

# **BERING SEA AND GULF OF ALASKA PELAGIC POLLOCK ELECTRONIC MONITORING EXEMPTED FISHING PERMIT**

**Report to the North Pacific Fishery Management Council**

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## **Part 1. Introduction**

Believing that the use of electronic monitoring (in lieu of onboard human observers) for compliance purposes will achieve a cost effective, adaptable, consistent, reliable, and sustainable fishery data collection program and strategy that takes advantage of current and emerging technologies, Bering Sea (BS) and Gulf of Alaska (GOA) pelagic pollock fishery participants have been interested in assessing the efficacy of electronic monitoring (EM) for monitoring compliance with a full salmon PSC retention requirement and in identifying key decisions related to operationalizing EM. In January 2020, an Exempted Fishing Permit (EFP) was approved by the National Marine Fisheries Service (NMFS) to help determine whether utilizing camera systems in lieu of human observers proves both cost effective and operationally effective for monitoring of catch and discards per North Pacific Fishery Management Council (Council) and NMFS requirements. To fully test the feasibility of EM aboard pollock trawl catcher vessels for compliance monitoring, the EFP provides exemptions for participating vessels from current regulations related to onboard observer coverage and vessel discard requirements. This report provides a summary (through April/May 2021) of the BS and GOA Pelagic Pollock Trawl Electronic Monitoring EFP.

### *Goals of Electronic Monitoring*

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

- Objective 1. Improve salmon accounting – to provide stable salmon accounting against the PSC hard cap for WGOA and CGOA pelagic pollock trawl catcher vessels as well as the salmon PSC performance standard for BS pelagic pollock catcher vessels.
- Objective 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 catcher vessels.
- Objective 3. Improve overall monitoring data for catch accounting and compliance – to explore innovative methods to account for PSC species and bycatch species that have the potential to limit participation in the pollock program, which requires high retention of catch; to explore innovative methods to account for protected species; and to achieve more comprehensive coverage.
- Objective 4. Examine current regulatory retention and discard requirements as necessary to achieve Objectives 1-3 – given existing IRIU and 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.

### *Goals of the Exempted Fishing Permit*

To facilitate the Council's objectives for EM in the BS and GOA pollock trawl catcher vessel fisheries, the EFP and its requested exemptions were necessary in order to demonstrate that current compliance monitoring needs for the BS and GOA pollock fisheries can be achieved via EM aboard vessels and that necessary biological data collection requirements for the target species can be shifted to observers at shoreside processing plants. To this end, the following specific EFP objectives were outlined in the EFP application and derived from the Council's overarching objectives contained in its 'Cooperative Research Plan':

- Objective 1. Demonstrate that maximized retention can be achieved in pollock trawl catcher vessel fisheries.
- Objective 2. Demonstrate that at-sea observers can be replaced with observers at shoreside processing plants such that data needs and data streams for effective fisheries management are maintained.
- Objective 3. Demonstrate that EM camera systems can adequately capture discard events (when they occur) and that video data can be used to verify vessel logbook discard information for compliance monitoring purposes.
- Objective 4. Improve salmon bycatch accounting for catcher vessels, especially for those delivering to tender vessels, through the use of EM camera systems that will enable shoreside observers to collect salmon bycatch census data.

The EFP is intended to gauge improvements in compliance monitoring through detection of discard events and providing more accurate discard estimates. In addition, the EFP indirectly supports improved salmon accounting in the portion of the GOA fleet that delivers to tenders, primarily in the WGOA. EM is seen as the first step towards replacing at-sea samples with census counts for deliveries to tenders (whereas deliveries to shoreside processors have always been censused for salmon by observers).

### *Participation Summary*

The EFP encompasses two separate pollock EM projects: one involving catcher vessels delivering to shoreside processors in the BS and (primarily Central) GOA and the other involving catcher vessels delivering to tender vessels and shoreside processors in the Western GOA [see Attachment A: EFP permit]. During the 2020 fishing year, the BS-GOA project successfully engaged a total of 29 pollock catcher vessel stakeholders (10 Bering Sea only vessels, 8 GOA only vessels, and 11 vessels that fish in both areas) in utilizing EM camera systems onboard their respective vessels while also deploying shoreside observers to eight processing plants in the BS and GOA to monitor deliveries from EM vessels. During the 2020 fishing year, the WGOA project successfully engaged a total of 27 vessels: 16 pollock catcher vessels (10 WGOA only; 6 WGOA and CGOA) and 11 tender vessels that utilized EM camera systems; of the 11 tender vessels, 8 were deployed with mobile EM systems (MBS). Shoreside observers were deployed to one processing plant that monitored deliveries from EM vessels. Vessel Monitoring Plans for all vessels engaged in EFP fishing included the following elements: (a) Vessel lay-out and description of cameras along with their positioning and function; (b) Description and configuration of all EM sensors; (c) Installation summary that gets updated with any changes made to equipment or camera positions; and (d) Operator responsibilities pre-trip, during a trip, and at the end of a trip including timely transfer of data to the third-party video reviewer and specific instructions on what to do in the event of equipment malfunction.

While the EFP began in January 2020, the two EM projects were initiated in 2019 with participating vessels carrying human observers (per specified area regulations) while also utilizing EM camera systems. This pilot work allowed for initial feasibility testing of EM systems aboard pelagic pollock catcher vessels and tender vessels.

For the 2021 fishing year, the BS-GOA EM project includes 52 vessels participating in the EFP, an increase of 23 vessels from 2019/2020. Additionally, ten shoreside processing plants are participating in 2021 compared to eight in 2019/20. For the WGOA project, 18 catcher vessels and at least 11 tender vessels will be installed, a total of 29 vessels (increase of 2 catcher vessels). It is anticipated that a similar number of vessels and one shoreside processor will actively fish under the EFP.

### *Reporting Requirements*

The EFP requires the PIs to provide summary reports to the Trawl EM Committee, the Council, and NMFS, as appropriate, for the project. Summary reports include EM metadata (e.g., number of drives, trips, and hauls reviewed), reports of discards (from both vessel logbooks and EM), and summaries of any equipment issues, malfunctions or data quality issues. The EFP application included nine metrics to gauge the success of EM for Compliance Monitoring. These metrics were suggested by the PIs in their EFP application and were approved by the Council in October 2019 and NMFS in January 2020. For purposes of this report, the summary reporting requirements from the permit are embedded in the metrics reports (versus being reported separately).

## **Part 2. Approved Metrics for Gauging the Success of EM for Compliance Monitoring**

The nine approved metrics for gauging the success of EM for pelagic pollock compliance monitoring are shown below. The metrics have been edited slightly from the original application to make them more concise and clearer. Additionally, given the overlap and connectivity between A1 and A2, these two metrics are reported on together in Part 3, Section A below.

- A. 1. Electronic monitoring equipment reliability and malfunctions (EM Objectives 1 and 3).  
Strategic placement of EM camera equipment aboard pollock catcher vessels is intended to provide unobstructed, uninhibited, and unencumbered views of an individual vessel's entire fishing operation. While equipment malfunctions are to be expected, especially when operating in the often-harsh environmental conditions of the North Pacific, the EFP team will be tracking the number and type of EM equipment malfunctions that occur. EM systems that are not functioning properly result in missing video data. Consistent malfunctions, requiring time and resources to address, will negatively impact the reliability of these systems for their intended use of compliance monitoring.
- A. 2. Functionality of vessel feedback loop between vessel operators and the EM service provider and third-party reviewer (EM Objectives 1, 2, and 3). An important subset to the overarching metric above relates to protocols for effective communication between a vessel operator and the EM service provider/third party reviewer. Such feedback provides notice to a vessel that their equipment is working as intended and/or highlights any problems encountered or areas of concern that may need to be addressed. EM service providers develop individual Vessel Monitoring Plans in conjunction with a vessel operator, pre-trip and at-sea Malfunction Tables, and a Frequently Asked Questions (FAQ) document to help guide operators through commonly encountered EM system issues. Additionally, technicians are available to vessels operators via email and phone communications at any time to answer questions and/or provide technical help. The EFP team will be monitoring the frequency and type of communications that occur, including how any system malfunctions encountered were addressed. Consistent malfunctions require money to address, which would negatively impact the overall costs associated with the use of EM; however, successful communications should be able to reduce the negative monetary and data impacts associated with system malfunctions.
- B. Discrepancies between vessel logbook and video discard estimates (EM Objective 3). Catch accounting for all retained target, incidental, and PSC species will occur via shoreside observers and the generation of fish ticket data from the shoreside processing facility. Discard estimates generated from review of the EM data will be used to verify discard data entered by the skipper into a vessel's logbook, which is included on the fish ticket data generated at the shoreside processor. Where discrepancies occur, the EFP team will be tracking the number of occurrences

and the scale of the occurrence to ensure reliability of vessel logbook data for precise catch accounting data and reporting improvements by operators due to the vessel feedback loop by the third-party reviewer (i.e., vessel operators address needed corrections to provided logbook information based on EM reviewer feedback).

- C. Cost metrics between EM and at-sea human observers (EM Objective 2). Based on the Alaska fixed gear EM Program, costs associated with EM encompass EM service provider project coordination; third-party data review, processing, and analysis; EM equipment services; and EM technical services. These costs will be compared with the daily human observer rate for the full coverage catcher vessels in the BS and the partial coverage observer costs for catcher vessels in the GOA.
- D. Changes in vessel fishing behavior due to a relief from current discard requirements (EM Objective 4). Removing discard requirements associated with defined PSC species, Maximum Retainable Amounts (MRAs) of incidentally caught species, and the GOA pollock trip limit will result in maximized retention pollock fisheries in the BS and GOA. The EFP team will be tracking whether there is an increase in the number of BS and GOA deliveries with MRA overages of incidentally caught species and significant increases in the amounts of PSC species (other than salmon) for the EM participating vessels compared to other EM vessels/ non-EM vessels within the pollock fleets. In addition, the EFP team will be tracking GOA vessel's trips with pollock deliveries significantly in excess of the 300,000 lbs. trip limit over for a single trip and over a series of trips on average. A vessel performance standard will be developed to ensure that GOA catcher vessels are not continually in excess of the 300,000 lbs. trip limit on average such that if a vessel receives warning and if they continually violate the performance standard they will lose their EFP privileges. In addition, performance standards for both the BS and GOA will be evaluated for MRAs with similar consequences for poor vessel behavior. A significant seasonal increase in these variables, when compared to historical trends, could be indicative of a change in a vessel's incentives for avoiding and/or minimizing catches of all non-target species and staying within the pollock trip limit. Examining vessel incentives under current discard requirements (including the identification of those species and instances where discarding is operationally difficult and costly) and comparing them to realized incentives when discard requirements are relaxed will help to inform regulations for maximized retention pollock fisheries in the BS and GOA.
- E. Impacts to shoreside monitoring (EM Objectives 1, 2, 3 and 4). Replacing vessel observers with EM systems will impact offload monitoring by the vessel observer at shoreside processing facilities. In the AFA fishery (BS) there will no longer be a vessel observer to move into the shoreside processor to assist the shoreside observers with offload monitoring duties. In the GOA, vessel observers move from the catcher vessel into the shoreside processor to conduct census counts of salmon. If these observers are not available no salmon census accounting would occur. In both cases additional dedicated plant observers are necessary. The EFP team will track the time and costs associated with placing an additional human observer to the processing plant for PSC accounting and general catch monitoring (e.g., ensuring that catch is properly sorted; that required biological samples are taken; and that fish tickets are completed accurately).
- F. Impacts to tendering operations (EM Objectives 1, 2, 3, and 4). Currently, tender vessels do not have monitoring requirements and they require enough operational flexibility to maintain current practices that maximize efficiency. For example, tenders are capable of accepting catch from multiple fisheries and management areas, they may accept a partial delivery to maximize capacity, or they may rapidly change participation in a fishery. For the purposes of this EFP, tenders are required to adhere to specific rules that ensures the chain-of-custody is maintained and salmon census is not negatively impacted. The EFP team will track if any EFP trips were negatively affected (i.e., trip unable to count under the EFP), and the frequency and type of tender operations or practices that were negatively impacted and/or modified due to EFP adherence. The

intent of this metric is to evaluate if EM can be used effectively on tenders, without hindering operational efficiency.

- G. Impacts to the current collection of biological samples for pollock (EM Objectives 3 and 4). Replacing vessel observers with EM systems will impact the collection of biological samples of the target pollock species taken onboard a catcher vessel. If those biological samples taken onboard a vessel by the human observer are not replaced, this could negatively impact the collection of information used in stock assessments; therefore, these samples would need to be collected at the shoreside processing plant. The EFP team will track the time associated with the duty of collecting these samples at the shoreside processing facility. In addition, the EFP team will compare the current amount and level of pollock biological information as it is used in the BS and GOA stock assessments with the level of pollock biological information collected at a shoreside plant (e.g., number of otoliths, sex, length frequency, trip by trip level information from a plant vs. haul-by-haul level information aboard a vessel). From that comparison, the EFP team can evaluate the deployment of shoreside observers and the need for maintaining current vessel biological data collection protocols (e.g., biological samples taken onboard a vessel vs. at a plant) for preserving or enhancing the precision of pollock stock assessments.
- H. Impacts to marine mammal monitoring (EM Objectives 3 and 4). Currently, vessel observers record interactions, collect specimens, and record sightings of marine mammals. The collection of this physical biological data could be negatively impacted by the removal of vessel observers. Given the current status of marine mammal interactions with pollock CVs in BS and GOA, the EFP team will work to identify the types of marine mammal information EM data can provide as well as the potential impacts to marine mammal management by the removal of vessel observers. The EFP team will also work to identify if there are types of information/samples currently collected by an observer that could potentially be collected by a vessel crew member.
- I. Challenges in meeting the terms of the EFP (EFP Objectives 1, 2, 3, and 4). To be identified as they occur during the course of the proposed EFP.

Table 1. EFP Evaluation Metrics

| Council Objective | Category  | Metric   |
|-------------------|---|--|
| 1, 3              | A.1. Electronic monitoring equipment reliability and malfunctions   | # and type of EM equipment malfunctions  |
| 1, 2, 3           | A.2. Functionality of vessel feedback loop between the vessel operator and the EM service provider/third party reviewer | Frequency and type of communications<br>How system malfunctions encountered were addressed   |
| 3                 | B. Discrepancies between vessel logbook and video discard estimates   | # and scale of occurrences<br>Comparison to 2019 observer estimates from Pilot Phase   |
| 2                 | C. Cost metrics between EM and human observers  | Cost comparison of EM vs. human observer onboard a vessel  |
| 4                 | D. Changes in vessel fishing behavior due to a relief from current discard requirements                                 | # of occurrences and amount of significant changes in deliveries of: MRA species; PSC species (other than salmon); trips in excess of 300,000 lbs (in GOA) |
| 1, 2, 3, 4        | E. Impacts to shoreside monitoring  | Time and cost of additional shoreside observers  |
| 1, 2, 3, 4        | F. Impacts to tendering operations  | # of EFP trips affected (unable to count as EFP)<br># operations changed to accommodate EFP vessels  |
| 3, 4              | G. Impacts to the current collection of biological samples for pollock  | Time associated with shoreside pollock sampling responsibilities<br>Comparison of current vs. EFP shoreside biological data collected                      |
| 3, 4              | H. Impacts to marine mammal monitoring  | Identify what data EM can provide<br>Identify potential impacts to management  |
| 1, 2, 3, 4        | I. Challenges in meeting the terms of the EFP   | To be identified   |

### Part 3. EFP Metrics Summary Results

#### A. Electronic monitoring equipment reliability and malfunctions and functionality of vessel feedback loop

##### a. Bering Sea and Gulf of Alaska Project

##### *Equipment Reliability and Vessel Malfunction Reporting Overview*

Throughout 2019, 2020 and into 2021, Archipelago Marine Research (AMR or Archipelago) served as the EM service provider for the participating pollock catcher vessels under the EFP. (Saltwater served as the service provider for eight of the new vessels participating in 2021. Equipment issues related to these vessels are captured in the WGOA project summary below; however, summary stats related to data drive reports are included in this section). The EFP requires that vessels report all EM equipment issues to their EM service provider. To facilitate this reporting, Archipelago offers three methods for vessels to report the issues:

1. A 24-hrs support line with both voice and text options;
2. A Technical support email address; and
3. A WhatsApp number for voice and text messages.

Archipelago logs and tracks all in-season vessel-initiated contacts (calls, email, and text messages) that are either program procedures and EFP requirements or that are initiated by the vessel to report equipment issues or malfunctions when they are encountered. For reporting purposes, these vessel-initiated contacts are grouped into one of three contact types:

1. **Procedural/EFP Requirements** – These represent in-season contacts that were regarding the EFP and program requirements and would include the following examples: problems meeting logbook submission timelines; needing to schedule repairs during an offload; issue encountered during a function test; and reporting camera recording abnormalities related to software function (system reboots/temporary system power loss).
2. **Malfunctions (no service required)** – This type of contact represents calls to report issues that were either intermittent and resolved by the EM system software, or issues that were able to be resolved by the crew working directly with remote phone/email support from the Archipelago service team.
3. **Malfunctions (service required)** – These reported issues were not able to be resolved by either the EM system software or through remote support, and therefore required a scheduled technician service (in either Kodiak or Dutch Harbor) to resolve the issue.

