



NOAA
FISHERIES

Developing Standards for EM Programs (NOAA and ICES)



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Alaska

Under Regulation

- Bering Sea and Aleutian Island (BSAI) Non-Pollock Trawl Catcher/Processor (C/P)
- Bering Sea Pollock Trawl C/P and Motherships
- Central Gulf of Alaska Rockfish Trawl C/P
- BSAI Pacific Cod Longline C/P
- Small Boat Fixed Gear (Longline and Pot)
- Halibut Deck Sorting Trawl C/P

Under FMC Development or EFP

- Pollock Trawl Catcher Vessels

Pilot Project

- Gulf of Alaska Rockfish Trawl Catch Vessels

West Coast

Under FMC Development or EFP

- Whiting Mid-Water Trawl
- Fixed Gear IFQ
- Non-Whiting Mid-Water Trawl
- Groundfish Bottom Trawl

Pacific Islands

Pilot Project

- Pelagic Longline—Hawaii Deep and Shallow Set

U.S. Electronic Monitoring Programs

Electronic monitoring (EM) is being piloted and implemented across the U.S. to expand and improve fisheries-dependent data collection, while reducing costs and increasing the timeliness of information. EM is used to audit logbook data, monitor compliance with discard requirements, and collect information on discards and bycatch. The programs on this map are listed in three categories: Operating under regulations; operating under an exempted fishing permit (EFP) and/or being developed by a Fishery Management Council (FMC); and operating as a pilot project.

For more information, visit fisheries.noaa.gov/national/fisheries-observers/electronic-monitoring.



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Greater Atlantic

Under Regulation

- Groundfish—Logbook Audit
- Groundfish—Maximized Retention

Atlantic HMS

Under Regulation

- Pelagic Longline

Southeast

Pilot Project

- Snapper-Grouper
- Gulf of Mexico Shrimp



EM Programs in the U.S.

Video Review

- EM used to validate logbooks, compliance, and direct observations
- Range from ~10% (Atlantic HMS) to 100% (many programs)
- Northeast groundfish audits 3rd party data quality (i.e., second video review)

Data Quality

- Timely feedback reports to captains and EM service providers is critical
- Alaska Fixed Gear program sends letters to participants due to poor quality
- Northeast programs have a [dynamic API](#) for receiving and validating data

Artificial Intelligence and Machine Learning

- Almost every program or project is annotating imagery for AI models
- Testing EM system configuration, chutes for discards
- Models for species ID, object detection (crew, fishing gear, catch on deck)
- Leveraging imagery from other programs (observers, dealers, survey vessels)
- National EM imagery library under development to centralize annotated data

West Coast Groundfish

- Service provider permits
- Extensive regulations & guidance

A valid Electronic Monitoring Provider Permit is required to provide electronic monitoring (EM) services for vessels authorized to use EM systems in the Pacific Coast Groundfish Fishery.

As part of an application for an Electronic Monitoring Provider Permit, a service provider must develop and submit an EM Service Plan (EMSP) that describes in detail how the applicant will provide EM services for vessels.

Fishery Type: Limited Access

Harvest Type: Commercial

Species Covered: Groundfish

Online Renewal: Yes

Logbook Requirements: Yes

Transferable: No

Expiration Date: Biennially, December 31 of the year following EM provider permit issuance. ESMPs are resubmitted during permit renewal, and may be changed at any time prior to renewal by submitting an amendment request to NMFS.

Fishing Area: EEZ off of Washington, Oregon, and California coasts

Forms:

- [EM Service Provider Application: New User Online Registration](#)
- [EM Service Plan \(EMSP\) Guidelines](#) (pdf)

- (j) **EM System Performance Standards.** 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;

Applications, Guidelines, and Templates

- [Electronic Monitoring Program Manual](#) - Updated November 2023 (pdf)

EM Vessels

- [EM System Certification Form](#)
- Online Application for Vessel EM Authorization
 - [New User Registration](#)
 - [Login page](#)
- [Vessel Monitoring Plan \(VMP\) Guidelines](#) - Updated November 2023 (pdf)
- [Trawl VMP Template](#) - Updated November 2023 (MS Word)
- [Fixed Gear VMP Template](#) - Updated November 2023 (MS Word)
- [VMP Template Appendices A-B: Installation and System Malfunction](#) (MS Word)
- [VMP Template Appendix E: Short-tailed Albatross](#) (pdf)
- [List of Approved EM Service Providers](#)

