

**INTER-AMERICAN TROPICAL TUNA COMMISSION**  
**WORKSHOP OF AN ELECTRONIC MONITORING SYSTEM (EMS) IN THE EPO:**  
**STANDARDS FOR AN EMS IN THE EPO**

**6<sup>TH</sup> MEETING**

*(by videoconference)*  
13-15 December 2023

**DOCUMENT EMS-06-01**

**LOGISTICAL AND DATA ANALYSIS AND REPORTING STANDARDS OF AN EMS IN  
THE EPO**

**CONTENTS**

1. Introduction and background .....	1
2. Logistical standards of an EMS in the EPO .....	3
3. Data analysis and reporting of an EMS in the EPO .....	4
4. References .....	7

**1. INTRODUCTION AND BACKGROUND**

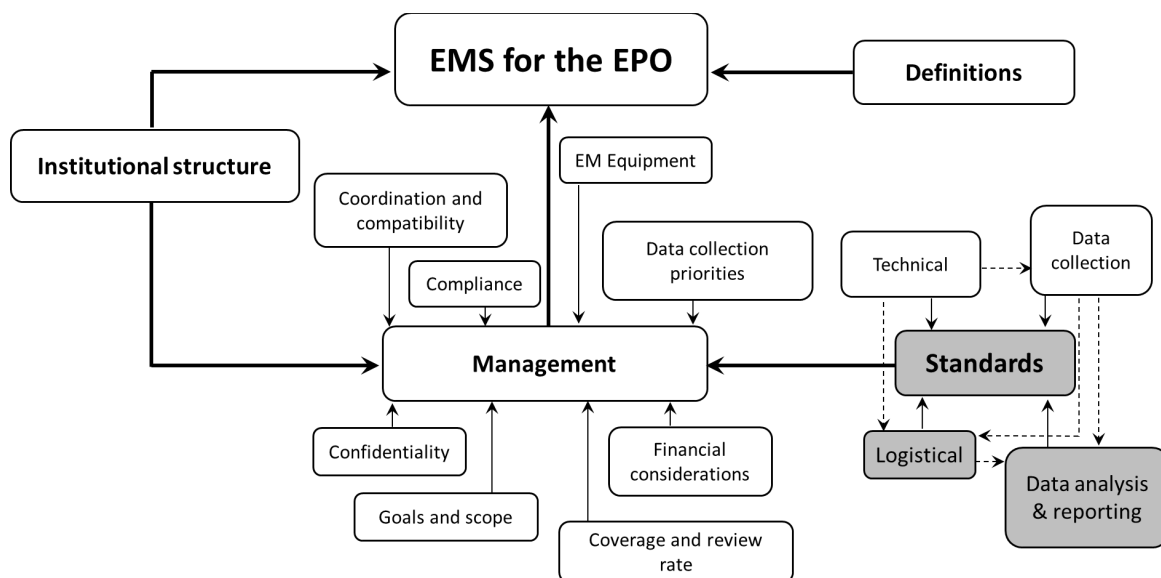
The Inter-American Tropical Tuna Commission has acknowledged and endorsed that electronic monitoring (EM) is a promising tool for monitoring, addressing data gaps, and improving data collection for both purse-seine and longline vessels that do not carry onboard observers, as well as for observed vessel as an instrument to complement observer’s data-collection (Resolution [C-19-08](#); Document [SAC-07-07f.i](#); Gilman et al., 2019). Accordingly, per request of the Scientific Advisory Committee (SAC) during its 10<sup>th</sup> meeting in 2019, and pursuant to paragraphs 9 and 10 of Resolution C-19-08, the IATTC staff prepared for consideration by the Commission the document [SAC-11-10](#) “*An electronic monitoring system for the tuna fisheries in the eastern Pacific Ocean: objectives and standards*”. This document, which received positive feedback from several global experts on the matter, was presented at the SAC 11<sup>th</sup> meeting in 2020. The Commission endorsed this concept during its 96<sup>th</sup> meeting (extraordinary) and agreed that the *1st Workshop on Implementation of an Electronic Monitoring System (EMS)* should be held in April 2021, before the SAC 12<sup>th</sup> meeting, aiming to further discuss some of the elements described in SAC-11-10, as well the presentation of a workplan for the implementation of an EM system (EMS) in the eastern Pacific Ocean (EPO), outlined in [EMS-01-02-Rev](#).

