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IMPLEMENTATION OF AN ELECTRONIC MONITORING SYSTEM (EMS)

UPDATED STAFF CONSIDERATIONS AND DRAFT RECOMMENDATIONS – PROGRESS REPORT

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SUMMARY

In line with the Commission-approved workplan for implementing of an Electronic Monitoring System (EMS) for EPO tuna fisheries, this document aims to provide a report on the progress made during the 6th EMS workshop on the logistical aspects, and data analysis and reporting standards, as well as a compilation of all the recommendations made by the IATTC staff on EMS (appendix I). This progress report incorporates feedback from workshop participants, capturing their insights from topic-based discussions sparked by preliminary recommendations put forth by the staff, with the understanding that these recommendations may evolve over time, after each subsequent workshop, influenced by the feedback received during discussions.

1. INTRODUCTION

As a general background, it is key to note that the IATTC has acknowledged and endorsed the use of electronic monitoring (EM) as a promising tool for addressing data gaps, improving data collection, and monitoring both purse-seine and longline vessels without onboard observers, as well as vessels with onboard observers to complement their data collection (Resolution C-19-08; Document SAC-07-07f.i). In response to Recommendation 3.1 from the Scientific Advisory Committee (SAC) during its 10th meeting in 2019, endorsed by the Commission, and in adherence to Resolution C-19-08, paragraphs 9 and 10, the staff prepared Document SAC-11-10 "*An Electronic Monitoring System for the Tuna Fisheries in the Eastern Pacific Ocean: Objectives and Standards*" and presented it at the 11th SAC meeting. This document outlined the potential of an Electronic Monitoring System (EMS), described its potential components, provided a comprehensive evaluation of the minimum standards for these components, and outlined the actions necessary for implementation. Based on this groundwork, the IATTC staff proposed that the *1st Workshop on Implementation of an Electronic Monitoring System* delve further into some elements from document SAC-11-10 and the recommendations compiled in Document EMS-01-01.

As a complement to these recommendations, Document EMS-01-02 (Rev.) proposed a workplan (Table 1; Figure 1), consisting of several workshops focusing on different components and subcomponents of EMS, analyzed in a logical and chronological order. The objective of these workshops is to educate participants, foster communication and discussions, generate ideas, and work towards a common understanding among stakeholders regarding EM matters. They also aim to identify areas where participants broadly agree and areas where there are strongly held differences that may pose future challenges. As a result,

during its 98th meeting in August 2021, the Commission adopted Resolution C-21-02, which established the Terms of Reference for these workshops. Additionally, on a provisional basis, the Commission adopted the definitions recommended in Document EMS-01-01 to facilitate discussions in the EMS workshops (Resolution C-21-03).

In line with Resolution C-21-02 and the adopted workplan for implementing an EMS in the EPO, the staff organized the *2nd Workshop of an EMS in the EPO* in fall 2021 to discuss aspects of the institutional structure, goals and scope of the EMS (refer to EMS-02-01 and EMS-02-02 Rev.). Subsequently, a *3rd EMS Workshop* was held in spring 2022 to discuss issues related to the management of an EMS for the EPO (see EMS-03-01). During SAC-13, the staff presented a compilation of workshop participants' comments and concerns and revised their preliminary recommendations accordingly (refer to SAC-13-INF-D).

To assist delegations in negotiating through a Member-appointed Chair towards the adoption of formal recommendations for the Commission adoption, the staff proposed establishing the *ad hoc* working group on EM (EMWG), which the Commission adopted via Resolution C-22-07 at its 100th Meeting. Following the adopted EMS workplan, the *4th EMS Workshop* took place in December 2022 to discuss matters related to technical standards and data collection priorities of an EMS (see EMS-04-01 and EMS-04-02). Subsequently, the *5th EMS Workshop* was held in the spring 2023 to discuss the financial considerations of an EMS (see EMS-05-01). During SAC-14, the staff presented a compilation of workshop participants' comments and concerns and revised their preliminary recommendations accordingly (refer to SAC-14-INF-H). Later, in accordance with Resolution C-22-07, the *1st meeting of the Ad Hoc Working Group on Electronic Monitoring* was held virtually in November 2023, to address, among other matters, a potential workplan for the implementation of an EPO-EMS, where in subsequent EMWG meetings, different components of an EMS and the development of minimum standards for the EMS will be agreed upon. As a result, participants agreed to present a draft workplan along with a draft of interim minimum standards for the consideration by the EMWG at its 2nd Meeting, presented in April 2024 (EM-02-01). Additionally, the 6th and final EMS workshop of the series proposed by the EM workplan (*6th Workshop of an Electronic Monitoring System*) was organized by the IATTC staff to address the logistical and data analysis and reporting standards (see EMS-06-01).