EM Service Providers

- [EM Service Provider Service Plan Info Page](#)
- [EM Service Plan \(EMSP\) Guidelines](#) (pdf)

Northeast Groundfish – Electronic Monitoring

Attachment 3b: Electronic Monitoring

This section includes the standards and requirements for electronic monitoring (EM) programs; and a detailed description of the NOAA Fisheries EM audit model and maximized retention programs. A sector may adopt the NOAA Fisheries EM audit model and/or maximized retention program(s) in its operations plan. To adopt a NOAA Fisheries EM program, append the [EM Program Standards](#) and corresponding [NOAA Fisheries EM Program Description\(s\)](#) (below) to the sector’s operations plan. Alternatively, a sector may use the NOAA Fisheries EM programs as a guide to design a new EM program in its operations plan. A sector may benefit from consultation and further refinement with NOAA Fisheries staff to ensure that any new plan meets the objectives of an EM Program and is suitable in place of ASM. The regulations documenting the EM program standards and requirements are described at § 648.11(l).

- [FY22 Audit Reviewer Guidance V4.pdf](#)
- [FY22 MREM Reviewer Guidance V1.pdf](#)
- [FY22 Video Reviewer Guidance Manual V2.pdf](#)
- [FY22 EM Audit Model Reviewer Guidance Manual.pdf](#)
- [Video Reviewer Guidance V20.pdf](#)
- [IFM EM Atl Herring Reviewer Manual V1.pdf](#)
- [Video Reviewer Guidance V19.pdf](#)
- [Video Reviewer Guidance V18.pdf](#)
- [Video Reviewer Guidance V17.pdf](#)
- [Video Reviewer Guidance V16.pdf](#)
- [Video Reviewer Guidance V15.pdf](#)
- [Video Reviewer Guidance V14.pdf](#)

A single JSON object representing the entire trip.

```

{
  "vessel_permit_number": integer,
  "vessel_name": string,
  "sail_datetime": string <date-time>,
  "land_datetime": string <date-time>,
  "evtr_num": integer,
  "all_effort_confirmed": string,
  "comments": string
}
    
```

required The fishing vessel permit number.

required The name of the fishing vessel.

string <date-time> Date and time the trip left the dock in ISO8601 standard datetime format.

string <date-time> Date and time trip returned to dock in ISO8601 standard datetime format.

integer Electronic Vessel Trip Report serial number.

string Enum: "Y" "N" Was the system functioning in a way that allowed for all fishing effort to be accounted for by the reviewer.

Camera Name:	Camera 1	\\SAMPLE STILL IMAGE: CAMERA 1///
Location:		
View:	Primary view of discard processing station	
Aim:		
Hardware:		
Resolution/FPS:		
Recording Trigger:		
Run On Time:		
Recording Exceptions:		

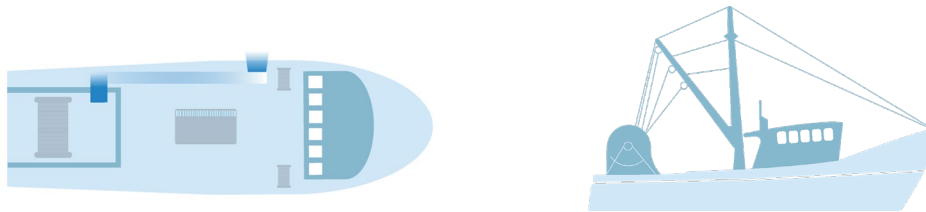
Camera Name:	Camera 2	\\SAMPLE STILL IMAGE: CAMERA 2///
Location:		
View:	Primary view used to monitor catch sorting. Secondary view of length strip.	
Aim:		

Northeast Groundfish – Electronic Monitoring

Vessel Monitoring Plan (VMP)

The VMP describes in detail how an EM system is specifically configured on a particular vessel, reporting requirements, and how fishing operations on that vessel will be conducted to effectively monitor fishing activities onboard. The VMP will clearly define the roles and responsibilities of all parties, including provisions to which each party must adhere.

