloads to meet data selection goals.

2.3.2 Vessel Monitoring Plan

After a CV opts into the Trawl EM program and is notified they are in the EM pool, the CV operator is instructed to coordinate with EM Service Providers for EM equipment installation and service. The CV operator is encouraged to participate in installation, and development and approval of the VMP. The EM service providers will explain catch handling requirements and describe the operation of the EM system, including common steps for troubleshooting. The service providers also go through each section of the VMP with the CV operator and answer any questions.

Vessel operator responsibilities will be specified within regulations and within the VMP. The VMP sets out operator responsibilities for maintaining EM equipment and provides guidance to CV owners and operators about their responsibilities to maintain a functioning EM system. The CV operators' primary responsibilities fall into three broad categories: 1) ensuring the EM system is operating, 2) retention of catch per regulation and 3) recording necessary information in the logbooks. All of these items are addressed clearly in the VMP. The VMP also describes how an EM system is specifically configured on a CV and how fishing operations on that CV will be conducted to effectively monitor fishing activities to document catch. The camera setup for monitoring fishing also works for monitoring offloads. VMPs are unique to the CV. After the VMP is completed by the EM technician with the CV operator, the VMP is sent to NMFS for review and approval.

VMPs are approved by the agency. In most scenarios, the development of the VMP addresses most issues and the VMP approval process is efficient. Agency staff review VMPs to ensure they meet data collection goals and have all of the required elements. Agency staff also look at the camera views and may suggest slight modifications prior to approval. Finally, approved VMPs are entered into agency databases for access during video review. VMPs are approved for one calendar year; however, they can be edited throughout the year if data issues are identified.

2.3.3 EM Function Test

The CV operator must run a function test prior to deploying gear on a trip. The purpose of the function test is to ensure the system is working prior to fishing activity to prevent loss of data should there be an equipment malfunction. The function test checks that the system is receiving data from the sensors, can record, hard drives have sufficient space to record and requires the operator to check the camera views are clear and working. This function test is described in the VMP with instructions provided in an appendix.

During pre-implementation, function tests were required before leaving port; however, this proved to be problematic to some CV operations during a normal fishery and the Trawl EM committee recommended relaxation of this requirement. The CV operator is strongly advised to conduct the function test prior to leaving port. A CV operator choosing to test after leaving port is taking a risk--if the test identifies a critical malfunction they must return to port prior to fishing.

During the 2021 fishery, this flexibility of performing function tests post port departure but prior to gear deployment was used occasionally, however most trips completed function tests prior to leaving port.

2.3.4 EM Equipment Malfunctions

During pre-implementation, the VMP included a section on equipment malfunction, CV operator responsibilities, and troubleshooting guidance. Equipment malfunctions are classified as "High" priority or "Low" priority in the malfunction tables in the VMP (Table 2-2). Low priority malfunctions will typically have a "work around" and will not affect the ability of a CV to depart on a trip, but, once identified, the issue must be resolved prior to taking an additional trip. High priority malfunctions typically result in the inability for the EM system to log the required critical data components. Due to the different monitoring levels and operational differences between the BS and the GOA pollock fisheries, there will be different protocols for dealing with High priority malfunctions. If the system passed the function test at the dock or at least two hours before deploying gear, and remains continuously powered during the trip, the CV is NOT required to return to port in the event of a High priority malfunction. The VMP outlines the guidance on troubleshooting malfunctions based on factors such as High/Low priority, when the malfunction was discovered, and malfunction type. If the malfunction cannot be resolved following the troubleshooting guide and/or with remote support, CV operators are instructed to continue to run the system with all functional parts, and contact the service provider immediately (from sea if possible) to schedule service at the time of landing. CV operators are also instructed to record all malfunctions in their logbook, including the time and date of the malfunction. Some CVs may choose to carry additional hard drives and spare parts, such as cameras, network switches and sensors to enable self-

service of the EM system. System malfunctions can occur at the dock, prior to departure, or while the CV is at sea. All system malfunctions must be recorded in logbooks and reported as soon as possible to EM Service Providers and EFP Managers. NMFS anticipates similar CV operator responsibilities related to equipment malfunctions would be part of the VMP and regulations in the implemented program.

Table 2-2 Example of Equipment Malfunctions

Malfunction Type	High/Low Priority	Potential Solution	Action if Malfunction Not Resolved
Control Center	High	Restart system	Troubleshoot and repair prior to next haul. If cannot repair, must contact EM service provider ASAP to report issues / schedule repair. Repair must occur prior to the next trip.
Loss of continuous power during fishing or offloading	High	Check power supply to system	Troubleshoot and repair prior to next haul. If cannot repair, must contact EM service provider ASAP to report issues / schedule repair. Repair must occur prior to the next trip.
Loss of continuous power while transiting	Low	Check power supply to system	May continue to transit (move to/from fishing grounds). Troubleshoot and attempt repair prior to next haul. If cannot repair, must contact EM service provider ASAP to report issues / schedule repair. May continue to fish during low priority malfunctions, but repair must occur prior to the next trip.
Insufficient lighting	High	Replace lights	May fish but cannot retrieve gear at night.
Critical camera (views of deck, horizon, stern ramp, and factory (if applicable))	High	Restart system; replace with spare camera	Troubleshoot and attempt repair prior to next haul. If cannot repair, must contact EM service provider ASAP to report issues / schedule repair. Repair must occur prior to the next trip.
Non-critical camera	Low	Restart system; replace with spare camera	Attempt to repair prior to retrieving gear. If cannot repair, must contact EM service provider ASAP to report issues / schedule repair. Repair must occur prior to the next trip.
Keyboard / Mouse	High	Replace with another keyboard / mouse	Before departing on another trip, must contact EM service provider to get a new keyboard or mouse.
Hydraulic Sensor	Low	Restart system	Must trigger video recording manually. Before departing on another trip selected for EM coverage, must contact EM service provider to schedule repair.

2.3.5 Maximized retention

Vessel operators are required to retain most catch to provide observers at the shoreside processing plant with unsorted catch to collect needed catch composition and biological information, CV operators are required to retain most catch. Retention of all catch was not possible because some catch events have unintentional discards. Some large species like sharks cannot be securely or safely stored. Additionally, in early phases of pre-implementation the CVs participating indicated a product quality issue when large

amounts of jellyfish are encountered. Therefore, requirements were clearly stated in the VMP that all catch was to be retained and discards were only allowed in certain cases.

Allowable discards:

- Small amounts of pollock and other incidental species removed from the deck and fishing gear during cleaning and other similar CV operations.
- Large individual marine organisms, such as marine mammals, shark species that are not spiny dogfish, and skates that are causing problems at the pump.
- Unavoidable discard of catch resulting from an event that is beyond the control of the CV operator or crew provided. Events beyond the control of the CV include:
 - Safety/stability;
 - The opening of a blow-out panel because the catch is otherwise too large to bring up the CV's stern ramp;
 - Net bleeds/venting of an overfull codend;
 - Discards due to mechanical failure.

2.3.6 Catch Handling Procedures

All catch and discards must be handled within view of the cameras as defined in the camera descriptions and deck diagram in the VMP. All catch handling from the previous haul must be complete prior to retrieving the next haul. Every CV is unique and in some cases a CV VMP may include additional catch handling, stowage, and discard procedures. As video review occurs, the video reviewers may identify additional requirements, which may require VMPs to be modified as necessary. An example of an additional catch handling procedure is the requirement of a single discard location for allowable discards that allows the reviewer a clear camera view to estimate these discards.

2.3.7 Logbooks

Logbooks are necessary for Trawl EM data flow. The Trawl EM program does not work without a logbook component. While many data, like location and effort, are collected by the EM systems, logbooks collect other data necessary for catch accounting and stock assessment. These data are either used to report catch in Elandings or annotated by EM reviewers during review. These logbooks can either be paper logbooks as currently used by the majority of the fleet or electronic logbooks that meet the requirements and are approved by NMFS. Therefore, a logbook requirement will be necessary for the Trawl EM program.

Discard information is reported in the logbook and these data are transferred to the processing plant during offload and are recorded in the Elandings report. These are the data necessary to account for at-sea discards as discussed in section 3. Additionally, since most data are collected at the trip level, concern has been raised about the loss of haul level data. Although haul level information on catch and bycatch is not available from the EM Trawl program, for some analyses logbook data at the trip level back-calculated to the haul level may be of sufficient resolution, as well as provide a novel source of size data for sharks.

CVs less than 60 feet length overall that participate in the WGOA do not currently have a logbook requirement. These CVs were required to maintain a logbook to participate in the Trawl EM EFP program. WGOA participants, Aleutian East Borough, and Saltwater Inc. developed an electronic logbook to collect information necessary to support Trawl EM. This sub-project has been successful but has not been able to be scaled up to other CVs at this time. There are many benefits for an electronic logbook, however requiring the use of electronic logbook is not ready for regulatory implementation. This remains a goal for the future.

2.3.8 Communications and Notifications of Deliveries for Shoreside Sampling

To facilitate the observer's selection of trips to sample, participating CVs and tenders are required to communicate with shoreside observers and participating processing plants to provide timely offload schedule information for all Trawl EM trips. Once fishing has concluded, CVs and tenders are required to notify the shoreside observer of expected offload time, estimated hail weight, and whether the CV or tender has a deck load. Notification will be through a communication means determined by AFSC, such as using the prior notice of landing or the ODDS system.