This document offers an overview of the background and rationale behind the recommendations presented in the EMS-06-01 document, which were discussed during the 6th EMS workshop on the logistical aspects and data analysis and reporting standards of an EPO-EMS. It also summarizes the discussions held during these workshops and revises the recommendations as needed. Appendix 1 compiles a summary of the staff recommendations discussed thus far.

2. WORKPLAN ON THE IMPLEMENTATION OF THE EMS IN THE EPO

2.1. Logistical and data analysis and reporting standards of an EMS

The *6th Workshop of an Electronic Monitoring System in the eastern Pacific Ocean,* which focused on logistical standards and data analysis and reporting, aimed to address organizational issues related to logistical considerations and various variables regarding EM analysis and reporting of data (EMS-06-01) for tuna fisheries in the eastern Pacific Ocean.

2.1.1. Logistical standards

Data transfer

Document EMS-06-01 explains that in the context of EMS, “logistical standards” primarily refer to the management of EM records. These standards can vary based on several factors, including the type of fishery, whether vessels are based in one or multiple ports, and port and vessel accessibility. These considerations can, in turn, impact the cost of EMS. The Commission will need to determine how to cover

different EM coverage costs and address security and confidentiality concerns related to the transfer and review of EM records. Regarding confidentiality, the staff mentioned several approaches among the range of options. One option would be for EM records to be reviewed and transformed into data by the program monitoring the vessel (e.g. national, regional, or Commission program), perhaps similar to how purse-seine observer data is reviewed under the AIDCP. Other options include the possibility of outsourcing EM record handling and/or EM analysis to an approved, certified, external third parties.

Workshop discussion on this topic**.** Participants discussed several key points regarding the processing and management of EM records in the context of EPO tuna fisheries, emphasizing the need for standardized processes, data quality assurance, and clarity on the scope and goals of the EMS in the EPO.

Concerning EM review rate and a centralized holding location and the costs this would imply to CPCs, there was a clarification that the recommendation doesn't imply analyzing all EM records but rather transferring original EM records to a centralized location, like a cloud storage managed by the deploying program or a third party associated with a review center.

Regarding EM complementarity with human observer data, in the case of longline vessels observed by national programs, EM data would complement human observer data. It was suggested that EM records should be processed by a national review center within the flag state, combining it with human observer data, and then communicating this data to the Secretariat, in a manner similar to the current observer data flow under Resolution C-19-08. Other participants emphasized the need for a homologation process to ensure EM data uniformity and quality across programs. Certification programs were suggested to ensure consistent interpretation of data fields among different programs. Challenges related to data transmission for long-trip longliners were discussed. Suggestions included periodic offloading of EM records during at-sea transshipment processes. Regarding transshipping, its inclusion within the scope of IATTC-EMS was highlighted, along with the need for clarity on which gear types would be included.

Concerning storage and encryption of EM records, the importance of backup and storage of EM records, as well as the need for encryption, was mentioned. However, there were doubts about the necessity of encryption if the purpose is solely scientific data collection. Domestic regulations for privacy and encryption varied among members, suggesting that detailed stipulations on encryption might not be necessary at this stage.

The IATTC staff, taking into account the expressed opinions, and seeking for standardized processes and quality assurance of EM records, considers that the recommendations will remain as originally proposed:

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

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

Document EMS-06-01 mentioned that having a single EM review center for the EPO may not be practical or preferred. An alternative suggestion is to adopt a model similar to AIDCP, where trip records are reviewed by the program responsible for monitoring that specific trip, whether it's IATTC or a national program. This would involve expanding existing programs or creating new ones at the national or potentially regional level. Another option, which isn't necessarily incompatible with the previous approaches, is to outsource the handling and analysis of EM records to a commercial entity, similar to the

observer program for carrier vessels under Resolution C-22-03. In this setup, logistical aspects like hiring and assigning observers are outsourced, while data processing and analysis are conducted by the vessel's flag CPC and shared with IATTC staff. With clear standard protocols and procedures in place, a hybrid system could also be considered, giving CPCs the flexibility to either outsource the work or handle it internally.