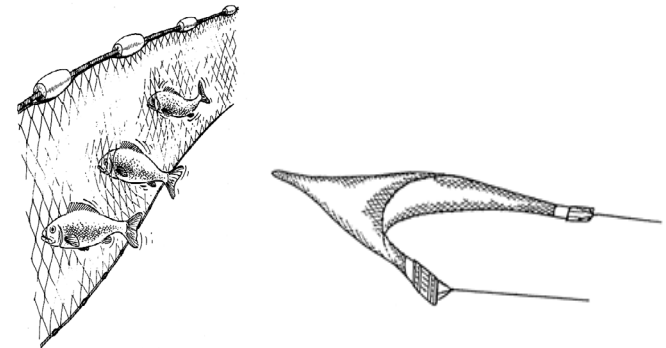
A vessel must adhere to EM program requirements and follow catch handling protocols as described in the VMP at all times on EM sector trips. Noncompliance with EM program requirements (e.g., catch handling inconsistent with the VMP) may affect a vessel's eligibility to participate in the EM program.



Vessel Monitoring Plan Requirements (cont.)

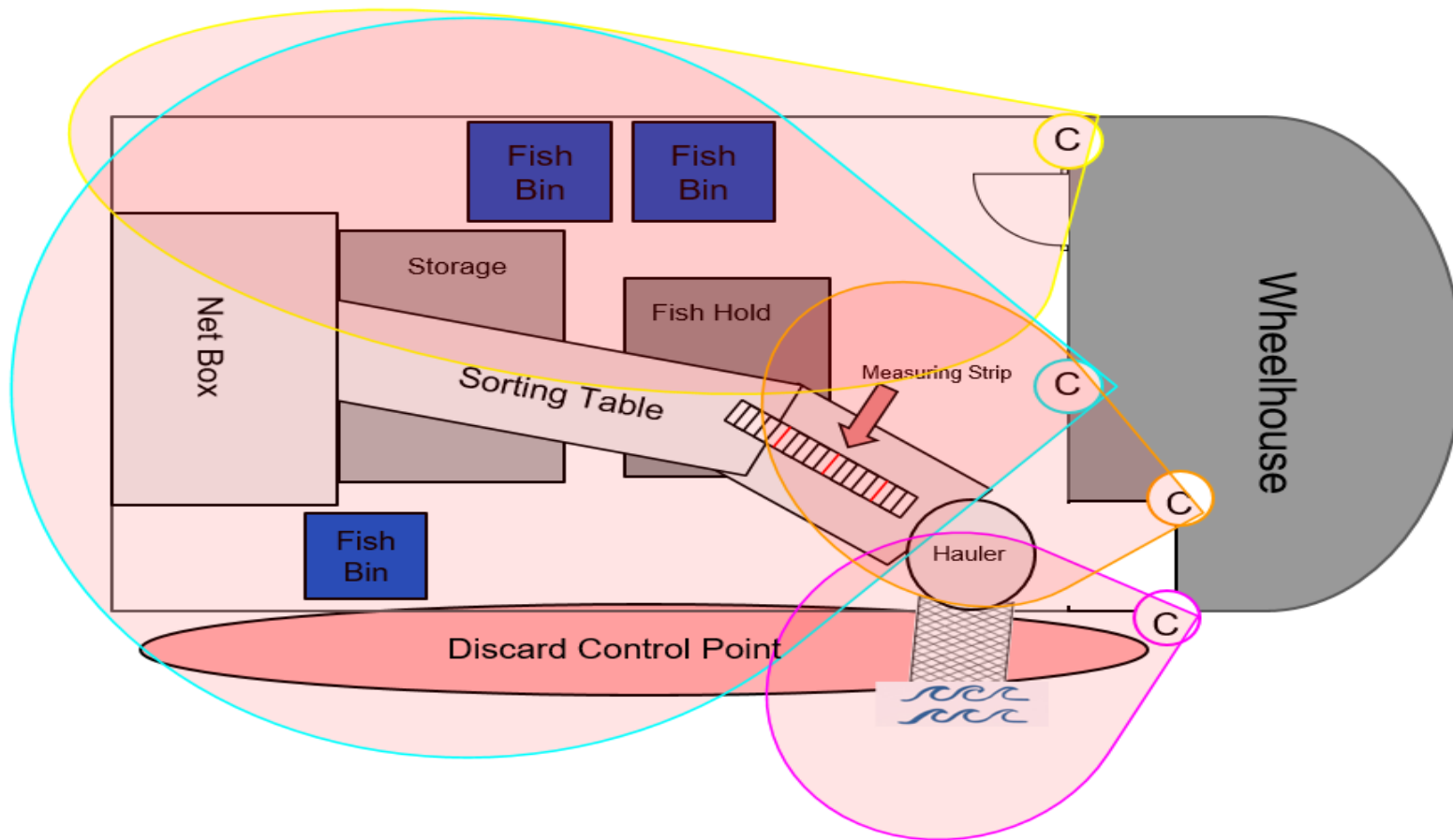
A vessel must have a NMFS-approved VMP to use EM for a given **gear type** on a sector trip. At a minimum, the VMP must incorporate these EM Program Standards by reference, and the following sections (below). Further details on the required information can be found in the VMP guidance template in the Resources Available to Sectors section:

- General vessel information, including gear type;
- List of contacts;
- EM system components and specifications;
- Vessel reporting requirements;
- EM system malfunction protocols; and
- Troubleshooting guide.
- Vessel operator responsibilities;
 - System operations and maintenance;
 - Catch handling requirements; and
 - Dockside monitoring requirements (if applicable);



Northeast Groundfish – Electronic Monitoring

Vessel Diagram of Deck During Fishing Activities



Northeast Groundfish – Electronic Monitoring

Appendix A: Gear Specific Required Views

The following information outlines the camera requirements for each electronic monitoring program and gear category. This section is not prescribing the order or number of required cameras, but rather the required views.

Midwater Trawl Camera Requirements	
Cam 1	Primary view of dewatering box and discard control point 1.
Cam 2	Focused view of pumping operations.
Cam 3	Stern view focused on net retrieval.
Cam 4	Alternate view of work deck/discard control point(s).
Cam 5	Alternate deck view.
Cam 6	Alternate view of operations during transit/non-fishing activity.

Purse Seine Camera Requirements	
Cam 1	Primary view of dewatering box and discard control point 1.
Cam 2	Focused view of pumping operations.; view of triplex (if used)
Cam 3	Stern view focused on net retrieval and/or skiff location
Cam 4	Alternate view of work deck/discard control point(s).
Cam 5	Alternate deck view.
Cam 6	Alternate view of operations during transit/non-fishing activity.





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ICES Working Group for Technology Integration for Fishery Data (TIFD)