2.4 Shoreside Processing Plant Elements

2.4.1 Catch Monitoring Control Plan (CMCP)

Shoreside processing plants that will be taking EM Trawl pollock deliveries will need to put in place a Catch Monitoring and Control Plan (CMCP) prior to accepting EM deliveries. A CMCP is a plan submitted by the owner and manager of a processing plant, and approved by NMFS, detailing how the processing plant will meet the catch monitoring and control standards to be determined by federal regulations. The BSAI processing plants already have a CMCP in place for the AFA pollock and salmon sorting processes, but the GOA shoreside processing plants do not at this time. If processing plants need to modify their current CMCP to incorporate slightly different requirements of EM offloads, that would be addressed.

The CMCP was not initially a requirement of the EM Trawl EFP. Throughout the first year of the EFP, issues were monitored and addressed in near real time through collaborative meetings (including the principle investigators (PI's), NMFS FMA and Alaska Regional staff). It quickly became apparent that the observers at GOA shoreside processing plants were unable to collect all the necessary data, but the observers at BSAI shoreside processing plants were keeping up with the workload and able to randomize samples. After a preliminary assessment of the data collection efforts, and feedback from the observers in the field, the PI's implemented Catch Handling Plans at the GOA shoreside processing plants in 2021.

Under a regulated program, the CMCP requirements will include elements to enable an observer's ability to collect and process random samples and collect the required prohibited species data. These would include (but are not limited to): designation of a plant liaison for each shoreside processing plant, who will be responsible for orienting new observers to the plant and assisting in the resolution of observer concerns; a safe location for observer sampling; specifications as to how the fish will move throughout the plant; and how the plant would enable observer's access to communication equipment to facilitate transmission of their data. Other specifics could include information as to how salmon PSC will be sorted and securely stored until the observer is able to collect the necessary biological information.

In addition, the CMCP would include communications and observation area requirements, and more information is included on these two aspects in the sections below.

Communications

Communication between observers, CVs and the plant personnel have proven to be imperative to ensuring that reliable and adequate data are collected. Without frequent and clear communications, observers will be unable to collect the data required for fisheries management. Details that need to be communicated to observers include, CV name, trip type (EM trip or not, non-EM, or observed), total catch on board, expected time of arrival, and approximate processing time or processing rate.

The CMCP would describe how observers will obtain the necessary information prior to the start of offload, including what communication equipment such as radios, pagers, or cellular phones, is used to facilitate communications within the shoreside processing plant. The plant owner must ensure that the plant manager provides the observer with the same communications equipment used by plant staff.

Currently there are no communications requirements in the GOA, but there are for the BSAI shoreside processing plants located in [50 CFR 6791.28\(g\)\(7\)\(viii\)](#).

Observer Equipment and Sampling Stations

Based on the feedback from observers there will be minimal updates to the BSAI observation areas, but GOA shoreside processing plants will have to work with NMFS to accommodate the observers sampling at the plants.

Each CMCP would designate an observation area. The observation area is a location designated by the CMCP where an observer may collect composition and biological samples, and monitor the flow of fish during a delivery. NMFS will establish a specific list of attributes that will be required for each observation area in Federal regulations for participating shoreside plants. The owner and manager of the shoreside plant must ensure that the observation area meets the outlined specifications.

All observation areas that will be required at the plant will be discussed in the CMCP. Some of these attributes may include but are not limited to:

- Total minimum area allocated for observer station
- Location of observer station (indoors vs outdoors)
- Distance from collection point
- Collection point parameters (such a diverter mechanism)
- Minimum passage widths
- Table dimensions
- Scale requirements (such as types/max height/test weights etc.)
- Flooring (non-slip/grating etc.)
- Lighting (type/amount etc.)
- Other attributes (hose etc.)

In both the GOA and the BSAI the observer sampling areas at shoreside processing plants will need to be assessed and proper parameters will need to be determined by NMFS for observers to collect all necessary data. Additionally, the GOA shoreside processing plants will need to streamline the salmon sorting process and account for this in a CMCP.

2.5 MRAs and Trip Limits

Maximum retainable amount (MRA) regulations attempt to constrain the harvest of species not open to directed fishing by placing limits on how much catch from species closed to directed fishing can legally be retained. The pollock trip limit establishes a 300,000 pound delivery limit on pollock in the GOA. In order to achieve maximized retention, the regulations requiring discard in these cases needed to be relaxed. The EFP exempted participating CVs from MRA and trip limit regulations to promote maximized retention.

Concerns were raised by managers and CVs not participating in the Trawl EM program about the potential impacts of removing MRAs and trip limits if CV operators change fishing behavior to take advantage of the removal of these regulations. Some CV operators were concerned that removal of MRAs and pollock trip limits would give advantages to participating CVs. The EFP PIs, in consultation with NMFS, designed a performance metric intended to formulate flexible enforcement steps over the course of the EFP to curtail potential abuse of exemptions to the GOA pollock trip limit and BSAI and GOA MRAs. The goal was to control behavior so that CVs continue to mostly stay under the limits over the long term, yet provide added flexibility that is needed due to the full retention requirement of the EFP.

The performance metric during pre-implementation sought to eliminate financial incentives of exceeding limits under full retention. All participating EM EFP CVs surrender the ex-vessel value above the

prescribed limits (GOA 300,000 pound pollock trip limit) to the North Pacific Fisheries Research Foundation (a non-profit that provides grant money to research projects in the North Pacific, including this EFP). The EFP holders track and invoice overages based on fish tickets. Preliminary estimates are that about \$96,000 will be collected from participating CV owners/operators.

In addition to forfeiting the value, CVs are tracked on two metrics to prevent egregious overages or changes in behavior that result from exemption of pollock trip limits. CVs will be allowed up to three offenses (pollock trip overages). The first two offenses result in documented warnings and conversations with EFP permit holders. The third offense results in a monetary fine assessed to the permit holders. Upon a fourth overage offense, the CV will be removed from the EFP participating CV list and may also be prohibited from participating in any future EM Pollock EFP. These performance metrics have proven to be an effective tool to manage changes in CV behavior.

Implementing similar performance metrics through regulations may present some difficulty due to limitations on MSA authority to collect the value of fish in excess of a limit. One idea currently being explored is to include performance metrics in existing Chinook salmon incentive plans that apply to all pollock vessels participating in the BS pollock fishery. The incentive plan requirement would be designed so that to participate in Trawl EM, a participant would also need to be a part of an incentive plan that would document how participating CVs would avoid exceeding limits. This would allow for a flexible approach to avoid negative impacts to the fishery. A similar solution would need to be created for the GOA CVs.

2.6 Observer Data Collection

2.6.1 Coverage Requirements

CVs participating in the Trawl EM program in the BS are in the full coverage observer category and have observer monitoring associated with every trip. This program is currently limited to pelagic fishing, and NMFS does not have a fishery that uses CVs in the AI. Under this program, the responsibilities associated with the at-sea collection of PSC data and biological samples normally taken by at-sea observers (on non EM trips) will be completed by observers stationed at the shoreside plant. Currently, observers assigned to vessels complete their data collection for salmon PSC at the processing plants, and are assisted by the observers stationed at the plant. Effectively, two observers (at least) are therefore working to account for salmon PSC. Processing plants participating in the trawl EM program will require additional observers to account for the reduction in vessel observers. CVs participating in the Trawl EM program in the GOA are in partial coverage observer category and are randomly selected to be monitored by an observer. Under the EFP, the goal has been to achieve observer monitoring at a rate of 1 in every 3 trips (33%). In addition, select CVs may deliver to tender vessels participating in the EFP. Those GOA tender vessels will be included in the observer sampling design of 33% in the GOA. Tender vessels may only accept catch from GOA CVs participating in the EFP. Similarly, participating CVs may only deliver catch to shoreside processing plants or tender vessels that are also participating in the EFP; EFP tender vessels must deliver to shoreside processing plants participating in the EFP. Under a regulated EM program, the observer coverage rates to monitor deliveries from CVs and tender vessel offloads would be determined by NMFS through the ADP process. Video reviewers handle logbook verification.

Vessels that opt into the Trawl EM selection pool will not be fully exempt from carrying observers on board the CVs. NMFS will maintain the right to deploy observers on EM CVs for the purpose of filling any data gaps that are not yet apparent, or collecting data for research projects requested by the data users. Examples of data collections that may require observers to be on board Trawl EM CVs include sampling of marine mammals, birds, sharks or skates, as these animals are often discarded and not available to shoreside observers.

2.6.2 Data collection priorities

Under the EM program, shoreside data collections will replace at-sea sampling and data collections that would have occurred on CVs had an observer been deployed. These shoreside collections should mirror standard at-sea observer data collections and will include additional data collections based on management and scientific needs. Note that EM data is confidential and not subject to FOIA.

CMCPs are currently required for shoreside processing plants taking deliveries from AFA and CDQ pollock, and AI directed pollock (50 CFR 679.28 (g)). The regulations at 50 CFR 679.28 have proven to be adequate for monitoring salmon bycatch in the BS and AI pollock fisheries. Some of the requirements outlined in the BSAI CMCPs include the standard requirements for observation areas/stations, communication with observers, and access to fish (including salmon bins). These requirements are vital in aiding the observer to collect reliable salmon retention data for each offload. With the addition of EM pollock pelagic trawl, and removal of observers from these CVs, data previously collected by at-sea observers were transferred to the observers at the shoreside processing plants. The additional collection of composition and biological data at the shoreside processing plants were necessary to fill the data gap that would emerge without observers collecting these types of data on the CVs. This resulted in an increased workload of the shoreside observer, and one or more additional observers were needed per shift to collect the composition and biological data as outlined by the AFSC while continuing to monitor the sorting lines for salmon.