Workshop discussion on this topic. A suggestion was made to edit the last sentence of this recommendation by inserting "…*or to designate the institution to conduct the review*". It was also reflected that the analysis of EM in line with this recommendation would be costly. Others felt that a hybrid system could be a good solution, and that it is also important to have an overview of costs.

The IATTC staff acknowledges the financial implications associated with EM analysis but believes that this recommendation outlines the minimum requirements essential for executing this task. Regarding the initial suggestion related to this recommendation, the staff has made a slight modification to its content as follows:

> *EM data should be generated by the program that monitored that trip, whether IATTC or a national program[1]. 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~~, or to designate the institution to conduct the review.*

2.1.2. Data analysis and reporting standards

Training

As outlined in EMS-06-01, EM analyses will necessitate skilled EM analysts. Training should follow standardized procedures to ensure consistent generation of EM data across EPO-EM programs. A viable source of EM analysts could be former observers with at-sea experience, familiar with the fishery and adept at identifying fish species. Training courses, overseen by the IATTC staff and developed with input from EM service providers and other experts, will need careful design and organization.

Workshop discussion on this topic. The discussion focused on the coordination and necessity of training for EM analysts within the EPO-EM programs. There were differing views regarding the role of IATTC staff in training coordination, with some emphasizing the importance of IATTC involvement to ensure standardization and high-quality data and remarked that IATTC-specific training is important for species ID, and also advocating for a senior observer to conduct the EM analysis. Others expressed concerns about language barriers and the need for flexibility in training approaches. Participants agreed on the need for standardized procedures and species identification training, particularly for EPO-specific species. The consensus leaned towards a collaborative approach where IATTC provides guidelines and principles, while national programs tailor training materials to their specific needs and languages. There was recognition of the fast-evolving nature of EM technology, emphasizing the importance of ongoing learning and adaptation. Overall, participants acknowledged the value of IATTC's expertise in facilitating standardization and data quality across national programs.

The staff recognized the high regard for and support to the AIDCP observers. As a result, these recommendations remain as originally proposed:

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

[1] This would involve expanding existing programs or creating new ones at national, or perhaps regional, level.

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

Automation

The staff explained that the EM 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. User-friendly tools should be also implemented to facilitate direct inclusion of information in the final EM data or reports and to expedite the EM analysis.

Workshop discussion on this topic. A participant said that these recommendations are common sense. However, they think the language is too strong as it is uncertain these could be 100% accomplished, and these would not make much sense in their implementation.

The staff considered that the capabilities stated in these recommendations are actually being applied in the EM analysis software used by EM review centers on rutinary basis, and some of them are important to generate reliable EM data, thus these recommendations remain as originally drafted:

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

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

Data quality

The staff noted that the EM analysis software should include error-checking procedures to ensure data quality. Cross-checks of EM-based catch estimates with other data sources, and appropriately calibrated digital measuring tools are key to obtain accurate measurements of individual animals. Review routines that effectively flag potential errors in EM data are also necessary.

Workshop discussion on this topic. Concerning checking routines, some participants suggested that these routines should be optional, citing existing tests and bug identification software used by suppliers. However, there was a question about whether IATTC or countries are developing built-in error check software. The staff clarified that they make recommendations to service providers but are not developing the software themselves.

When discussing data standardization, there was a consensus that the flag state should provide EM data in a standard format, but compatibility with databases is not essential since analysis will be done by flag state authorities. Participants emphasized the need for clarity on coverage percentages for EM and human observers, with decisions on coverage allocation left to the country. Additionally, all EM analyses should ideally be conducted by CPC's EM review center. Others contrasted these opinions by expressing that the EM data standardization needs to reflect what the Secretariat needs, not what some CPCs want to provide.