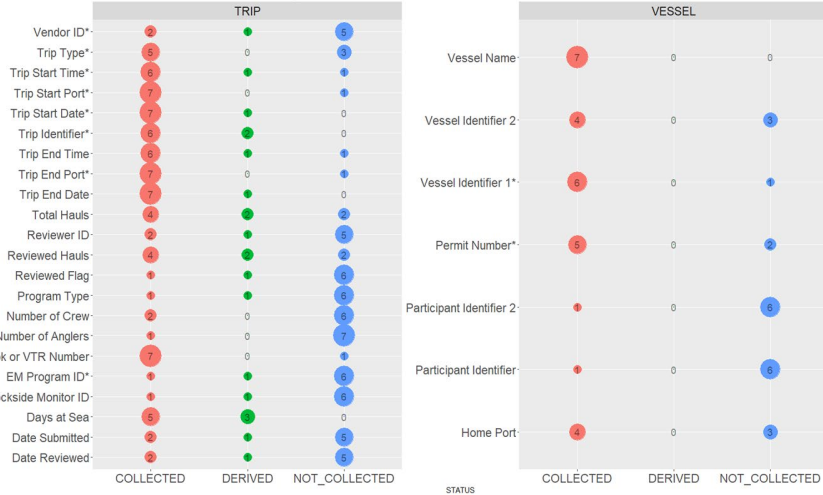
NOAA FISHERIES

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

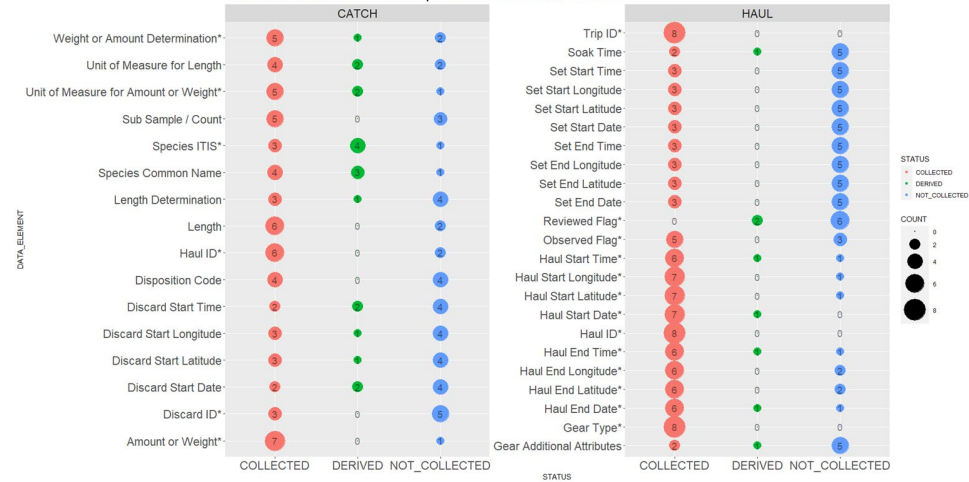
EM DATA MODEL DEVELOPMENT: SURVEY

Compile common fishery dependent data elements from individual fishery monitoring programs.....

Data Call Data Element Responses: VESSEL and TRIP



Data Call Data Element Responses: HAUL and CATCH



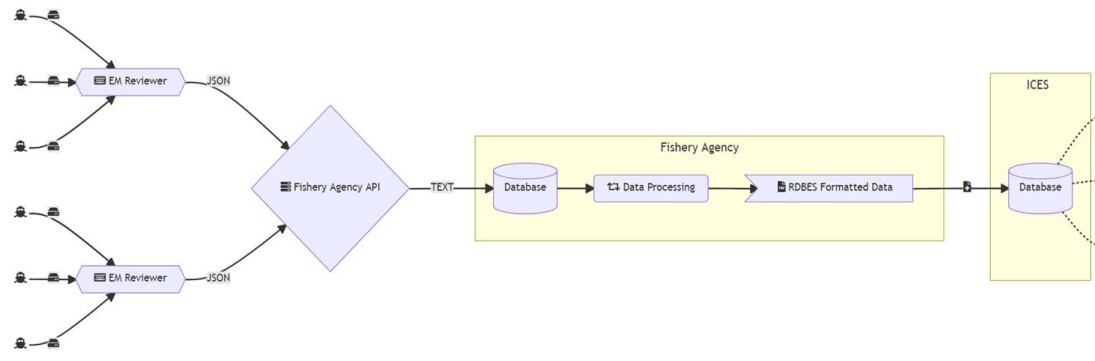
.....Identify common elements to be included in DRAFT EM data model