A preliminary review of the data collection efforts was done by NMFS and EFP PIs in March of 2020, and it became apparent that the project was not meeting its sampling goals. Although there were multiple elements that impacted the data collection efforts in 2020, it became clear that one observer at the plant could not cover all the species composition, biological data collections, and conduct the salmon monitoring at the same time. The deficit in species composition and biological data collection efforts were far below the goals initially set by the Trawl EM EFP in March 2020. In the 2020 B season additional observers were placed at the plants so that at least two observers would be on shift to cover the EM pollock offload duties outlined by the AFSC. With the addition of the extra observers at the plant the sampling effort and monitoring goals were greatly improved. In order for one observer to be able to collect the minimum species composition and biological samples in the future, NMFS may look more closely at the work load and potential tradeoffs of removing observers from the salmon sorting line, and look for alternative approaches to sort salmon (e.g.: cameras, having sorters appropriately trained to sort salmon, updated CMCPs).

2.6.3 Data Collection methods

The current Trawl EM priority is salmon accounting. To do this under the current framework, the sorting process must be monitored by an observer at the plant's sorting line. AFA deliveries typically have two observers present during an offload, one observer can monitor the sorting belts for salmon, or collect biological samples from salmon, while the other can collect species composition samples and biological samples from non-PSC species throughout the offload. To set up a sampling design for composition samples, observers must first obtain an estimate of the offload size and anticipated duration of sorting. This information can be provided by or obtained from the CV or plant personnel prior to the start of the offload process. Once the species composition samples are selected, the observers can collect the biological data from within these samples as outlined by the Observer Program.

Species Composition

Species composition samples should be collected throughout each monitored offload when possible. These samples will serve as the source of fish (population) for biological specimens for each delivery as well as provide a means for auditing the fish ticket information provided by the plant. When at least two observers are on shift and are available to assist with a single EM offload, one observer will monitor catch as it flows across the belt while the other collects and processes composition samples.

Biological Sampling

Observers will collect Sex/Length and other biological data such as otoliths from pollock and other various species from the species composition samples that are collected at the plant. The collection of species and biospecimen data will be determined by FMA as they collaborate with their data users. These data collection points can be adjusted by FMA should the data users request more or less information. Figure 2-3 below provides an example of the data that were collected in 2021. Shoreside observers do not collect halibut viability data because all halibut are dead.

Predominant Species	Sex/Length Data	Biological Data (All specimen fish must have an associated s/l/w specimen)	Halibut Condition
Bering Sea Pollock	Every Sampled Offload ~100 pollock and ~100 squid (unsexed) and ~25 Rougheye and ~25 Sablefish	Every Sampled Offload	Every Sampled Offload Measure and Assess the Viability of ALL Halibut
		2 pollock otolith pairs with maturity scan for all female otolith fish and ~ 8 pollock sex/length/weight specimens (must not be from an otolith fish)	
		Every Sampled Offload	
		25 Rougheye otolith pairs	
Gulf of Alaska Pollock	Every Sampled Offload ~ 150 Pollock and ~ 30 Pacific Cod	Every Sampled Offload 25 Pollock otolith pairs with maturity scan for all female otolith fish and 5 Pacific Cod otoliths	Every Sampled Offload Measure and Assess the Viability of ALL Halibut

Figure 2-3 Example of 2021 EM EFP Biological Sampling Goals

Halibut Monitoring (L/W and count)

While monitoring the sorting of salmon throughout the offload process, the observer monitoring the sorting activity will also monitor the sorting/retention of halibut. This collection, similar to the process of conducting a salmon retention count, aims to provide a total accounting of all halibut within the offload. Salmon and halibut must be removed and set aside in a designated storage area/container (e.g., observer basket, crab tote etc.) until the end of the offload process. Once the salmon retention count and its associated specimen collections have been completed, each halibut is measured and weighed.

Salmon Data Collection

Conducting an accurate and reliable salmon count is prioritized above all other data collections. When monitoring the flow of fish during an offload, observer’s attention must remain on the line and should not be diverted or focused on other tasks. The final salmon retention count will occur at the end of each offload and will be conducted in a manner consistent with current FMA salmon data collection protocols outlined in the observer manual. It is important that each pollock offload (whether BSAI or selected GOA trips) has an associated salmon retention count and is associated with the appropriate cruise. CMCPs are important for accurate salmon accounting and enable NMFS to work with each processing plant to account for salmon bycatch in the processing plant.

An observer spends the majority of an offload on the sorting line looking for salmon along with all the plant sorters. During this time, they can collect other samples; however, observing the sorting prevents collection of some biological samples until after the offload has been completed. Throughout this EFP, participants have been discussing how to better use observer time to meet sampling goals. The time spent sorting PSC was identified as the largest time sink that may present options for efficiency.

The agency would like to explore alternate methods to continue to collect precise salmon and halibut PSC data and allow for increased opportunities to collect biological samples and other data. One idea includes adding elements to the CMCP similar to sorting bin monitoring on trawl catcher processors. During that sorting process, cameras with monitors at observer sampling stations can be used by observers to verify that no salmon are removed after being sorted and to verify sorting is occurring. This, combined with strengthened elements of CMCP to further prevent after-scale salmon, could provide opportunities for observers to focus on collection of other data during offloads rather than solely on salmon PSC sorting. Observers would continue to count salmon at the end of each offload, consistent with current FMA salmon data collection protocols outlined in the observer manual.

Salmon genetic collections will be conducted at a rate based on whether the CV is delivering catch from the BS or GOA (See Flowchart below). The frequency and subsequent quantities of genetic specimens vary by fishery and should be collected following the current FMA collection protocols. Salmon encountered in the BS and GOA may contain small, embedded tags called coded wire tags (CWTs), and the snouts of these salmon will be collected by observers per FMA guidelines.

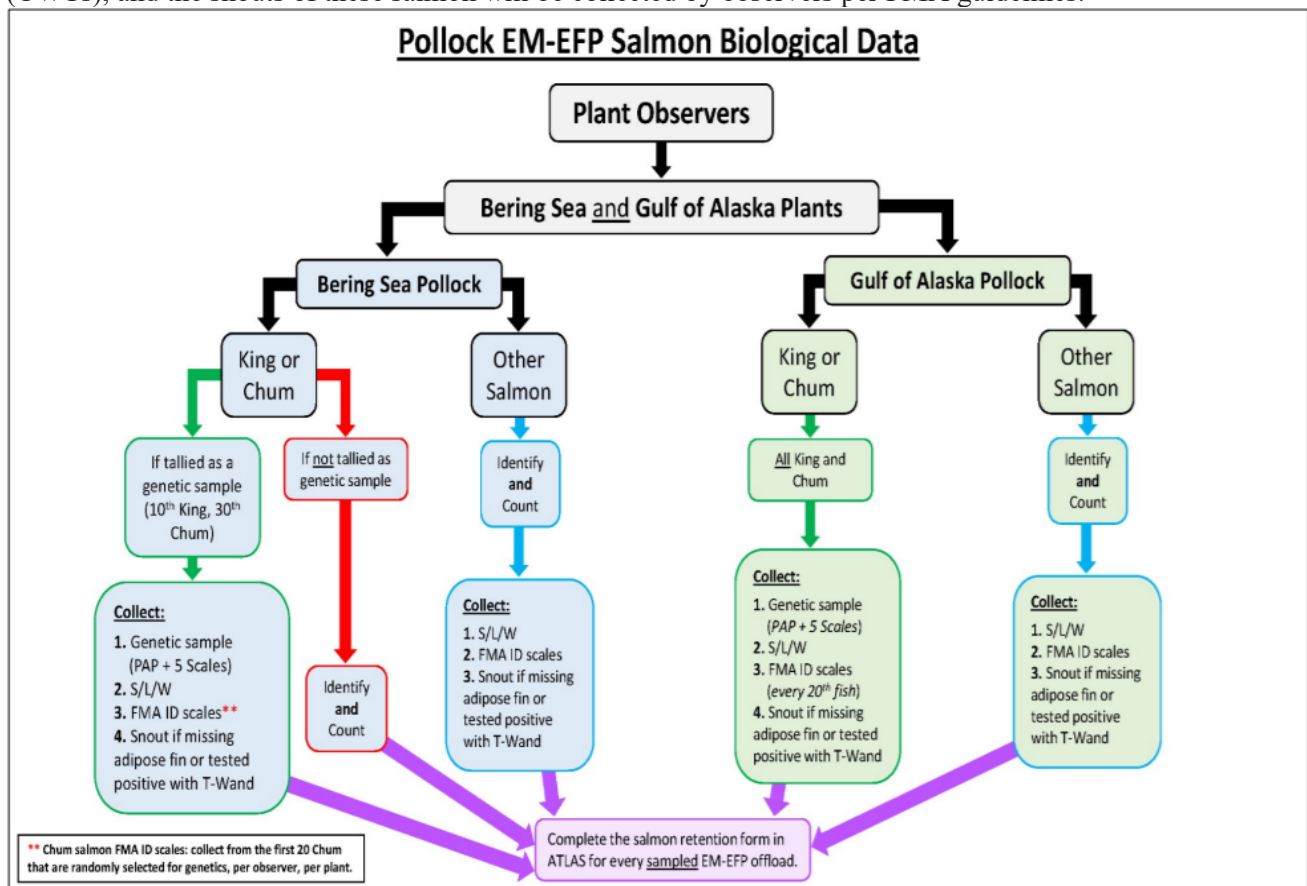


Figure 2-4 Pollock EM-EFP Salmon Biological Data Flow

3 Video Review

3.1 Video Review Protocols

EM video review protocols will be established by NMFS and will clearly explain data collection priorities to meet data collection goals. These would also establish the reporting requirements for EM review, entry of logbook data and how the EM review data would be made available to NMFS. During pre-implementation, protocols were modified from the west coast EM review protocols to meet the goals of the Trawl EM EFP.