Figure 1 provides a summary of the percentage of contacts that were received for each of the three contact types, and includes all contacts received during the 2020 season and the 2021 season to date (up to April 15<sup>th</sup>).

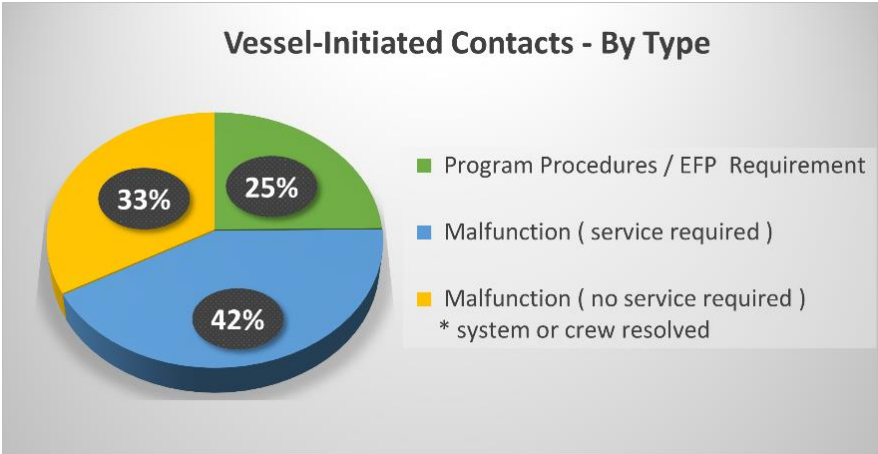


Figure 1. Percentage of contact types received by AMR January 2020 through April 15, 2021.

The contacts received demonstrates that vessel operators are doing a well with reporting equipment issues that are encountered for both issues that are system or crew-resolved and, also those that require a technician service event. The contact volume also demonstrates that vessel operators are being diligent with reporting issues that may affect their adherence to the program procedures and EFP requirements.

Under the EFP, vessel operators are required to report all equipment issues or malfunctions that are encountered. The issues need to be reported either from the dock prior to trip departure if the vessel is in port at the time the issue occurs, or from sea if the issue occurs after the vessel has departed port. The graph below (Figure 2) summarizes the number of in-season issues directly related to EM equipment issues that were reported by either the vessel operator, or by the Pacific States Marine Fisheries Commission (PSMFC) following the data review. This figure summarizes the reported issues for the complete 2020 season and also includes those trips reviewed for the 2021 season up to April 15<sup>th</sup>.

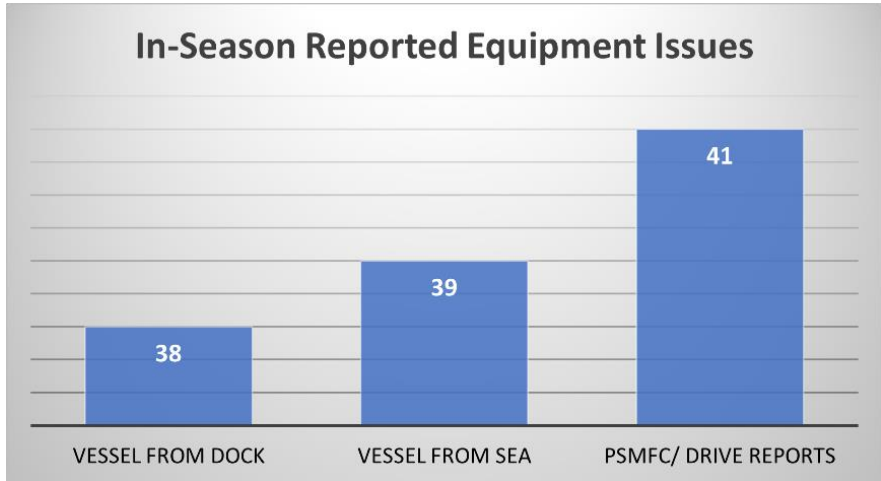


Figure 2. In-season reported EM equipment issues by source January 2020 through April 15, 2021.

It should be noted that several issues reported on the PSMFC drive reports were the same issues reported by the vessels either from sea or from the dock. While most equipment issues encountered at the dock are generally resolved prior to trip departure and would therefore not necessarily have been noted during data review, the close correlation between the issues reported from sea and those noted on the drive reports is a good indicator that vessels are doing well at reporting issues when they occur, and also noting these issues in their logbooks as well.

The following graph (Figure 3) shows the in-season vessel reported equipment issues summarized by the component causing the issue. For reporting purposes, equipment issues were classified by component type in this graph only when it was possible to confirm which specific hardware component or software component was the root cause of the issue:

- Cameras – Camera issues generally result in video gaps on individual cameras or across multiple cameras. Some of these video gaps are short in duration (< 5 minutes) and others may be considered long in duration (> 5minutes). It should be noted that many of these reported issues were resolved with a system reboot and did not necessarily require any work to be done on the cameras themselves.
- Sensors – Hydraulic pressure and drum rotation sensors are used to activate video recording and are also used to automate the annotation of both setting and hauling events in the data review software. Inconsistent performance or failure of a hydraulic pressure or rotation sensor can result in video data loss if the vessel does not initiate manual recording in the event of a failure, and may slow down data review if their signatures are not present within the sensor data
- PoE Switch – Provides ethernet connection and power to all cameras. Failure of a PoE switch results in video loss across all cameras that are connected to that switch.
- Software Configuration – Software configurations have common elements across all vessels and some elements that need to be specifically adjusted to a particular vessel’s operations. While the required adjustments to the software configurations are not actually component malfunctions, they can result in some loss of data or inconsistency with EFP data collection requirements until they are properly adjusted.
- Other – These instances summarize issues with the removeable data drives, system power loss events, keyboard or monitor failure and system cabling damage.

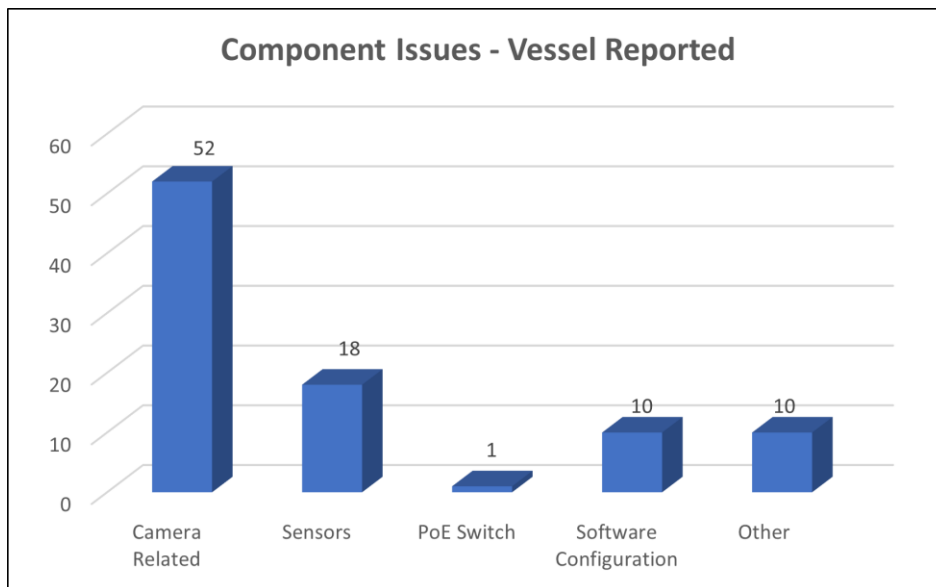


Figure 3. EM component issues as reported by vessels January 2020 through April 15, 2021.

The majority of the identified issues in the figure above are camera related and this is typically a reflection of the higher number of cameras per vessel in relation to the other system components. Most systems onboard pollock catcher vessels have between four and six cameras per system, therefore the instances of reported camera issues will always trend on the higher side in relation to the other system components. It should be noted that many of these reported issues were resolved either by a system watchdog (automatic system reboot) or crew intervention with a manual reboot of the system and did not actually require a technician service or replacement of the camera. Camera mounting locations have also



been carefully selected to capture the required imagery and, when possible, to provide some overlap or redundancy between camera views so that if an issue occurs with a single camera the overlapping camera view is sufficient to capture the required imagery and does not result in any data loss. The second highest reported issue category is related to the sensors. Vessels use a combination of hydraulic pressure sensors and drum rotations sensors to detect setting and hauling of the gear and activate the camera recording. The majority of vessels are equipped with a primary and a backup secondary hydraulic pressure sensor. The installation of the primary and secondary hydraulic sensors allows for redundancy so that if the primary sensor fails, the backup will provide the required camera activation trigger in order to prevent any video data loss. The software that runs on the EM control center also has a manual recording icon that allows the vessel operator to initiate manual recording at any time, including when a faulty or incorrectly configured sensor might not automatically initiate the video recording.

As an overall general conclusion, the EM systems and peripheral equipment are performing very well and on par with other EM programs in terms of the number and types of equipment issues being encountered. While ongoing equipment issues that will need to be addressed can be expected, having these issues promptly reported by vessel operators is a key factor to ensuring they get addressed in a timely manner that limits the amount of data loss. We have seen a high level of compliance from vessel operators with reporting issues when they have occurred, and this has been a key factor in the overall high rate of data capture that we have seen to date and expect to continue to see into the future.

#### *Feedback Loops and Drive Report Summary Overview*

Feedback loops between the PSMFC data review team, Archipelago, and the vessel operators are a key educational component to the program; they help ensure that issues are being understood by all parties and that they are being addressed and resolved in a timely manner. The primary tool that is being used for the full feedback loop between all parties is the drive report that is completed for each data drive reviewed by PSMFC. Under the EFP, at the conclusion of the data review, a drive report summarizing any issues (or lack thereof) is emailed out to the EFP project team, select NMFS representatives, and to the vessel contacts. [see Attachment B: PSMFC Data Drive Report Template] The information and general trends that can be seen in the drive reports can be used to provide some basic metrics on the type and frequency of issues that are being encountered, but they also serve as an educational tool to help inform/remind operators of the EFP requirements and to help drive behavioral change when necessary.

To summarize metrics from the drive reports and for general reporting purposes, drive report issues are categorized into five main reporting categories that are very closely aligned with the categories used by PSMFC on the actual drive reports. The five main reporting categories we used are as follows:

1. Catch Issues – This category includes items related primarily to catch handling/sorting (all discards occur at VMP documented control points), reporting of discards and fish retained for use onboard, and adherence to EFP requirement for retention of all catch other than allowable discards.
2. Data Quality – This category includes reporting on items related to sensor and video data completeness, as well as catch being handled within camera views, camera views unobstructed, lighting adequate for review, and overall image quality sufficient to determine fate of all catch.
3. Function Tests – This summarizes whether the EFP function test requirement was met. This documents if a function test was performed prior to either the trip departure (pre-2021 season) or at least two hours prior to gear deployment (2021 season).
4. No Issues – This is used to categories drive reports that had no reported issues at all.
5. Vessel Reporting Requirements – This category is used to summarize issues related to EFP requirements for hard drive and logbook data submission timeframes (within 24 hours of landing), logbook completion requirements, maximum allowable trips on a data drive not exceeded (3 trips max), and offload video recording completeness.

Figure 4 below provides an overview of the number of issues for each of the five main reporting categories that were reported on by PSMFC for all drive reports for the 2020 season and for the 2021 season up to April 15<sup>th</sup>. The instances reported in this figure are based on drive report instances and are not specific to individual trips contained within a given hard drive (drives contain more than one trip). For example, if all three trips on a drive had the same issue, this would only be logged as one instance of that issue for that data drive. Additionally, if a single drive had multiple issues across different categories (e.g., both reporting requirements and function test issues) an instance of each issue type was recorded for that drive report.

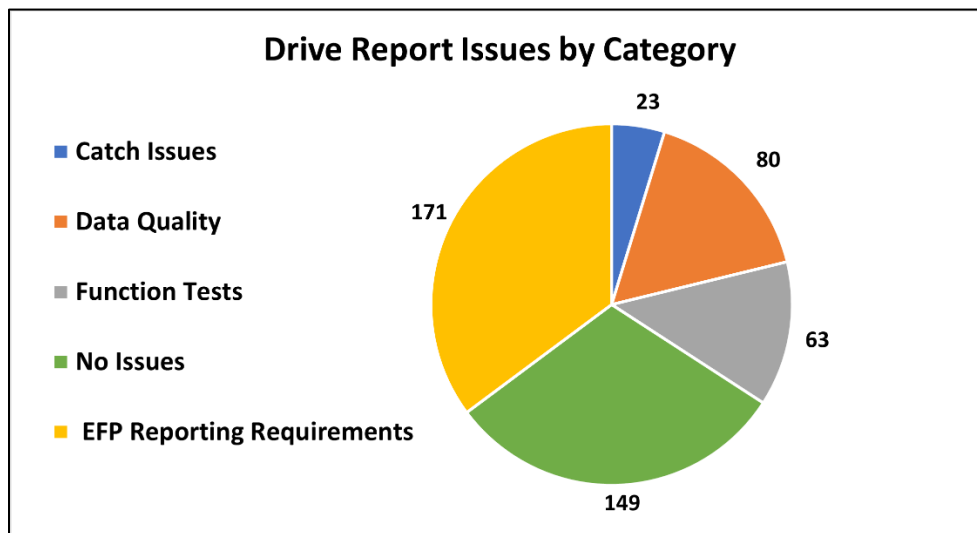


Figure 4. Primary issues reported on Data Drive Reports January 2020 through April 15, 2021.

It is positive that a significant portion of the drive reports (149) contained no issues at all. The other two categories that had significant numbers of reported instances were Data Quality and EFP Reporting Requirements. To get a better understanding of some of the trends we are seeing in these two categories and how they may affect the overall program data collection goals, these two categories are broken down into smaller categories subtypes for review.

Figure 5 takes the Data Quality issues from the previous figure and breaks them down by the following issue subtypes that best represent the majority of occurrences:

- Video Gaps (major) – This category includes reported video gaps that occurred during fishing operations or during the offload and therefore affected data review.
- Video Gaps (minor) – This category includes reported video gaps that occurred outside of fishing/offload events and therefore did not affect data review.
- Data Gaps (long) – These are data gaps (sensor and video) that exceeded five minutes in length.
- Data Gaps (short) – These are data gaps (sensor and video) lasting less than five minutes in length and are typically a result of a system watchdog reboot, or crew intervention to exchange a data drive.
- Delayed EM system Power On – These includes instances where the EM system was not powered on prior to the vessel leaving the dock. Many of these include instances where the EM system was powered on prior to setting gear while the vessel was headed to the fishing grounds.
- Catch Handling – These are primarily instances where small amounts of catch were not processed in view of the cameras or were taken outside of camera view (typically for onboard use).

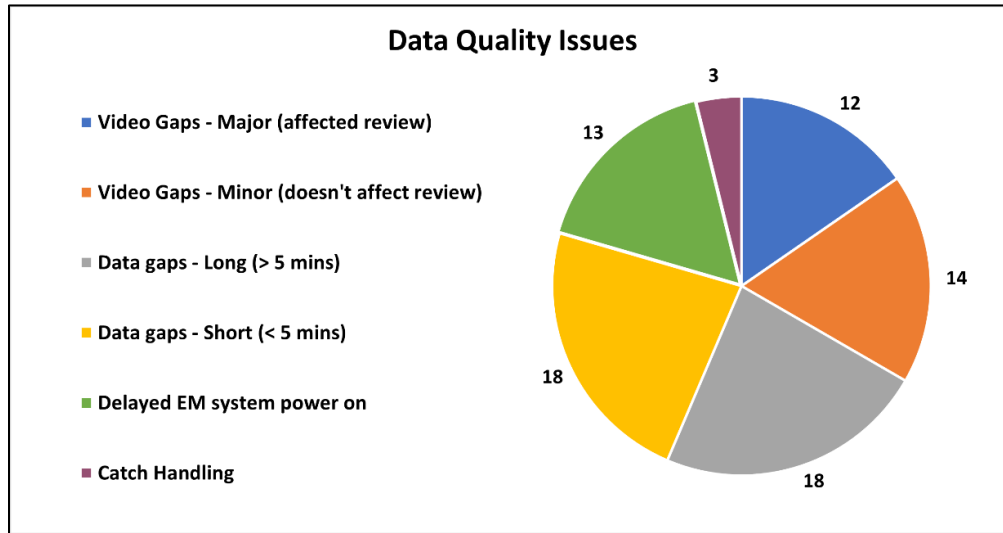


Figure 5. Breakdown of EM data quality issues January 2020 through April 15, 2021.

In general, the number of data quality issues that are being documented on the drive reports are relatively low in comparison to the overall number of drives that have been reviewed (see Section B below). Many of the video and data gaps classified as major in this reporting will have already been reported by the vessel operator and will have already been resolved prior to the data review being completed. The delayed system power on and catch handling issues reported are typically seen when vessels are new to the EM program, and the reminders that are provided on the drive reports have been effective at educating the vessel operators and crew on the program requirements such that the behavior is corrected following the initial drive report feedback.

The largest reporting category where there have been the most reported issues on the drive report is in the EFP Reporting Requirements Category. This category is broad and generally covers the vessel's EFP reporting responsibilities for proper logbook documentation, submission timelines for logbook data and submission of the EM data drives, and requirements for video recording throughout the offload.