Prepared for the 1<sup>st</sup> Workshop, document [EMS-01-01](#) recommended a number of actions for endorsement by the Commission. Among these was a workplan formulated by IATTC staff (EMS-01-02-Rev), which proposed a series of workshops to consider and analyze the EMS components and subcomponents in a hierarchical and chronological order. To provide structure for these workshops and other activities related to the EMS implementation process, the staff also recommended the adoption of Terms of Reference (ToR) for the EM workshops and a set of working definitions. The associated TORs and a set of definitions were adopted through the Resolutions [C-21-02](#) and [C-21-03](#), respectively, during the 98<sup>th</sup> Meeting of the IATTC. The workplan was also adopted with a minor modification to show flexibility on a potential starting date for the EMS in the EPO (EMS-01-02-Rev). Subsequently, since December 2021, and in accordance with the approved workplan, the IATTC staff has organized four additional workshops covering in a hierarchical manner the EPO-EMS components and subcomponents: the 2<sup>nd</sup> workshop on

Institutional Structure, Goals and Scope of the EMS (December 2021); the 3<sup>rd</sup> workshop on Management Considerations (April 2022); the 4<sup>th</sup> workshop on technical standards and data collection priorities (December 2022), and the 5<sup>th</sup> workshop on financial considerations of an EMS in the EPO (April 2023). All of these [EMS workshops](#), along with the respective documents presented at each workshop, the discussion summaries for each one, and the summary documents prepared for the respective SACs, are available at the [IATTC website](#).

This document has been prepared for the 6<sup>th</sup> workshop in the series, as outlined in the adopted EMS workplan (EMS-02-02 Rev), and primarily focuses on logistical, and data analysis and reporting standards, key subcomponents of the EMS infrastructure in the EPO (Figure 1). While this workshop will delve into these crucial aspects, it is also essential, for the sake of context, to recall that the other subcomponents of EM standards (technical and data collection standards) were previously presented and discussed at the 4<sup>th</sup> EM workshop. In this regard, the IATTC staff would like to encourage readers to revisit document [EMS-04-01](#) to refresh the presented information and associated recommendations on technical standards, particularly those describing the specifications for selecting, installing, operating and maintaining the EM equipment (e.g., cameras, sensors, data storage devices) and the associated software and hardware aboard vessels. Additionally, document [EMS-04-02](#) outlines matters concerning data collection standards and priorities, including the staff's proposed recommendations for the collection of minimum data fields for both purse seine and longline fisheries.

Throughout the remainder of this document, the IATTC staff will present, within a series of outlined text boxes, a number of preliminary recommendations on various topics to be considered by the 6<sup>th</sup> Workshop. The preliminary nature of these recommendations deserves special emphasis. One of the primary objectives of these EMS workshops is to foster discussions and generate ideas that will shape future IATTC staff recommendations on EMS, as well as recommendations from CPCs and other IATTC bodies such as the SAC or the newly established *ad hoc* working group on EM (EMWG) (Resolution [C-22-07](#)). In essence, these preliminary recommendations are meant to initiate discussions and serve as starting points. They are not intended to preempt or limit meaningful discussions or alternative approaches.



**FIGURE 1.** Structure of the EMS for the tuna fisheries in the EPO, emphasizing (in gray) the standards discussed in this document.

## 2. LOGISTICAL STANDARDS

Logistical considerations revolve around the management of EM records, and their complexity varies based on factors such as fishery type, vessel allocation in single or multiple ports, and port accessibility, among others. These factors may also impact the financial aspects of the EMS. Regardless of the chosen arrangement, the Commission will need to determine costs coverage and address confidentiality matters related to EM record transfers. Specific logistical aspects of an EMS that require consideration include data transfer and review.

**Data transfer:** Ideally, EM records stored on a vessel's EM equipment should be transmitted periodically to land-based storage; once a week, for instance, like the catch reports sent by AIDCP observers at sea. However, this is costly: in the pilot study, the EM equipment generated 40 GB or more of data per day, and Gilman (2019) reported that transmitting a single megabyte via satellite costs about US\$ 8.