Regarding compatibility and standards, some participants stressed the importance of EM data standardization to meet the Secretariat's needs efficiently and without overburdening the staff. This includes providing good quality, standardized EM data, similar to current arrangements with national observer programs for purse-seine vessels. Additionally, review routines for EM analysis and defined standards for providing EM data information were deemed necessary.

The staff understood there were no substantial indications to modify these recommendations, hence they are drafted as originally proposed:

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 of the EM program or review center that generated it and must be generated and reported using standard protocols and procedures.

Conversion factors

As referred in the document WSEMS-06-01, to reduce the uncertainty in the species catches and size estimates, 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 are necessary.

Workshop discussion on this topic**.** There was general support for this recommendation. Only one participant suggested the recommendation be edited to read: "*Standard factors for conversions should be developed by the staff and approved by Commission*".

The IATTC considered this comment, and made some edits to its content as follows:

Standardized species-specific length-weight and weight-number conversion factors, based on peer-reviewed research results and/or empirical data, should be developed by the IATTC staff, approved by the Commission as needed, and updated as necessary.

Format

Document EMS-06-01 remarks the importance of minimum standards being 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 the EM records and the resulting EM data files.

Workshop discussion on this topic**.** Only one comment was voiced, expressing its total support of this recommendation, and stressing its importance.

The recommendation will remain as originally proposed:

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

This recommendation takes into account differences among data types and fisheries. For EM records, timely submission is essential, with a recommendation to submit EM 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.

Workshop discussion on this topic**.** An attendee felt that this recommendation should not specify deadline times here. It is certain that EM records should be sent to the EM review center as soon as possible, but on the other hand it gives more flexibility among members. Additionally, the trip definition for longliners is different among members, so this will need to be clarified.

Taking into account the comments received, and after internal discussion, IATTC staff have revised this draft recommendation to reflect the different situations that may arise regarding transmission of EM

records to IATTC. The new draft text reads as follows:

> *Where the Commission has identified the need for IATTC staff or contractors to review and process of EM records, including their conversion into EM data, these records should be transmitted to the IATTC Secretariat within 30-days following the end of a trip. Flag CPCs should also ensure that owners and operators may provide EM records immediately upon request where the Commission has established the obligation of such provision in the framework of the IATTC EMS program*.

As for EM data, a confusion emerged regarding to whether EM data implies that the CPC sends the hard drive with raw information or does CPC have to review the information and then submit it. Others also mentioned that an annual EM data submission to the IATTC would suffice to ensure compatibility with other Commission data submission procedures, such as those carried out in the AIDCP and other IATTC programs.

While considering this comment, the staff clarified the first point by explaining that this recommendation pertains exclusively to EM data, to be submitted on an annual basis: in March and June of the following year for purse-seine and longlines, respectively. There is no need for it to be sent on hard drives because it is already distilled, analyzed, and encrypted data. Given these considerations, the staff has decided to maintain the recommendation in its initial form:

> *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 ensure the prompt and accurate reporting of EM data and records, the staff proposed submitting them through a dedicated cloud-based portal. This portal should prioritize user-friendliness and automation, including features such as quality control (e.g., format checking, error flagging), procedures, and automatic reminders for submitting EM data or records.

Workshop discussion on this topic**.** Some participants considered that the EM data should be submitted through the flag CPCs. Another felt that this recommendation would only work for a centralized EMS, but not for EM national programs, they should not send the large amount of data to the Secretariat. Additionally, they suggested removing the term 'EM records', since uploading such a high volume of information is not only impractical, but costly. There was also a concern about the type of information requested in this recommendation is about EM records and/or EM data.

The staff concurred that this EM records-EM data bifurcation is depending on whether there is a centralized repository or if the CPCs are submitting on their own, as well as the final goal and scope of the EPO EMS The IATTC staff. Additionally, the staff expressed that it could be also EM records (if required) based on the 4th recommendation on the institutional structure), but also clarified that EM data should be only submitted through the cloud, given the current actual costs. Therefore, the staff, for now, considers that this recommendation will remain as originally proposed:

> *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*.