Figure 6 summarizes the vessel EFP Reporting Requirements, which includes the following issue sub-categories:

- Delayed drive submission – EM data dives are required to be submitted within 24hrs of landing after completion of the 3<sup>rd</sup> trip.
- Delayed log submission – Logbooks data not submitted to PSMFC within the EFP required 24 hours of trip landing.
- Drives with More than Three trips –The EFP allows for a 3- trip maximum limit before submitting data drives.
- Incomplete offload recording– EFP requirement is for one or more specified cameras to be actively recording for the entire offload
- Logbook recording errors – Some discard event or discard species were not properly recorded in the vessel logbook.
- Missing Logbook or page(s) – Some logbook data or portion of the logs were not submitted
- Missing offload recording – There was no offload video recorded for a trip(s).

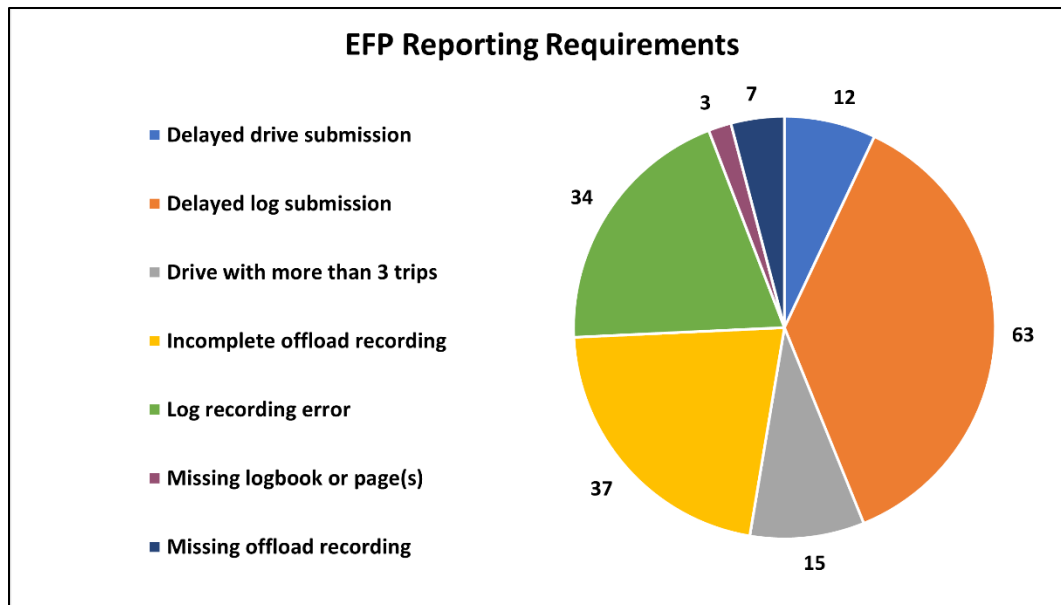


Figure 6. Issues encountered regarding EFP reporting requirements by participating vessels January 2020 through April 15, 2021.

The highest instances of issues for the EFP reporting requirements were related to the logbook requirements. While there were very few instances of logbooks not being submitted at all, there were a high number of delayed submissions where the logbooks were not submitted to PSMFC within 24 hours of trip landing. Some of the delayed logbook submissions we know are due to poor communication or transmission capabilities in some of the Bering sea ports (no access to wi-fi or poor/no cellular data connection). When reviewing the incomplete offload recording instances, it should be noted that the requirement for the offload recording changed after the 2020 season. In 2021, the requirement for having the entire offload recorded was amended to allow for a short (15 minutes max) gap in the recording in order for the vessel operator to facilitate a data drive exchange on the third trip landing. On several of the drive reports for 2021, it was noted that the entire offload was not recorded but that the remainder of the offload may be present at the beginning of the next submitted data drive. For this reason, the instances of offloads not being fully recorded is likely artificially high for the 2021 season drive reports.

b. Western Gulf of Alaska Project

*Equipment Reliability and Vessel Malfunction Reporting Overview*

Throughout 2019, 2020, and into 2021, Saltwater Inc. served as the EM service provider for the 31 vessels operating under the EFP in the WGOA. In 2021 Saltwater Inc. also acted as the EM service provider for eight of the vessels in the Bering Sea and Gulf of Alaska project. Equipment issues related to all of these vessels are summarized in this section. The EFP requires that vessels report all EM equipment issues to their EM service provider.

Saltwater logs and tracks all vessel-initiated contacts (calls, email, and text messages). For reporting purposes communications with vessels are classified into four categories:

1. Program Assistance - Vessels needed help with participation in the overall program. (Ex: questions on how to log EM trips in ODDS, filling out logbooks, etc.)
2. EM System Assistance - Vessels had questions about or needed assistance using their EM system (Ex: Knowing when their hard drive is full, how to perform a system check, etc.)
3. Reporting EM System Issue - Vessels initially reporting a system issue or malfunction (Ex: Notifying technicians of an error message on the system)
4. EFP Issue - EFP Program compliance issues (Ex: discarding salmon, etc.)

Figure 7 summarizes all vessel-initiated contacts in 2020. Nearly 70% of the vessel-initiated communications concerned questions about, or a request for assistance with, EFP rules and overall program participation. By comparison calls requesting assistance with the EM system like a reminder of how to swap out a hard drive represented 13.2% of the total calls. Calls reporting EM system issues like my GPS is down represented only 11.3% of the total calls. Calls about EFP compliance issues including questions about how to fill out the logbook represented only 5.7% of calls.

Participant Communication

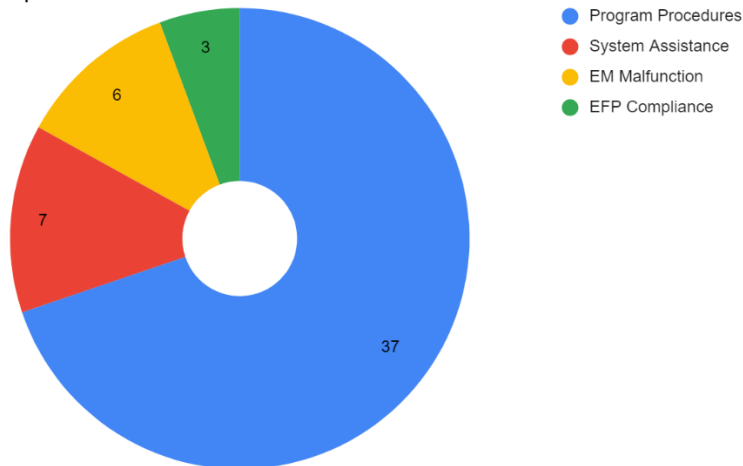


Figure 7. Participant communications during the WGOA pollock trawl fishery in 2020.

Frequent communications between the vessels and the EM service provider are a key part of the success of this program and highlight the fleet’s commitment to both reporting issues and following the EFP requirements and program procedures. It also underlines the importance of this ongoing communication.

In addition to reports from skippers, Saltwater tracks equipment issues with system performance checks, and through review of the data from each trip. This information is relayed to the vessel, Saltwater’s technicians, and the project PIs on a per vessel and per trip basis through detailed Feedback Forms that include pictures and comments on problems. Saltwater distributed 271 Feedback Forms in 2020. This tight feedback loop between the vessel operators and Saltwater’s technicians and review team allows system or data issues to be resolved swiftly and efficiently.

Most EM system issues were able to be resolved remotely and did not require a service call to the vessel. Saltwater technicians provide extensive training to vessel operators as the EM systems are installed, so by the time a problem arises most can be resolved with a phone call. A small subset of EM system issues required particular system components to be replaced (Figure 8). Over half of the issues identified in the figure below are camera-related which reflects the high number of cameras per EM system relative to the number of sensors or computers per EM system. It also reflects an unusual manufacturer defect in camera hardware in 2020 that led to the replacement of 22 cameras. Most of these cameras were replaced prior to failing onboard the vessel, so data was not affected. Overall, the EM systems performed very well with minimal loss of data throughout 2020.

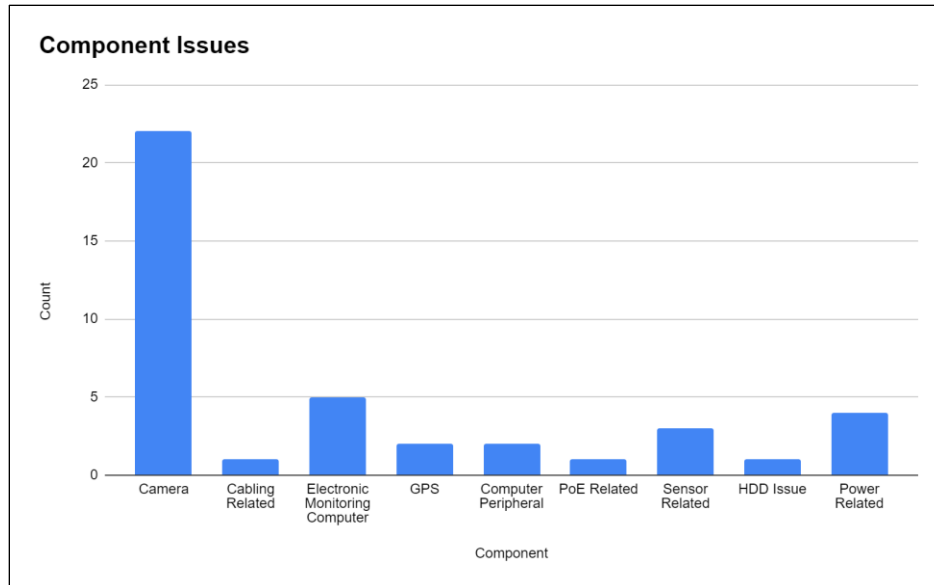


Figure 8. EM Components Replaced in WGOA fleet in 2020.

### *Feedback Loops and Review Overview*

#### *Catch Issues*

During the review of each trip, reviewers assessed and reported all catch handling issues including discards away from VMP discard control points, handling catch outside of the camera views, and retaining catch other than allowable discards per the EFP requirements. Catch handling issues were communicated to the vessel operators and the PI after each trip via a detailed Feedback Form. The most common issue seen was vessels discarding outside of the designated discard areas listed in their VMP. Prior to the EFP, vessels could essentially discard from any point on the vessel and are now being asked to only discard catch at certain points. It takes time for crews to incorporate a new behavior into their established routines, and reminders via Feedback Forms helped crews be more mindful of where they were discarding catch. These constant reminders not only kept vessels in compliance with EFP requirements, but also improved the data.

A second notable issue was the discard of catch not allowed under the EFP. Reviewers observed skates which can cause an issue with pumps during offloads and sharks under 6 feet in length being discarded by crew members. In the case of a salmon discards, Saltwater immediately notified participants and the PI of the compliance issue via Feedback Form, email, and/or phone. Participants were reminded of the regulations stipulating that all salmon must be retained and delivered. Throughout 2020 the EFP group discussed whether additional organisms could be considered an allowable discard.

#### *Data Quality*

This category includes reporting on items related to video and sensor data: completeness and usability of video and sensor data; assessment of video imagery and camera views (proper camera angles, exposure settings, unobstructed views, adequate lighting, and image quality factors (Figure 9) such as water spots and improper camera cleaning); and catch handling occurring in view of the cameras. Reviewers assess the completeness and usability of video and sensor data including GPS, hydraulic sensors, rotation sensors, and video on a trip-by-trip basis. All instances of missing or erroneous sensor and/or video data which affect review are recorded and reported to vessel operators in the Feedback Forms. Reviewers report whether current cameras views and image quality are sufficient to monitor compliance and also to identify and estimate discards. The reports detail whether camera views should be adjusted or if cameras

need to be maintained or cleaned more frequently. Reviewers report whether the crew is handling catch in view of the cameras so that species and disposition of catch can be properly identified.

Total Image Quality Factors

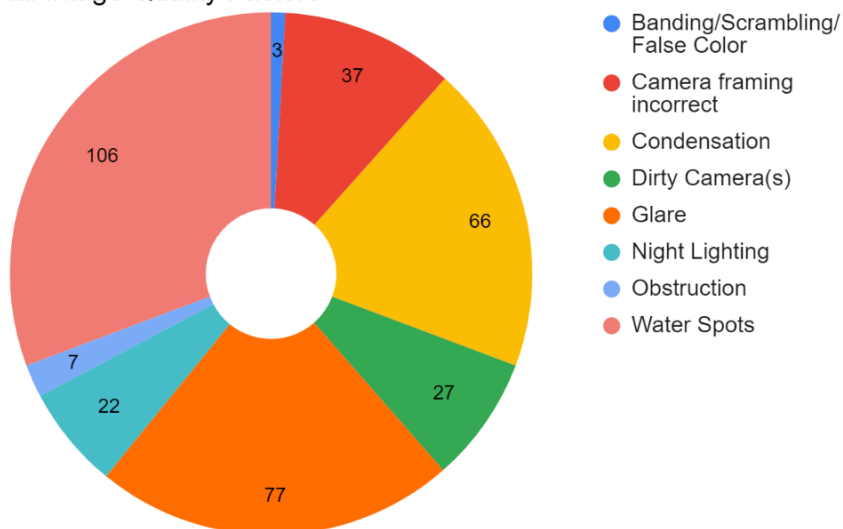


Figure 9. Occurrences of image quality issues broken down by category for 2020.

All 271 trips were reviewed for data quality in 2020. Reviewers reported catch to be complete for 94.2% of catcher vessel hauls, 97.0% of catcher vessel deliveries to tenders, and 77.9% of offloads for both catcher vessels and tenders. Offloads had the lowest level of completeness due to systems being turned off, recordings ending due to power loss, or intermittent gaps in camera recordings. Notable issues reviewers observed in 2020 were the need to adjust camera views to better monitor discards off the stern and to ensure reviewers could see areas of the decks and tank hatches. Reviewers reminded crew to regularly clean the cameras and worked closely with vessels and technicians to improve vessel camera views. Throughout 2020 and into 2021, reviewers observed a continual increase in the care, maintenance, and cleaning of cameras by vessel operators.

#### Function Tests

The EFP requires vessel operators to perform a function test of the EM system prior to departing for a trip (2020), or at least two hours prior to setting gear (2021). During 2020 reviewers recorded two main issues regarding function tests. Vessels regularly performed system function tests, but tests were sometimes done after the vessel had already left port for a trip. Most vessels performed the system function test prior to setting gear, so this is not of concern in 2021. Reviewers also observed some vessels completing system performance tests once per hard drive rather than once per trip. In some instances, we believe this relates to the confusion regarding the definition of a “trip” for catcher vessels delivering to tender vessels. Reviewers communicated to vessels via Feedback Forms when system performance tests should be performed (before leaving for the trip in 2020) and worked with the EFP group to iron out the definition of a trip, which should help resolve these issues. To date, no issues have been observed for 2021.

#### Vessel Reporting Requirements

During 2020 reviewers assessed and reported on a variety of data submission and EFP reporting requirements, some of which are unique to the WGOA fleet:

1. Tender vessels accepting EM catch may only record one trip on a hard drive, and submission of both the associated logbook and the hard drive must be submitted to the Saltwater review office

within 24 hours of landing. Tenders must also submit copies of the logbooks from the catcher vessels to the shoreside processor.

2. For a participating catcher vessel delivering to a shoreside processor, up to three trips may be recorded on a hard drive within that fishing season if there is appropriate storage. A copy of the logbook must be submitted to the processor at the time of offload for each trip, and the logbooks associated with the trips on the hard drive must be submitted to the Saltwater review office within 24 hours of landing the final trip for that hard drive.
3. Catcher vessels delivering to tender vessels may record a maximum of three trips per hard drive if there is enough storage available on the hard drives, and fishing has not exceeded two weeks from the start of the first trip recorded on the hard drive. A copy of the logbook for each trip must be submitted to the tender vessel accepting their catch at the time of offload, and the catcher vessel operator must ensure any sharks pulled out at offload are reported on the logbook. The catcher vessel must also submit all associated logbooks with the hard drive to the Saltwater review office within 24 hours of landing the last trip recorded on the hard drive.

There were issues in consistently meeting all of these requirements during 2020. The main issues reviewers reported were logbook submissions and errors in discard reporting. Throughout the fishing seasons reviewers worked with vessels via Feedback Forms that provided comments, instructions, and screenshots highlighting errors to assist vessels in properly recording logbook information. There was a considerable increase in the submission of logbooks in 2020 compared to 2019, and an improvement in both the completion and correctness of logbook documentation. Data submission and reporting requirements have been updated for 2021. For example, catcher vessels delivering to tender vessels are now required to submit their data within one week from the start of the first trip recorded on the hard drive. Reviewers will report on the vessels' adaptation to these programmatic changes, and efforts will continue to assist vessels in reporting and data submission through meetings, instructional materials, and Feedback Forms. Further improvements are anticipated with the implementation of the eLog and data portal in 2021.

Overall, the review of EM data has underscored a consistent improvement in vessel participation and efforts to ensure compliance with EFP requirements that aid in the collection of high-quality data for management purposes. We anticipate that all vessels will continue to improve in the categories previously summarized.

## B. Discrepancies between vessel logbook and video discard estimates

### a. Bering Sea and Gulf of Alaska Project

Throughout 2019, 2020, and 2021, the Pacific States Marine Fisheries Commission served as the third-party video reviewer for all EM hard drives submitted by participating vessels [see Attachment D: PSMFC video review protocols.]