An alternative approach involves automated data transmission via mobile networks, Wi-Fi, or satellite communication (EFCA, 2019). Pre-analyzed sensor data using AI can provide reliable information on key and priority fishery data, such as geographical and temporal location of the sets, total/by species tuna catches, which may be further validated via EM analysis, if needed. As satellite communication becomes more affordable, the possibility of sending AI-filtered EM records should be taken into consideration.

Currently, a practical procedure for purse-seiners is transferring all trip EM records to the EM review center at the end of each trip. For longliners, staying at sea for extended periods (i.e., several trips), this may not be practical. However, longline vessels interact with other vessels at sea (e.g., transshipments) and could hand the discs to trusted actors, at least while remote transfer of data is not a feasible option. With these considerations, the staff recommendation on data transfer of EM records is as follows:

All EM records must be transferred from the vessel to the EM review center at the end of each trip.

While it is imperative that the EM equipment aboard a vessel to be tamper-evident, there should also be a mechanism to delete EM records from the storage device and the backup once the chain of custody of the storage devices is confirmed, and the records are successfully copied or transmitted. The deletion process can be executed remotely, utilizing one-time passwords by the vessel crew. Alternatively, a technician could visit each vessel upon its return to port, and either copying the EM records from the storage device or physically removing it, while leaving the backup device in place. After the records have been transferred to an EM review center and undergone analysis, they would be deleted from the vessel's devices. In accordance with these considerations, the recommendation is as follows:

Irrespective of the data transfer method used for EM records, an encrypted storage device containing the same EM records information must remain on board as backup. The deletion of records from the vessel's backup devices should only occur once the EM records have been converted to EM data at the EM review center.

**Data review:** A single EM review center for the EPO might be impractical or undesirable. An alternative approach is adopting the AIDCP model, where trip records are reviewed by the program that monitored that trip, be it IATTC or national program. Implementing this would require extending existing programs or establishing new ones at the national or potentially regional level. Another option, not necessarily incompatible with the previous approaches, is outsourcing EM record handling and/or EM analysis to a commercial enterprise, similar to the observer program for carrier vessels under Resolution [C-22-03](#). In this setup, logistics, including the hiring and assignment of observers, are outsourced, but data processing and analysis are carried out by a vessel's flag CPC and shared with the IATTC staff. Provided that standard protocols and procedures are followed, a hybrid system might also work, wherein CPCs can choose whether to contract the work out or do it themselves.

Taking all these elements into account, the recommendations for data review in logistical standards are as follows:

EM data should be generated by the program that monitored that trip, whether IATTC or a national program<sup>1</sup>. Provided that standard protocols and procedures are followed, CPCs should choose whether to contract the work out through a commercial EM review service provider or do it themselves.

A final consideration, to offer flexibility for both the IATTC and any EM national program to select an EM review center that aligns with their logistical and financial requirements, it would be ideal if EM records obtained from an EM equipment provider could be compatible for EM analysis with any EM review center provider.

### 3. DATA ANALYSIS AND REPORTING STANDARDS

Whether EM analysis is conducted by the IATTC staff, an individual EM program or EM review center, or a third-party contractor, it is important that the resulting EM data maintain consistency and comparability. Therefore, it should be generated and reported using standard protocols and procedures. This will require, among others, developing procedures to check or validate data, such as species identifications, catch data (both total and by species), individual measurements, etc., developing standard conversion factors (e.g., length-to-weight, number-to-weight) and establishing a schedule for reporting data to the IATTC by individual EM programs.

Several elements must be considered in developing standards for EM analyses and reporting, including the following:

**Training:** EM analyses will require skilled EM analysts. The training should be conducted in a standardized manner to ensure consistent EM data is generation across the EPO-EM programs. A potential pool of EM analysts could be drawn from trained observers with at-sea experience, who are familiar with the fishery and proficient in identifying fish species but no longer interested in sea duties. Training courses, coordinated by the IATTC staff, will need to be designed and organized, with input from EM service providers and other experts. The staff's recommendation for training EM analysts is as follows:

Design and organize training courses for EM analysts, coordinated by IATTC staff, with input from EM service providers and other experts.

