



NOAA
FISHERIES

Electronic Monitoring Program Manual

West Coast Region
Groundfish



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Electronic Monitoring Program Manual 2021-2022

United States Department of Commerce
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National Marine Fisheries Service
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Contents

Program Contact Information	3
Background	5
1.1 EM Program Overview	8
1.1.1 Vessel owners and operators	9
1.1.2 EM Service Providers	10
1.1.3 Permits and Monitoring Branch	11
1.1.4 WCGOP	11
2. EM Service Provider Responsibilities	13
2.1 Field and Technical Support	13
2.2 Data Services	17
2.2.1 Overview of the Logbook Audit Model	18
2.2.2 Discard Logbook Data Processing	20
2.2.3 EM Data Processing	20
2.2.4 Species Identification	21
2.2.5 Data Tracking and Processing	22
2.2.6 Providing Summary Data	32
2.2.7 Feedback Reports and Feedback Loop	33
2.2.8 Data Storage and Access	33
2.2.9 Providing Data for NMFS Debriefing: Secondary Review	34
Glossary	35
Appendix A: List of Species	38
Appendix B: Logbook page examples	41
Appendix C: Feedback Report Template	44
Appendix D: Business Rules for discard comparison of logbook and EM	46

Background

In 2000, the West Coast groundfish fishery was declared a federal disaster due to overfishing. This resulted in large fishing area closures and prohibitive trip limits implemented by the Pacific Fishery Management Council (PFMC). A 2003 federal buyout program reduced the fleet size through permit consolidation in an effort to ease some of the burden, yet more work was needed.

In 2011, NOAA Fisheries implemented a catch share program for the West Coast groundfish trawl fishery. The Pacific Coast Groundfish Fishery's Trawl Catch Share Program (Trawl Rationalization Program), consists of an Individual Fishing Quota (IFQ) Program for the shorebased trawl fleet and cooperative programs for the at-sea mothership and catcher/processor trawl fleets.

The catch share program divides the amount of catch allocated to the trawl fishery into shares controlled by individual fishermen or groups of fishermen (cooperatives). Under this program, fishermen have more flexibility for harvesting their catch than under the previous management structure.

Arrowtooth flounder	Other flatfish
Bocaccio rockfish South of 40°10' N.	Pacific cod
Canary rockfish	Pacific halibut (IBQ) North of 40°10' N.
Chilipepper rockfish South of 40°10' N.	Pacific ocean perch North of 40°10' N.
Cowcod South of 40°10' N.	Pacific whiting
Darkblotched rockfish	Petrale sole
Dover sole	Sablefish North of 36° N.
English sole	Sablefish South of 36° N.
Lingcod North of 40°10' N.	Shortspine thornyheads North of 34°27' N.
Lingcod South of 40°10' N.	Shortspine thornyheads South of 34°27' N.
Longspine thornyheads North of 34°27' N.	Splitnose rockfish South of 40°10' N.
Minor shelf rockfish North of 40°10' N.	Starry flounder
Minor shelf rockfish South of 40°10' N.	Widow rockfish
Minor slope rockfish North of 40°10' N.	Yelloweye rockfish
Minor slope rockfish South of 40°10' N.	Yellowtail rockfish North of 40°10' N.

Table 1: The thirty IFQ and Individual Bycatch Quota (IBQ) species categories for the Trawl Catch Share Program. See Appendix A for additional information regarding species groupings.

One characteristic of the catch shares program is individual accountability, which includes 100-percent at-sea monitoring of all fishing trips. **Observers** were originally the only approved method to satisfy the at-sea monitoring requirement. Beginning in 2022, **electronic monitoring (EM)** may be used as an alternative to meet this requirement. At-sea monitoring holds individuals accountable for discards that do not make it to port. For the shorebased sector, **catch monitors** verify vessel landings at a licensed **first receiver**.

Observers are NMFS-certified, independent fisheries biologists deployed aboard working fishing vessels to collect scientific data on fishing operations, catch composition, protected resources, and biological sampling. **Catch share observers** are deployed on:

- Vessels participating in the IFQ program, including whiting and non-whiting groundfish trawl and non-trawl vessels;
- Motherships participating in the at-sea whiting fishery;
- **Mothership catcher vessels (MS/CV)** participating in the at-sea whiting fishery; and
- Catcher-processors participating in the at-sea whiting fishery.

EM may be deployed on:

- Vessels participating in the IFQ program, including whiting and non-whiting groundfish trawl and non-trawl vessels; and
- MS/CV participating in the at-sea whiting fishery.

In order to collect the biological samples and other data that cannot be obtained from using EM systems alone, non-catch share observers provided by the West Coast Groundfish Observer Program (WCGOP) may be deployed to a vessel participating in EM, specifically when there is potential for sorting and discarding at sea. Catch monitors also play a crucial role by verifying retained species and collecting samples at the dock.

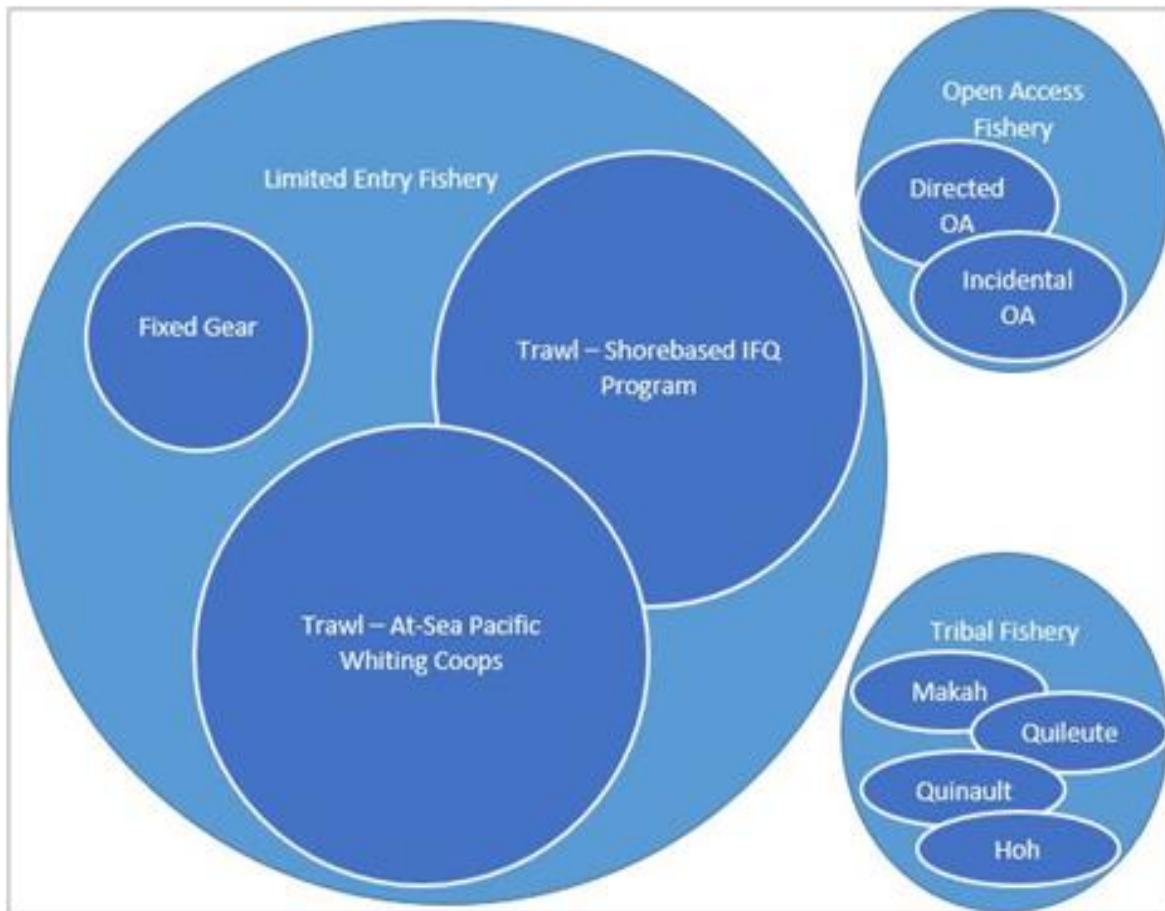


Figure 1. Diagram illustrating the relationship between commercial fisheries: limited entry, open access, and tribal. The size of the circle represents the proportion of fish allocated to each fishery. The EM program provides at-sea monitoring coverage for the shorebased IFQ program and for at-sea whiting catcher vessels delivering to motherships under a whiting co-op.

1.1 EM Program Overview

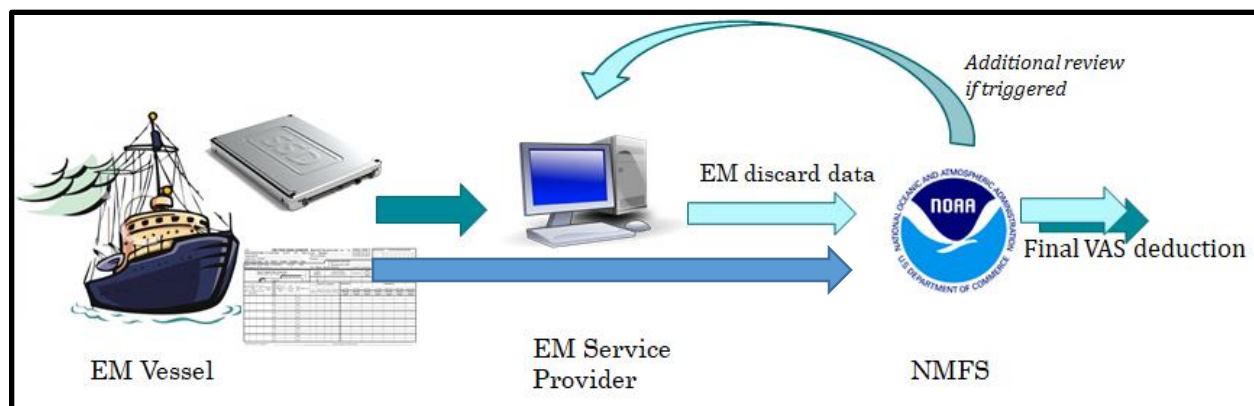


Figure 2. Diagram representing simplified flow of EM data. After an EM trip, the vessel operator submits EM data (typically a hard drive) and discard logbook to the EM service provider. Logbooks are sent directly to NMFS via a web application. The provider verifies the data for completeness and submits discard logbook data to NMFS. The provider then conducts EM data review, then submits EM summary data with discards to NMFS. NMFS runs automated checks before final upload to vessel accounts or returns the data to the EM service provider for additional review, if necessary.