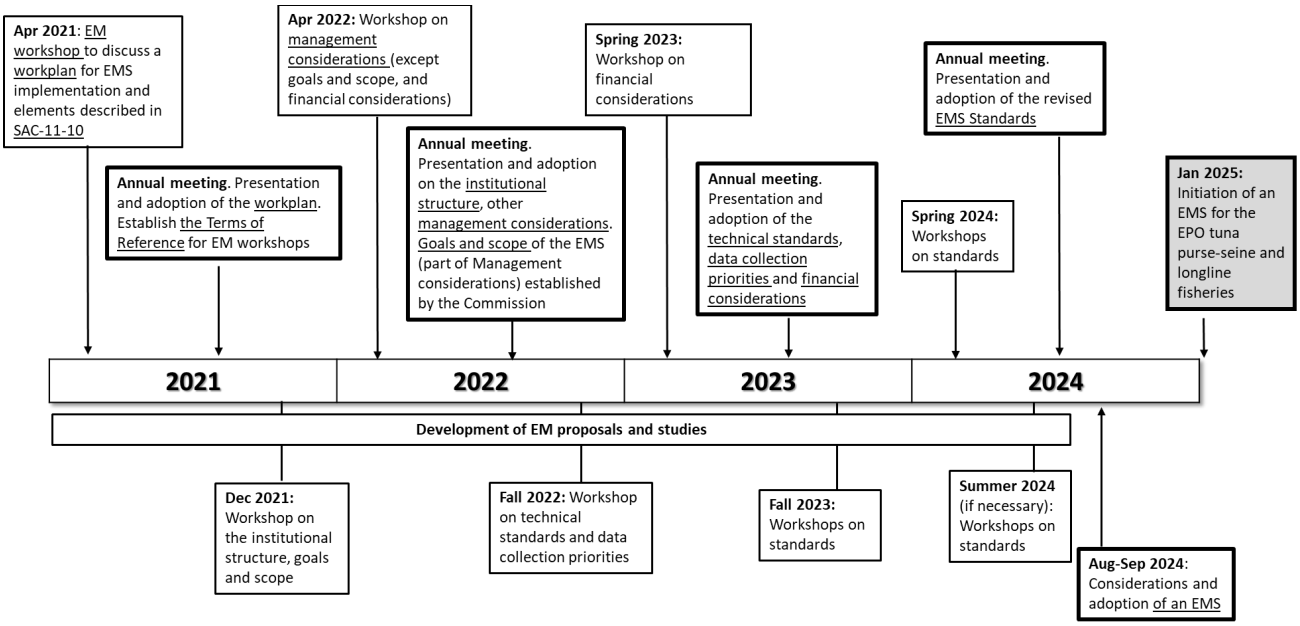

FIGURE 1. Commission's adopted workplan on the implementation of an EMS for the tuna fisheries in the EPO.
FIGURA 1. Plan de trabajo adoptado por la Comisión para la implementación de un SME para las pesquerías de atún en el OPO.

TABLE 1. Timetable of activities in the workplan adopted by the Commission.
TABLA 1. Calendario de actividades del plan de trabajo adoptado por la Comisión.