EM analyses should only be conducted by trained EM analysts, ideally possessing some experience at sea.

**Automation:** the analysis software should make entering the EM records and generating the EM data as automated as possible. This should include, among others, location, date and time stamps on any activity identified by the cameras and the sensors. Additionally, user-friendly tools should be implemented to facilitate direct inclusion of information in the final EM data or reports and to expedite the overall EM analysis. The proposed recommendations in this regard are as follows:

Make EM data generation automatic and user-friendly to expedite EM analysis and directly include information in EM data or reports.

---

<sup>1</sup> This would involve expanding existing programs or creating new ones at national, or perhaps regional, level.

Any activity identified by the cameras should automatically include, at a minimum, location, date, and time stamps.

**Data quality:** error-checking procedures should be built into the analysis software to ensure data quality, such as cross-checks of EM-based catch estimates, port-sampling data, and/or logbook data, and appropriately calibrated digital measuring tools to obtain accurate measurements of individual animals. Review routines that effectively flag potential errors in EM data are also necessary. In light of these considerations, the recommendations for data quality are as follows:

Develop software with built-in error and cross-checking procedures and digital measuring tools, as well as review routines to flag potential errors.

EM data should be consistent and comparable, regardless the EM program or review center that generated it and must be generated and reported using standard protocols and procedures.

**Conversion factors:** catches are typically measured either in weight or numbers, but the factors used to convert these data from one to the other, or into lengths, vary among institutions and researchers, increasing the uncertainty in the estimates and hampering direct comparison of results. Standard, species-specific length-weight and weight-number conversion factors, based on peer-reviewed research results and/or empirical data, will need to be developed and agreed upon, and updated as necessary.

Toward this end, the following recommendation is proposed:

Standardized species-specific length-weight and weight-number conversion factors, based on peer-reviewed research results and/or empirical data, should be developed and agreed upon, and updated as necessary.

**Format:** It is important that minimum standards be required to ensure that the EM data adheres to a standardized format and can seamlessly integrate into the IATTC databases. Standardized formats should be used when generating both in the EM records (e.g., dates as DDMMYY) and the resulting EM data files (e.g. csv, accdb, xlsx). Based on the above, the staff recommendation regarding format is as follows:

Standard formats should be used for generating EM data fields (e.g. dates as DDMMYY, latitude and longitude in decimal units) and creating resulting EM data files (e.g. csv, accdb, xlsx).

**Reporting frequency:** the reporting schedule will need to take into account differences among data types and fisheries. For EM records, timely submission is essential, with a requirement to submit records within 30 days of the end of the corresponding trip. When it comes to EM data, a system similar to current AIDCP/IATTC could be used, in which EM programs would submit purse-seine and longline data to the IATTC annually, in March and June, respectively, of the following year. The recommendations on reporting frequency are as follows:

EM records should be submitted to the EM review center within 30 days of the end of the corresponding trip.

EM data should be submitted following a system similar to the AIDCP or other IATTC procedures, where EM programs submit purse-seine and longline data to the IATTC annually, in March and June, respectively, of the following year.

**Reporting procedure:** to simplify and facilitate the timely and accurate reporting of EM data and records, they would be submitted via a dedicated cloud-based portal. This portal should be as user-friendly and automated as possible, incorporating features like quality control (e.g., format checking, error flagging), procedures and automatic reminders for the submission of EM data or records. In this regard, the staff recommendation is as follows:

EM records and data should be submitted via a dedicated cloud-based portal. The portal should be as user-friendly and automated as possible, and include quality control (e.g. format checking, error flagging) procedures, as well as automatic reminders for the timely submission of EM data and records.

#### **4. REFERENCES**

- EFCA, 2019. Technical guidelines and specifications for the implementation of Remote Electronic Monitoring (REM) in EU fisheries. European Fisheries control agency, Vigo, p. 43.
- Gilman, E., Legorburu, G., Fedoruk, A., Heberer, C., Zimring, M., Barkai, A., 2019. Increasing the functionalities and accuracy of fisheries electronic monitoring systems. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 29, 901-926.