There are many moving parts to the EM program, from the initial permitting and system installation on the vessel, to review and catch accounting, to data storage and NMFS feedback post-trip. By following the roles and responsibilities for each step involved in an example fishing trip, one can gain a sense of the process.

EM trip timeline:

1. Before a trip, the **vessel operator** of an **EM-authorized vessel** makes the proper declarations to the Office of Law Enforcement (OLE), and the West Coast Groundfish Observer Program (WCGOP). The vessel captain or WCGOP staff opens an EM trip in the database, which would be shared with the vessel's EM service provider.
2. Following the trip, the vessel operator closes out the trip with WCGOP and submits copies of their discard and retained logbooks to their certified **EM service provider**. The vessel operator also submits the hard drive/EM data to the EM service provider.
3. The EM service provider enters the logbook data and submits it to NMFS **within 48 hours (two business days) from receipt of the discard logbook from the vessel**. NMFS uses the logbook data to debit at-sea discards.
4. The service provider will also store EM data, conduct review of EM data, and provide summary data to NMFS. The service provider is expected to submit EM summary data to NMFS no later than **fifteen business days (approximately three weeks)** from the date of hard drive receipt.

5. Portions of trips may be reviewed. In fisheries where the review rate is not 100%, specific hauls will be randomly selected. Providers will be able to access a report via the web-based EM application to identify the selected hauls.
6. If the logbook passes the initial comparison, the logbook data will stand as the discard source used to debit the vessel account. If the logbook does not pass, the EM data will be used to debit the vessel account and review of additional video may be required of the service provider for the trip.
7. Following the review, the provider would also submit a feedback report which captures feedback from the review for the vessel owner, operator, and NMFS. Feedback reports should also be submitted within **fifteen business days** from the date of hard drive receipt.
8. Providers will also be required to notify NMFS of EM system malfunctions or other requests for technical assistance if they affected a trip.
9. For the NMFS secondary review, WCGOP may review a portion of data previously reviewed by the service provider. WCGOP will direct the provider to submit raw EM data and annotation records, according to the NMFS secondary review procedures.

1.1.1 Vessel owners and operators

As an EM service provider, you are partnering with vessel owners and operators participating in the shorebased trawl IFQ and/or catcher vessels in the whiting mothership cooperative to provide EM equipment, maintenance, and data services.

To participate in the trawl catch share EM program, vessel owners' and operators' responsibilities include¹ to:

- Maintain a valid trawl-endorsed limited entry permit (**LEP**) assignment on the vessel;
- Have an active **vessel account**, if participating in the shorebased IFQ sector;
- Obtain an **EM Authorization** from NMFS;
- Procure services from a NMFS-certified EM service provider;
- Obtain an **EM system certification** after EM system installation; and
- Maintain a NMFS-accepted **vessel monitoring plan** (VMP).

Once approved, pre-trip responsibilities of the vessel owner and operator include to:

- Make a declaration report to OLE;
- Provide notice to the WCGOP (and accept a WCGOP observer, if selected);
- Ensure they have logbook and hard disk space for the trip;
- Conduct a pre-trip **function test** of the EM system; and
- Contact the service provider to resolve any issues before departure.

¹ See § 660.604 *Vessel and first receiver responsibilities* for a complete list of regulatory requirements.

The EM-applicable gear types or sectors, and monitoring type for OLE declaration reports, (from 50 CFR 660.13(d)(4)(iv)):

- *Limited entry groundfish non-trawl, shorebased IFQ, electronic monitoring,*
- *Limited entry midwater trawl, Pacific whiting shorebased IFQ, electronic monitoring,*
- *Limited entry midwater trawl, Pacific whiting mothership sector (catcher vessel), electronic monitoring*
- *Limited entry midwater trawl, non-whiting shorebased IFQ, electronic monitoring,*
- *Limited entry bottom trawl, shorebased IFQ, not including demersal trawl, electronic monitoring,*

During an EM trip, the vessel operator must:

- Monitor the EM system and its components to ensure it is in compliance with the VMP;
- Ensure crewmembers follow the catch handling protocols and discard rules as described in the VMP;
- Immediately notify the EM service provider of EM system malfunctions; and
- Fully and accurately report catch data and discards in the appropriate logbook.

Post-trip responsibilities for the vessel owner and operator include to:

- Submit the logbook to EM service provider;
- Submit the EM data (hard drive) to EM service provider; and,
- Respond to EM service provider and NMFS feedback and requests.

Shorebased Plants and Catch Monitors

For shoreside deliveries, the EM vessel delivers retained catch to a licensed **first receiver**. There, all catch is offloaded, sorted, identified, and weighed. The catch monitor verifies the first receiver information and is responsible for the shorebased component of 100% IFQ monitoring. The EM system must be operational and recording until the offload begins. The catch monitor will take over monitoring duties at that time.

For EM trips, the catch monitor will sample retained salmon or other biological data otherwise sampled by an at-sea catch share observer.

1.1.2 EM Service Providers

To become an EM service provider, you must first submit an application to the NMFS West Coast

Region Fisheries Permit Office. More information about the application process, including forms and templates for the **EM Service Plan**, can be found online at: <https://www.fisheries.noaa.gov/west-coast/commercial-fishing/west-coast-fishing-permits>

The EM Program Guidelines provide best practices and flexible frameworks for creating an EM Service Plan and vessel monitoring plans, which together explain the complete EM services for vessel and provider. There are gear-specific catch handling and sorting requirements which must be followed across vessels, and EM service providers must be able to review and report EM summary data for IFQ discards to NMFS using standardized methods. The details of the EM service provider's role are provided in this manual.

1.1.3 Permits and Monitoring Branch

Staff in the Permits and Monitoring Branch of the West Coast Region's Sustainable Fisheries Division manage permits associated with the catch shares program, including EM. They coordinate with vessel owners and operators, co-op managers, EM service providers, WCGOP, OLE, and others to ensure the program meets the regulatory requirements.

Permits and monitoring staff are responsible for:

- Processing EM service provider permit applications and issuing service provider permits;
- Processing vessel EM authorization applications and issuing EM authorizations;
- Reviewing EM system certification forms;
- Providing assistance in the creation of vessel monitoring plans, and reviewing final plans;
- Managing the service provider feedback and technical reports online reporting system; and,
- Serving as the initial point of contact for reports of potential harassment, conflicts of interest, system tampering, and other compliance issues.

1.1.4 WCGOP

The [West Coast Groundfish Observer Program](#) (WCGOP) is responsible for managing the logbook and EM data submitted by EM service providers and ensuring that EM service providers follow the species identification and discard estimation protocols for the video review. EM service providers submit EM summary data to WCGOP, who provide the technical framework for data submission needs. WCGOP also performs a secondary review of a portion of the trips reviewed by an EM service provider to evaluate EM service providers' and video reviewers' performance.

WCGOP is responsible for:

- Identifying hauls that are selected for the initial review to the provider;
- Quality assure/quality check (QA/QC) of the data summary;
- Reporting discard data for catch accounting purposes;
- Conducting secondary review and debriefing of the EM service provider;
- Storing video and annotated data from the secondary review;
- Data analysis and reporting as needed;
- Database and application maintenance and support; and,
- Deploying non-catch share observers to selected EM trips.

2. EM Service Provider Responsibilities

An EM service provider has many responsibilities under the EM program, divided into two categories - EM Field and Technical Support and EM Data Services. In general, the EM service provider²:

- Installs and certifies a vessel's onboard EM system;
- Provides information for the vessel owner/operator to complete the VMP;
- Provides technical (remote and field) services for the EM system and EM data;
- Provides hard drives (or other approved media) for transferring data from the vessel to the EM service provider;
- Receives raw EM data recorded by the EM system;
- Receives vessel logbook data submitted by the vessel captain;
- Stores EM and logbook data;
- Reviews raw EM data and creates annotations;
- Submits EM summary data to NMFS for at-sea discards;
- Gives feedback to the vessel operator post-review; and,
- Submits to a NMFS secondary review as requested.