<table>
<tr><th colspan="12">2021</th></tr>
<tr><th colspan="6">Semester 1</th><th colspan="6">Semester 2</th></tr>
<tr><td>Month 1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td colspan="5">Jan 1, 2021. Cont. Pilot project of EM in the purse-seine fishery (D.2.a).</td><td colspan="7"></td></tr>
<tr><td></td><td colspan="11">Feb. Pilot project of EM in the longline fishery (C.2.b).</td></tr>
<tr><td colspan="2"></td><td colspan="10">Mar. Exploring technologies for remote FAD identification (C.1.a).</td></tr>
<tr><td colspan="6"></td><td colspan="6">Jun: Cost-benefit analysis of EM for tuna fisheries in the EPO.</td></tr>
<tr><td colspan="3"></td><td colspan="3">Spring. EM workshop to discuss a work plan for EMS implementation and elements described in SAC-11-10.</td><td></td><td colspan="2">Annual meeting. Presentation and adoption of the workplan. Establish the Terms of Reference for EM workshops.</td><td colspan="3">Fall. Workshop on the institutional structure and EMS objectives and scope.</td></tr>
<tr><td colspan="12">Development of new EM proposals and studies</td></tr>
<tr><th colspan="12">2022</th></tr>
<tr><th colspan="6">Semester 3</th><th colspan="6">Semester 4</th></tr>
<tr><td>Month 13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td colspan="5"></td></tr>
<tr><td colspan="12">Jan 1, 2022. Cont. Pilot project of EM in the longline fishery (C.2.b).</td></tr>
<tr><td colspan="3">Jan. Cont. Exploring technologies for remote FAD identification (C.1.a).</td><td colspan="9"></td></tr>
<tr><td colspan="6">Jan. Analysis to define EM sampling coverage and EM data review rates (purse-seine fishery). (subject to/pending decisions on EMS objectives)</td><td colspan="6"></td></tr>
<tr><td colspan="3"></td><td colspan="3">Spring. Workshop on management considerations (except Goals and scope, and financial considerations)</td><td colspan="3">Jul/Aug, Annual meeting. Presentation and adoption on the institutional structure, other management considerations. Goals and scope of the EMS (part of Management considerations) established by the Commission</td><td colspan="3">Fall. Workshop on technical standards and data collection priorities.</td></tr>
<tr><td colspan="12">Development of new EM proposals and studies</td></tr>
<tr><th colspan="12">2023</th></tr>
<tr><th colspan="6">Semester 5</th><th colspan="6">Semester 6</th></tr>
<tr><td>Month 25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td></tr>
</table>

Jan 1, 2023. Cont. Pilot project of EM in the longline fishery (C.2.b).												
Jan. Analysis to define EM sampling coverage and EM data review rates (longline fishery). *(subject to/pending decisions on EMS objectives)*												
						Spring. Workshop on financial considerations		Jul/Aug, annual meeting. Presentation and adoption of the technical standards, data collection priorities and financial considerations.		Fall. Workshop on standards (1)		
Development of new EM proposals and studies												
2024												
Semester 7						**Semester 8**						
Month 37	38	39	40	41	42	43	44		45	46	47	48
			Spring. Workshop on standards (2)		Jun. Workshop on standards (3) *if necessary	Jul/Aug, Annual meeting. Presentation and adoption of the revised EMS Standards.						
									Aug/Sep. Final consideration and adoption by the Commission of the whole set of EMS components for the purse-seine and longline fishery on the basis of the conclusions and recommendations of the EMS workshops as well as the discussion and decisions of the Commission during its intervening meetings as described in the workplan and in this timetable**.** The EM equipment should be installed and the EMS operative before Jan 1, 2025, or on a date to be agreed upon by the Commission based on the conclusions and recommendations of the EM workshops described in the workplan and in this timetable.		
Development of new EM proposals and studies												
2025												
Semester 9									**Semester 10**			
Month 49			50	51	52	53	54		55	56	57	58	59	60
Jan 1, 2025, or on a date agreed upon by the Commission, initiation of an EMS for the tuna fisheries in the EPO												
Development of new EM proposals and studies												

APPENDIX 1

List of the recommendations as presented in the EMS workshop documents EMS-02-01, EMS-02-02 and EMS-03-01.

Institutional structure

Structure of the EMS program

Establish a single, unified EMS Program for the EPO following the International Dolphin Conservation Program (IDCP) model, in which databases, standards, procedures and protocols are standardized across all components/individual programs and are compatible with existing IDCP and IATTC practices.

Rules and procedures: standardization and compatibility

Agree that national EMS programs that may be set up to complement the IATTC EMS Program, can be fully or partially contracted out to third parties, but only if they apply the common standards, protocols, procedures, and databases of the overarching EPO EMS Program.

Harmonization and compatibility of EPO EMS with WCPFC EMS

To the extent practical, seek to ensure harmonization and compatibility of EPO EMS with WCPFC EMS procedures and standards among others to facilitate cooperation and exchange of information as appropriate and necessary between the two organizations.

Data: integration, access and sharing

Agree that all EM data resulting from national EMS programs (and, if required for research purposes, the underlying EM records) be shared with the IATTC staff.

Task the IATTC staff with coordinating the EPO EMS and integrating all derived EM data for their future utilization and analysis, as appropriate.