In 2019 a total of 584 pollock trips comprising 1,445 pollock hauls were reviewed. Because fish tickets weren't being used in 2019 (vessels were still carrying observers), there is not a straight-forward way to match up logbooks and EM data. Additionally, not all pollock EM data was reviewed from 2019 since it was non-EFP fishing and reviewers were facing other time constraints.

In 2020 EM hard drives were received from 24 vessels in the Bering Sea and 17 vessels in the Gulf of Alaska (Table 2). These vessels completed 773 trips, with logbooks available and matched for 756 of these trips. Of the trips without paired logbook data, 14 were missing logbooks (all were from 2 vessels), two had a mismatch between the fish ticket number entered with the e-log and what was given to PSMFC, and one had a split landing between two fish tickets.



Table 2. Summary of EM participation in the Alaska pollock fisheries by region, 2020, and the availability of logbook data for these same trips.

| Region         | All EM Pollock Data |       |       | EM Pollock Data with Logbooks |       |
|----------------|---------------------|-------|-------|-------------------------------|-------|
|                | Vessels             | Trips | Hauls | Vessels                       | Trips |
| Bering Sea     | 24                  | 527   | 1843  | 24                            | 518   |
| Gulf of Alaska | 17                  | 246   | 573   | 16                            | 238   |

Discards were compared between EM and logbook records at the trip level. For these comparisons, most species were grouped together by total weight, although large organisms were evaluated separately (see information below). Additionally, a few logbooks reported discards of species that were not required to be reported and that would not have been reported by EM reviewers (e.g., jellyfish) so these were excluded from analysis. While discard events recorded by the EM reviewers were higher in 2019 than those seen and recorded in 2020 (attributed to the fact that participating vessels began fishing under the EFP in 2020, which allows for exemptions from regulatory discard regulations), the majority of discards seen by EM reviewers were small (<100 lbs.; Figure 9) whether the discard occurred on-deck (allowable discards including small amounts of catch cleaned from the net or deck and unavoidable discards resulting from events beyond the control of the vessel as well as non-allowable discards) or the discard occurred before the net reached the deck (e.g., net bleeds). Overall, logbooks reported greater discard volume than EM reviewers (Table 4; Figure 10); however, even the higher logbook estimates only totaled approximately 555,000 lbs. over 756 trips across both regions (an average of 734 pounds per trip). Some EM and logbook estimates were quite similar, but it was also relatively common to have a small or medium sized discard reported by either EM or the logbook with no discards reported on the other. On some occasions, reviewers noted issues with the camera set-up (e.g., glare on the video or camera malfunctions) that might lead to discrepancies with the logbook. Additionally, some discrepancies could be attributed to net cleaning events where EM reviewers did not see or record these events except during the rare occurrence where the net cleaning occurred during hauling/sorting activity. There were also many trips with no discards reported by either EM or logbook (256 trips representing 34% of trips).

Table 3. Comparison of EM and logbook discard volume in the Alaska pollock trawl fisheries for those deliveries where both data sets are available, 2020. On-deck discards include all discards after the net has come on the deck. Total discards include both the on-deck discards and net bleeds or other discards occurring prior to the net coming on deck.

| Region         | Vessels | Trips | Hauls | Total EM Discards (lbs) | On-deck EM Discards (lbs) | Total Logbook Discards (lbs) |
|----------------|---------|-------|-------|-------------------------|---------------------------|------------------------------|
| Bering Sea     | 24      | 518   | 1,798 | 375,493                 | 235,943                   | 335,552                      |
| Gulf of Alaska | 16      | 238   | 556   | 177,079                 | 66,680                    | 219,578                      |

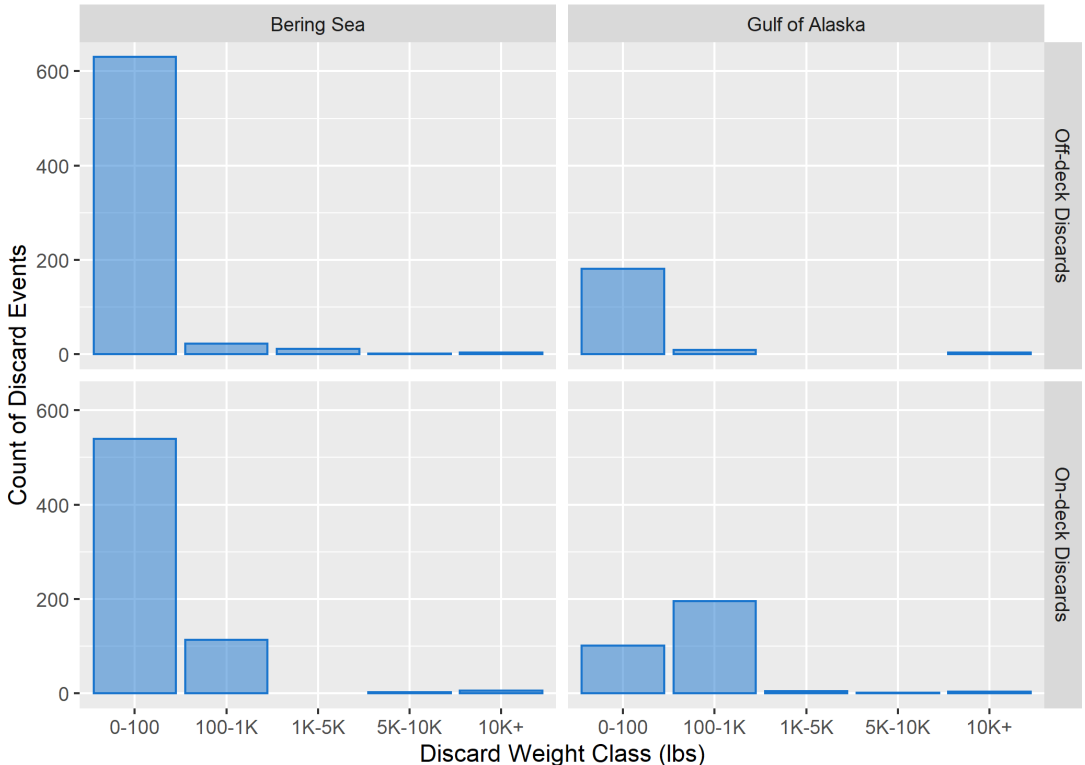


Figure 10. Sizes of EM discards by individual discard event in the Alaska pollock trawl fisheries, 2020.

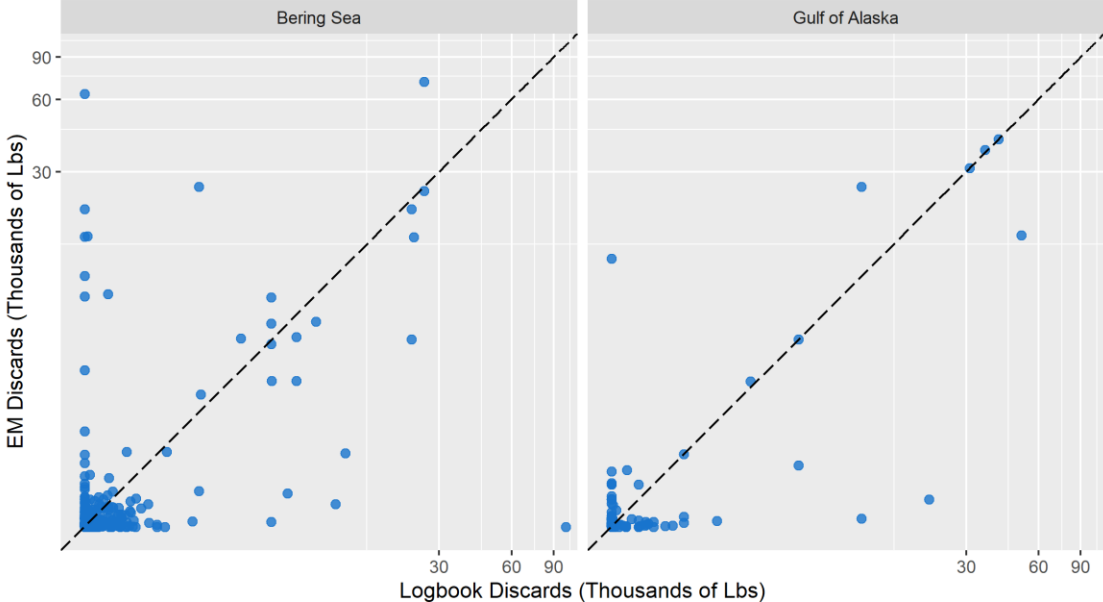


Figure 11. EM versus logbook estimates of discards by delivery in the Alaska pollock trawl fisheries, 2020. Each data point represents a sum of discards for one trip (518 trips for the Bering Sea, 238 for the Gulf of Alaska). The dashed line represents a 1:1 relationship so a perfect match of EM and logbook data will fall on the dotted line. Points above the line indicate the EM estimate was higher while points below the line indicate the logbook estimate was higher. Note that data is shown on log-2 scaled axes so that smaller discards can be better visualized.

Logbooks reported a total of 70,144 pounds of shark discards while EM reported a total of 116,812 pounds of shark discards. During the second half of the 2020 fishery, sleeper shark and salmon shark length/weight tables were provided to vessels and PSMFC. Vessels were instructed to measure and record the length of these sharks on their logbooks. Some vessels only estimated the shark weight, whereas other vessels used the length/weight chart for their weight estimate. During the second half of 2020, PSMFC estimated length for discarded sleeper and salmon sharks, and used the length/weight chart for the review discard estimate. Counts were not consistently reported on logbooks, but EM reviewers reported a total of 141 individual shark discards. EM reviewers recorded two salmon of unidentified species as fate ‘unknown’. These salmon were taken out of view of the cameras by crew and were not seen retained in the hold or discarded. No logbooks reported discarded salmon.

In addition to reviewing at-sea video footage, PSMFC reviewed the offloads of participating vessels. For the BS, the total haul review time was 141.4 hours while the offload review time was 194.3 hours. Thirty trips had discards during or after offload totaling 3,193 lbs. Of these discards, 80% (2,557 lbs.) were 10 large-species sharks. For the GOA, the total haul review time was 49.1 hours while the offload review time was 63.2 hours. Twenty-seven trips had discards during or after offload totaling 13,065 lbs. Of these discards, 95% (12,387 lbs.) were 31 large-species sharks. For both regions the discards/separate catch removed from the hold at the dock were primarily sharks, but some discards included a mix of pollock, unidentified fish, and skates.

In 2021, looking only at trips reviewed through April 15<sup>th</sup>, there have been 32 vessels in the Bering Sea and 14 vessels in the Gulf of Alaska (Table 4). These vessels completed 262 trips, with logbooks available and matched for 261 of these trips. The missing logbook was from a vessel that typically submits e-log data, but the data were not available from AKFIN at the time of this report writing (it is anticipated the data will be available later in the year).

Table 4. Summary of EM participation in the Alaska pollock fisheries by region, 2021, and the availability of logbook data for these same trips. Only EM trips reviewed by April 15<sup>th</sup> are included.

| Region         | All EM Pollock Data |       |       | EM Pollock Data with Logbooks |       |
|----------------|---------------------|-------|-------|-------------------------------|-------|
|                | Vessels             | Trips | Hauls | Vessels                       | Trips |
| Bering Sea     | 32                  | 149   | 483   | 32                            | 148   |
| Gulf of Alaska | 14                  | 113   | 246   | 14                            | 113   |

As was done in 2020, discards were compared between EM and logbook records at the trip level with most species grouped together by total weight. Most discards seen by EM reviewers were small (<100 lbs.; Figure 12) whether the discard occurred on-deck (allowable discards including small amounts of catch cleaned from the net or deck and unavoidable discards resulting from events beyond the control of the vessel as well as non-allowable discards) or the discard occurred before the net reached the deck (e.g., net bleeds). Similar to 2020, overall logbooks reported greater discard volume than EM reviewers for the Bering Sea region while estimates were similar for trips in the Gulf of Alaska (Table 5; Figure 13), though it is highly variable trip to trip. However, even the higher logbook estimates totaled only ~368,000 pounds of discards over 262 trips across both regions (an average of 1,404 pounds per trip, which is quite low compared to typical catch volume). Some EM and logbook estimates were quite similar, but it was also relatively common to have a small or medium sized discard reported by either EM or the logbook with no discards reported on the other. On some occasions reviewers noted issues with the camera set-up (e.g., glare on the video or camera malfunctions) including on two trips from the same vessel where logbook discards totaled ~146,000 pounds. Additionally, some discrepancies could be attributed to net

cleaning events where EM reviewers did not see or record these events except during the rare occurrence where the net cleaning occurred during hauling/sorting activity. There were many trips with no discards reported by either EM or logbook (101 trips, representing 39% of total reviewed trips).

Table 5. Comparison of EM and logbook discard volume in the Alaska pollock trawl fisheries for those deliveries where both data sets are available, 2021. On-deck discards include all discards after the net has come on the deck. Total discards includes both the on-deck discards and net bleeds or other discards occurring prior to the net coming on deck. Only EM trips reviewed by April 15<sup>th</sup> are included.

| <b>Region</b>         | <b>Vessels</b> | <b>Trips</b> | <b>Hauls</b> | <b>Total EM Discards (lbs)</b> | <b>On-deck EM Discards (lbs)</b> | <b>Total Logbook Discards (lbs)</b> |
|-----------------------|----------------|--------------|--------------|--------------------------------|----------------------------------|-------------------------------------|
| <b>Bering Sea</b>     | 32             | 148          | 481          | 201,299                        | 96,526                           | 385,006                             |
| <b>Gulf of Alaska</b> | 14             | 113          | 246          | 166,518                        | 138,161                          | 157,260                             |

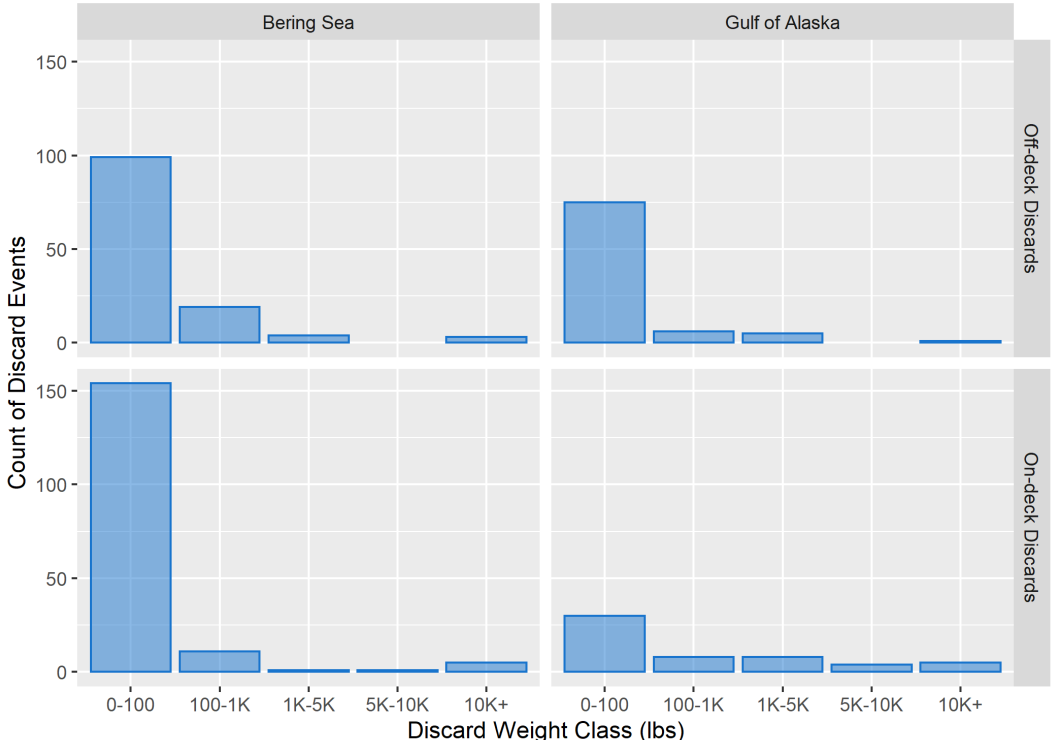


Figure 12. Sizes of EM discards by individual discard event in the Alaska pollock trawl fisheries, 2021. Only EM trips reviewed by April 15<sup>th</sup> are included.



Figure 13. EM versus logbook estimates of discards by delivery in the Alaska pollock trawl fisheries, 2021. Each data point represents a sum of discards for one trip (148 trips for the Bering Sea, 113 for the Gulf of Alaska). The dashed line represents a 1:1 relationship so a perfect match of EM and logbook data will fall on the dotted line. Points above the line indicate the EM estimate was higher while points below the line indicate the logbook estimate was higher. Note that data is shown on log-2 scaled axes so that smaller discards can be better visualized. Only EM trips reviewed by April 15<sup>th</sup> are included.