From the start of the trip, the EM reviewers look for compliance with the function test, checking that camera views are as noted in the VMP and checking on the overall quality of the data. If any issues are identified, these will be reported in the EM ODDS issue tracking database.

The review of Trawl EM video is efficient. Reviewers can go directly to footage when gear is in operation based on information collected by sensors in the EM system and identified by the review software. The reviewer will look at video from times when the sensor indicates haul activity. The reviewer has the logbook and can also use that to identify haul times, in the event of a sensor malfunction. The video reviewers can review at various speeds and have multiple camera views.

When fishing activity is identified, the reviewer will record the time the net went in the water to capture the start haul time and location from the EM system GPS. They will watch the fishing activity at a fast speed. EM reviewers will also record the time and location when the net leaves the water. These data can be compared to logbook data; however, the EM data provides more accurate time and location of fishing data.

The EM reviewer will watch the entire haul back with options to speed up or slow down review as needed to enable collection of data. First, they focus on the horizon and reel stern camera, viewing the net for any fish flowing from the net from rips or tears in the trawl net. During the Trawl EM EFP pre-implementation it was identified that the stern cameras provide potentially additional new data that may not have been previously available to observers. During retrieval of the trawl net, the areas in the stern of the CV are dangerous and the observer typically does not have access due to safety reasons. Video cameras have clear views of the stern and when combined with a horizon view provide some data that are not typically available to observers such as fish leaving the net from overfull nets (spillage) or rips and tears in the net. These discards can be estimated. Comparisons between the logbook data and the estimates by video reviewers have indicated that CV operators attempt to estimate these events in the discard section of the logbook.

As the net leaves the water and crew begin to pull the zipper to dump catch on deck, the reviewer focuses on the deck and handling of the fish. EM systems are designed to show all areas of the deck so the reviewer will watch multiple streams from various cameras. With the maximized retention requirement the reviewer is watching for fish that are being discarded. In most cases on a pollock CV, there is little handling of the fish. The fish are dumped and flow straight into the refrigerated seawater tanks. In cases of allowable discards, the reviewer will attempt to estimate the weight. The reviewer will note any discards and compare to what was reported in the logbook. Any missing data or large discrepancies are noted in the CV feedback report.

3.2 Vessel Feedback Report

An important component of the Trawl EM design is the vessel feedback report. The vessel feedback reports provide enhanced communication between the agency, EM service providers, video reviewers, and the CV operator. The use of the vessel feedback report helps address data quality or technical issues in a timely manner to reduce loss of data. It also acts as a way to communicate with CV operators on how they can improve data quality by improving their catch handling to result in high quality data.

The primary use of these reports is for education and outreach. Throughout the pre-implementation EFP, most vessel feedback reports do not indicate any issues. The reports with identified data quality or functionality issues resulted in better compliance, usually with little additional outreach from agency staff.

The vessel feedback report has four main sections with multiple elements under each section. These are as follows:

- 1) Reporting issues: vessel feedback on the operation of the EM system. These metrics include hard drive submission in required time period, completeness of the submission, were logbooks submitted with the hard drives and if these logbooks were submitted with all required data elements. This section also confirms the video was recording during all parts of the trip including the offload.
- 2) Functionality issues: vessel feedback on the EM system including if a function test was performed at least two hours before setting gear and identifies any critical malfunctions that occurred and the CV operators' annotations in the logbook concerning these.
- 3) Data quality issues: This section identifies any sensor or time gaps in EM data, and whether the CV complied with catch handling procedures identified in the VMP. This section also identifies any issues with camera views, lighting or other issues that may affect data quality so they can be addressed by EM service technicians and/or the CV operator.
- 4) Catch related issues: This section of the vessel feedback report notes any discards that occurred, whether these were reported accurately in the logbook and that CVs were compliant with the maximized retention requirements.

An example of the vessel feedback report is displayed in Figure 3-1.

Drive Report for Sensor and Video Review

This document summarizes EM data review for the following drive(s). This report may not be inclusive of all EM issues. This report may contain sensitive or confidential information and is intended only for the vessel owner(s), vessel operator(s), or authorized representative(s). If you are not the intended recipient, you may not access this report or share the information with any other unauthorized person, and must immediately destroy all copies. By downloading this document you acknowledge notification of any potential violations of the terms and conditions of the exempted fishing permit.

Report ID:	Vessel Name / Date	Date of Data Set Begin:	10/xx/2020
Vessel Name:		Date of Data Set End:	10/xx/2020
Date of Report:		Date Drive Received:	10/xx/2020
Completed By:		Number of Fishing Trips on Drive:	3
<u>Trip Number:</u>	<u>Return Date:</u>	<u>Fish Ticket Number</u>	
1	10/xx/2020	E20xxxxxx	
2	10/xx/2020	E20xxxxxx	
3	10/xx/2020	E20xxxxxx	

Note this is a sample. The data presented here is not real. It is very rare for multiple events to be reported on a drive report. Most drive reports have at most one category with a note. I grabbed examples from multiple different reports over the year to show how we communicate various issues.

	Event	Present: (Y/N/P/NA)	Comments:
Reporting Issues	Hard drive submitted in the required time period	Yes	
	Hard drive submitted with a complete data set	Yes	
	Logbooks submitted in the required time period	Partial	Trip 2 logbooks submitted late due to internet issues.
	Logbooks submitted complete	Partial	Sample TEXT Trip 2, Haul 2: Rockfish kept for personal use not recorded in the logbook. Please record all personal use in logbook
	Number of trips on hard drive does not exceed maximum trips allowed under vessel's EFP	NO	Drive submitted after 4th trip (3 trips are allowed per vdrive)
	Vessel recording continued through offload	Yes	
Functionality Issues	Pre-Trip Function Test Completed	Yes	
	If a critical malfunction occurred, the vessel stopped fishing until it was resolved or downgraded (Note: they are allowed to complete the haul if gear is already deployed)	N/A	
Data Quality Issues	Sensor and Video Data Complete (No Time Gaps)	Partial	Sample TEXT Trip 1, Haul 6: 3 sensor/video gaps during the beginning of the tow, ~1.5 minutes each. These did not impact review. Trip 2, Haul 4: During the middle of the tow, the system rebooted itself and lost the forward deck camera. This did not impact review as the other views covered what we needed to see. These issues did not occur again for the remaining trips on the drive. There was a note in the logbook that recorded the system reboot and forward deck camera issue.
	All catch handled inside of camera view and consistent with VMP. Camera views are unobstructed, lighting adequate, etc. Ability to identify the species of fish caught and/or discarded or the fate of the catch is uncompromised by image quality	Yes	
Catch-related Issues	All discarding occurred at VMP designated control point	Yes	
	All fish retained other than operational discards, animals larger than 6-ft, unavoidable discards	Yes	SAMPLE TEXT Trip 2 Haul 2: Had a 25,000 lb net bleed/overflow net. Recorded in logbook.
Other Notes:			

Figure 3-1 Example Vessel Feedback Report

3.3 Data Quality/Validation Considerations

EM video reviewers are given specific training and participate in data validation exercises to track the quality and efficacy of our review programs. The training focuses on the goals of the program, methods for data collection and estimation, and proper ways to report or annotate EM data. Estimation of catch on video is less precise than a scale weight and can result in some variation between reviewers. Therefore, data validation exercises are done throughout the year to provide both enhanced training and validate collection methods. In the best practices learned from the EFP program, periodic testing of reviewers and multiple reviewers confirming the identification or weight for certain events helps to ensure precise data reporting. Additionally, review staff working under the EFP were either previously or concurrently certified as groundfish fishery observers or catch monitors (and in good standing), thus having first-hand knowledge of fishery operations and species encountered in the field.

4 Catch, Bycatch, and Effort Information

4.1 Integrating Catch and Bycatch Data into Catch Accounting System

This section outlines how data from the Trawl EM program will be incorporated into the Catch Accounting System (CAS). The purpose of the CAS is to assess the amount and type of total catch and bycatch in groundfish and halibut fisheries off Alaska. Observer information, EM data, dealer landing reports (“fish tickets”), and at-sea production reports are combined to provide an integrated source for fisheries monitoring and inseason decision making. An important aspect of the CAS is to provide near real-time delivery of accurate data for Inseason Management decisions. To meet this objective, data from industry is reported through eLandings and is fed into the NMFS database every half-hour. Data from observers and fixed gear EM are integrated into the FMA database as soon as they become available, and are incorporated into the CAS every night.