Goals and scope

Goals

The EPO EMS should generate data to be made be available for use in both scientific and compliance related activities, as defined by the Members.

Scope

The EPO EMS should include the following types of vessels operating in the IATTC Convention Area: tuna purse-seine vessels of all sizes; all longline vessels of 12 meters in length or more and motherships of longline vessels less than 12 meters in length, and transshipment authorized carriers.

EMS Management considerations

Coordination and compatibility

The EPO EMS should, to the extent practicable, be designed to operate as part of, or in close coordination with, the existing observer programs and other relevant data-collection programs, to maximize efficiency and avoid unnecessary duplication of effort and/or data collected.

Confidentiality

The Commission should consider whether it is necessary to clarify or amend IATTC and AIDCP data confidentiality rules to ensure that they are adapted to the circumstances and requirements related to the implementation of an EMS, in particular to guarantee the personal and commercial privacy and confidentiality of EM records and EM data.

Compliance

Non-compliance with measures adopted by the IATTC

Non-compliance with EM standards and requirements established pursuant to other IATTC decisions (e.g., IATTC Resolutions) should be referred to the relevant Members for investigation and further consideration, and also reported to the Review Committee for recommended improvements to increase compliance, or other actions, as appropriate.

Regulation-adapting process

The Commission will take all appropriate measures to promote and improve compliance, including through the appropriate capacity building activities.

EM equipment

EM equipment installation, malfunction and manipulation

The Commission should establish policies and procedures for installation, use, and repair of EM equipment malfunctions, and prevention of tampering.

The EM equipment should be capable of detecting, recording and reporting malfunctions, and instances of possible tampering.

Robustness of the equipment

EM records storage devices should be capable of securely storing, and preventing external data input or manipulation. Cameras and other sensors should be weather and tamper-evident as well, but also capable of allowing repair by vessel crew when at sea in coordination with EM service providers, as needed.

Provisions when EM equipment is nonfunctional

Vessels should be prohibited from leaving port unless their EM equipment is functioning properly.

If the EM equipment ceases to record useful or sufficient data, the vessel should be required to return to port in a reasonable timeframe when at-sea repair is not feasible.

EM coverage and review rate

EM coverage

The objective of EM coverage should be 100% coverage for all longline and purse-seine vessels and trips, with an interim objective of making sure that programmatic coverage at less than 100% must be representative of all fleets and fishing strategies.

EM review rate

When a vessel has operational EM equipment, it should be used to monitor all fishing activities conducted by that vessel for the entire trip.

Separate EM review rates should be established for compliance and for science, taking into account costs and feasibility.

For those EM data fields that do not require an EM review rate of 100%, the review rate should be established on a scientific basis (e.g., through the analysis of EM data provided by the Projects D.2.a, C.2.b). Results should be discussed in a workshop (possibly in fall 2022) involving stakeholders with experience in fisheries EM programs and presented to the SAC, before being transmitted to the Commission.

EM review rates should be reviewed periodically so that they are revised, if necessary, following results of analysis of EM data.

Technical standards

General aspects of the technical standards

The standards need to be purpose and performance oriented, flexible enough and periodically reviewed by the Commission to accommodate technological advances and changes in priorities, as well as the particular requirements of vessels of different sizes, gears, and fishing practices.

Unless (or until) common standards are adopted, the EM equipment installed should be capable of working with all existing hardware and software and be adaptable to future technological developments.

Cameras

Cameras must be sufficient in number and quality to meet the data requirements of the EMS, with high-resolution images that allow the identification of species, specific fishing activities and the vessel's surroundings, and durable enough to withstand conditions at sea.

Cameras should be capable of recording both video and still images, with a minimum frame rate of 15 frames per second (15 fps) and a minimum image capture interval of no more than 2 seconds, respectively.

For purse seine vessels, the cameras should cover, at a minimum, the working deck (both port and starboard sides), the net sack and the brailer, the foredeck or amidships, and (if applicable) the well deck and conveyor belt. A first proposal for location of cameras in class 2-6 purse seiners is provided in Annex 1, based on the experience of the pilot project D.2.a.