Logbooks reported a total of 5,361 pounds of shark discards while EM reviewers reported a total of 9,158 pounds of shark discards. Sleeper shark and salmon shark length/weight tables were provided to vessels and PSMFC and vessels were instructed to measure and record the length of these sharks on their logbooks before discarding. However, some vessels only estimated the shark weight whereas other vessels used the length/weight chart for their weight estimate. When possible, PSMFC estimated length for discarded sleeper and salmon sharks and used the length/weight chart for the review discard estimate. Counts were not consistently reported on logbooks, but EM reviewers reported a total of 14 individual shark discards. No salmon discards were reported on logbooks or by EM reviewers.

b. Western Gulf of Alaska Project

*Participation*

Throughout 2020 and 2021, Saltwater Inc. (SWI) served as the third-party video reviewer for all EM hard drives submitted by participating vessels [see Attachment E: Saltwater video review protocols]. In 2020, 16 WGOA catcher vessels and 11 tender vessels had EM systems installed, and 14 catcher vessels and 11 tender vessels actively fished under the EFP. A vessel was considered active if it completed at least one trip under the EFP during 2020. A small quota and a canceled catch share fishery reduced participation during WGOA’s A/B seasons in January and March, during which only six catcher vessels and one tender vessel participated. The majority of the WGOA’s fishing effort under the EFP was concentrated in the late summer and fall C/D seasons.

Saltwater received 126 hard drives in 2020. CVs submitted 111 hard drives and the remaining 15 hard drives were from tenders. Vessel operators consistently turned their hard drives in a timely manner (94%) with only 7 of the 126 total received late. Drives are considered late if they are submitted after more than two weeks from the start of the first trip, as required by the EFP. No drives failed or were lost during A/B Seasons, and only a single drive failed during C/D season. Review was still able to be completed on the one failed drive. The hard drives contained a total of 271 trips. Catcher vessels completed 250 trips with a total of 445 hauls. Tenders completed 21 trips and received 66 deliveries. Saltwater completed review and provided Feedback Forms to vessels for all 271 trips. Of the 271 total trips completed, 264 logbooks were turned in for a 96.4% total submission rate, which was a marked improvement from logbook submissions in 2019 (61%). Catcher vessels had a 97.6% submission rate, while tender vessels submitted 95.2% of logbooks.

Table 6. Data review summary stats by year

| Year       | Vessel Stats |                |       | Catcher Vessel Stats |                   |                         | Tender Vessel Stats |                  |                         |
|------------|--------------|----------------|-------|----------------------|-------------------|-------------------------|---------------------|------------------|-------------------------|
|            | Active CVs   | Active Tenders | Total | CV Trips             | Logbooks Received | Logbook Completion Rate | Tender Trips        | Logbook Received | Logbook Completion Rate |
| 2019       | 14           | 2              | 16    | 171                  | 110               | 61.45%                  | 8                   | 0                | 0%                      |
| 2020       | 16           | 11             | 27    | 250                  | 244               | 97.6%                   | 21                  | 20               | 95.2%                   |
| 2021<br>A* | 2            | 0              | 2     | 4                    | 4                 | 100%                    | 0                   | 0                | 0%                      |

*Discards*

Vessels are required to record all at-sea discards in their logbooks so discard reports can be entered into eLandings by the processing plant. Reviewers annotate both innumerable discards, defined as an estimated discard weight of catch volume (e.g., net bleeds), and quantifiable discards, defined as singulated catch (e.g., one shark). Reviewers documented 145 discard events under 100-pounds in the innumerable discard category indicating that vessels discarded small quantities most often. However, by weight, these smaller discards made up only 1.65% of total discards reported. Discards greater than 10,000 pounds were far less frequent (8 events), but represented 80.78% of the innumerable discards by

weight (Figure 14 and Table 7). Quantifiable discards mainly consisted of catch too large to be pumped from the vessel, catch kept for personal consumption, and other misc. species (flatfish unid., roundfish unid., and invertebrates).

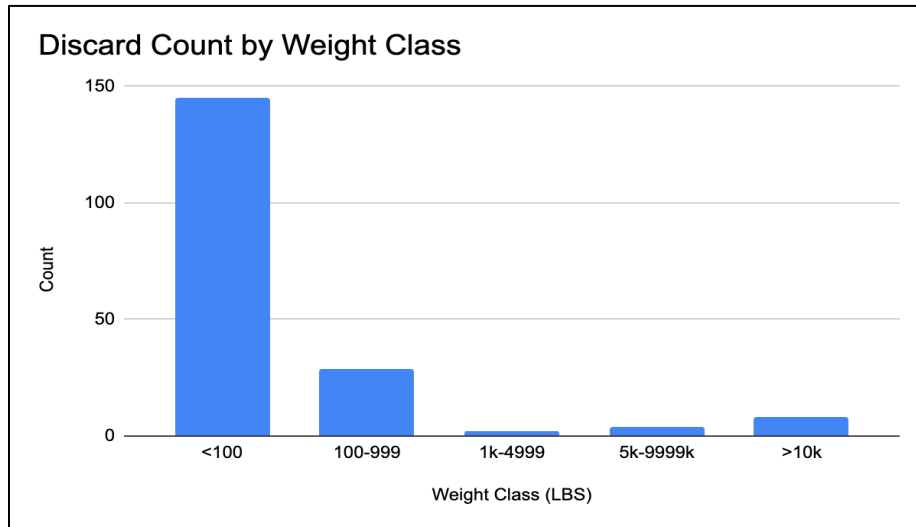


Figure 14. Sizes of EM discards by individual discard event in the WGOA pollock fishery in 2020.

| Weight Class (LBS) | <100  | 100-999 | 1k-4999 | 5k-9999k | >10k    | Total          |
|--------------------|-------|---------|---------|----------|---------|----------------|
| Count              | 145   | 29      | 2       | 4        | 8       | <b>188</b>     |
| Weight (LBS)       | 3,482 | 9,758   | 4,172   | 23,043   | 170,023 | <b>210,478</b> |
| Percentage         | 1.65% | 4.64%   | 1.98%   | 10.95%   | 80.78%  | <b>100.00%</b> |

Table 7. Sizes of EM discards by individual discard event in the WGOA pollock fishery in 2020.

Reviewers noted that discards occurred both during and outside of gear retrievals. Most discards (63.75%) occurred during gear retrievals with the remaining 36.25% occurring outside of retrievals. Onboard observers would likely not be on deck to see and report discards between gear retrievals.

Vessel logbooks overall reported a higher discard volume than EM reviewers. Vessels reported 286,915.5 pounds and EM reviewers estimated 210,478 pounds discarded across all trips (Figure 14). Variations in EM data and logbook discard information reflect that while both EM reviewers and vessels are providing estimates, reviewers and vessel operators each have limitations on what discards are seen (e.g., vessel operators and/or reviewers may have a more difficult time observing smaller discards, a captain may not see a crew member discarding a salmon, or reviewers could miss a discard due to poor image quality). Discard estimates are also affected by the review protocol in place. For example, protocols define the amount of video watched, the types of discards marked, and/or how discards are marked and changing protocols can alter these items.

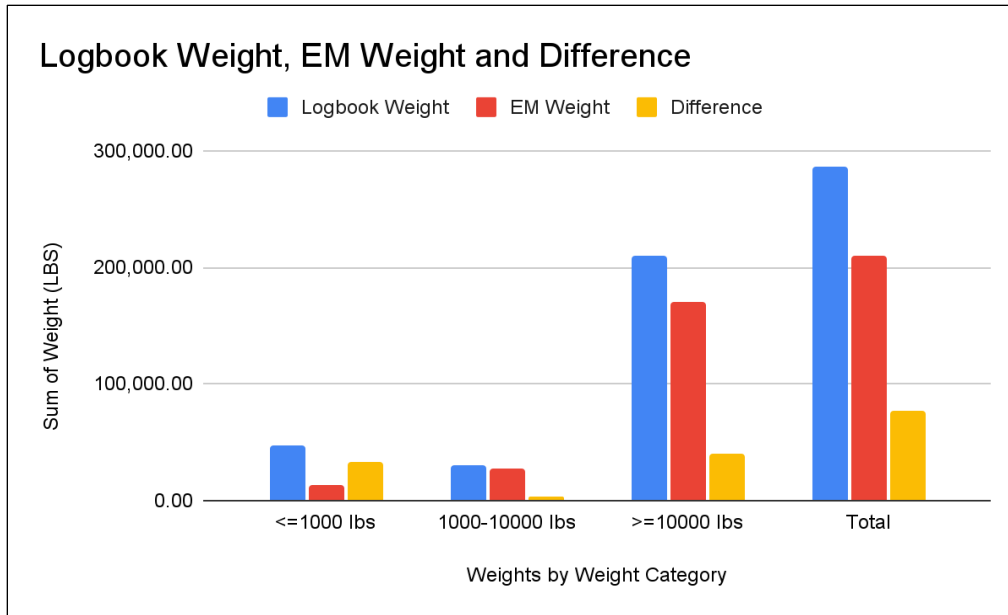


Figure 15. Logbook and EM discard comparisons in the WGOA pollock fishery in 2020.

During 2020, one bird was observed to be discarded during net cleaning activities. The reviewer was unable to verify the species due to the condition but commented that it may have been a Shearwater. The discarded bird was not reported in the logbook, but the crew member did present the bird to the camera prior to discarding. EM data reported a total of 245 sharks discarded during trips (excluding offloads) while vessel logbooks reported only 149 sharks discarded. Vessels are not required to document sharks discarded at the dock. This requirement belongs to the processors who document them in eLandings. Vessels documented 60.1% of sharks that were found during review. One factor that likely contributed to 100% of sharks not being reported by vessels and processors was confusion over the discard reporting responsibilities depending on the circumstances of when a shark was discarded. A total of eight salmon were discarded in two separate events. In one instance, the CV captain observed a new crew member discarding a single salmon. The captain immediately clarified with the crew member that discarding salmon is prohibited, and then self-reported to Saltwater via the logbook and a phone call. In the second instance, a newly contracted tender vessel sorted seven salmon into a tote and discarded them. The vessel’s fleet manager and PI were contacted, and that tender was released from its contract and will not be participating in the EFP in the future.

*eLandings Comparison*

Reviewers compared eLandings data with EM data and vessel logbooks. Both vessels and processors made reporting mistakes including landed discards not being reported in eLandings, submitted logbooks not being entered into eLandings, vessels not providing complete information needed for eLandings reporting (e.g., vessels may have been missing a weight or species), vessels failing to initially submit their logbook to the processors, and delivered salmon coded as being discarded at sea.

During C-season Saltwater discovered that while vessels were submitting copies of logbooks to Saltwater’s review office, a number of boats were not submitting copies of logbooks to the processors at offload. This prevented discard information from initially being entered into eLandings. The PI and the Fleet Representative actively worked to round up logbooks and get them submitted to the processor. This issue may have affected the accuracy of eLandings data since delivery information may have been entered before the processors received discard information from logbooks. Many vessels were using logbooks and



participating in the EFP for the first time in C Season, so some issues were anticipated. Through active communication problems were quickly resolved.

It is important to note that while vessels were sometimes responsible for failing to report discards in their logbooks, there were occurrences when discards were accurately reported by the vessel but were not entered by the processor into eLandings. Two particularly noteworthy instances occurred in D-season 2020, when vessels properly recorded significant amounts of pollock (5,000 lbs and 10,000 lbs) as discarded at sea due to a gear malfunction and safety reasons respectively, but neither was reported by the processor in eLandings. In 2021 vessels will be using eLogs and the information from the eLog will be available to processors in near real time through a data portal that has been established at the processing plants. This should alleviate discrepancies between the eLogs and eLandings. While there have been some minor challenges, it is important to recognize that the WGOA fleet is comprised of under 60' vessels that have not been required to use logbooks prior to voluntarily joining the Trawl EM program. The WGOA fleet has made marked improvements each year, with a 61.45% logbook return rate in 2019 to 97.6% in 2020, in addition to also learning how to use eLog simultaneously.

#### *Offloads Review*

In addition to reviewing trip video footage, SWI reviewed offloads of participating vessels to ensure compliance with salmon retention requirements according to the NMFS-approved review protocols. In addition to the catch stored in tanks, offload review also included monitoring the pumping of deckloads which represented 48% of all catcher vessel offloads. Discards for large species and personal retention of some species are allowed; however, large organisms like sharks are utilized in ecosystem management and need to be documented by the processor. Saltwater's comparisons of review data to eLandings data suggests there are still discrepancies in required reporting of these shark discards.

During offloads, reviewers identified 181 catch items from multiple individual species or species groups with no weight, and 45 innumerable discard events that amounted to an estimated 6,394 pounds of fish discarded at the dock during offloads. In 2020, 19.2% of total review time was spent monitoring offloads and the remaining 80.8% of review time was concentrated at the trip level. Saltwater reviewers observed processor and/or vessel crew interaction with the catch as well as marine mammal interactions during offloads.

#### *2021 Data Review*

Due to low quota, there was no A Season in Area 610. However, two WGOA vessels did participate in the CGOA A season, and a total of 4 trips were completed consisting of 11 hauls. Logbook completion was 100%. No tenders participated in the A season. Due to the small amount of data available for the A season, a more detailed analysis of the 4 trips will be included with the B season reporting.

#### C. Cost reporting and metrics between EM and human observers

As part of the work looking at the overall cost reporting structures for the EM program and the associated metrics that might potentially be used for comparisons to other EM programs and against traditional monitoring using human observers, it may be necessary to develop a consistent cost reporting structure that could be used by all EM service and data review service providers. If consistent and similar cost reporting is used by all EM providers, this will allow participants and Agency/Observer Program staff to make better informed decisions for EM provider selection and contracting.

Table 8 below shows the six proposed cost reporting categories supported by a subset of the PIs and project partners for potential use going forward under a regulated EM program. These categories were chosen because we feel they balance cost transparency with the recognition that different EM service providers, EM video review providers and human observer providers will have varying service delivery models and different internal cost tracking systems. These proposed new categories were also developed

to begin moving away from the 5-year amortized cost model for equipment and installation services that was previously used by some EM programs in the past. The proposed cost categories will now be considered to being either ongoing (will reoccur in varying levels each year) or will be considered a one-time cost (initial purchase and installation of new systems).

Table 8. Proposed cost reporting categories.

| Reporting Category   |
|--|
| <b>1.0 Service Provider Fees and Overhead (ongoing)</b>        |
| Project Coordination   |
| EM Software and Data Review Support                            |
| Technician/Contractor Recruitment and Training                 |
| <b>2.0 EM Equipment Maintenance and Upkeep (Ongoing)</b>       |
| Existing Vessel Services                                       |
| EM Spare/Replacement Parts and Accessories                     |
| <b>3.0 Data Transmittal (Ongoing)</b>                          |
| Drive Shipping Expenses (Envelopes & Freight)                  |
| <b>4.0 Equipment Purchases and Installation (One Time)</b>     |
| New Vessel Equipment   |
| New Vessel Installation Labor                                  |
| New Vessel Installation Expenses                               |
| <b>5.0 Data Processing and Storage (ongoing)</b>               |
| TBD  |
| <b>6.0 Plant Observer Provider Fees and Overhead (ongoing)</b> |
| TBD  |

The following paragraphs provide a general overview of each of the six main proposed categories as well as some context on what associated activities, responsibilities and task costs would be captured under each of the sub-categories listed under the six main categories.

*1.0 Service Provider Fees and Overhead*

This category is used to capture costs related to the overall infrastructure required for both physical work locations (e.g., office/equipment storage, locations) and human resources (e.g., program staff and technician wages) that are required to facilitate an EM program’s overall coordination. This section would be used to capture costs associated with provider communication costs, software support fees, and costs associated with training of new technicians and remote port contractors. It would also encompass costs associated with project reporting and data analysis support services. Vessel monitoring plan updates and distribution would also be captured within this category. It is anticipated that the Project Coordination sub-category is likely to see the most variability between providers based on differences within each provider’s service delivery models and operational business practices. It would therefore be necessary for individual providers to work closely with their contracting authorities to better define the specific items and tasks being captured under Project Coordination.

*2.0 EM Equipment Maintenance and Upkeep*

This category is used to capture ongoing costs that are associated with vessel services to troubleshoot and resolve technical issues and includes the equipment replacement costs for damaged or malfunctioning equipment as needed. Pre-season startup services and contracted labor used for remote port services is also captured under this category.

### *3.0 Data Transmittal*

This category captures the costs for the pre-paid data drive shipping envelopes and the costs associated with shipping data drives to the ports and processing plants. It is anticipated in the future that this category will also capture costs associated with electronic data transmission services.

### *4.0 Equipment Purchases and Installation (new vessel systems only)*

This category is used to track new vessel system purchases including all the labor and expenses that are incurred during installation of new EM system only. This is currently the only suggested category that is considered to be a one-time cost, as once the new system is installed, any replacement equipment would fall under category 2.0 Equipment Maintenance and Upkeep.

### *5.0 Data Processing and Storage*

This will include all overhead and data processing costs that would be incurred by the EM data review contractor. These costs would include the labor associated with tracking EM trips, tracking received drives, performing the required data and video review and performing the associated reporting and feedback following the data review. Costs associated with the short- and long-term archiving of the raw EM sensor and video data would also be included here.

### *6.0 Plant Observer Provider Fees and Overhead*

This category would capture all costs associated with supplying the shoreside plant observers including all coordination labor, observer wages, and all costs associated with transportation and lodging.