The CAS relies on observer data, information from electronic monitoring (EM), production, and landings information to generate estimates of total groundfish catch, including at-sea discards, as well as estimates of Prohibited Species Catch (PSC) and other non-groundfish incidental catch. The estimates of PSC are based on at-sea sampling by observers or data from fixed gear EM. Observer data are used to create PSC rates (a ratio of the estimated PSC to the estimated total catch in sampled hauls). This observed information from the at-sea samples is used to create PSC rates that are applied to unobserved vessels. For trips that are unobserved, the PSC rates are applied to industry supplied landings of retained catch. Expanding on the observer data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of aggregated data (post-stratification). Data are matched based on processing sector (e.g. catcher/processor or CV), week, target fishery, gear, and federal reporting area. A detailed description of the current catch estimation methods was published by Cahalan et al. (2014).

The Trawl EM program combines: maximized retention requirements; EM on 100% of trips for all vessels (both CVs and tenders) in the program; and shoreside observers. The information derived from the video is not used directly in the CAS and instead is available for verification. The data used for management comes from Elandings landing reports or observers in the shoreside processing plants that monitor offload to collect biological data and obtain species composition information and offload data on PSC.

Information on both retained and discarded groundfish on Trawl EM trips come from landing reports. This is true even on partial coverage Trawl EM trips in the GOA where an observer is not selected to sample the offload at the shoreside processing plant. If there is any groundfish that is discarded at sea on the Trawl EM trip, the CV notes this information in their logbooks, provides a discard report to the plant, and the discards are reported on the Elandings landing report. With some species, such as large sharks, the only data collected is with logbooks because vessels are permitted to discard those species. The self-reported discards can be verified via the information derived from the Trawl EM video

review. There is video on 100% of Trawl EM trips in both the BSAI and GOA and video from every trip is reviewed.

On Trawl EM trips where there is a shoreside observer monitoring the offload, they will collect information on the amount of salmon and halibut PSC during the offload. This information will be used to estimate salmon and halibut PSC on Trawl EM trips where there is no offload sampling. Information on other PSC including crab and herring will come from the Elandings landing report. Crab and herring will be sorted at the plant and reported by the plant on the landing report. Observers in the plant will provide some “spot check” verification of the self-reported information. For example, the observer could watch sorting of the crab and herring and verify the counts and/or weights.

Data on non-groundfish (e.g. squid, smelt, prowlfish, etc.) will also come from the landing report. Since many of these species have not been previously reported by all processing plants, outreach to processing plant personnel has been done to encourage them to enter this information on the landing report. In some cases, however, there is lower species resolution than observer data. For example, during the Trawl EFP there were landings that contained smelt and NMFS determined that it was challenging for staff in the processing facility to accurately distinguish between osmerid species of Eulachon, capelin, and surf smelt. To avoid misidentification, shoreside processing plants will report catch of these species under one reporting code – Family Osmeridae. As a result, the catch of species in the group that comes from CVs in the Trawl EM program will be an aggregate estimate for the osmerid group. The stock assessment would rely on data from observers to understand the relative proportions of species within the osmerid group.

Table 4-1 below summarizes the data source that will be used in CAS for the different scenarios in the Trawl EM fishery:

1. Full observer coverage CV delivery with offload sampling: CVs in the BS are in the full coverage category and there will be an offload sampling and salmon census record for all trips.
2. CV delivery shoreside with offload sampling: This category includes partial coverage category CVs that were selected by an observer for shoreside sampling during the offload at the shoreside processing plant. There will be offload data for the trip. This is the same scenario as all the trips in the BS and applies to about 30% of the trips in the GOA.
3. CV delivery shoreside - no offload sampling: This could be a trip that was not selected for shoreside sampling, or a selected trip where we do not have the offload data (i.e. observer was unable to monitor or the offload data has not yet been loaded). This is the scenario for about 70% of trips in the GOA.
4. CV delivery to a tender - offload sampling: This will occur when tender offloads are randomly selected by the observer to be sampled during the tender delivery. All of the catch from the CVs that delivered to the tender will be sampled at the same time. This scenario applies to about 30% of the tender offloads.
5. CV delivery to a tender - no offload sampling: This is the remainder of the tender offloads that are not randomly selected for sampling (~70% of tender offloads).

Table 4-1 Data Sources to be used in CAS

Catch Category	BSAI	GOA			
	Shoreside Deliveries	Shoreside Deliveries		Tender Deliveries	
	Offload Sampling (100%)	Offload Sampling (~30%)	No Offload Sampling (~70%)	Offload Sampling during the tender delivery (~30%)	Offload Sampling during the tender delivery (~70%)
Retained Groundfish	Landing report	Landing report	Landing report	tLanding report for each CV	tLanding report for each CV
Groundfish discarded at sea	Landing report	Landing report	Landing report	tLanding report for each CV	tLanding report for each CV
Salmon PSC	Offload salmon retention counts collected by observer in processing plant	Offload salmon retention counts collected by observer in processing plant	PSC rates from trips where offload sampling occurred are applied to the landing.	Offload salmon retention counts collected by shoreside observer during tender offload	PSC rates from trips where offload sampling occurred are applied to the landing.
Halibut PSC	Offload retention counts collected by observer in processing plant	Offload retention counts collected by observer in processing plant	PSC rates from trips where offload sampling occurred are applied to the landing.	Offload retention counts by shoreside observer during tender offload	PSC rates from trips where offload sampling occurred are applied to the landing.
Other PSC (herring, crab)	Landing Report	Landing Report	Landing Report	Processing plants apportion the catch to tLanding reports for CVs that delivered to the tender	Processing plants apportion the catch to tLanding reports for CVs that delivered to the tender
Non-groundfish (e.g. squid, smelt, prowlfish, etc.) brought back to dock	Landing Report	Landing Report	Landing Report	Processing plants apportion the catch to tLanding reports for CVs that delivered to the tender	Processing plants apportion the catch to tLanding reports for CVs that delivered to the tender

Sharks were identified early on as problematic for CVs to retain and observations made by EM reviewers indicated that CV operators were not able to accurately estimate the weights of large sharks. In addition, it

was identified that some retained sharks were not being reported into Elandings. These issues were discussed among the participants and Dr. Cindy Tribuzio, the lead shark assessment author, was included in solving this issue. The result of collaborative problem solving resulted in new catch handling and reporting requirements for sharks. When CVs encounter large sharks, they are instructed to measure them and report these lengths in their logbook and these lengths will be made available to stock assessors. The new reporting requirement and a length/weight lookup was included in the VMP so that CV operators could translate these measurements into more precise estimates of shark weight that get reported on the Elandings report, resulting in more accurate accounting for shark incidental catch. These large sharks also presented an opportunity to collect data not typically available. Dr. Tribuzio and the industry participants developed protocols to allow collection of biological data from these sharks that may result in new data on sharks in the North Pacific.

During the first year of pre-implementation, jellyfish catch was identified by the industry as problematic for fish quality. When CVs encounter large amounts of jellyfish, it has negative impacts on product quality because jellyfish can clog pumps necessary for efficient fishing operations. The industry participants raised these concerns and asked to be allowed to discard jellyfish. Additionally, both EM reviewers and industry participants indicated that estimating these jellyfish discards was difficult. The agency consulted with the EM reviewers to assess the risk of allowing jellyfish discards. EM reviewers indicated that they could determine if other fish were mixed with the jellyfish so the risk that these discards may provide opportunity for salmon discards was minimal. AFSC stock assessors were asked about the impact of loss of these jellyfish data. It was identified that while some jellyfish data are used in the ecosystem report, the loss of these data collected by observers or the Trawl EM program would not impact current data needs. Currently, jellyfish are allowed to be discarded.

4.2 Timeliness of EM Data

Timeliness of EM data is less of a concern under a compliance monitoring design. Data collected by hard drives needs to be shipped and then enter a queue to be reviewed. Review can occur as early as two weeks after a trip; however, it is more typical for these data to be delayed for a month or more after a trip is completed. Therefore, the design of any EM program needs to assess how EM will affect the timeliness of data necessary for management and stock assessment.

EM data obtained under the Trawl EM Program do not directly feed into catch accounting or stock assessments. The data collected is used to verify reported data. Most data used for management is collected with Elandings. Other data continue to be collected by observers. The Trawl EM program has not affected the timeliness of these data sources; it only affects where these data are collected. Both of these data sources continue to be readily available to managers so there is little to no additional delay in these data due to Trawl EM. If logbook inaccuracies are noted during video review, the larger number will be the one that takes precedence (EM reviewer vs. vessel report).

4.3 Incorporating information into Stock Assessments

A workshop was held on EM data in AFSC stock assessments in September 2021.⁴ Five primary areas of concern for stock assessment were discussed that span all gears (trawl and fixed gear EM):

1. Loss of haul-level information.
2. Biological samples: reduced spatial resolution and/or distribution shifts of sampled fish in a Trawl EM program.
3. Selection bias and getting observers where needed to ensure sufficient at-sea catch weight and biological specimen data are available to support catch estimation and inform stock assessment parameters for the fixed gear EM portion of the fleet.
4. Coordinated effort for authors to voice concerns regarding fishery-dependent data.

⁴ https://meetings.npfmc.org/CommentReview/DownloadFile?p=8f0f7099-3367-49a5-af93-48b03670ab9b.pdf&fileName=EM_data_workshop.pdf

5. Access to data.

Workshop participants noted there are substantial concerns with the changes in the data streams that need to be addressed to ensure that data are collected and processed in a manner that can most effectively be used within stock assessments.