2.1 Field and Technical Support

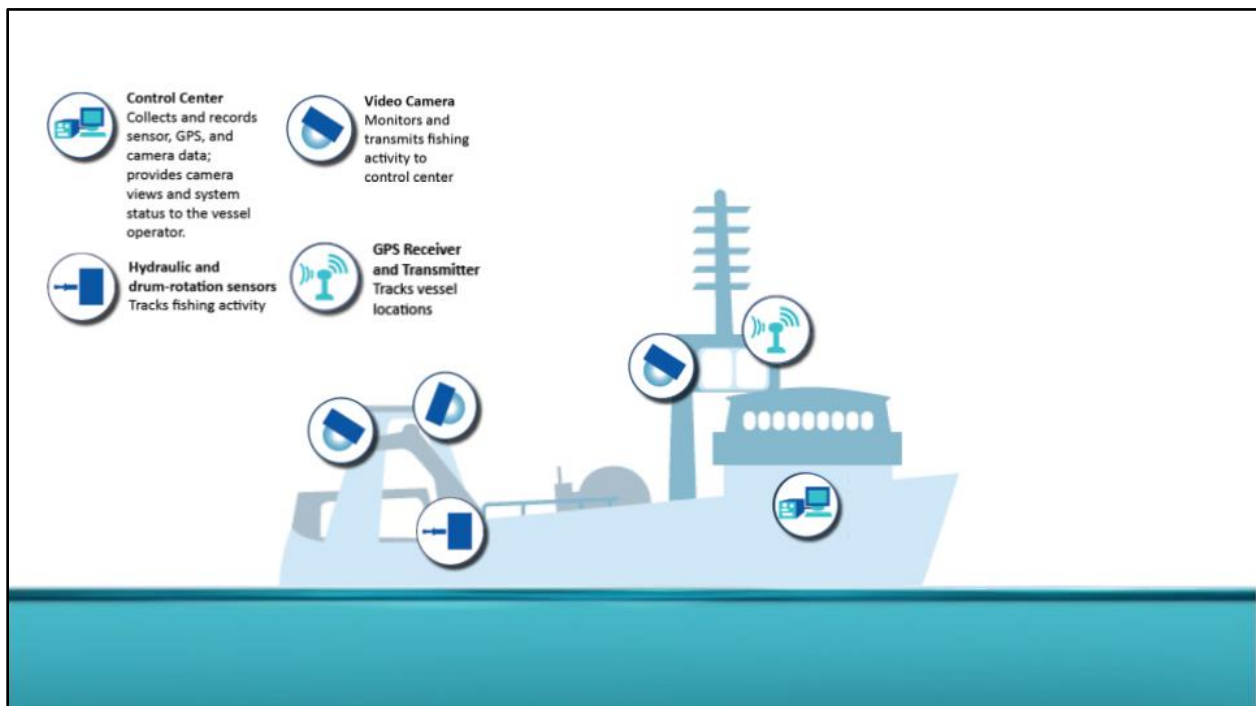


Figure 4. Example EM system and components onboard a trawl vessel.

² See § 660.603 *Electronic monitoring provider permits and responsibilities* for a complete list of regulatory requirements.

An approved EM service provider must provide field and technical support services to vessels with which they have a contract. This includes managing EM systems, installation, maintenance, and technical support, according to the NMFS-accepted EM Service Plan. (regulatory excerpts in the following sections are shown in **bold**).

The *EM system* is the on-board technology that records fishing activity. For the west coast program, the system records the activity using video cameras, GPS, and gear sensors. Computer hardware writes these *raw EM data* onto removable or transferable storage (hard drives are currently the most accepted method, although wireless transfer is emerging). The vessel captain monitors the status of the system, including camera views and recording status, in real time through one or more video monitors.

A vessel owner that applies for and passes initial eligibility for the EM Authorization, may procure and install an EM unit from a NMFS-permitted provider.

At the time of installation, the EM service provider must:

- (i) **Install an EM system that meets the performance standards under § 660.604(j);**
- (ii) **Ensure that the EM system is set up, wires run, system powered, and tested with the vessel in operation;**
- (ii) **Brief the vessel operator on system operation, maintenance, and procedures to follow for technical support or field service;**
- (iii) **Provide necessary information for the vessel operator to complete the VMP, such as images and diagrams of camera views and vessel layout, specific information about system settings, and designated discard control points; and,**
- (iv) **Complete an EM System Certification Form for the vessel owner.**

EM System Performance Standards, from § 660.604(j):

The specifications (*e.g.*, image resolution, frame rate, user interface) and configuration of an EM system and associated equipment (*e.g.*, number and placement of cameras, lighting) used to meet the requirements of this section must be sufficient to:

- (1) **Allow easy and complete viewing, identification, and quantification, of catch items discarded at sea, including during low light conditions;**
- (2) **Continuously record vessel location (latitude/longitude coordinates), velocity, course, and sensor data (*i.e.*, hydraulic and winch activity);**
- (3) **Allow the identification of the time, date, and location of a haul/set or discard event;**
- (4) **Record and store image data from all hauls/sets and the duration that fish are onboard the vessel until offloading begins;**

- (5) Continuously record and store raw sensor data (i.e., GPS and gear sensors) for the entire fishing trip;**
- (6) Prevent radio frequency interference (RFI) with vessel monitoring systems (VMS) and other equipment;**
- (7) Allow the vessel operator to test and monitor the functionality of the EM system prior to and during the fishing trip to ensure it is fully functional;**
- (8) Prevent tampering or, if tampering does occur, show evidence of tampering; and,**
- (9) Provide image and sensor data in a format that enables their integration for analysis.**

The employee of the EM service provider who installed the EM system must complete an EM Certification Form to attest to the system's functionality and adherence to program standards. The form requires that the technician test the EM system under different conditions to identify common technical issues (e.g., radar interference). The form is available online at:

www.fisheries.noaa.gov/west-coast/resources-fishing/electronic-monitoring-west-coast

Following installation, the EM service provider must provide certain information to the vessel owner to enable completion of the vessel monitoring plan (VMP), such as images and diagrams of camera views and vessel layout, specific information about system settings, and designated discard control points. The VMP provides documentation on the EM system and how the approved configuration allows for the vessel operator and crew to handle catch appropriately, in order to collect useful EM data. The vessel owner is responsible for preparing and submitting the VMP to NMFS, but a vessel owner may contract with an EM service provider to prepare the VMP on their behalf. NMFS has published VMP Guidelines and templates to assist vessel owners and service providers in preparing VMPs. These documents are also available on NMFS's website at the above web address.

Throughout the fishing season, the EM service provider has the following responsibilities. The way each service provider intends to carry out these duties must be described in the service provider's EM Service Plan (see EM Service Plan Guidelines, available online).

From §660.603(k):

- **The EM service provider must communicate with vessel operators and NMFS to coordinate service needs, resolve specific program issues, and provide feedback on program operations.**
- **The EM service provider must provide maintenance and support services, including maintaining an EM equipment inventory, such that all deployed EM systems perform according to the performance standards at § 660.604(j) and that field service events are scheduled and carried out with minimal delays or disruptions to fishing activities.**
- **The EM service provider must provide technical assistance to vessels, upon request, in EM system operation, the diagnosis of the cause of malfunctions, and assistance**

in resolving any malfunctions. Technical support must be available 24-hours per day, seven days per week, and year-round.

- **The EM service provider must submit to NMFS reports of requests for technical assistance from vessels, including when the call or visit was made, the nature of the issue, and how it was resolved.**

The Permits and Monitoring Branch provides EM service providers with access to a web application where they can log technical service requests from vessels and their resolutions, in addition to logging the review feedback requirements (including feedback reports). See the feedback report section of this manual for more information on the web application.

2.2 Technical Assistance and Litigation Information

As a requirement of its permit, the EM service provider must provide the following to NMFS or authorized officers, upon request (from §660.603(l)):

- (1) Assistance in EM system operation, diagnosing and resolving technical issues, and recovering corrupted or lost data.**
- (2) Responses to inquiries related to data summaries, analyses, reports, and operational issues with vessel representatives.**
- (3) Technical and expert information, if the EM system/data are being admitted as evidence in a court of law. All technical aspects of a NMFS-approved EM system may be analyzed in court for, inter alia, testing procedures, error rates, peer review, technical processes and general industry acceptance. To substantiate the EM system data and address issues raised in litigation, an EM service provider must provide information, including but not limited to:**
 - (i) If the technologies have previously been subject to such scrutiny in a court of law, a brief summary of the litigation and any court findings on the reliability of the technology.**
- (4) All software necessary for accessing, viewing, and interpreting the data generated by the EM system, including maintenance releases to correct errors in the software or enhance the functionality of the software.**
- (5) Notification to NMFS of any change of management or contact information or a change to insurance coverage.**
- (6) A copy of any contract between the service provider and entities requiring EM services.**

(7) Proof of sufficient insurance.

(8) Copies of any information developed and used by the EM service provider and distributed to vessels, including, but not limited to, informational pamphlets, payment notifications, and description of EM service provider duties; and,

(9) EM data and associated meta data, and other records specified in the regulations.

The EM service provider must also notify NMFS within 24 hours after the EM service provider becomes aware of the following (§660.603(l)(5)):

(i) Any information, allegations, or reports regarding possible harassment of EM provider staff;

(ii) Any information, allegations, or reports regarding possible EM system tampering;

(iii) Any information, allegations, or reports regarding any action prohibited under §§ 660.12(f) or 660.602(a)(13); or,

(iv) Any information, allegations or reports regarding EM service provider staff conflicts of interest.

The EM service provider will directly contact the EM Program Coordinator to notify NMFS of the above information, allegations, or reports.

Harassment is defined as when EM service provider staff feel threatened or feel that their work or work environment is being compromised.

2.2 Data Services

The EM service provider must process vessels' EM data according to a prescribed sampling scheme, as specified by NMFS, and determine an estimate of discards for each sampled haul using standardized estimation methods. This section describes the EM service provider's responsibilities in processing, reporting, and storing vessels' EM data, and the standard sampling and estimation methods that must be used.

2.2.1 Overview of the Logbook Audit Model

Under a *logbook audit model*, EM is used to validate the self-reported logbook discards submitted by the vessel operator. Vessel operators are expected to accurately report catch and discards with estimated weights and correct species identification. During EM review, the EM service provider will create independent discard estimates for sampled hauls, and based on the comparison of the two, NMFS will use either EM or logbook data for the final discard estimate to debit the vessel's IFQ account.