Costs reported on in this report are related only to those incurred during execution of the EFP (and funded through NFWF) though the PIs have made efforts to present cost information in a way that is similar to the categories presented above. Table 9 below projects what the cumulative at-sea observer costs would have been for the 29 BS/CGOA vessels participating in the EFP in 2020. The total number of days fished was calculated based on the days reported on fish tickets while participating vessels were operating in the trawl electronic monitoring (TEM) fishery as identified in the NMFS catch accounting system. This method calculates the number of days for each trip logged as TEM using the fishing start date and landing date of every delivery individually. Given that this method provides an underestimate for the number of actual observer days due to things like the waiting time between trips, etc., an estimate with +1 day and +2 days was added to the reported number of days fished to accommodate this discrepancy and to provide a plausible range upon which to base observer costs. For 2021 it is anticipated that the projected observer costs contained in Table 10 to nearly double given the increase in vessel participation (primarily in BS).

Table 9. Projected cumulative at-sea observer costs for all EM vessels had they not been participating in the EFP in 2020.

| <b>Bering Sea 2020</b>                       |  |   |  |                                |   |
|--|--|---|--|--------------------------------|---|
| Days Fished TEM Labeled eLandings (+1)       | Days Fished TEM Labeled eLandings (+2) | Pay-As-You-Go Observer Cost                               | Total Observer Costs for Participating EM Vessels        |                                |   |
| 1,951  | 2,447                                  | \$400/day   | <b>\$780,400 - \$978,800</b>                             |                                |   |
| <b>Gulf of Alaska (CGOA &amp; WGOA) 2020</b> |  |   |  |                                |   |
| Days Fished TEM Labeled eLandings (+1)       | Days Fished TEM Labeled eLandings (+2) | Observed Days Fished Based on ADP 20% Sampling Rate* (+1) | Observed Days Fished Based on ADP 20% Sampling Rate (+2) | Partial Coverage Observer Cost | Total Observer Costs for Participating EM Vessels |
| 1,522  | 2,069                                  | 304   | 413  | \$1,381/day**                  | <b>\$419,824 - \$570,353</b>                      |

\*This is the ADP established deployment rate for all trawl in the partial coverage sector, not just pelagic pollock.

\*\*This is the daily rate reported in the 2021 Annual Report for fishing year 2020, which was \$1,380.

Using an average of the above ranges, total at-sea observer costs in 2020 for both the BS and GOA would have been approximately \$1,375,379.

For comparison, Table 10 below shows the realized shoreside observer costs based on the actual number of days used for the EM observers deployed to processing plants in the Bering Sea and Gulf of Alaska under the EFP. For 2021, the shoreside observer costs in Table 10 are not anticipated to increase dramatically with the addition of the new plants.

Table 10. Total realized shoreside observer costs for EM observers deployed to processing plants under the EFP (similar to cost reporting category 6.0) in 2020.

|                        | Total Shoreside EM Observer Days | Observer Cost/Day* | Total Shoreside Observer Costs |
|------------------------|----------------------------------|--------------------|--------------------------------|
| Akutan                 | 332                              | \$400              | \$132,800                      |
| Unisea                 | 216                              | \$400              | \$86,400                       |
| Icicle/Northern Victor | 232                              | \$400              | \$92,800                       |
| Kodiak - All Plants    | 390                              | \$400              | \$156,000                      |
| Trident – Sand Point   | 167                              | \$400              | \$66,800                       |
| <b>Totals</b>          | <b>1337</b>                      |                    | <b>\$534,800</b>               |

\*This amount is based on the pay-as-you-go observer cost and is the amount that was used for creating NFWF grant budgets under which the Observer Provider operates.

Table 11 shows the approximate EM equipment and installation costs per vessel (based on average prices) as well as the total equipment and installation costs for the 56 initial catcher vessels and tenders in the BS and GOA participating in the EFP in 2020 as well as for the 23 new vessels participating in 2021. Equipment costs include the actual EM systems (camera and hardware), installation materials, and EM software while installation costs include travel and labor.

Table 11. Approximate EM system and installation costs for vessels participating in the EFP (similar to cost reporting category 4.0).

| EM Equipment Costs/Vessel | EM Installation Costs/Vessel | Total Cost (Equipment & Installation)/Vessel | 2020 Participating Vessel Costs (56 vessels) | 2021 Participating Vessel Costs (23 vessels) | Total EFP Equipment and Installation Costs |
|---------------------------|------------------------------|--|--|--|--|
| \$11,750                  | \$5,750                      | \$17,500                                     | \$980,000                                    | \$402,500                                    | \$1,382,500                                |

For 2020, approximate video review costs are shown below, which do not include logbook entry (logbook entry costs will be included for 2021). This total cost does include all video review, project management, analysis, report writing, supplies, etc. and breaks down to the following:

Table 12. Average EM video review costs for 2020 (similar to cost reporting category 5.0).

|                          |                     |
|--------------------------|---------------------|
| Average Cost per Trip    | \$ 82.00            |
| Average Cost per Haul    | \$ 26.00 - \$41.00* |
| Average Cost per Sea Day | \$ 23.00 - \$35.00* |

\*Average cost is dependent upon number of trips per haul as well as number of sea days.

With 1,041 EM trips in 2020, total EM video review costs is approximately \$85,362.

With the start of the EFP, vessels were required to record and video reviewers were required to review an entire offload (not done in 2019 under the pilot work), which is reflected in the cost per trip shown in Table 12. On average, it took 1.3 times longer to review offloads per trip than it took to review only the hauls at-sea per trip such that the average total haul review time per trip was 0.25 hours while the average offload review time per trip was 0.33 hours.

In addition to the shoreside observer costs, equipment costs, and data review costs outlined in the tables above, in 2020 there was an additional approximate cost of \$313,500 that was incurred for the EM service provider fees and overhead. Based on the new suggested reporting categories, this amount would encompass costs associated with proposed categories 1 through 3.

Based on all the preceding cost information detailed above, including the one-time cost for EM equipment and installation, for 2020 EM cost approximately \$538,000 more than what at-sea observers would have cost. However, all things being equal and excluding the one-time equipment and installation cost, EM would have cost approximately \$442,000 less than what at-sea observers would have cost. There is still some future work that needs to be done to determine how the main costs in the tables above will be paid for under the regulated program. It is recognized that there will likely need to be two distinct methods: one method for the full-coverage Bering sea vessels and another method for the partial coverage GOA vessel fleet. While these methods are not fully determined at this time, it is anticipated that vessels fishing in the Bering Sea or participating in the West Coast whiting fishery will most likely be responsible for the majority of the costs associated with their program. It is also anticipated that vessels participating in only the GOA fishery will likely have the main portion of their program costs paid through their annual ODDS fees.

#### D. Changes in vessel fishing behavior due to a relief from current discard requirements

The Performance Standard component of the EFP is 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 BS-GOA

maximum retainable amounts (MRAs) for incidental species and PSC catches. The intent is to control behavior so that participating vessels 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. To eliminate financial incentives of exceeding limits under full retention, all participating EM EFP vessels surrender the ex-vessel value above the prescribed limits to the non-profit North Pacific Fisheries Research Foundation, which then provides the collected money as matching grant funds under the annual National Fish & Wildlife EM funding process for continuation of the EFP. The permit holders calculate and invoice overages based on fish tickets. In addition to forfeiting the value, vessels are tracked on specified metrics to prevent egregious overages or changes in behavior that result from EFP exemptions [see Attachment F: Vessel Performance Standard].

*GOA Pollock Trip Limit*

In 2020, there were seven vessels that received one offense. No vessels had more than one offense. Three of those vessels received an offense based on an egregious overage (>345,000 lbs). The other four vessels/offenses were due to the average of four trips exceeding 300,000 pounds. In three of those four cases the average was less than 301,000 pounds. Overall, there were 62 trip overages out of 545 GOA trawl EM trips in 2020 (11.4%). Some overages were expected with full retention. However, as measured by the average over four trips, vessels appear to be meeting the overall intent of the limit over multiple trips. The data appears to show vessels making smaller trips after incurring an overage to ensure they did not exceed the 300,000 pound average over four consecutive trips. A vessel is allowed up to four pollock trip limit “offenses” in a year before being expelled from the EFP. See Figure 16 for breakdown of overage amounts for the year 2020.

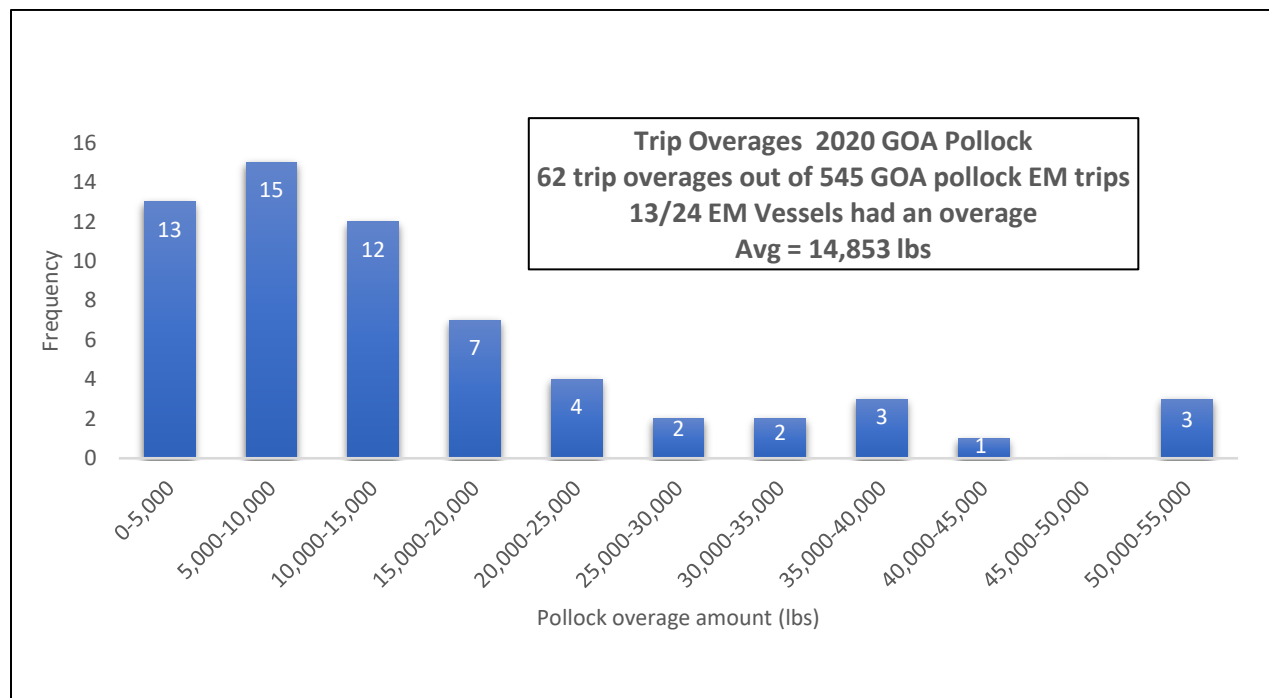


Figure 16. GOA 300,000 lb trip overages by EM vessels, 2020.

During A season 2021, a single vessel received one offense for an egregious overage and one vessel received two offenses for exceeding the 4-trip average of 300,000 pounds. Overall, there were 35 trip overages out of 133 GOA trawl EM trips (26.3%) compared to 47 out of 208 trips (22.6%) of GOA EM trips over the same time period in 2020. See Figure 17 for breakdown of overage amounts.

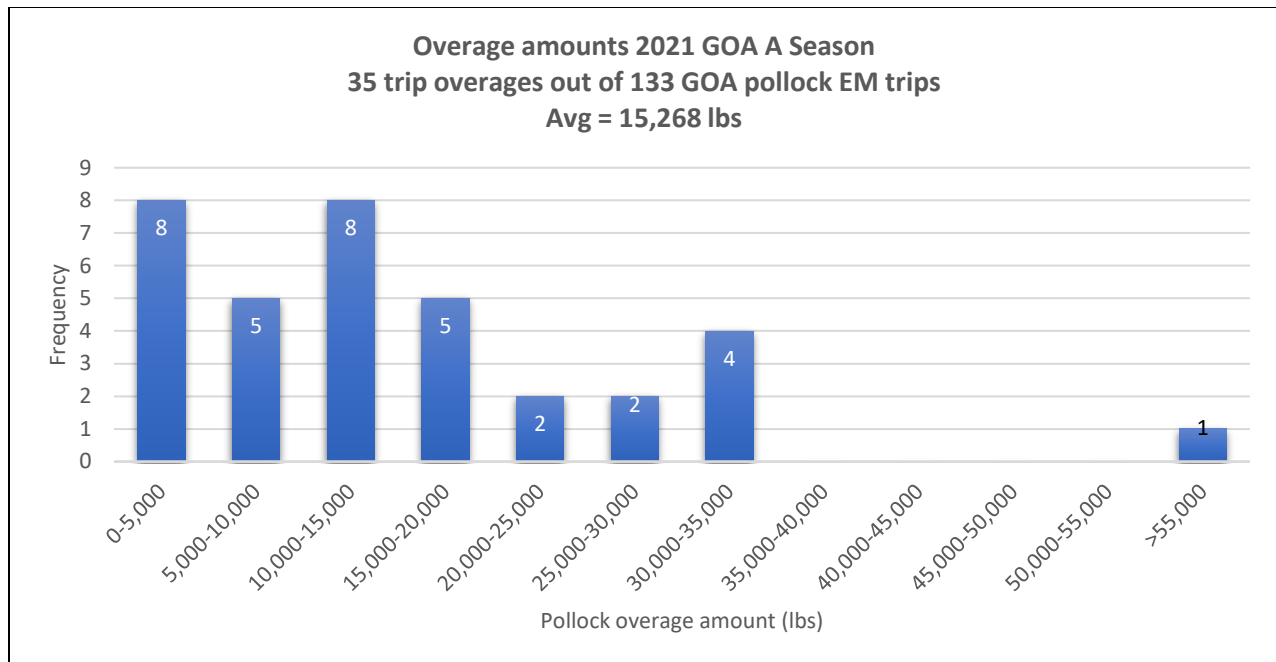


Figure 17. GOA 300,000 lb trip overages by EM vessels, A Season 2021 (as of April 24, 2021).

*Maximum Retainable Amounts (MRAs)*

For purposes of MRA enforcement under the EFP, an MRA overage was considered an overage only if valued >\$250. An “offense” occurred if the vessel had at least two MRA overages during the year valued at >\$250 each.

In 2020, EM pollock fishing was very clean with 99.3% of catch being target species. There were 25 MRA overages, 13 in the GOA and 12 in the Bering Sea, with 20 of the 25 MRA overages for aggregated rockfish, three for forage fish, one for sablefish, and one for Atka mackerel. Seven of those 25 MRA overages were valued at >\$250 so were therefore considered an official “overage”. However, only three vessels had two official MRA overages each, which were considered “offenses” under the EFP performance standards. A vessel is allowed up to 4 MRA “offenses” per year before being expelled from the project. Additionally, spatial analysis for the 2020 fishing year indicates that there was virtually no difference between the location of catch between EM EFP vessels and non-EM EFP vessels in both the BS and GOA.

In 2021, There were only five MRA overages in the Gulf of Alaska committed by four vessels and zero overages in the Bering Sea. Four of the five MRA overages were for forage fish (capelin/eulachon) with no value and one for aggregated rockfish (mostly POP), which also had no value since all the POP was sent to the fish meal plant.

*Base Stats on the 2020 Fishery (BS/GOA)*

- Total no. vessels in pelagic trawl (PTR) pollock target: 120
- Total no. EM vessels in PTR pollock target that made an EM landing: 41 (34%)
- Total no. Landings (PTR Pollock target): 3,323
- Total no. EM landings: 1,041 (31.3%)
- Total Non-EM landings: 2,282 (68.7%)
- Total pollock catch from vessels using pelagic gear in pollock targets: 701,986 mt
- Total EM: 142,003 mt 20.2%
- Total Non-EM: 559,983 mt 79.8%

*Base Stats on the 2021 A season Fishery (BS/GOA through 5-7-21)*

- Total no. vessels in pelagic trawl (PTR) pollock target: 98
- Total no. EM vessels in PTR pollock target that made an EM landing: 48 (49%)
- Total no. Landings (PTR Pollock target): 1,290
- Total no. EM landings: 626 (48.5%)
- Total Non-EM landings: 664 (51.5%)
- Total pollock catch from vessels using pelagic gear in pollock targets: 316,565 mt
- Total EM: 151,474 mt (47.8%)
- Total Non-EM: 165,09 mt (52.2%)

Overall, the performance standard strategy worked as intended and there was no change in fishing behavior as a result of exempting vessels in the EFP from both the GOA pollock trip limit and BS-GOA MRAs. Given these results, no changes were made to the Performance Standards for A Season 2021; however, the PIs continue to evaluate the need for potential changes based on vessel feedback received.

E. Impacts to shoreside monitoring

a. Bering Sea and Gulf of Alaska Project

Throughout 2020, Saltwater, Inc. served as the Observer Company providing dedicated observers at the following shoreside processing plants taking pollock deliveries from participating EM catcher vessels: Trident Kodiak, APS, Ocean Beauty Seafoods (OBSI), Trident Akutan, Trident Sand Point, Northern Victor, Unisea, and Peter Pan King Cove. At the Peter Pan facility, AFA observers were used to support the project; at the other facilities project specific shoreside observers were deployed. For 2021, Alyeska and Silver Bay Kodiak were added to the group of processing plants participating in the EFP. Additionally, two observer provider companies were selected for placing observers at the shoreside plants; Saltwater is providing observers for Trident Akutan and all plants in Kodiak while Alaska Observers, Inc. (AOI) is providing observers for Unisea, Northern Victor, and Alyeska.