The following sections address these topics as they related to the Trawl EM program.

4.3.1 Haul-Level Effort and Fishing Location Information

Before Trawl EM, at-sea observers collected information about haul times, locations, and size from vessel logbooks and added it to their data. The replacement of at-sea observers by EM systems under the Trawl EM program has removed the ability of stock assessment analysts to estimate haul-level effort (tow duration) from observer data on EM trips. Haul-level information is available from vessel logbooks sent along with the EM hard drives for video review. The self-reported logbook data are keypunched into electronic form by the video reviewers during the EM video review process. The keyed-in haul-level information that is necessary includes:

- Duration of tow
- Location of fishing
- Hail weight of each haul

NMFS is in the process of developing the infrastructure to enable the haul-level logbook data collected during the video review process to be transmitted to NMFS and incorporated into NMFS’ databases so that it is available for analysts. Table 4-2 summarizes how haul-level information will be collected under the Trawl EM program from either the EM system or the vessel logbook.

Table 4-2 Collection of Haul-Level Information

Data element	Data Source
Haul start position	EM system, logbook provides a backup source
Haul retrieval position	EM system, logbook provides a backup source
Haul start date/time	EM system, logbook provides a backup source
Haul retrieval date/time	EM system, logbook provides a backup source
Bottom depth	Vessel logbook
Fishing depth	Vessel logbook
Haul Hail weight	Vessel logbook
Landing Report ID (to link haul-level data to catch estimates)	NMFS database

Since species composition of the catch will be captured in fish ticket data for each trip and estimated at the spatial level of NMFS reporting area, spatially-explicit information on fishery removals is not available and haul-level analytics would be missing (e.g., location or time of day analyses of catch composition data). A potential approach to help analysts evaluate haul-level catch estimates would be to back-apportion fish ticket landings to the hauls within the EM trip. As part of the infrastructure being developed, NMFS could provide these back-apportioned catches, although it will be important to flag these estimates as being different from estimates produced by at-sea observers. Methods will also need to be developed to utilize this information while taking into account its lower resolution and assumptions.

4.3.2 Length Composition and Specimen Data

Length composition data and specimens (i.e. otoliths and salmon genetic information) from the Trawl EM EFP will be collected by shoreside observers for sampled trips (see section 2.5.1 for explanation of observer sampling). The FMA will provide this information to stock assessment analysts and AKFIN. As

mentioned above, the information on catch will be captured in fish ticket data for each trip and estimated at the spatial level of NMFS reporting area in CAS, so spatially explicit information and haul-level analytics of the length composition and biological data would be missing. However, FMA and AKRO would link the observer data collected at the trip-level with the effort and location information from the logbook to enable analysts to evaluate the haul-specific aspects of the trip.

5 Protected Species

5.1 Marine Mammals

The North Pacific ocean supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the order Carnivora, superfamilies Pinnipedia (seals, sea lions, and walrus), Ursoidea (polar bears), and Musteloidea (sea otters), and from the order Artiodactyla, infraorder Cetacea (whales, dolphins, and porpoises). Some marine mammal species are resident in waters off Alaska throughout the year, while others migrate into or out of North Pacific fisheries management areas. Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf, including inshore waters. NMFS maintains management authority for all marine mammal species in the North Pacific and Arctic, except northern polar bears, Pacific walrus, and northern sea otters, which are managed under the authority of the U.S. Fish and Wildlife Service (USFWS).

The Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the Fur Seal Act are the relevant statutes for managing marine mammal interactions with human activities, including commercial fishing operations. The MMPA was enacted in 1972 with the purpose of ensuring that marine mammal populations continue to be functioning elements of the ecosystems of which they are a part. One of the incentives for enacting the MMPA was to reduce takes of marine mammals incidental to commercial fishing operations. While marine mammals may be lawfully taken incidentally in the course of commercial fishing operations, the 1994 MMPA Amendments established a requirement for commercial fishing operations to reduce incidental mortalities and serious injuries (M/SI) of marine mammals to insignificant levels approaching a zero rate, commonly referred to as the Zero Mortality Rate Goal (ZMRG). ZMRG is considered to be met for a marine mammal stock when the M/SI level from all commercial fisheries is 10% or below the Potential Biological Removal level (PBR) of that marine mammal stock (69 FR 43338, July 20, 2004). Likewise, the ESA was enacted to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve such conservation. In practice, the ESA outlines a program to protect endangered species on the brink of extinction and threatened species that are likely to be on the brink of extinction in the near future and pursue their recovery. The ESA also requires designation of any habitat of endangered or threatened species, which is considered to have physical or biological features essential to the conservation of the species and which may require special management considerations or protection.

The FMA provides information to managers on marine mammal direct and indirect interactions with fisheries. The 2021 Observer Sampling Manual explains that the role of observers under the MMPA is to conduct statistically reliable monitoring of fishing operations and to record information on all interactions between fishing operations and marine mammals (AFSC 2021).

Observers are important sources of data for the marine mammal stock assessment reports (86 FR 38991, July 23, 2021 (2020 SARS))⁵ and the List of Fisheries (LOF; 86 FR 3028, January 14, 2021) for compliance with the Marine Mammal Protection Act. Under the restructured Observer Program, NMFS is monitoring the take of all marine mammals in the BSAI and GOA groundfish fisheries and deploys NMFS-trained observers on vessels per the annual deployment plan (ADP).

⁵ <https://media.fisheries.noaa.gov/2021-07/NOAA-TM-AFSC-421.pdf?null%09>

NMFS’s List of Fisheries annually classifies U.S. commercial fisheries into one of three categories according to the level of injury of marine mammals. The Alaska BS pollock trawl fishery was a Category II fishery in 2020 (2021 LOF, 86 FR 3028, January 14, 2021), meaning there is occasional incidental mortality and serious injury (M/SI) of marine mammals. The Alaska GOA pollock trawl fishery was a Category III fishery in 2020 (2021 LOF), meaning there is either a remote likelihood of or no known M/SI of marine mammals in this fishery.

Table 5-1 and Table 5-2 below list the marine mammal species and/or stocks incidentally killed or injured in the BSAI and GOA pollock trawl fisheries (2021 LOF). Of the species that have had documented interactions with the BSAI and GOA pollock trawl fisheries only the bearded seal, Steller sea lion and fin whale are listed under the ESA. The rest of this analysis focuses on these most vulnerable species. For bearded seals, the minimum estimated mean annual level of human-caused M/SI for the portion of the Alaska bearded seal stock in U.S. waters between 2014 and 2018 is 6,709 seals: 1.8 in U.S. commercial fisheries, 6,707 in the Alaska Native subsistence harvest (2020 SARS). Between 2014 and 2018, M/SI of bearded seals in U.S. waters occurred in two of the federally managed U.S. commercial fisheries in the North Pacific monitored for M/SI by fisheries observers: the BSAI pollock trawl and BSAI flatfish trawl fisheries. As noted above, the minimum estimated mean annual M/SI rate incidental to U.S. commercial fisheries between 2014 and 2018 is 1.8 bearded seals, based exclusively on observer data (2020 SARS).

In addition, between 2014 and 2018, M/SI of Western Steller sea lions was observed in 10 of the federally-managed commercial fisheries in Alaska that are monitored for M/SI by fisheries observers: BSAI Atka mackerel trawl, BSAI flatfish trawl, BSAI Pacific cod trawl, BSAI pollock trawl, BSAI Pacific cod longline, GOA Pacific cod trawl, GOA Pacific cod longline, GOA flatfish trawl, GOA rockfish trawl, and GOA pollock trawl fisheries, resulting in a mean annual M/SI rate of 22 sea lions (2020 SARS).⁶ The minimum estimated mean annual level of human-caused M/SI for endangered Northeast Pacific fin whales between 2014 and 2018 is 0.6 whales due to ship strikes. Ship strikes are a known threat for this stock and reductions in sea-ice coverage may lead to range extension and increased susceptibility to ship strikes from increased shipping in the Chukchi and Beaufort seas (2020 SARS).⁷

Table 5-1 BSAI Pollock Trawl Fishery

Marine mammal species and/or stocks incidentally killed or injured	ESA or MMPA Status
Bearded Seal, AK	Threatened, Depleted, Strategic
Beluga Whale, Bristol Bay	None
Beluga Whale, Eastern Bering Sea	Strategic
Beluga Whale, Chukchi Sea	None
Harbor Seal, AK	None
Northern Fur Seal, Eastern Pacific	Depleted, Strategic
Ribbon Seal, AK	None
Spotted Seal, AK	None

⁶ <https://media.fisheries.noaa.gov/2021-08/STELLER%20SEA%20LION%20%28Eumetopias%20jubatus%29%20-%20Western%20U.S.%20Stock.pdf>

⁷ <https://media.fisheries.noaa.gov/2021-08/FIN%20WHALE%20%28Balaenoptera%20physalus%29%20-%20Northeast%20Pacific%20Stock.pdf>

Stellar Sea Lion, Western U.S.	Endangered, Depleted, Strategic
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Table 5-2 GOA Pollock Trawl Fishery

Marine mammal species and/or stocks incidentally killed or injured	ESA or MMPA Status
Dall's Porpoise, AK	None
Fin Whale, Northeast Pacific	Endangered, Depleted, Strategic
Northern Elephant Seal, North Pacific	None
Stellar Sea Lion, Western U.S.	Endangered, Depleted, Strategic

In accordance with the MMPA (16 U.S.C. 1387(e)) and 50 CFR 229.6, any vessel owner or operator participating in a fishery listed on the LOF must report to NMFS all incidental mortalities and injuries of marine mammals that occur during commercial fishing operations, regardless of the category in which the fishery is placed (I, II, or III) within 48 hours of the end of the fishing trip.⁸ “Injury” is defined in 50 CFR 229.2 as a wound or other physical harm. In addition, any animal that ingests fishing gear or any animal that is released with fishing gear entangling, trailing, or perforating any part of the body is considered injured, regardless of the presence of any wound or other evidence of injury, and must be reported.