The following steps outline the logbook audit process:

1. The vessel operator declares an EM trip to WCGOP using the web-based EM application. EM service providers may login to application to view the list of open trips for their vessels. (The EM service provider may separately require notification from the vessel operator, if desired).
2. After an EM trip, the vessel operator submits images of the retained and discard logbook to WCGOP via mobile application within 24-hours of landing. The EM service provider may login to the application to obtain the logbook images for processing.
3. The EM service provider has two different options available to submit the logbook data to WCGOP. 1) If the provider annotates the logbook using their software, they may upload the annotated data summary via the API. 2) The logbook data may be entered directly in the E-logbook module in the web-based application. WCGOP uses the logbook data to initially debit discards from the vessel's account. WCGOP also uses the logbook data to determine the subsample of hauls to be selected for video review, if less than 100% (i.e., bottom trawl, fixed gear) based on the vessel's declaration.
4. Upon receipt of the hard drive, the EM Service Provider will then confirm trip level EM data matches the logbook. This includes verifying that the number of hauls reported on the logbook matches the number of hauls reported by the EM system. The EM service provider will work with the vessel operator to resolve discrepancies.
5. The EM service provider may login to the application to determine the sampling rate for a given trip (if less than 100%).
 - a. The sampling unit is at the haul level, with either all or a percentage of hauls reviewed on each trip.
 - i. Shorebased whiting – 100% of hauls
 - ii. MS/CV - 100% of hauls
 - iii. Non-whiting midwater trawl – (100% of hauls for maximized retention³,

³ For maximized retention fishing trips, sorting catch is generally prohibited and there are few discard events of unsorted catch. Conversely, optimized retention trips involved diverse catch with allowable sorting and discarding of certain species. Vessel captains will self-identify the retention type in their OTS declaration.

- 25% for optimized retention)
 - iv. iv. Bottom trawl - (100% of hauls for maximized retention, 25% for optimized retention)
 - v. Fixed gear - 25% of hauls
- b. The EM service provider is not required to review "steam time" (vessel transit between hauls, to and from the fishing grounds) or time in port.
6. The EM service provider conducts the *primary video review* for hauls selected for review, which includes:
- a. Review of all raw sensor and image data to determine completeness.
 - b. Review of sensor data to annotate haul start and end times and locations, and to identify the total number of hauls in a trip.
 - c. Annotate discard events (described in Section 2.3.4).
7. The EM service provider submits an *EM summary report* to WCGOP via the API. NMFS will compare the EM data to logbook data based on the following business rules and notify the provider if the trip has "passed" the comparison. If the trip has passed, no further action is needed. If the trip has not passed, see Step 8. Tables 2 and 3 below describe the business rules used for comparing the EM summary data and self-reported logbook discards.

Type of Mismatch	IFQ Species/Group	Business Rule
LB > EM	All IFQ species/groups	Use LB to debit discards.
LB < EM	Cowcod rockfish South of 40°10'N, yelloweye rockfish	If LB < EM by more than 10% or 2 lb of the EM estimate, trigger 100% review, and use EM to debit discards.
LB < EM	All other IFQ species/groups	If LB < EM by more than 25% or 5 lb of the EM estimate, trigger 100% review, and use EM to debit discards.
If no EM estimate* (e.g., due to EM system failure)	All IFQ species/groups	Use LB to debit discards.

Table 2. Summary of EM/Logbook comparison criteria for non-whiting midwater trawl (optimized retention), bottom trawl (optimized retention), and fixed gear trips.

Type of Mismatch	IFQ Species/Group	Business Rule
LB > EM	Total weight of discard	Use LB to debit discards.
LB < EM	Total weight of discard	If LB < EM by more than 25% or 5 lb of the EM estimate, use EM to debit discards.
If no EM estimate* (e.g., due to EM system failure)	Total weight of discard	Use LB to debit discards.

Table 3. Summary of EM/Logbook comparison criteria for Pacific whiting midwater trawl, non-whiting midwater trawl (maximized retention), and bottom trawl (maximized retention) trips.

8. For trips that do not pass the logbook audit, in the case of maximized retention trips where 100% of video is initially reviewed, the EM estimate will be used and no further action is needed. For optimized retention trips the provider must review the remaining hauls from the trip and resubmit the EM summary report for the entire trip to WCGOP via the API.

2.2.2 Discard Logbook Data Processing

Vessel captains are responsible for documenting EM trips and discards in their logbook. The type of discard logbook depends on the fishery and gear type used. Bottom trawl, fixed gear, and midwater trawl vessels each have different logbook reporting requirements. All are required to report IFQ or unsorted discards with estimated weight and reason.

EM vessel operators will initiate a trip in the Observer Trip Selection (OTS) app. Within 24 hours of the vessel's landing, the captain must submit all pages from the logbook for that trip. The vessel operator will submit logbook data directly to their EM service provider upon trip completion. The provider is required to transcribe and submit the logbook transcription details to NMFS via the TripsAPI/CatchAPI.

Additional details on the API are available in the section *Providing Summary Data*.

2.2.3 EM Data Processing

EM service providers train their data processing staff to accurately identify and quantify discard events. EM service providers use software to ingest and process the raw EM data and format it in a way to make EM review possible. There is no NMFS certification for training data processing staff, but NMFS provides the tools needed for species ID, weight estimation, fate determination, and data formatting. Individual reviewer performance may be evaluated by NMFS as part of the secondary review process. As a

certified EM service provider, your staff will have the experience needed to complete the following tasks (From 50 CFR 660.603(m)):

Data services. For vessels with which it has a contract (see § 660.604(k)), the EM service provider must provide and manage EM data processing, reporting, and record retention services, as described below and according to a NMFS-approved EM Service Plan, which is required under § 660.603(b)(1)(vii), and as described in the EM Program Manual or other written and oral instructions provided by the EM Program, and such that the EM Program achieves its purpose as defined at § 660.600(b).

(1) The EM service provider must process vessels' EM data according to a prescribed coverage level or sampling scheme, as specified by NMFS, and determine an estimate of discards for each trip using standardized estimation methods specified by NMFS. NMFS will maintain manuals for EM data processing protocols on its website.

(2) The EM service provider must ensure that its data processing staff are fully trained in:

- (i) Use of data processing software;
- (ii) Species identification;
- (iii) Fate determination and metadata reporting requirements;
- (iv) Data processing procedures;
- (v) Data tracking; and,
- (vi) Reporting and data upload procedures.

2.2.4 Species Identification

EM data reviewers working for a service provider must be trained for accurate species identification and be knowledgeable of fishing operations for the west coast groundfish fishery.

Because the IFQ program requires accurate reporting of the weights of discarded IFQ species, reviewers must be able to distinguish between IFQ and non-IFQ species, and identify IFQ species to the lowest taxonomic level allowed. In the best practices learned from the EFP program, periodic testing of reviewers and multiple reviewers confirming the ID or weight for certain events helps to ensure accurate data reporting. Additionally, review staff working under the EFP were either previously (and in good standing) or concurrently certified as west coast groundfish fishery observers or catch monitors, thus having first-hand knowledge of fishery operations and species encountered in the field.

As a certified EM service provider, WCGOP will direct you to the approved protocols and guides to use when determining the appropriate level of identification of IFQ species, prohibited species, protected species, and other allowable and non-allowable discards. WCGOP trains and certifies human observers for species identification and fisheries data quality standards, and has the expertise to set standards for meeting these needs with EM.

Appendix A. List of Species summarizes the species covered by the Pacific Coast Groundfish fishery management plan. This list further breaks down the composition of the IFQ species groupings

previously shown in Table 1. EM data processing staff should expect to encounter any number of the species listed during EM review.

In addition, the following field guides are recommended as species identification resources:

- *Pacific Coast Fishes*, Eschmeyer
- *Coastal Marine Fishes of California*, Miller & Lea
- *Marine Mammals and Turtles of the U.S. Pacific*, Wynne
- *A Field Guide to Western Birds*, Peterson

For information regarding west coast observer training and certification, please refer to the WCGOP page: <https://www.fisheries.noaa.gov/west-coast/fisheries-observers/west-coast-groundfish-and-sea-hake-observer-data-collection-quality>

2.2.5 Data Tracking and Processing

A provider will describe procedures for tracking hard drives and/or data files throughout their use cycle in their service plan. At any time, the service provider should be able to report where a given hard drive is located, for example, by assigning it a unique ID and documenting its deployment, transit, receipt, data wiping, and redeployment.

Vessel operators and EM service providers will coordinate efforts so that a vessel has sufficient storage capacity prior to embarking on an EM trip. After completing the fishing trip(s) and at the start of the final offload, the vessel operator will submit the EM data (using a shipping method with tracking if a hard drive is mailed).

Once a hard drive (or other acceptable data transmission) is received by the EM service provider, the original data files must be stored following the minimum retention requirements (see section 2.3.7). Any annotation or further processing of the data must not alter the original files.

EM Data Review

Now that the service provider has taken possession of the EM data set, they carry on with the logbook audit. The first step of the audit is to verify that the number of records from EM and logbook data match. Second, a sampling frame is established. Third, discard estimates are made. Finally, summary data is submitted to NMFS.

Initially, the EM data is checked for completeness, by checking for *time gaps* and by verifying the number of hauls for each trip. The number of hauls may be verified using *interval annotations*.

Interval Annotation

Interval annotations mark the start and end points of a fishing event in the service provider's EM review software. Trips, hauls, and haul processing events may have interval annotations which flag the start/end points of those events in the data timeline. EM review staff, through data processing software, may be able to indicate these points in the data by identifying characteristics in vessel speed, hydraulic pressure or other gear sensor data; or a combination of one or more of these data sources.

Interval Annotations:

- Trip: mark all trip start and end points
- Haul/set: mark all haul start and end points

All trips from a drive should be reviewed for completeness, to identify potential data gaps.

Time Gaps: Are reported along with the interval annotations. At this level, data gaps would include gaps which affected your ability to create the interval annotations. Gaps may be attributed to delayed system start, power loss, hard drive swap, or failure of one or more EM cameras. Additionally, for shoreside trips you must verify that the EM system recorded until the start of the offload. (If there are multiple offload points for a single trip, recording must continue until the final offload begins.)

Initial Logbook Verification

Through the logbooks submitted by the vessel operator, the EM service provider is given the number of hauls for each trip. The interval annotations should agree with the number of trips on a drive and the number of hauls for each trip. If there are discrepancies, the EM service provider will work with the vessel operator to reconcile and submit corrections as needed.

Sampling frame

Once the number of hauls are confirmed and submitted, NMFS will provide the service provider with the hauls selected to review. For optimized trips requiring less than 100% review, NMFS will randomly select hauls for review. The service provider will be able to access this report via the web-based EM application. Alternatively, the service provider may elect to receive a “sampling report” with hauls selected for review.