DRAFT EM DATA MODEL

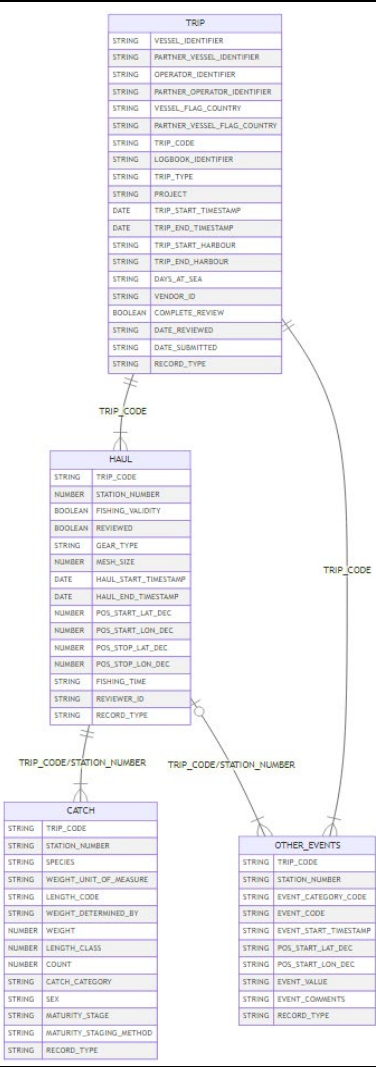
```

{
  "VESSEL_IDENTIFIER": "99999",
  "PARTNER_VESSEL_IDENTIFIER": "88888",
  "OPERATOR_IDENTIFIER": "11111",
  "PARTNER_OPERATOR_IDENTIFIER": "22222",
  "VESSEL_FLAG_COUNTRY": "IRL",
  "PARTNER_VESSEL_FLAG_COUNTRY": "IRL",
  "TRIP_CODE": "123456789",
  "LOGBOOK_IDENTIFIER": "987654321",
  "TRIP_TYPE": "1",
  "PROJECT": "THIS IS A PROJECT NAME",
  "TRIP_START_TIMESTAMP": "2022-11-04T02:20:35.000Z",
  "TRIP_END_TIMESTAMP": "2022-11-04T22:38:00.000Z",
  "TRIP_START_HARBOUR": "REGWY",
  "TRIP_END_HARBOUR": "REGWY",
  "DAYS_AT_SEA": "1",
  "VENDOR_ID": "100",
  "COMPLETE_REVIEW": "Y",
  "DATE_REVIEWED": "2022-11-04",
  "DATE_SUBMITTED": "2022-11-04",
  "RECORD_TYPE": "TR",
  "HAUL": [
    {
      "STATION_NUMBER": 1,
      "FISHING_VALIDITY": "Y",
      "REVIEWED": "Y",
      "GEAR_TYPE": "TRAWL",
      "MESH_SIZE": 9.5,
      "HAUL_START_TIMESTAMP": "2022-11-04T13:13:00.000Z",
      "HAUL_END_TIMESTAMP": "2022-11-04T15:25:25.000Z",
      "POS_START_LAT_DEC": 53.248081,
      "POS_START_LON_DEC": -8.982117,
      "POS_STOP_LAT_DEC": 53.248081,
      "POS_STOP_LON_DEC": -8.982117,
      "FISHING_TIME": "1",
      "REVIEWER_ID": "A2000",
      "RECORD_TYPE": "HH"
    }
  ],
  "CATCH": [
    {
      "STATION_NUMBER": 1,
      "SPECIES": "12847",
      "WEIGHT_UNIT_OF_MEASURE": "KG",
      "LENGTH_CODE": "CM",
      "WEIGHT_DETERMINED_BY": "LENGTH",
      "WEIGHT": 1.5,
      "LENGTH_CLASS": 22,
      "COUNT": 1,
      "CATCH_CATEGORY": "DIS",
      "SEX": "F",
      "MATURITY_STAGE": "R",
      "MATURITY_STAGING_METHOD": "ICES",
      "RECORD_TYPE": "HC"
    }
  ],
  "OTHER_EVENTS": [
    {
      "STATION_NUMBER": 1,
      "EVENT_CATEGORY_CODE": "1",
      "EVENT_CODE": "5",
      "EVENT_START_TIMESTAMP": "2022-11-04T15:22:25.000Z",
      "POS_START_LAT_DEC": 53.248081,
      "POS_START_LON_DEC": -8.982117,
      "EVENT_VALUE": "100",
      "EVENT_COMMENTS": "THIS IS A COMMENT",
      "RECORD_TYPE": "HC"
    }
  ]
}

```



Data Specification → JSON Transmission → API → Database Table



Technology Standards and Interoperability

Recommendations for electronic monitoring program design and requests for proposal



EM Service Provider Recommendations on RFPs or Statements of Work

1. Ensure that bidders are working with a common set of assumptions concerning program operations. This includes providing fundamental information on fishery operations (e.g., number of vessels, ports of operation), providing specific parameters to bid against and, when possible, providing sample fishing activity video to all bidders.
2. Provide clear performance-based specifications for hardware and all other EM program delivery elements.
3. Clearly define roles and responsibilities at program interfaces.
4. Require EM systems to generate information that enables reporting on system performance.
5. Request clear explanation of any proposed implementation of artificial intelligence (AI). This should be accompanied by a description of the provider's current AI capabilities and the benefits and risks the provider sees to implementing AI in the EM program.
6. Consider factors that are within the direct control of EM providers and those that are not (vessel cooperation, coordination with other parties, etc.) with pricing estimates for those items outside of EM service provider control separated or excluded.