While EM would not change fishing behavior, trawl vessels would need to continue to comply with existing Federal regulations, which include protections for Steller sea lion rookeries and haulouts. As the western distinct population segment of the Steller sea lion is listed as endangered under the ESA, current Steller sea lion protection measures close much of the Aleutian Islands region to trawling up to 10 or 20 nautical miles offshore from rookeries and haulouts (BSAI Amendment 20 and GOA Amendment 25), with less restrictive zones for hook-and-line and pot gear.

In 2014, NMFS published a final EIS, biological opinion, and final rule to implement modified Steller sea lion protection measures (79 FR 70286, November 25, 2014). The 2014 biological opinion included the following Reasonable and Prudent Measures as necessary and appropriate to minimize the impact of incidental take of western distinct population segment of Steller sea lions (NMFS 2014): NMFS will monitor the take of ESA-listed marine mammals in the BSAI groundfish fisheries. In order for any incidental takes to be exempt from the prohibitions of section 9 of the ESA, NMFS must comply with the associated terms and conditions below, which implement the Reasonable and Prudent Measures:

1. NMFS-trained observers will be deployed on vessels in these fisheries per the Observer Program’s Annual Deployment Plan.
2. NMFS will use observer data to estimate the minimum mean annual mortality for each fishery.
3. NMFS will evaluate the observer coverage to determine if changes in coverage are warranted to better assess take of listed marine mammals.

⁸ Mortality/injury reporting forms and instructions for submitting forms to NMFS can be found at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-authorization-program#reporting-a-death-or-injury-of-a-marine-mammal-during-commercial-fishing-operations> or by contacting the Alaska Regional Office Protected Resources Division (Suzie Teerlink, 907-586-7240). Forms may be submitted via any of the following means: (1) Online using the electronic form; (2) emailed as an attachment to nmfs.mireport@noaa.gov; (3) faxed to the NMFS Office of Protected Resources at 301-713-0376; or (4) mailed to the NMFS Office of Protected Resources (mailing address is provided on the postage-paid form that can be printed from the web address listed above). Reporting requirements and procedures are found in 50 CFR 229.6.

5.1.1 Comparison of Alternatives

None of the alternatives would change the management of the fisheries, the location of the fisheries, fishing effort, or the marine mammal protection measures in place. Spatial and temporal concentration effects by these fisheries, vessel traffic, gear moving through the water column, or underwater sound production, which could affect marine mammal foraging behavior, would not be affected by the proposed action. Significant incentives for compliance with marine mammal protection management measures, such as area closures, would remain in place under all of the alternatives. In addition, NMFS would have to examine how these alternatives meet the requirements of the 2014 biological opinion since they rely heavily on observers and the data they collect.

The FMA reports mammal interactions to AFSC Marine Mammal Lab staff and estimates are made independent of the CAS.

Under Alternative 1, NMFS is now placing observers on trawl vessels. Observers record –

- number, marine mammal species identifications, and types of interactions with marine mammals;
- number, species identification, length, photographs, tissue samples, and disposition (dead, released alive, etc.) of marine mammals caught in the gear; and
- associated marine mammal incidental take or interaction location, date and time, gear type, catch composition, fishing depth.

Alternative 1 would leave observer coverage in place and data collected by observers would continue according to status quo. In addition, the terms and conditions of the 2014 biological opinion would continue to be met.

Under Alternatives 2 and 3, trawl vessels would be able to carry EM instead of an observer. Under either EM alternative, however, the ability to gather tissue samples would cease, because vessels do not have the appropriate authority under the MMPA to collect those samples. Only the NMFS observers have this authority. EM cameras would be set up to view deck activity, the stern ramp, and a horizon view to capture discards from the net during haulback, but there would be no side cameras to look for marine mammals in the area. Video reviewers would not be looking for marine mammals unless they see interactions with fishing gear. In addition, samples taken to gather data on marine mammal prey would be lost, as well as photo identification of whale flukes, which observers take when the opportunity is present. Other information such as injuries, specimen length, and disposition may not be able to be accurately recorded. EM would not provide the same types of data on interactions with marine mammals and may decrease the gains made in collecting data on marine mammal interactions in the fishery.

Under Alternatives 2 and 3, cameras would be able to record dead marine mammals coming on board the vessel, but would be unable to record animals that fell off the gear prior to coming on board or being entangled in gear. Two humpback whale interactions with trawl gear were recorded during the Trawl EM EFP (#2019-03) in 2021, and the video from the cameras was used to identify them. However, because no observer was onboard, no biological samples or identification photos were taken.

With regard to the 2014 biological opinion, at-sea observers would no longer routinely be deployed once EM is in place. However, EM monitoring would be deployed on 100% of EM designated trips and would be used to estimate the minimum mean annual mortality of Stellar sea lions. In some cases, NMFS may need to evaluate the configuration of the EM system on the vessel to determine whether changes in camera views are warranted to better assess take of listed marine mammals.

5.2 Seabirds

North Pacific waters support extremely large concentrations of seabirds. Over 80 million seabirds are estimated to occur in Alaska annually, including 40 to 50 million individuals from the numerous species that breed in Alaska (Table 5-3; USFWS 2009). An additional 40 million to 50 million individuals do not breed in Alaska but spend part of their life cycle there. These include short-tailed and sooty shearwaters and three albatross species: the black-footed albatross, the Laysan albatross, and the endangered short-tailed albatross (Table 5-3; USFWS 2009).

As noted in the Final Programmatic Supplemental Environmental Impact Statement (PSEIS) on the Alaska Groundfish Fisheries (NMFS 2004 and 2015), seabird life history includes low reproductive rates, low adult mortality rates, long life span, and delayed sexual maturity. These traits make seabird populations extremely sensitive to changes in adult survival and less sensitive to fluctuations in reproductive effort. The problem with attributing population changes to specific impacts is that, because seabirds are long-lived animals, it may take years or decades before relatively small changes in survival rates result in observable impacts on the breeding population.

Table 5-3 Seabird Species in Alaska

Type	Common name	Status	Type	Common name	Status
Albatrosses	Black-footed		Guillemots	Black	
	Short-tailed	Endangered		Pigeon	
	Laysan		Eiders	Common	
Fulmars	Northern fulmar			King	
	Shearwaters	Short-tailed		Spectacled	Threatened
Sooty				Steller's	Threatened
Storm petrels	Leach's		Murrelets	Marbled	
	Fork-tailed			Kittlitz's	
	Pelagic			Ancient	
	Red-faced		Kittiwakes	Black-legged	
	Double-crested			Red-legged	
Gulls	Glaucous-winged		Auklets	Cassin's	
	Glaucous			Parakeet	
	Herring			Least	
	Mew			Whiskered	
	Bonaparte's			Crested	
	Slaty-backed		Terns	Arctic	
Murres	Common		Puffins	Horned	
	Thick-billed			Tufted	
Jaegers	Long-tailed				
	Parasitic				
	Pomarine				

The PSEIS identifies how the BSAI groundfish fisheries activities may directly or indirectly affect seabird populations (NMFS 2004 and 2015). Direct effects may include incidental take (lethal) in fishing gear and vessel strikes. Indirect effects may include reductions in prey (forage fish) abundance and availability, disturbance to benthic habitat, discharge of processing waste and offal, contamination by oil spills, presence of nest predators on islands, and disposal of plastics, which may be ingested by seabirds.

The impacts of the North Pacific groundfish fisheries on seabirds were analyzed in the Harvest Specifications EIS (NMFS 2007) which evaluated the impacts of the alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. The focus of this analysis is similar, as any changes to the groundfish fisheries in the BSAI could change the potential for direct take (death) of seabirds. Potential changes in prey availability (seabird prey species caught in the fisheries) and disruption of bottom habitat via the intermittent contact with non-pelagic trawl gear under different levels of harvest are examples of indirect effects on seabirds and are discussed in NMFS (2007). However, prey

availability changes could also be closely associated with changes in seabird take levels. Therefore, all impacts to seabirds are addressed by focusing on potential changes in seabird takes (direct effects).