If either 100% review or after receiving the sampling scheme, the provider will then move on to creating *point annotations*.

Review for Discards and Catch Handling: Point Annotations

Point annotations will capture individual discard events and include weight, species identification, and discard type. Creating point annotations allow the service provider and NMFS to pinpoint discard events in the EM data and confirm the characteristics of that event. The point annotations will be used in creating the summary report (See section 2.3.5 on data fields).

The following sections give instructions by gear type, for the point annotations reviewers are expected to create. The annotation methods used here were largely designed, tested, and refined by PSMFC under a NMFS grant for the EM EFP operating from 2015 through 2021. Service providers will compile the point annotations to create the EM summary report, and submit the summary data to NMFS used for catch accounting.

It is important to note that point annotations are used for the service provider to create the EM summary data, and are not necessarily submitted to NMFS as part of routine data submission. API instructions and data tables showing the data fields required for EM summary data are discussed in later sections. EM service providers are required to submit annotation files for trips selected for NMFS secondary review.

POINT ANNOTATIONS: FIXED GEAR

For fixed gear vessels, gear consists of either pot/trap or longline. Defining a set of conventional longline or pot gear is straightforward. A set begins at a buoy and ends at a buoy. The set includes all of the hooks or pots in between the two buoys. Generally, conventional longline sets have thousands of hooks and span two or more miles. Pot sets range from 10 to 50 pots per string. All hooks or pots set together in a string, even those lost prior to retrieval, are considered a set and included.

Fixed gear vessels will have all discarded IFQ fish and retained priority species annotated.

Discarded invertebrates and non-IFQ fish will not be annotated, with exceptions listed below.

Annotate all discarded protected species with counts (sea birds, turtles, marine mammals, and green sturgeon [with the exception of Dungeness crab]). Annotate all retained protected species with counts (sea birds, turtles, marine mammals, dungeness crab (WA and OR), and green sturgeon).

a. **Retained:**

- i. Annotate retained counts for priority rockfish species.
- ii. Annotate any retained protected species with Piece Counts: sea birds, turtles, marine mammals, green sturgeon, and Dungeness crab.
- iii. Record **disposition**
 1. Retained
 2. Discard

b. **Discarded IFQ/IBQ:**

- i. Record the **Species** to the lowest identifiable taxonomic level
- ii. Record a round **Weight** estimate in pounds
- iii. Record a piece **Count** estimate, if able.
- iv. Record **Length** of discarded species if held up to a measuring board
 1. Only record length if head and tail are still attached to each other
 2. Record total length
- v. Record **disposition**
 1. Retained
 2. Discard
- vi. Record the **reason for discard** code

Avoid making assumptions about the discard reason. If discard reason is unknown use Other/Unknown

Options for reason for discard:

1. Unintentional Discard: Catch that was not deliberately removed from the gear by crew, but fell out/off of the fishing gear.
2. Unknown: Catch taken out of view of the camera or unsorted catch on deck when camera fails.
3. Discarded – General: Catch released. No damage apparent that would deem catch unmarketable, no state of decomposition apparent.
4. Discarded – Damaged: Catch with scavenger predation or general damage, deeming catch unmarketable, which is released. Count required for IFQ species AND for decomposed fish that are indistinguishable from IFQ.
6. Throwback: Catch previously identified as retained and has now been discarded or utilized on-board.
7. Utilized On-board: Catch is consumed/intended to be consumed by crew, or used as/intended to be used as bait. It might be filleted onboard. This catch will not show up on a fish ticket with retained catch. Fish with this fate are treated as discards in the database.

POINT ANNOTATIONS: TRAWL GEAR
Pacific whiting

HAUL:

- 1) **Haul** begins when the doors go into the water and ends when the doors return to the vessel. A haul will appear in the sensor data as a drop in speed, with an increase in either hydraulic pressure or drum rotation or both.
 - a. If the vessel is making a turn the doors may come back up for the turn and then go back down to resume fishing. Do not end the current haul. Record the two or more segments as a single haul.
 - b. If at the end of a haul the vessel does not empty the codend and instead resets the net along with the contents of the codend for a second haul, annotate two separate hauls with comments.
 - c. If you suspect that an annotated haul may not match up with logbook records (as can happen with water hauls and other unusual hauling activity), leave a comment at the haul level.
- 2) **Video Hauls** encompass the sorting, processing and stowing of catch.
 - a. Video Haul begins when the doors return to the vessel at the haul annotation end.
 - b. Video Haul ends when all of the catch has been sorted and stowed in the fish holds, and the hatches are closed.

- i. If the catch handling of the haul is incomplete before the next haul is brought onboard, end the video haul when the new net is dumped. Start the next video haul at that time.
1. Create annotations for the catch, specific to each haul within the associated video haul

CATCH:

All shoreside and MSCV whiting vessels will have all fish that are discarded/utilized onboard annotated.

Annotate all discarded protected species with counts (sea birds, turtles, marine mammals, and green sturgeon [with the exception of Dungeness crab]). Annotate all retained protected species with counts (sea birds, turtles, marine mammals, *Dungeness crab (WA and OR)* and green sturgeon).

Each vessel has its own codend(s) with a specific design, total capacity, number of straps, and number of pounds that can fill each strap. This capacity may be used to estimate discards. Codend capacities are available in discard logbook data submitted to the EM service provider by the vessel operator. These capacities should be made available to the reviewer in a way that ensures blind review, so that other fields of the discard logbook are not made available to the reviewer.

Discards:

Record ALL discard events

- If fish thought to be discards are shoveled into an empty codend and then placed into the water, these will be included with the next haul. Do not record any retained or discard weight for these fish for the current haul, but comment on the situation.
- If fixed gear pots are included in the whiting catch and the contents are discarded, annotate as selective discards. The fish included in the pot should be identified down to species level if possible, and a visual estimation of the weight recorded in the annotation. Include a comment in the video haul annotation with the number of pots.
- It may be necessary to calculate large volume discards by using the estimated capacity of the codend. To calculate a weight per strap value divide the codend capacity by the total number of straps on the net.

Annotating discards:

- IFQ and non-IFQ fish (less than 6 ft) discards that have been deliberately separated from the rest of the catch, whether it is sorted to species or not.
- Record the **reason for discard** code
 - Avoid making assumptions about the discard reason. If discard reason is unknown use Other/Unknown

Options for reason for discard:

1. Unintentional Discard: Catch that was not deliberately removed from the gear by crew, but fell out/off of the fishing gear.
 2. Unknown: Catch taken out of view of the camera or unsorted catch on deck when camera fails.
 3. Discarded – General: Catch released. No damage apparent that would deem catch unmarketable, no state of decomposition apparent.
 4. Discarded – Damaged: Catch with scavenger predation or general damage, deeming catch unmarketable, which is released. Count required for IFQ species AND for decomposed fish that are indistinguishable from IFQ.
 6. Throwback: Catch previously identified as retained and has now been discarded or utilized on-board.
 7. Utilized On-board: Catch is consumed/intended to be consumed by crew, or used as/intended to be used as bait. It might be filleted onboard. This catch will not show up on a fish ticket with retained catch. Fish with this fate are treated as discards in the database.
- Discards that have not been deliberately sorted from the rest of the catch (mixed catch). These discard events may have the same species composition as the total catch. Catch may have been shoveled off deck, deliberately discarded from codend, catch cinched-out of a mothership net. Catch may have bled out of the net or released through a net blow-out panel.
 1. Record unsorted/unidentified
 2. Record an **Estimated Weight**
 3. Record the **reason for discard**
 - Examples of situational discard estimates for Pacific whiting
 - a. Catch is on deck:
 - i. Visually estimate how many round baskets the fish would fill.
 - ii. One round basket filled with hake weighs approximately 80lb. Multiply the estimated number of baskets by 80 to get an estimated weight of discard.
 - iii. Example: Pile of fish looks like it might fill 7 round baskets. $7 * 80 = 560$ lbs of non-selective discard

- b. Catch spilled while zippering the codend for mothership transfer:
 - i. Based on how far back the bag is cinched, estimate how many straps the fish that are not included in the cinched codend would fill
 - ii. Multiply the number of straps by the number of pounds per strap for that codend
 1. Example: Fish spilled filled 3 straps prior to cinching.
 - a. $3 \text{ straps} * 3,500 \text{ lbs/strap} = \mathbf{10,500 \text{ lbs}}$ of non-selective discard
- c. Discarded straps of catch:
 - i. Do not count straps that are immediately released as “retained”
 1. This catch may be brought near or on the stern of the vessel during hauling
 - ii. Use codend capacity/strap weights to determine how many straps are being discarded at each percentage (or estimate a weight if this strategy does not fit the situation) and determine the Discarded weight
- d. Net bleeds/Blowout Panel – Catch in the water with net reference:
 - i. Make an estimate of fish in the net prior to the bleed based on number of full straps, how full the straps are and how many pounds per strap that codend would represent.
 - ii. After the bleed, estimate catch following the above steps.
 - iii. Record the difference between the estimated weight of fish before and after the bleed
 - iv. Example:
 1. Before bleed: $19 \text{ straps} * 100\% \text{ full} * 3000 \text{ lbs/strap} = 57,000 \text{ lbs}$
 2. After bleed: $17 \text{ straps} * 75\% \text{ full} * 3000 \text{ lbs/strap} = 38,250 \text{ lbs}$
 3. **Discarded amount:** $57,000 \text{ lbs} - 38,250 \text{ lbs} = \mathbf{18,750 \text{ lbs}}$ of nonselective discard
- e. Net Bleeds/Blowout Panel – Catch in the water with no net reference:
 - i. Estimate the number of round baskets the fish on the surface would fill.
 - ii. Multiply total number of baskets by 80 lbs/basket
- f. Entire net spill:
 - i. Assume the codend is slightly overfilled causing the codend failure
 - ii. If this trip contained full or overflowing hauls prior to this haul, use the two most recent full or overflowing hauls.
 1. Take the total retained catch + the total non-selective discarded catch for each of the two hauls to obtain the total catch of each haul
 2. Calculate the average of those two haul values
 3. Record the average total catch value as a non-selective discard for this haul

iii. If this trip did not contain full or overflowing hauls

1. Take the known codend capacity of the vessel and add 10%
2. Example: Vessel has a codend capacity of 160K lbs, codend is spilled as it is pulled up to the vessel, record the discard as 176K lbs.