For 2020, the project initially forecast that 1,027 shoreside observer days would be required to mitigate the loss of biological data typically collected by at-sea observers aboard pollock catcher vessels. For 2020 there were a total of 1,170 days expended, an overage of 143 days (Tables 13 and 14). COVID-19 had a large operational impact on the shoreside monitoring component of this project.

**Table 13. 2020 Observer Days Forecast v. Actual**

| Plant                  | A-Season Forecast Days | A-Season Actual Days | A/B-GOA Season Forecast Days | A/B-GOA Season Actual Days | B-Season Forecast Days | B-Season Actual Days | C/D-GOA Season Forecast Days | C/D-GOA Season Actual Days | Total 2020 Forecast Days | 2020 Forecast Budget for Observed Days | Total 2020 Actual Days | 2020 Actual Budget for Observed Days |
|------------------------|------------------------|----------------------|------------------------------|----------------------------|------------------------|----------------------|------------------------------|----------------------------|--------------------------|--|------------------------|--------------------------------------|
| Akutan                 | 178                    | 182                  |                              |                            | 270                    | 150                  |                              |                            | 448                      |  | 332                    |                                      |
| Unisea                 | 89                     | 85                   |                              |                            | 83                     | 131                  |                              |                            | 172                      |  | 216                    |                                      |
| Icicle/Northern Victor | 89                     | 92                   |                              |                            | 135                    | 140                  |                              |                            | 224                      |  | 232                    |                                      |
| Kodiak - All Plants    |                        |                      | 125                          | 217                        |                        |                      | 58                           | 173                        | 183                      |  | 390                    |                                      |
| <b>Totals</b>          | <b>356</b>             | <b>359</b>           | <b>125</b>                   | <b>217</b>                 | <b>488</b>             | <b>421</b>           | <b>58</b>                    | <b>173</b>                 | <b>1027</b>              | <b>\$357,396</b>                       | <b>1170</b>            | <b>\$407,160</b>                     |



**Table 14. 2020 Actual Days by Plant by Month**

|                        | Jan | Feb | Mar* | Apr | May | June | Jul | Aug | Sep | Oct | Nov | Dec | Total Observer Days |
|------------------------|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|-----|---------------------|
| Akutan                 | 26  | 58  | 48   | 30  | 20  | 26   | 31  | 31  | 30  | 30  | 2   |     | 332                 |
| Unisea                 | 14  | 29  | 31   | 11  |     | 18   | 31  | 31  | 30  | 21  |     |     | 216                 |
| Icicle/Northern Victor | 12  | 29  | 31   | 20  |     | 19   | 31  | 31  | 30  | 29  |     |     | 232                 |
| Kodiak - All Plants    | 42  | 110 | 65   |     |     |      |     | 16  | 78  | 79  |     |     | 390                 |
| Totals                 | 94  | 226 | 175  | 61  | 20  | 63   | 93  | 109 | 168 | 159 | 2   | 0   | 1170                |

\* In March Trident imposed a COVID-19 lockdown and would not allow vessel observers to disembark from their boat to help monitor offloads. Because of this they agreed to pick up the cost of 1 of 2 EM observers.

#### *Central GOA (Areas 620, 630, and 640) Pollock Shoreside Deliveries*

More observer days were required in Kodiak than originally anticipated. Fishing effort in this region is difficult to forecast with the unpredictable race for fish, variable effort, three different federal management areas plus the State of Alaska Prince William Sound pollock fishery, fish grade, salmon bycatch, stand downs, and weather. And for both post-March 2020 and A season 2021, a global pandemic.

The Central GOA A-season was forecasted to run from January 20 – February 10, 2020 (A season actually ended February 23) and three observers were initially deployed to the Kodiak plants; however, the observers were quickly overwhelmed during the first three days of the fishery. Because much of the sampling occurs outside, the extreme cold weather hampered the observer’s ability to sample for long periods of time. Vessels in this region are smaller and have shorter offloads, making it difficult to complete all tasks for one vessel before another offload starts that also requires sampling. In response, additional observers were deployed to ensure the requisite data could be collected. Fishing started on January 20 but due to high salmon bycatch, the fleet opted to voluntarily stand down January 23–February 2 which gave the plant observers a needed break. After the standdown, the fleet fished February 2-5 but stood down again February 6–11 when it became clear salmon bycatch was still a problem. The fishery started in earnest on February 12 and A season closed on February 19<sup>th</sup> (Area 620) and February 23<sup>rd</sup> (Area 630). B Season ran from March 9-11 (Area 630, which was a short, combined A-B season fishery) and March 10–18 (Area 620). Effort in Area 640 started after Area 620 closed and ran from February 24 – March 9 (closed March 13). But NMFS closed that fishery a little too early so it reopened March 24-28 under a lottery agreement (four trips).

The 2020 CGOA C-season ran from August 25 through October 1 under a voluntary catch share agreement since Kodiak was slammed unexpectedly with late pink salmon returns; the D-season was a race for fish from October 1 through October 29. Area 630 closed October 17 and Area 620 closed on October 20 but reopened October 27 – October 29 when seven vessels selected via lottery cleaned up the remaining quota. By the fall, robust COVID-19 mitigation protocols were in place for deploying shoreside observers. For plants this requirement involved a 14-day monitored quarantine, which included daily health checks, food delivery service, and COVID-19 testing. If quarantine occurred in Anchorage, a private charter service was required to safely transit observers to the field, which ensured there was no interaction with the general population. Due to COVID-19 quarantine requirements, removing observers from the field between seasons was no longer a practical option. In response to the understaffing that occurred during the A/B-seasons, efforts were made to staff appropriately for the second half of 2020 but the C/D-seasons experienced poor fishing and the shoreside observers were underutilized. If COVID-19

had not been a factor, observers would have been removed from the field but this step was not taken because if fishing improved it would have been extremely difficult to react quickly due to quarantine requirements.

The State waters Prince William Sound pollock fishery, which is not part of the EM project or EFP, ran from January 20 – February 29. Fourteen vessels participated, seven of which were EM vessels, with most of the fishing occurring from February 10-14 and February 21-29. The addition of State water pollock trips to the mix of federal pollock trips did create some initial confusion and communication challenges with the observers.

At the start of 2021, the season structure changed with two seasons instead of four. A Season started January 20 but the fleet stood down due to high numbers of salmon bycatch. The GOA fleet agreed to a voluntary catch share agreement (CSP) for Areas 620 and 630 to address salmon bycatch concerns and because of COVID-19 outbreaks at some of the Bering Sea processing plants (the fear being that the same processing disruption could happen at Kodiak facilities). The fleet started fishing February 1 with 38 GOA vessels participated in the 620/630 A season, 22 of which were EM vessels. Area 610 remained closed due to the low amount of pollock quota. The Area 640 federal pollock fishery was race for fish; the fishery closed March 9 but reopened April 1 – 6 under a lottery system with three vessels (two of them EM vessels) chosen randomly to clean up the remaining three trips. The second opener closed April 6.

For 2021, two plant observers were deployed to the Trident plant; two observers were deployed at Ocean Beauty and North Pacific Seafoods (combined), and one at Silver Bay Seafoods. The observers were released when the majority of deliveries had been taken. As became apparent over the season as well as from Observer Survey responses, the observers in Kodiak were underutilized during the season. This was, in part, due to ten of the 22 EM vessels opting out of EM for some or all of their pollock trips and the slower pace of the fishery because of CSP that was in place.

There were multiple communication issues between plant personnel and observers in Kodiak at the start of the 2021 A season. Some were technical in nature (e.g., establishing proper protocols for communication as well as educating everyone on the use of those tools) and some required higher-level intervention by both the Observer Provider and the PIs. Observers expressed frustration regarding a lack of proper notification for when a permit-designated EM vessel was coming in, what their target was and how much was onboard, and whether or not the vessel was using EM for that trip. To mitigate these communication issues and to help facilitate notification and planning, plant observers were issued a phone to be shared by the plant observer team such that GOA vessels could call the observer directly to provide them with the necessary information. Because this “call in” protocol for GOA participants was implemented halfway through the season, it was initially not followed consistently. February was the most challenging month as the issues were worked through, but by early March communications had improved.

#### *Bering Sea (AFA) Pollock Shoreside Deliveries*

Under the AFA Program, fishing effort in the Bering Sea is much more predictable than it is in the GOA. Although the 2020 A-season pollock fishing was slow overall and forecasted days would have most likely been slightly underestimated, COVID-19 was the main reason why forecasted days far exceeded actual days expended. This difference is primarily due to operational decisions made by the processing plant in Akutan in March:

1. By March 17, vessel observers were no longer allowed off their vessel to help monitor for salmon at offload. This protocol was established to ensure COVID-19 did not enter their plant. The result was that the EM observers stationed at this plant would be needed to help monitor all deliveries, both observed and EM deliveries. Due to this change, the processing company in

Akutan agreed to bring one of the two observers assigned under the EFP onto their contract. As such, while the observer days were still required, the project was no longer responsible for covering those costs.

2. As 2020 A-season fishing effort was winding down, there were concerns on the potential consequences if plant personnel and crew were released between seasons. At this point there was not the full infrastructure in place to quarantine and safely transit such a large number of employees. In response, the processing company intentionally slowed their operations and kept vessels fishing longer, which resulted in an extension of their A-season effort by approximately 30 days. This decision allowed the plant to keep their processing crew in place for the short amount of downtime between seasons, which also included both the AFA and EM observers (all of whom agreed to this change).

For 2020, had COVID-19 not been a factor it is believed that the original number of forecasted observer days would have more closely aligned for the BS pollock fishery than actually reported here since the days were utilized but paid for outside of the project. Forecasted days in the GOA pollock fishery would have still been underestimated, but without the restrictions related to COVID-19 an observer provider would be more adaptable in how observers are deployed in this area. The ability to freely move observers in and out of an area in response to fishing effort is key to cost containment for shoreside monitoring.

In 2021, COVID-19 again played a major role in the first months of the season with virus outbreaks occurring in Dutch Harbor and Akutan. The longest operational delay occurred at the Trident Akutan plant, delaying processing from the normal January 20<sup>th</sup> start date to the first delivery occurring on February 23. This delay resulted in AFA vessels (both observed and EM participants) being diverted to Trident's Sand Point facility starting on February 2. The Sand Point plant would normally process Western GOA pollock quota (WGOA 2021 A season pollock was closed due to low quota); however, for the duration of their A-Season operations deliveries were almost exclusively from AFA vessels, both EM and observed deliveries. Production is slower at this plant than at the Akutan plant, with offloads spanning almost a full day to offload. As the season progressed, Trident made agreements with Unisea and Peter Pan to also help process their quota in order to shorten the overall days required to capture their A-Season targets. Once the Akutan plant re-opened, they ran at less than full capacity, ensuring they could maintain operations with no further COVID outbreaks. For the plants in Dutch Harbor, there were a couple of situations that required consultation with NMFS to 1) allow EM deliveries with reduced observer coverage levels at a plant and 2) potentially divert delivery by an EM vessel to a processing plant that was not participating in the EM EFP. The need to allow fish to pass through the plant with reduced observer coverage was brought on by some positive COVID tests and the related need to quarantine the observers. The solution involved adding an observer that had coincidentally been held in quarantine in Dutch Harbor and pulling an observer off a non-EM vessel to serve as a plant observer. The need to divert an EM delivery to a non-participating plant did not come to fruition but remains an important consideration for the future.

In general, the move by the NMFS Observer Program in 2021 to have all observers at processing plants trained in and participating in both the sampling of EM boats and non-EM boats provided a significant improvement from 2020. Some minor communication issues were encountered regarding a lack of the required hour notification ahead of an offload as well as a few reports from observers regarding concerns with the operations at one plant when there were higher levels of bycatch in the delivery. In this situation, the plant pulled in crew that were unfamiliar with species identification to help with sorting, which led to some halibut not being properly sorted. When the observers tried to help with the species identification, they were distracted from their own monitoring duties. These issues were resolved with communication between the observers and plant management (many of the solutions to these break downs in communication came directly from the observers themselves). Notes provided by the plant observers from

2020 helped inform the 2021 A-season observers on how to proceed and which vessels to look for that might be carrying observers rather than participating in the EFP.

b. Western Gulf of Alaska Project

*GOA (Area 610) Pollock Shoreside Deliveries*

Saltwater, Inc. (SWI) served as the Observer Company providing dedicated observers at the Trident Sand Point plant, which is the only WGOA plant that participated in 2020. For 2020, the Area 610 A-season occurred from March 9-10; B-season occurred from March 10-14; C-season occurred from August 25-September 3; and D-season occurred from October 1-6 with a second opener from October 27-29. For 2021, due to low A-Season quota there was no season in Area 610 and no observers were deployed for the WGOA project; two WGOA CVs did participate in the CGOA fishery and delivered to shoreside processors in Kodiak, which was covered under the BS/GOA project. For 2020, the project initially forecast that 64 shoreside observer days would be required to mitigate the loss of biological data typically collected by at-sea observers aboard pollock catcher vessels. For 2020 there were a total of 167 days expended, an average of 103 days (Tables 15 and 16). This discrepancy is partially due to underestimation of observer days needed, but largely due to COVID-19, which significantly impacted the shoreside observer component of the program.

It was originally anticipated that one observer would be sufficient to sample at the Sand Point plant during A- and B-Seasons. The Area 610 pollock quota is significantly lower during the early A and B seasons, and traditionally only a small number of boats fish these seasons. It became apparent, however, that one observer would not be enough once NMFS issued sampling procedures, and observers stationed in Kodiak (where fishing began earlier than in the WGOA), described their work schedules. As a result, two observers were deployed to Sand Point.

COVID 19 impacted the deployment of observers in the shoreside component of the program significantly. The mandates implemented by the State of Alaska and the seafood industry complicated both the logistics of observer deployment and the number of observer days dramatically. Observers at the Sand Point plant were required to quarantine 14-days prior to entering the processor campus, and could only fly on air charters organized by the processor. In addition, to avoid an outbreak between the C and D seasons, the processor held crew including observers over between seasons. In 2020 there was a 27-day lag between the end of C-Season and beginning of D-Season and a 20-day lag between the two openings in D-Season. Typically, observers would be rotated out during long breaks, but with the time and cost of re-quarantining observers and transporting observers, it was more cost-effective to hold observers over in plants.

Due to understaffing during the A- and B-seasons, efforts were made to add a third observer to the plant for C- and D-seasons. However, a delay in communication and challenges in staffing observers last-minute (due to COVID-19) prevented a third observer from being deployed. The C-Season and the D-Season first opener operated as a race for fish and, as expected with only two observers deployed, they had some difficulty accomplishing their samplings duties as observer post-deployment surveys noted. Despite there being a long gap between the conclusion of C-season and the beginning of D-season, the two observers were held over in the plants as this was more cost-effective than rotating observers and re-quarantining and chartering. As a possible solution for maximizing cost-effectiveness, a model was tested where one shoreside observer was fully trained in EM data review and was provided a secure station to review data during downtime. This concept is promising, however more work needs to be done to demonstrate feasibility.

**Table 15. 2020 Observer Days Forecast v. Actual**

| Plant                | A/B-GOA Season Forecast Days | A/B-GOA Season Actual Days | C/D-GOA Season Forecast Days | C/D-GOA Season Actual Days | Total 2020 Forecast Days | 2020 Forecast Budget for Observed Days | Total 2020 Actual Days | 2020 Actual Budget for Observed Days |
|----------------------|------------------------------|----------------------------|------------------------------|----------------------------|--------------------------|--|------------------------|--------------------------------------|
| Trident - Sand Point | 20                           | 31                         | 44                           | 136                        | 64                       | \$51,200                               | 167                    | \$84,804.51                          |

**Table 16. 2020 Actual Days by Plant by Month**

|                      | Jan | Feb | Mar* | Apr | May | June | Jul | Aug | Sep | Oct | Nov | Dec | Total Observer Days |
|----------------------|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|-----|---------------------|
| Trident – Sand Point |     | 8   | 23   |     |     |      |     | 16  | 60  | 60  |     |     | 167                 |

**F. Impacts to tendering operations (WGOA Project only)**

To maintain flexibility in their tendering operations processors needed an EM system that could be rotated between their tender operations. Saltwater developed a EM system that met those requirements and the data requirements of the EFP. During 2020, 11 tender vessels had EM systems installed, with nine actively participating in the fishery. (No tender activity occurred at the start of 2021.) A vessel was considered “active” if it completed at least one trip under the EFP during 2020. Tenders completed 21 trips and received 66 deliveries. The tender fleet successfully adhered to the four rules outlined for tenders in the EFP, without sacrificing participation in the EFP. However, there were instances where tenders or CVs deviated from normal operations in order to stay within the EFP. Outlined below are instances of issues or concerns specifically related to adhering to the EFP:

1. One processor was concerned they did not have enough tenders with EM systems in place during the fishery and wanted to use another tender (without EM) last-minute to accept a delivery from an EFP CV. As a rule, EFP catcher vessels must deliver to EFP tenders to maintain the Chain of Custody; therefore, this request was not allowed. Ultimately less CVs participated than anticipated and the issue was not resolved. Mobile systems were developed for this exact issue; however, an extra mobile system was not readily available. To prevent this in future seasons, extra mobile systems have been provided to processors.
2. A similar concern expressed by processors, was the process of adding a new tender vessel to the EFP last-minute. By current regulation, tenders are not required to have VMPs but they are required to have one under the EFP. VMPs are developed specific to individual vessels and are required to be approved by NMFS. There was some concern this would not happen fast enough to maintain efficient operations. In order to circumvent this issue, the PI collected lists from processors with tenders that were likely to participate. Saltwater then proactively developed VMPs, and NMFS was able to turnaround approvals typically within 24 hours.
3. Some tenders were new to both the pollock fishery and the EFP, and there were some communication issues during the initial briefing between the processor and their tenders, resulting in a salmon discard. Vessels that regularly participate in the heavily monitored pollock fishery are well versed in the regulation, especially salmon discard violations, but when recruiting new tender vessels this needs to be made explicit. When the violation occurred, open communication between Saltwater, the vessel’s fleet manager and EFP principal investigators allowed for swift response and resolution before any other compliance violations occurred. The EFP team also developed several tools for the processors to use when briefing new tenders, to make it simpler and more effective.