Guidance on EM Procurement

Project Goals and Background

- Monitoring objectives, fishery description, management drives
- Roles and responsibilities, service and maintenance requirements

Technical Information

- Hardware and software, data transmission and storage

Video Analysis and Data Delivery

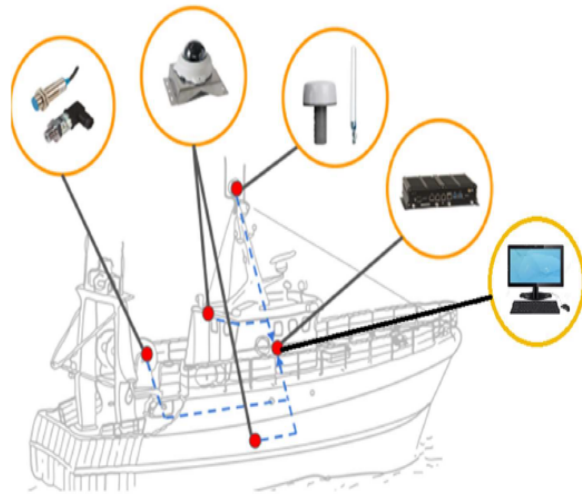
- Entire data file, partial review, sampling strategy, timing requirements

Contractual and Bidding Information

- Timeframe, budget, experience, evaluation and metrics, etc.

Technology Standards and Interoperability

Technical guidelines and specifications for the implementation of Remote Electronic Monitoring (REM) in EU fisheries



European Fisheries Control Agency
Vigo, 2019

3.1 Control box

The control box is the on board computer that acquires and stores all sensor data and video footage. It is recommended that the unit is based as a minimum on the following technical specifications:

The below listed specifications do not physically have to be inside the unit, but may be connected to/integrated in it.

- A. Fan-less passive cooling – with high temperature cut out.
- B. 12-24V DC isolated power input.
- C. Max. power 60W.
- D. GPS sensor or equivalent.
- E. 4G/LTE or faster (upload), mobile data connection.
- F. Wired interconnection of the components of the system on board.
- G. Capability for wireless (e.g. WiFi (802.11ac or faster)/Bluetooth) connections.
- H. Utilization of existing on-board satellite data connection for sensor data transmission. For vessels only fishing within in cell phone range 4G can be used for sensor data transmission.
- I. Automatic prioritisation of best suitable connection for data transfer and remote access.
- J. Data storage capability for storing sensor data and video footage. Minimum data storage capacity depends on the vessel activity (days at sea), the number of cameras and the data storage duration.
- K. At least one removable/swappable back-up data storage of variable sizes.
- L. Support at least the required number cameras, including spare camera capacity.
- M. On board screen connection for verification including keyboard (and mouse) or touch screen.
- N. Supports remote access/configuration.
- O. UPS (Uninterruptible power supply) of controlled shutdown, logging in case of power loss. If possible, UPS should also enable continuation of recording for relevant timespan (for e.g. 10 minutes). Information on any power failure should automatically be recorded for subsequent notification to the FMC.
- P. Sensor data and video footage needs to be properly encrypted and compressed.
- Q. Digital signature (date and time stamp, vessel name, vessel registration and GPS co-ordinates).
- R. If data transmission is temporarily not possible, the request shall be stored on the control box and the requested data shall be secured to prevent possible deletion or tampering. The requested data shall be automatically transmitted when data transmission again is feasible.

Available Resources on EM

Electronic Technologies Policies

- National Electronic Technologies Policy Directive (04-115)
- EM Cost Allocation Procedural Directive (04-115-02)
- EM 3rd-Party Data Retention Procedural Directive (04-115-03)
- Procedural Directive on Applying Information Law to EM Data (04-115-04)

National EM Workshops (2019 and 2020)

- Report and video recordings from workshops

ICES Working Group to Integrate Technology in Fisheries (WGTIFD)

- Reports from 2019 - 2021; TORs approved 2022 - 2024

Regional EM Programs

- [Alaska](#)
- [West Coast](#)
- [Northeast](#)

Public Websites

- NOAA [Website](#) and [EM Story Map](#)
- [EM4Fish](#)
- [SAFET](#)

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Thank you!