Bottom Trawl

HAUL AND VIDEO HAUL:

- 1) **Haul** begins when the doors go into the water and ends when the doors return to the vessel. A haul will appear in the sensor data as a drop in speed, with an increase in either hydraulic pressure or drum rotation or both.
 - a. If the vessel is making a turn the doors may come back up for the turn and then go back down to resume fishing. Do not end the current haul. Record the two or more segments as a single haul.
 - b. If at the end of a haul the vessel does not empty the codend and instead resets the net along with the contents of the codend for a second haul, annotate two separate hauls with comments.
 - c. If you suspect that an annotated haul may not match up with logbook records (as can happen with water hauls and other unusual hauling activity), leave a comment at the haul level.
- 2) **Video Hauls** encompass the sorting, processing and stowing of catch.
 - a. Video Haul begins when the doors return to the vessel at the haul annotation end.
 - b. Video Haul ends when all of the catch has been sorted and stowed in the fish holds, and the hatches are closed.
 - i. If the catch handling of the haul is incomplete before the next haul is brought onboard, end the video haul when the new net is dumped. Start the next video haul at that time.

CATCH:

Annotate all discarded protected species with counts (sea birds, turtles, marine mammals, and green sturgeon [with the exception of Dungeness crab]). Annotate all retained protected species with counts (sea birds, turtles, marine mammals, dungeness crab (WA and OR), and green sturgeon).

- 3) Retained:
 - a. Only priority fish species need to be annotated as “**Retained**” with **Piece Counts** for all individuals. If for some reason a count is unable to be obtained (e.g. twenty thousand cowcod are caught), a total weight should be determined instead.

- b. Annotate any retained protected species with Piece Counts: sea birds, turtles, marine mammals, green sturgeon, and Dungeness crab (If able).
- c. Record **disposition**
 - i. Retained
 - ii. Discard

4) Annotate all **Discarded IFQ** fish species

- a. Enter the **Species** to the lowest identifiable taxonomic level
- b. Record a round **Weight** estimate in pounds
- c. Record **Length** of discarded species if held up to a measuring board
 - i. Only record length if fish is whole
 - ii. Record total length
- d. Record **disposition**
 - i. Retained
 - ii. Discard
- e. Record the **reason for discard** code

Avoid making assumptions about the discard reason. If discard reason is unknown use Other/Unknown Options for reason for discard:

 - 1. Unintentional Discard: Catch that was not deliberately removed from the gear by crew, but fell out/off of the fishing gear.
 - 2. Unknown: Catch taken out of view of the camera or unsorted catch on deck when camera fails.
 - 3. Discarded – General: Catch released. No damage apparent that would deem catch unmarketable, no state of decomposition apparent.
 - 4. Discarded – Damaged: Catch with scavenger predation or general damage, deeming catch unmarketable, which is released. Count required for IFQ species AND for decomposed fish that are indistinguishable from IFQ.
 - 6. Throwback: Catch previously identified as retained and has now been discarded or utilized on-board.
 - 7. Utilized On-board: Catch is consumed/intended to be consumed by crew, or used as/intended to be used as bait. It might be filleted onboard. This catch will not show up on a fish ticket with retained catch. Fish with this fate are treated as discards in the database.

5) Halibut discards - viability

Pacific halibut discards use a default 90% mortality rate on board bottom trawl vessels. A time on deck model has been approved for use, where correct handling procedures and the amount of time individual fish are on deck are used to determine specific mortality for hauls selected for EM review.

1. Keep track of time starting from when the catch is brought on board until the individual halibut is discarded.
2. Annotate the length of individual halibut (when crew are measuring properly)
3. Annotate the time of discard
4. Annotate catch handling (good or poor)

6) Volumetric references

The following container weights can be used for the respective species groups:

1. **Round Basket** [Volume= 0.0422 m³] (100% Full):

- a. Flatfish: 80 lbs.
- b. Roundfish: 80 lbs.
- c. Rockfish: 60 lbs.

2. **Tote** [Volume= 0.079 m³] (100% Full):

- a. Flatfish: 150 lbs.
- b. Roundfish: 150 lbs.
- c. Rockfish: 120 lbs.

3. **Observer Basket** [Volume= 0.04 m³] (100% Full):

- a. Flatfish: 76 lbs.
- b. Roundfish: 76 lbs.
- c. Rockfish: 60 lbs.

4. **20 Gal Containers** [Volume= 0.07571 m³] (100% Full):

- a. Roundfish: 144 lbs.
- b. Rockfish: 115 lbs.

5. **32 Gal Containers** [Volume= 0.1211 m³] (100% Full):

- a. Roundfish: 203 lbs.

2.2.6 Providing Summary Data

The EM Service Provider will submit summary data to the EM database. The summary data should contain trip and catch data aggregated for each individual haul. Detailed point annotation data is not required. All Logbook, Trip and Catch summary data will be submitted via an OpenAPI using a JSON format. Providers will be able to submit requests via the API and retrieve basic trip information necessary for submitting data such as the TripID. The TripID is critical to linking Logbook, Trip and Catch summary data with the WCGOP database.

TripsAPI/CatchAPI overview:

- Username and Password are required to access the EM TripsAPI/CatchAPI.
- User sends a request with username and password. API responds with a valid JSON Web Token (JWT).

TripsAPI:

- User sends request containing basic trip info (Vessel Name, Vessel ID, Fishery, Start/End dates + Ports, etc). API responds with a unique 6 digit TripNum/TripID.
- User sends request containing TripNum. API responds with trip details associated with that trip.
- User sends request containing one or more search criteria, such as Vessel ID. API responds with all trips that match the search criteria.

CatchAPI:

- User sends request containing Logbook data or EM Review summary data (Must also contain a TripNum/TripID from Trips API). API stores data and confirms success.
- User sends request containing updated Logbook data or updated EM Review summary data. API updates stored data and confirms success.

API instructions are found online at:

<https://www.webapps.nwfsc.noaa.gov/trips/instructions>

Contact WCGOP for additional details about the required fields and access.

2.2.7 Feedback Reports and Feedback Loop

The EM Service Provider must communicate with vessel operators and NMFS to coordinate data service needs, resolve specific program issues, and provide feedback on program operations. The EM service provider must provide feedback to vessel representatives, field services staff, and NMFS regarding:

- (i) Adjustments to system settings;
- (ii) Changes to camera positions;
- (iii) Advice to vessel personnel on duty of care responsibilities;
- (iv) Advice to vessel personnel on catch handling practices; and,
- (v) Any other information that would improve the quality and effectiveness of data collection on the vessel.

Summary reports for each drive will be created by the service provider and submitted to NMFS and the vessel owner (see Appendix A). These reports capture potential compliance issues, malfunctions, and repairs or other corrective action taken. They also highlight exemplary data collection.

Certified EM service providers are given access to a web application managed by the WCR EM coordinator. EM reviewers, technicians, and managers are able to enter and submit feedback reports and summarize technical service calls provided to vessels (as they relate to EM trips).

2.2.8 Data Storage and Access

Regulations require that EM raw data, reports, and other records must be stored for 12 months from when data is finalized for a given fishing year. For the groundfish trawl fishery, data for the fishing (calendar) year are typically finalized by April of the following year.

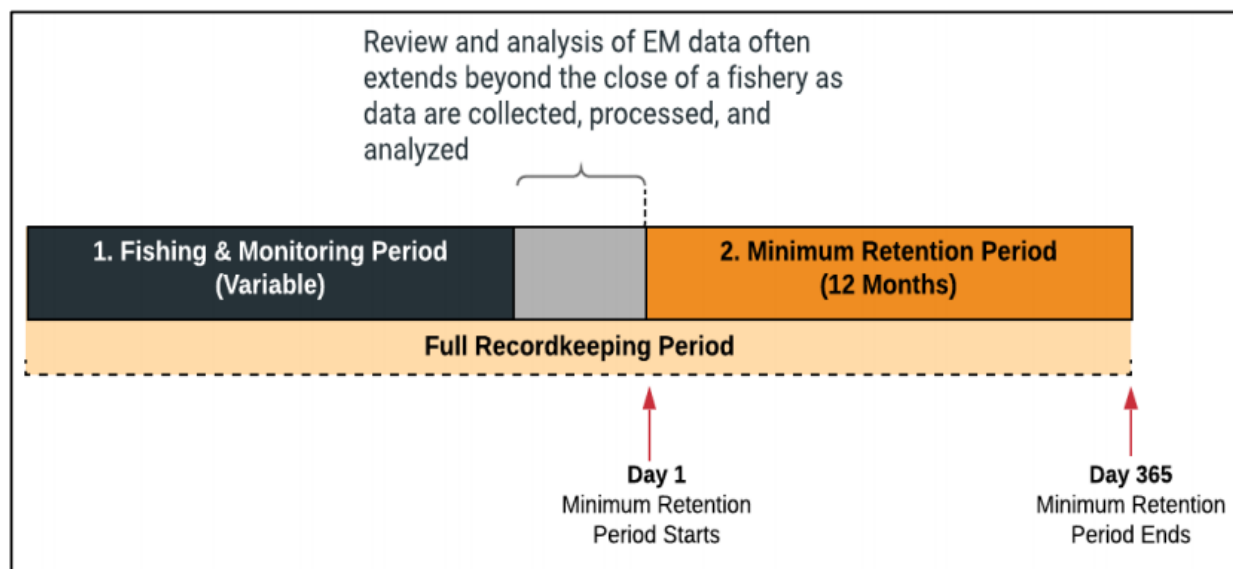


Figure 7. Model of minimum EM data retention requirements. From Third-Party Minimum Data Retention Period in electronic Monitoring Programs for Federally Managed US Fisheries, 2020.