4. Another major concern from the fleet was not being able to split offloads between tenders, a practice that maximizes tender capacity. This was not an explicit rule under the EFP, but was treated as such until the EFP team comprehensively understood the problem and potential ramifications.

Finally, while not technically an issue related to tender EFP adherence, the ability for data reviewers to “match” trips between CVs and tenders is essential to monitoring the Chain of Custody. There was confusion between NMFS’ definition of an “ODDS trip” and Saltwater’s definition of an EM trip. Partway through the season the EFP team learned that vessels could deliver multiple trips to a tender under the same ODDS trip number. Some vessels were using new ODDS numbers for every trip, and others were using the same one repeatedly. Tender vessels are merely shuttles and do not utilize the ODDS system. This complicated data collection and efforts to match EM data to eLandings, particularly in respect to tender vessels.

**G. Impacts to the current collection of biological samples for pollock**

Prior to the start of the EFP, a sampling design was established and approved by the Observer Program in conjunction with the PIs [see Attachment G: EFP Sampling Plan]. The table below shows the complete 2020 EM sampling statistics as well as the EM sampling targets through May 7, 2021 for both the Bering Sea and Gulf of Alaska (CGOA and WGOA). Note that the total number of EM offloads presented reflects EM offloads that are reported by observers at the shoreside plants and does not include EM offloads by vessels that delivered to tenders.

Table 17. Complete 2020 EM sampling targets and 2021 EM sampling statistics through May 7, 2021.

| <b>BS 100% Sampling Rate</b>                 | <b>Bering Sea 2020 (annual)</b> | <b>Bering Sea 2021 (A Season)</b> |
|--|---------------------------------|-----------------------------------|
| Total Number EM Offloads                     | 494                             | 490                               |
| # EM Offloads w/ Salmon Counts               | 494                             | 490                               |
| % EM Offloads w/ Salmon Counts               | 100                             | 100                               |
| # EM Offloads with Pollock Biologicals       | 483                             | 483                               |
| % Offloads with Pollock Biologicals          | 98                              | 99                                |
| Expected # Offloads with Pollock Biologicals | 494                             | 490                               |
| # Pollock Lengths                            | 37,375                          | 44,381                            |
| Expected # of Pollock Lengths                | 49,400                          | 49,000                            |
| Average # Pollock Lengths per Offload        | 77.4                            | 91.9                              |
| Target # Pollock Lengths per Offload         | 100                             | 100                               |
| # Pollock Otoliths                           | 929                             | 888                               |
| Expected # Pollock Otoliths                  | 988                             | 980                               |
| Average # Pollock Otoliths per Offload       | 1.92                            | 1.84                              |
| Target # Pollock Otoliths per Offload        | 2                               | 2                                 |
| # Offloads w/ Species Comp.                  | 446                             | 486                               |
| % Offloads w/ Species Comp.                  | 90                              | 99                                |
| Total # Species Comp. Samples                | 1,275                           | 1,434                             |
| Expected # Species Comp. Samples             | 1,482                           | 1,470                             |
|  |                                 |                                   |
| <b>GOA at 30% Target Sampling Rate</b>       | <b>GOA 2020 (annual)</b>        | <b>GOA 2021 (A Season)</b>        |
| Total Number EM Offloads                     | 471                             | 132                               |
| # EM Offloads w/ Salmon Counts               | 151                             | 34                                |
| % EM Offloads w/ Salmon Counts               | 32                              | 26                                |
| # EM Offloads with Pollock Biologicals       | 102                             | 33                                |

|  |        |       |
|--|--------|-------|
| % Offloads with Pollock Biologicals          | 22     | 25    |
| Expected # Offloads with Pollock Biologicals | 141    | 40    |
| # Pollock Lengths                            | 10,707 | 4,205 |
| Expected # of Pollock Lengths                | 21,195 | 5,940 |
| Average # Pollock Lengths per Offload        | 105    | 127.4 |
| Target # Pollock Lengths per Offload         | 150    | 150   |
| # Pollock Otoliths                           | 2,354  | 703   |
| Expected # Pollock Otoliths                  | 3,518  | 986   |
| Average # Pollock Otoliths per Offload       | 23.08  | 21.3  |
| Target # Pollock Otoliths per Offload        | 25     | 25    |
| # Offloads w/ Species Comp.                  | 89     | 33    |
| % Offloads w/ Species Comp.                  | 19     | 25    |
| Total # Species Comp. Samples                | 178    | 113   |
| Expected # Species Comp. Samples             | 424    | 119   |

In general, it can be seen from the statistics above that EM deliveries in the Bering Sea achieved or nearly achieved their target sampling whereas EM deliveries in the Gulf of Alaska have not been as successful in meeting their target sampling. This can largely be attributed to the challenges encountered in placing observers at processing plants in the GOA, as described in Section E above and Part 4 below.

All shoreside EM observers are being requested to complete an exit questionnaire upon finishing their EM plant assignments, which contain questions related to sampling duties, workload, and time management. These observer responses will be summarized at a later date. Finally, it is important to highlight that all data previously collected by at-sea observers (e.g., biological and species composition as well as spatial locations for individual hauls) is all still being recorded whether at the plant, by the vessel, or by the EM video reviewer. Currently, the AKRO is building and/or modifying the infrastructure needed so that the end users of this data are able to access it.

#### H. Impacts to marine mammal monitoring

##### a. Bering Sea and Gulf of Alaska Project

One take of a Steller sea lion in 2020 and two Stellar sea lion takes in 2021 were recorded and reported by EM reviewers. In these instances, the vessels involved accurately reported the animal in their logbook and reported the incident to the NMFS Office of Protected Resources.

##### b. Western Gulf of Alaska Project

Only one take of a marine mammal occurred in 2020 when a Steller sea lion was caught in the trawl net and the vessel accurately reported it in their logbook. This information was captured in the EM data via an annotated Marine Mammal Interaction while awaiting clarification from NMFS on whether to also mark the take as a discard. EM reviewers also reported other marine mammal interactions which largely consisted of vessels attempting to deter sea lions away from their vessels.

#### I. Challenges in meeting the terms of the EFP

To date, there have been no challenges in meeting the terms stipulated under the EFP. Issues that arose during execution of the EFP, as detailed in Part 4 below, were able to be adequately addressed and modifications to the EFP were able to be made to improve its functionality.

#### **Part 4. Issues Addressed as They Were Identified and Modifications Made for 2021**

Prior to the start of the EFP and throughout its continued duration, Trawl EM EFP teleconference meetings have been held weekly (or as needed) between the PIs and personnel with NMFS, the Observer Program, OLE, AFSC, EM service providers, EM video reviewers, and shoreside observer providers. These meetings, in addition to periodic educational and debriefing sessions held by the PIs for the vessel and processor EFP participants, were essential in identifying and resolving issues encountered in near real time, including the following:

##### *Seabirds*

When one vessel operator encountered a seabird strike on his vessel and reported it to PIs, it was realized that there were no detailed instructions in place for EFP vessel participants that may encounter seabirds. A one-page handout was quickly developed and distributed to all vessel participants with clear steps to take when an injured or dead seabird is encountered during an EFP trip, including placing the bird in the camera's view for at least three seconds in different positions as well as completing the necessary U.S. Fish & Wildlife form to document the encounter.

##### *Sharks*

Throughout 2020, the EFP allowed participating vessel operators to discard large marine organisms (>6ft), which included sharks. EM reviewers reported that large sharks brought up on deck and discarded at-sea were frequently either not being reported in the logbooks or were being incorrectly identified with inaccurate weight estimates recorded. In response, a one-page species shark ID guide was created and distributed to all participating vessel operators and it was requested for vessel operators to also record an estimated shark length in their logbook along with an estimated weight, which was the original requirement under the EFP. EM reviewers highlighted that the 6-foot length requirement for sharks was somewhat arbitrary and recommended that allowable shark discards be based on species. For 2021, the EFP requirements were modified to allow discards of large individual marine organisms (>6ft) and all sharks regardless of size (except Pacific spiny dogfish). Additionally, given these incidental shark interactions, NMFS took this as an opportunity to collect much needed data on large sharks, which are generally discarded at-sea with no data collected by vessel observers. In 2021, 15 EFP vessels in Kodiak, six vessels in Sand Point, and two vessels in King Cove voluntarily took sample kits to collect data on incidentally caught sleeper sharks. As of April 5, 2021, only two samples were returned by Kodiak vessels, which were delivered to the Observer Program office in Kodiak for shipment to NMFS.

In 2020 EM video reviewers also noticed sharks and skates brought to the shoreside processing plant that were too large to get pumped off the boat were placed on the deck of the vessel during the offload. Some of these larger sharks/skates were then not being offloaded by the plant, weighed, or reported on the fish ticket in contrast to regulations requiring all fish to be offloaded, weighed, and reported. NMFS staff conducted outreach with the processing plants to correct this oversight.

##### *Jellyfish*

Early in 2020, vessel operators expressed concern about having to retain jellyfish, which could negatively affect belt systems, refrigerated seawater (RSW) pumps, and the quality of pollock landed. Additionally, the difficulty in providing an accurate weight estimate for discarded jellyfish was noted. In response, the EFP requirements for jellyfish were revised in 2020 to allow discards of jellyfish at-sea so long as the vessel operator recorded the jellyfish discard in their logbook (no weight estimate needed).

##### *Swapping out of vessel hard drives during offload and EM function test*

Vessel operators, particularly those in the GOA operating under a race-for-fish, wanted to efficiently use the time during their offload to swap hard drives and run the required EM function test in order to identify any issues well in advance of needing to depart again immediately following completion of the offload. EM service providers also wanted the same type of flexibility so they could perform system repairs at the



time of offload. Starting in 2021, if a participating vessel did not have a deckload at the time of offload, the EFP allows for an interruption of up to 15 minutes was allowed for hard drive exchanges, equipment servicing, and repairs and any interruption to the offload video must be noted as a comment in the vessel logbook.

Similarly, due to the race-for-fish nature of the GOA pollock fishery, vessel operators found it difficult to meet the requirement of performing an EM function test before immediately leaving the dock for their next trip after completion of delivery. In 2021, the EFP was modified so that EM function tests were allowed after departing from the dock and at least two hours before deploying the net (adherence to Malfunction Table protocols outlined in a vessel's VMP still apply).

#### *Shoreside Plant Observers*

Initially, at the start of the EFP, plant observers hired by the Observer Providers for the EM EFP project were instructed to monitor only EM deliveries from participating EM vessels such that AFA shoreside observers monitored only AFA non-EM deliveries in the Bering Sea. When AFA vessel observers in the Bering Sea, as well as AIS vessel observers in the GOA, were no longer allowed in the processing plants due to COVID-19 restrictions, it quickly became necessary to remove the distinction between shoreside EM observers and shoreside non-EM observers to allow for efficient coordination of all necessary delivery monitoring requirements from both EM and non-EM vessels.

Unlike in the Bering Sea, GOA processing plants were not required to have shoreside observers nor were they required to have Catch Monitoring Control Plans (CMCPs). As such, there were several challenges encountered at the start of 2020, including: inadequate space for observer gear and sampling equipment, inadequate sample stations including lack of platform scales, plant personnel being unaccustomed to observers being deployed to their facilities, poor preparation by the plant for meeting observer requirements of the EFP, communication difficulties and bitterly cold weather. Outreach to the plants by both the PIs and NMFS helped overcome the majority of these issues. Extra observers for the fall 2020 season and the 2021 A season also helped reduce the workload burden for the observers. Additionally, starting in 2021, the EFP required all GOA plants to submit a CMCP that included details regarding EFP plant liaison contact information and a detailed description of how fish is offloaded from the vessel into and throughout the plant, including where and how catch and PSC are sorted and stored. The CMCP also detailed the observer's sampling station and how after-scale salmon PSC information is provided to the observers.

Starting in 2020 and continuing in 2021, all shoreside observers were requested to complete an EFP Shoreside Observer Survey (developed by the PIs in conjunction with the Observer Program) upon completion of their contract. The feedback from the 31-question survey was useful to understand the observers' experiences and help resolve some of the observer-specific difficulties encountered (mostly at the GOA plants that were unaccustomed to observers working in their facilities).

#### *Communications between shoreside observers, processing plant personnel, and pollock vessels*

Initially in 2021, communications regarding EM deliveries between GOA plant observers and plant personnel was challenging but improved when observers were equipped with project-only cell phones and vessel operators were requested to communicate with plant observers directly about their delivery ETA, hail weights, and whether their pollock trip was EM or non-EM (in the GOA, EM vessels have the option to opt out of EM on a trip-by-trip basis and the sampling target for EM trips is 30%). Communication issues were likely an issue at the beginning of 2020 as well; however, given the other more immediate issues highlighted in Section E above, the need for improved communications did not become a focus until 2021. In the Bering Sea, communications since the beginning of the EFP have been less complicated given that all deliveries from participating vessels are EM trips (100% sampling coverage).

### *Vessel Monitoring Plans*

At the start of the EFP, each project was utilizing their own VMP developed with their respective EM service provider. NMFS identified this as an area of improvement to create consistency between VMPs and to streamline the VMP approval process for the agency. For 2021 a single uniform catcher vessel VMP was created for both projects and included a universal EM EFP logbook.

## **Part 5. Lessons Learned, EFP Summary Conclusions**

### *Lessons Learned*

- Clear and timely communication between all parties is critical: vessel operators, processing plant personnel, EM service providers, EM reviewers, shoreside observers, observer provider companies, and NMFS and FMA personnel.
- Weekly/biweekly EFP team meetings were invaluable for identifying and resolving issues.
- Strong education and outreach programs need to be in-place and regularly delivered to all vessel and processing participants.
- Vessel operators tend to overestimate discard amounts. Given the discard recording requirements under the EFP, vessel operators also needed reminders on how to fill out their logbooks correctly.
- Shoreside observer challenges in the GOA, where EM vessels have the option to opt out of EM on a trip-by-trip basis and delivery schedules can change with little notice, continue and improvements are constantly being evaluated.

### *Conclusions*

- Maximized retention (minimal discard exemptions = reduced at-sea discards) in BS and GOA pelagic pollock fisheries can be achieved (Objective 1).
- EM can adequately capture discard events (when they occur) and video data can be used to verify vessel logbook discard information for compliance monitoring purposes (Objective 3).
- At-sea observers and their required sampling duties can be replaced with observers at shoreside processing plants (Objective 2).
  - While not a specified measurable metric under the EFP or objective of EM (as approved by the Council), it should be noted that utilizing EM for compliance monitoring removes and eliminates concerns associated with human observer safety at-sea.
- While data streams for EM differ from data streams available from at-sea observers, data needs for effective fisheries management are maintained and, in some cases, improved:
  - Maximized retention for MRA and other incidentally caught species allows for accurate recording at the plant vs. observer discard estimates at-sea
  - Full halibut census occurs at the plant vs. less accurate estimates from at-sea samples
  - At-sea discards amounts are based on verified operator logbook data
- Salmon bycatch accounting improved through the use of EM camera systems; the observer effect for GOA shoreside pelagic pollock deliveries is removed since trips are monitored by EM and randomly sampled for salmon bycatch at the plant (Objective 4).
- For tender deliveries, salmon census counts became possible whereas estimates were previously based on at-sea observer samples (Objective 4).
- EM can successfully be used on tender vessels to maintain the Chain of Custody.
- Vessel behavior did not change when at-sea discard requirements were removed (e.g., pollock trip limit, MRAs, and non-salmon PSC)
- Initial comparisons indicate that EM is more cost-effective for compliance monitoring in pelagic pollock fisheries, especially in the Bering Sea, when compared to at-sea observers (observer costs for vessel at-sea days vs. observer costs for shoreside days and removing one-time costs associated with equipment and installation). However, it is recognized that the exact level of cost effectiveness depends on several variables, including, but not limited to: how/if video review of vessel offloads will be required; how recurring/one-time costs will be reported; and unknown potential efficiencies without COVID-19 as a back drop for shoreside observers.

- The use of EM for compliance monitoring functions better in a rationalized fishery with an established and well-defined fishing/processing schedule.

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