Of particular concern is the impact on seabirds listed under the ESA. Three species of seabirds are currently listed as either threatened or endangered; the endangered short-tailed albatross (*Phoebastria albatrus*), the threatened Alaska-breeding population of Steller's eider (*Polysticta stelleri*), and the threatened Spectacled eider (*Somateria fischeri*). In 2021, NMFS completed reinitiation of formal consultation under section 7 of the ESA with USFWS to ensure that the BSAI and GOA groundfish fisheries are not likely to jeopardize the continued existence of endangered short-tailed albatross, threatened spectacled eider, or threatened Alaska-breeding population of Steller's eider or adversely modify the designated critical habitat for either eider species. There is no designated critical habitat for the short-tailed albatross. The reason for this reinitiation was the take of the two eider species due to vessel collision. Prior to 2019, there had been no reported takes of either the spectacled eider or the Alaska-breeding population of Steller's eider by vessels operating in Federal fisheries off Alaska. However, in October of 2019, twenty-two spectacled eider fatally collided with a demersal longline vessel. Then, in March of 2020, one Steller's eider believed to be from the Alaska-breeding population, fatally collided with a fishing vessel in the trawl groundfish fishery of the BSAI. The vessel strike was recorded on the vessel's electronic monitoring system and the mortality was reported by the vessel captain to USFWS using the Threatened and Endangered Bird Species Encounter and Reporting Form (found at <https://www.fisheries.noaa.gov/alaska/bycatch/seabird-avoidance-gear-and-methods>). Neither of these vessels were actively engaged in fishing at the time of the bird strike mortality events.

In March of 2021, the USFWS finalized a new Biological Opinion (USFWS 2021) which superseded the 2015 Biological Opinion (USFWS 2015). In their 2021 Biological Opinion, USFWS concluded that the GOA and BSAI groundfish fisheries are not likely to jeopardize the continued existence of the short-tailed albatross, spectacled eider, or the Alaska-breeding population of Steller's eider; nor are they likely to result in the destruction or adverse modification of critical habitat of the spectacled or Steller's eider. In their 2021 Biological Opinion, USFWS anticipates take of up to six short-tailed albatross bi-annually (every 2 years); up to 25 spectacled eider every 4 years; and up to 3 Steller's eider from the Alaska-breeding population every 4 years in the BSAI and GOA FMP areas using hook-and-line or trawl gear (combined). These incidental take limits apply starting in 2021. The 2021 Biological Opinion left in place most of the conservation measures that were specified in the previous 2015 Biological Opinion but did add new recommendations for vessel lighting. The 2021 Biological Opinion stipulates that NMFS will recommend that 1) to the maximum extent practicable vessels will minimize the use of external lighting at night and avoid the use of sodium lighting and other high-wattage light sources, except when necessary for vessel and crew safety and 2) all lights should be angled or shielded downward toward the surface of the water, except when necessary for safe vessel operation.

Trawl-induced seabird mortality is difficult to quantify because birds that strike the cables may fall into the water and go unobserved (Dietrich and Melvin 2007, NMFS 2020, Zador and Fitzgerald 2008). When discussing seabird bycatch attributed to trawl gear, it is important to remember that standard observer sampling does not account for all seabird mortality. This discussion focuses only on the numbers reported, which were generated from the standard observer sample, i.e., birds caught in the codend part of the net and brought aboard the vessel. A number of efforts are underway at AFSC to better understand the amount of cryptic mortality related to trawl vessels and how to properly extrapolate that to provide a fleet-wide estimate.

Seabird bycatch related to trawl gear (CV and C/P combined) constitutes about 11% (range 4 to 24%) of the overall estimated 2011 through 2020 seabird bycatch (Krieger and Eich 2021). As seabirds fly and forage around vessels, they can become entangled in trawl gear or strike a vessel cable or the vessel itself. Seabirds are attracted to the catcher vessel's trawl net when it is being set and retrieved. There may also be some discard of whole fish as decks and equipment are washed or fish spill overboard while the

codend is being emptied. Fishing mode and other vessel-related attributes also affect seabird attendance. One component of an North Pacific 2002 pilot electronic monitoring study indicated that bird attendance around CV's was infrequent or low during towing operations and was high only during setting or hauling of the net, while the net was on the surface (McElderry et al. 2004).

5.2.1 Comparison of Alternatives

Under Alternative 1, seabird bycatch estimates are produced using a ratio estimator in the NOAA Fisheries Alaska Region CAS. Methods are provided in Cahalan et al. (2014) with additional description specific to seabirds provided in Krieger and Eich (2021).

The majority of observed seabird bycatch in fisheries occur in the hook-and-line fisheries; however, small numbers of seabird bycatch have been observed in trawl and other fisheries. Observer protocols are not set up to monitor trawl fisheries in the same way that hook-and-line are monitored. Trawl bycatch is difficult to quantify (NMFS 2015, Fitzgerald et al. in prep). Less than 3 percent of the total estimated seabird bycatch from trawl fisheries (all targets) from 2011 through 2020 occurred on CVs (203 birds; Krieger and Eich 2021). When looking specifically at seabird bycatch estimated for BSAI pollock trawl CVs from 2016 through 2020, total bycatch was estimated to be 13 birds (annual average of 3 birds per year) (Table 5-4). No seabird bycatch was estimated for GOA pollock trawl CVs from 2016 through 2020.

Table 5-4 Seabird Bycatch (Number of Birds) Estimated for BSAI Pollock Trawl CVs. Data Source: NOAA Fisheries Alaska Region Catch Accounting System (CAS)

Species/Species Group	2016	2017	2018	2019	2020	Grand Total	Ann Avg.
Northern Fulmar	6	3	0	0	0	9	1
Shearwaters	0	0	0	0	1	1	2
Murre	3	0	0	0	0	3	0
Total	9	3	0	0	1	13	3

No take of short-tailed albatross or spectacled eider have ever been documented in the BSAI or GOA groundfish fishery when using trawl gear (AFSC 2014, Krieger and Eich 2021). However, in March of 2020, one Steller's eider believed to be from the Alaska-breeding population, fatally collided with a fishing vessel in the trawl groundfish fishery of the BSAI that was participating in the Trawl EM EFP. The vessel was not fishing at the time of the collision. The vessel strike was recorded on the vessel's EM system and, as required in the VMP, the mortality was reported by the vessel captain to USFWS.

The changes to the Observer Program proposed under Alternatives 2 and 3 are not expected to affect current rates of interaction. No changes in the indirect effects of fisheries on prey (forage fish) abundance and availability, benthic habitat as utilized by seabirds, and processing of waste and offal, all of which could affect seabirds, are expected under the alternatives.

The amount of seabird bycatch is not expected to change under Alternatives 2 and 3. The only difference between Alternative 1 and the action alternatives is the reporting of seabird bycatch. EM systems would record seabird interactions however, due to camera angles, cameras are not able to see all of the same parts of the vessel the same way as an observer. However, given that seabird bycatch can happen at any time, including when vessel crew and observers are not located in a particular area of the vessel or are asleep, camera footage may provide more coverage. EM systems are able to accurately record seabird species with crew instructed to hold the birds up to the camera for identification. Additionally, since seabirds are relatively small, it is reasonable to expect that the majority of them would make it to the processing plant with the rest of the catch. Information on seabirds delivered to the processing plant could be collected by observers as long as the carcasses were made available to them. Under all of the

alternatives, if no observer is onboard, vessel owners or captains are instructed to report any ESA-listed seabird injury or mortality immediately to NMFS (1-800-853-1964 or 907-586-7228) or to the USFWS using the *Threatened and Endangered Bird Species Encounter and Reporting Form* (found at <https://www.fisheries.noaa.gov/alaska/bycatch/seabird-avoidance-gear-and-methods>).

In contrast to the situation with marine mammals, under all of the alternatives if no observer is onboard, the 2021 Biological Opinion states that unidentified albatross and eider carcasses should be retained for future identification, or, at minimum, pictures documenting the species should be taken for verification, a report will be filled out, and the carcass processed as detailed below:

1. Three photos should be taken: one of the front with wings outstretched; one from the back with wings outstretched; and one of the head and beak, preferably near a measurement board or other reference of size for the beak.
2. A report of the threatened and endangered species encounter should include the name of the person making the report, name of the vessel (optional), date of encounter, time, coordinates, photographs, species, cause of death or injury, if known, and any other pertinent information. The report may be made on the USFWS *Threatened and Endangered Bird Species Encounter and Reporting Form* (found at <https://www.fisheries.noaa.gov/alaska/bycatch/seabird-avoidance-gear-and-methods>).
3. If an observer is not on board, a verbal report should be called-in and a written report will be made out as described above and the carcass immediately frozen, or kept as cold as possible. Due to the rarity of these species, every effort should be made to salvage the carcass. The carcass should be labeled with the vessel name, latitude and longitude, assumed cause of death, and the numbers and colors of any leg bands (leg bands should be left attached). If unable to keep the carcass, take photos and provide the information described in numbers 1 and 2 above. A report should be submitted using the USFWS *Threatened and Endangered Bird Species Encounter and Reporting Form* (found at <https://www.fisheries.noaa.gov/alaska/bycatch/seabird-avoidance-gear-and-methods>).

Given that overall takes of seabirds in this fishery are relatively uncommon and because this action is not expected to result in changes to the timing and persecution of the fishery, the effects on seabirds under any of the Alternatives are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA and ESA documents.

6 Next Steps

There is no specific action or decision making associated with this preliminary review. The purpose is to provide early communication and seek feedback from the SSC regarding concerns about data types, quality, availability and priorities. Decisions regarding specific, unresolved program design elements will occur at later review stages. Any action to move forward with the proposed management change to establish a Trawl EM program would require a National Environmental Policy Act analysis and a Regulatory Impact Review. An initial review draft (including NEPA/RIR analysis) is scheduled for review at the June 2022 Council meeting.

7 References

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