Using Figure (7) as an example, the minimum retention period for 2022 data would start approximately April 15, 2023 and last through April 15, 2024. NMFS publishes a public notice every year to provide notification of when data are finalized, and will notify certified EM service providers when this notice publishes.

EM data may be stored locally on hard drives, local servers, or using cloud storage services.

NMFS expects most requests for access or submission of EM data and other records associated with a specific EM trip will be made during the year in which that trip was taken (January 1 – December 31) and until data is finalized for that year (on or about March 1 of the following year). EM data files may be transmitted to NMFS via a secure website from which NMFS and authorized officers can download the data files, or by mailing a hard drive, CD, or other medium containing the data files. The provider may wish to take this information into account when planning for and comparing the costs and accessibility of different storage options.

2.2.9 Providing Data for NMFS Debriefing: Secondary Review

The West Coast Groundfish Observer Program (WCGOP) is responsible for completing the QA/QC of the EM summary data, which will include *secondary review* of the video data from some trips. The WCGOP will calculate an independent catch estimate to compare against the providers estimates. Upon request the EM provider will provide all video, sensor, and annotated data files for review.

The NMFS debriefing protocol will generally follow the same review procedures as conducted by the service provider's logbook audit review. WCGOP staff verifies logbook and raw EM data, and conducts review blind (without using the service provider's annotations). Once review is completed, staff compare the two estimates and annotations and provide feedback to the EM service provider.

Additionally, WCGOP may conduct additional review of data, including monitoring steam times. The detailed process for selecting debriefing data, data QA/QC, and feedback will be provided to certified EM service providers.

Glossary

Active sampling unit: the portion of the groundfish fleet in which an observer coverage plan is being applied.

Annotation: Information associated with a particular data point in an EM data set, created during either primary or secondary video review.

Discard control point: the location on the vessel designated by a vessel operator where allowable discarding may occur.

Discard event: a single occurrence of discarding of fish or other species.

Electronic Monitoring (EM): the use of an electronic monitoring system (EMS) to passively monitor fishing operations through observing or tracking.

Electronic Monitoring Authorization: the official document provided by NMFS that allows a vessel with a limited entry trawl permit to use electronic monitoring under the provisions of this subpart.

Electronic Monitoring System (EMS): a data collection tool that uses a software operating system connected to an assortment of electronic components, including video recorders, to create a collection of data on vessel activities.

Electronic Monitoring System Certification Form: the official document provided by NMFS, signed by a representative of a NMFS-permitted electronic monitoring service provider that attest that an EM system and associated equipment meets the performance standards defined at § 660.604(j) of this subpart, as required by § 660.604(e)(3)(i).

EM data: the information output of the Electronic Monitoring System (e.g., imagery, sensor data, and other associated data files).

EM data processing: the review, interpretation, and analysis of EM data and associated meta data.

EM dataset: a collection of EM data from a single EM trip or group of EM trips.

EM Program: the Electronic Monitoring Program of the West Coast Region, National Marine Fisheries Service.

EM Service Plan: the document required under § 660.603 that describes in detail how the EM service provider will provide EM services.

EM service provider: any person, including their employees or agents, that is granted a permit by NMFS to provide EM services for vessels as required under § 660.603 and § 660.604.

EM technician: an employee of the EM service provider that provides support for EM systems and technical assistance.

EM trip: any fishing trip for which electronic monitoring is the declared monitoring type.

Harassment: EM service provider staff feel threatened or feel that their work or work environment is being compromised.

Initial Administrative Determination (IAD): a formal, written determination made by NMFS on an application or permit request that is subject to an appeal within NMFS.

Non-trawl shorebased IFQ vessel: a vessel on a declared limited entry groundfish non-trawl, shorebased IFQ trip.

Maximized retention: A vessel does not sort at sea and retains all catch from a trip until landing, with certain exceptions.

Optimized retention: A vessel sorts at sea and retains all IFQ and certain non-IFQ species until landing, with exceptions.

Pacific whiting fishery: Pacific whiting primary season fisheries described at § 660.131. The Pacific whiting fishery is composed of vessels participating in the C/P Co-op Program, the MS Co-op Program, or the Pacific whiting IFQ fishery.

Pacific whiting IFQ fishery: vessels on Pacific whiting IFQ trips.

Pacific whiting IFQ trip: a trip in which a vessel uses midwater groundfish trawl gear during the dates of the Pacific whiting primary season to target Pacific whiting, and Pacific whiting constitutes 50 percent or more of the catch by weight at landing as reported on the state landing receipt. Vessels on Pacific whiting IFQ trips must have a valid declaration for limited

entry midwater trawl, Pacific whiting shorebased IFQ.

Shorebased IFQ Program or *Shorebased IFQ sector*: the fishery described at § 660.140, subpart D, and includes all vessels on IFQ trips.

Vessel Monitoring Plan (VMP): the document that describes how fishing operations on the vessel will be conducted and how the EM system and associated equipment will be configured to meet the performance standards and purpose of the EM Program.

Appendix A: List of Species

List of groundfish species covered by Pacific Coast Groundfish Fishery Management Plan (PCG FMP) (§ 660.11 General definitions):

- Sharks: leopard shark (*Triakis semifasciata*); soupfin shark (*Galeorhinus zyopterus*); spiny dogfish (*Squalus acanthias*).
- Skates: big skate (*Raja binocularata*); California skate (*R. inornata*); longnose skate (*R. rhina*).
- Ratfish: ratfish (*Hydrolagus colliei*).
- Morids: finescale codling (*Antimora microlepis*).
- Grenadiers: Pacific rattail (*Coryphaenoides acrolepis*).
- Roundfish: cabezon (*Scorpaenichthys marmoratus*); kelp greenling (*Hexagrammos decagrammus*); lingcod (*Ophiodon elongates*); Pacific cod (*Gadus macrocephalus*); Pacific whiting (*Merluccius productus*); sablefish (*Anoplopoma fimbria*).
- Rockfish: in addition to the species listed below, longspine thornyhead (*S. altivelis*) and shortspine thornyhead (*S. alascanus*), “rockfish” managed under PCG FMP include all genera and species of the family *Scorpaenidae* that occur off Washington, Oregon, and California, even if not listed below. The *Scorpaenidae* genera are *Sebastes*, *Scorpaena*, *Scorpaenodes*, and *Sebastolobus*. Where species below are listed both in a major category (nearshore, shelf, slope) and as an area-specific listing (north or south of 40°10' North latitude) those species are considered “minor” in the geographic area listed.
 - Nearshore rockfish includes black rockfish (*Sebastes melanops*) and the following minor nearshore rockfish species:

§ North of 40°10' N. lat.: Black and yellow rockfish (*S. chrysomelas*); blue rockfish (*S. mystinus*); brown rockfish (*S. auriculatus*); calico rockfish (*S. dalli*); China rockfish (*S. nebulosus*); copper rockfish (*S. caurinus*); gopher rockfish (*S. carnatus*); grass rockfish (*S. rastrelliger*); kelp rockfish (*S. atrovirens*); olive rockfish (*S. serranoides*); quillback rockfish (*S. maliger*); treefish (*S. serriceps*).

§ South of 40°10' N. lat., nearshore rockfish are divided into three management categories:

 - Shallow nearshore rockfish consists of black and yellow rockfish (*S. chrysomelas*); China rockfish (*S. nebulosus*); gopher rockfish (*S. carnatus*); grass rockfish (*S. rastrelliger*); kelp rockfish (*S. atrovirens*).
 - Deeper nearshore rockfish consists of black rockfish (*S. melanops*); blue rockfish (*S. mystinus*); brown rockfish (*S. auriculatus*); calico

rockfish (*S. dalli*); copper rockfish (*S. caurinus*); olive rockfish (*S. serranoides*); quillback rockfish (*S. maliger*); treefish (*S. serriceps*).

· California scorpionfish (*Scorpaena guttata*).

- Shelf rockfish includes bocaccio (*Sebastes paucispinis*); canary rockfish (*S. pinniger*); chilipepper (*S. goodei*); cowcod (*S. levis*); shortbelly rockfish (*S. jordani*); widow rockfish (*S. entomelas*); yelloweye rockfish (*S. ruberrimus*); yellowtail rockfish (*S. flavidus*); and the following minor shelf rockfish species:

§ North of 40°10' N. lat.: Bronzespotted rockfish (*S. gilli*); bocaccio (*S. paucispinis*); chameleon rockfish (*S. phillipsi*); chilipepper (*S. goodie*); cowcod (*S. levis*); dusky rockfish (*S. ciliatus*); dwarf-red (*S. rufianus*); flag rockfish (*S. rubrivinctus*); freckled (*S. lentiginosus*); greenblotched rockfish (*S. rosenblatti*); greenspotted rockfish (*S. chlorostictus*); greenstriped rockfish (*S. elongates*); halfbanded rockfish (*S. semicinctus*); harlequin rockfish (*S. variegatus*); honeycomb rockfish (*S. umbrosus*); Mexican rockfish (*S. macdonaldi*); pink rockfish (*S. eos*); pinkrose rockfish (*S. simulator*); pygmy rockfish (*S. wilsoni*); redstripe rockfish (*S. proriger*); rosethorn rockfish (*S. helvomaculatus*); rosy rockfish (*S. rosaceus*); silvergray rockfish (*S. brevispinis*); speckled rockfish (*S. ovalis*); squarespot rockfish (*S. hopkinsi*); starry rockfish (*S. constellatus*); stripetail rockfish (*S. saxicola*); swordspine rockfish (*S. ensifer*); tiger rockfish (*S. nigrocinctus*); vermilion rockfish (*S. miniatus*).

§ South of 40°10' N. lat.: Bronzespotted rockfish (*S. gilli*); chameleon rockfish (*S. phillipsi*); dusky rockfish (*S. ciliates*); dwarf-red rockfish (*S. rufianus*); flag rockfish (*S. rubrivinctus*); freckled (*S. lentiginosus*); greenblotched rockfish (*S. rosenblatti*); greenspotted rockfish (*S. chlorostictus*); greenstriped rockfish (*S. elongatus*); halfbanded rockfish (*S. semicinctus*); harlequin rockfish (*S. variegatus*); honeycomb rockfish (*S. umbrosus*); Mexican rockfish (*S. macdonaldi*); pink rockfish (*S. eos*); pinkrose rockfish (*S. simulator*); pygmy rockfish (*S. wilsoni*); redstripe rockfish (*S. proriger*); rosethorn rockfish (*S. helvomaculatus*); rosy rockfish (*S. rosaceus*); silvergray rockfish (*S. brevispinis*); speckled rockfish (*S. ovalis*); squarespot rockfish (*S. hopkinsi*); starry rockfish (*S. constellatus*); stripetail rockfish (*S. saxicola*); swordspine rockfish (*S. ensifer*); tiger rockfish (*S. nigrocinctus*); vermilion rockfish (*S. miniatus*); yellowtail rockfish (*S. flavidus*).

- Slope rockfish includes darkblotched rockfish (*S. crameri*); Pacific ocean perch (*S. alutus*); splitnose rockfish (*S. diploproa*); and the following minor slope rockfish species:

§ North of 40°10' N. lat.: Aurora rockfish (*Sebastes aurora*); bank rockfish (*S. rufus*); blackgill rockfish (*S. melanostomus*); redbanded rockfish (*S. babcocki*); rougheye rockfish (*S. aleutianus*); sharpchin rockfish (*S. zacentrus*); shorttraker

rockfish (*S. borealis*); splitnose rockfish (*S. diploproa*); yellowmouth rockfish (*S. reedi*).

§ South of 40°10' N. lat.: Aurora rockfish (*Sebastes aurora*); bank rockfish (*S. rufus*); blackgill rockfish (*S. melanostomus*); Pacific ocean perch (*S. alutus*); redbanded rockfish (*S. babcocki*); roughey rockfish (*S. aleutianus*); sharpchin rockfish (*S. zacentrus*); shortraker rockfish (*S. borealis*); yellowmouth rockfish (*S. reedi*).

- Flatfish: Arrowtooth flounder, also called arrowtooth turbot, (*Atheresthes stomias*); butter sole (*Isopsetta isolepis*); curlfin sole (*Pleuronichthys decurrens*); Dover sole (*Microstomus pacificus*); English sole (*Parophrys vetulus*); flathead sole (*Hippoglossoides elassodon*); Pacific sanddab, (*Citharichthys sordidus*); petrale sole (*Eopsetta jordani*); rex sole (*Glyptocephalus zachirus*); rock sole (*Lepidopsetta bilineata*); sand sole (*Psettichthys melanostictus*); starry flounder (*Platichthys stellatus*).

Example of trawl retained logbook page

EM Program Manual
Page A-41

Vessel Name Endless Summer Departure: Date 9 - 12 - 2015 Time 0600 Port Astoria, OR
WOC Logbook Page # 42955 Return: Date 9 - 14 - 2015 Time 0920 Port Astoria, OR

DATE (mo/day)	SET TIME	DISCARDED—Estimated pounds discarded each tow, enter the 4 letter code from the species list provided										RETAINED — Priority Species				
			DOVR	ARTH	EGLS	PWHT	PHLB	PDAB				BOTH REQUIRED	CNRY	CWCD	BCAC	YEYE
09/12	13:30	<u>Pounds</u> (Required)	10	100	----	1000	15	15				<u>Pounds</u>			45	
		Count	35	----	----	----	1	----				<u>Count</u>			11	
09/12	17:20	<u>Pounds</u> (Required)	5	20	500	10	1000	40				<u>Pounds</u>			100	
		Count	3	15	----	8	75	----				<u>Count</u>			35	
9/13	00:30	<u>Pounds</u> (Required)	100	5	2	300	----	----				<u>Pounds</u>				
		Count	----	8	3	----	----	----				<u>Count</u>				
9/13	05:09	<u>Pounds</u> (Required)	----	----	10	----	----	150				<u>Pounds</u>				
		Count	----	----	34	----	----	----				<u>Count</u>				
9/13	10:15	<u>Pounds</u> (Required)	----	----	----	----	28	10				<u>Pounds</u>				8
		Count	----	----	----	----	2	----				<u>Count</u>				2
9/13	15:08	<u>Pounds</u> (Required)	20	----	50	----	----	----				<u>Pounds</u>	5	3		
		Count	----	----	----	----	----	----				<u>Count</u>	1	1		
		<u>Pounds</u> (Required)										<u>Pounds</u>				
		Count										<u>Count</u>				
		<u>Pounds</u> (Required)										<u>Pounds</u>				
		Count										<u>Count</u>				
		<u>Pounds</u> (Required)										<u>Pounds</u>				
		Count										<u>Count</u>				

Example of EM trawl discard logbook page (Courtesy of PSMFC).

EM FIXED GEAR LOGBOOK															Observed Trip (circle one): Yes - No		PORT		GEAR		Delivery Date		Fish Receiving Ticket Number	
Year: _____															Permit (circle one): LE Fixed Gear - LE DTL - IFQ - Open Access		Permit # _____							
Vessel Name: _____															Port of Landing: _____									
Vessel Doc. Number: _____															Buyer(s): _____									
Gear (circle one): pot - barrel - bucket - longline - other															Escapement Hole Size: _____									
Type of Pot (circle one): rectangular - conical - other															# Escapement Holes: _____									
Dimensions of Pot: (H'/W'/L') _____ X _____ X _____															Pot / Barrel / Bucket Spacing: _____ ft. apart on groundline									

Type of Longline Gear: (circle one) FIXED HOOK - AUTO LINE - SNAP										Longline Gear ID		Length of Skate or Line in Tub (feet)		Hook Size		Hook Spacing (feet)		# Hooks per Skate or Tub		Total Number of Skates or Tubs Lost		
										A												
										B												

String or Set #	# of Skates, Tubs, or Pots per Set	LL Gear ID (A or B)	Delivery Date	Set & Up (Retrieve) Date	Time (24 Hour Clock)	String	Depth (Fm)	Latitude & Longitude				SABLEFISH				SABLEFISH				
								Lat. Degree	Decimal Minutes	Long. Degree	Decimal Minutes	RETAINED		RETAINED		RELEASED		RELEASED		
												Pounds Count	Pounds Count	Pounds Count	Pounds Count	Pounds Count	Pounds Count			
				Set		Start														
				Up		End														
				Set		Start														
				Up		End														
				Set		Start														
				Up		End														
				Set		Start														
				Up		End														
				Set		Start														
				Up		End														
				Set		Start														
				Up		End														

Vessel Operator's Signature: _____

Vessel Operator's Name (print): _____

Comments: _____

Example of EM fixed gear logbook page (Courtesy of PSMFC).

Appendix C: Feedback Report Template

Incident Type	Vessel Type	Incident	Low Priority	High Priority
Functionality Issues	All vessels	Function test was not completed		Before departing port
		Vessel did not stop fishing when a Critical malfunction occurred (Note: they are allowed to complete the tow if gear is already deployed)		Any instance
Data Quality Issues	All vessels	Catch handled outside of camera view or inconsistent with VMP, camera view obstructed, lighting inadequate, etc., resulting in an inability to identify the species of fish caught and/or discarded or the fate of the catch		Any instance
		Time gaps in sensor or video data		Any instance
		Any evidence of tampering or other damage or disruption to the EM system		Any instance
Reporting Issues	All vessels	Hard drive not submitted or submitted with incomplete data set		Any instance
		Logbook not submitted or submitted incomplete		Any instance
		Offload was delayed, but video was not turned on to record the time in port		Any instance
Other Fishing Regulations	All vessels	Gear deployed or retrieved in a closed area		Any instance
Catch Related Issues	All vessels	Discarded outside designated control point		Any instance

		Discarded for a mechanical or safety issue		Any instance
		Discarded salmon or undersize lingcod		Any instance
	Non-whiting vessels	Retained Pacific halibut, marine mammal, seabird, sea turtle, eulachon, Dungeness crab seaward of WA/OR, or green sturgeon		Any instance

Catch Related Issues	Whiting vessels	Discarded fish other than 1 tote/haul of operational discards, animals larger than 6-ft		Any instance
	Bottom trawl	Discarded IFQ species or non-IFQ species (other than 1 tote/haul of operational discards, animals larger than 6-ft, invertebrates)		Any instance
	Fixed gear vessels	Discard of IFQ species or non-IFQ species (other than animals larger than 6-ft, invertebrates, depredated fish)		

Appendix D: Business Rules for discard comparison of logbook and EM

Table D.1. Summary of EM/Logbook comparison criteria for non-whiting midwater trawl (optimized retention), bottom trawl (optimized retention), and fixed gear trips. LB = logbook, EM = electronic monitoring

Type of Mismatch	IFQ Species/Group	Business Rule
LB > EM	All IFQ species/groups	Use LB to debit discards.
LB < EM	Cowcod rockfish South of 40°10'N, yelloweye rockfish	If LB < EM by more than 10% or 2 lb of the EM estimate, trigger 100% review, and use EM to debit discards.
LB < EM	All other IFQ species/groups	If LB < EM by more than 25% or 5 lb of the EM estimate, trigger 100% review, and use EM to debit discards.
If no EM estimate* (e.g., due to EM system failure)	All IFQ species/groups	Use LB to debit discards.

Table D.2. Summary of EM/Logbook comparison criteria for Pacific whiting midwater trawl, non-whiting midwater trawl (maximized retention), and bottom trawl (maximized retention) trips.

Type of Mismatch	IFQ Species/Group	Business Rule
LB > EM	Total weight of discard	Use LB to debit discards.
LB < EM	Total weight of discard	If LB < EM by more than 25% or 5 lb of the EM estimate, use EM to debit discards.
If no EM estimate* (e.g., due to EM system failure)	Total weight of discard	Use LB to debit discards.

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