On longliners, the cameras should provide, at a minimum, a view of all hooked fauna, both those brought aboard the vessel and those discarded or released without landing them on the vessel. A first proposal for the location of cameras on longliners is provided in Annex 2, based on information provided by the pilot project C.2.b, EM service providers and other international initiatives.

CPCs will require their vessels to cooperate with and facilitate the installation, maintenance and repair of cameras and other EM equipment according to the device placement design plan for their vessel or vessel type.

Sensors

EM equipment may also include sensors for recording non-visual data (e.g. vessel movement, hydraulic pressure, environmental information), and also possibly mechanisms for activating/disactivating cameras so as to focus visual data collection during activities of interest.

Data storage

EM equipment should include sufficient capacity to store all required EM records, at a minimum, for the duration of a fishing trip.

Vessels should have onboard enough blank data storage devices (preferable solid-state drives) in case these must be replaced at sea. A specially trained crew member may need to replace the devices during a fishing trip if the data storage capacity is exhausted, always in coordination with the EM service provider.

EM equipment should include separate duplicate backup devices, to ensure that data are not lost if one device fails.

Compatibility

EM equipment should use and generate records and/or data in a format compatible with IATTC databases and IT resources.

Malfunction/tampering

EM equipment should be tamper-evident/resistant and send automatic alerts in real time to the appropriate EM program in cases of malfunctions, manual activation/shutdown, manual data input, external data manipulation, or attempts to tamper with the equipment or EM records. It should also be possible for data recording to be controlled manually, but only in case the EM equipment fails to start or stops automatically, and any manual activation should trigger an automatic alert. Manual shutdown should not be permitted.

Data encryption

EM equipment should be capable of transmitting EM records in encrypted form.

EM equipment maintenance

At sea, all maintenance, repairs and replacement activities of EM equipment should be conducted by a specially trained vessel crew member, only in coordination and when instructed to do so remotely by the EM service provider.

On land, all maintenance, repairs and replacement activities of EM equipment should be conducted by an official technician, in coordination with EM service provider.

Each vessel must have a designated crew member responsible for routine camera lenses cleansing, per a specific protocol, to ensure the clarity of EM records. The protocol should include the following instructions: i) the lenses of cameras operating within 10 meters of any fishing activity must be wiped clean before every set; ii) the lenses of all other cameras must be wiped clean once every week. Appropriate cleaning materials must be used to avoid lenses damage and should always be available onboard.

Data collection priorities

Overview of priorities in data collection

Priorities for EM data collection should be established, taking into account, among others, the provisions of the Antigua Convention, the IATTC Strategic Science Plan, the status and vulnerability of species, and the needs for compliance monitoring.

The Commission should support and ensure the funding of research activities that would improve EM data collection for scientific and compliance purposes (e.g., sensors that could remotely identify satellite buoys attached to FADs, accurate identification of certain fishing activities, other fishery components).

Purse seine vessels

Recognize, on a provisional basis, the need to collect for the purse seine fishery, at a minimum, the fields presented in Appendix 2.

Longline vessels

Recognize, on a provisional basis, the need to collect for the longline fishery, at a minimum, the fields presented in Appendix 3.

Financial considerations

Assessing the economic implications of an EMS for the tuna fisheries in the EPO

Consider the results of the cost-benefit analysis for longline fisheries, as reported in Rogers et al. (2021), and conduct a similar analysis for purse seine fisheries to facilitate a more efficient implementation of an EMS in the EPO.

Establishing financing, cost-allocation procedures and responsibilities for EMS and its components

Establish cost-allocation and financing options for all expenses related to implementing and maintaining an EMS and its components (e.g. EM equipment, installation, technical assistance both at sea and at EM review centers, and EM analysis, including training, hardware and software).

Conduct cost-recovery studies to explore options, and develop guidelines, for the recovery of costs of an EPO-EMS.

Committee reviewing and monitoring the EPO-EMS

The Committee on Administration and Finance (CAF) should review and monitor the financial and administrative aspects of the EMS, and subsequently submit relevant recommendations to the Commission.

Logistical standards

Data transfer

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

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

EM data should be generated by the program that monitored that trip, whether IATTC or a national program[2] . 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 to designate the institution to conduct the review.

Data analysis and reporting standards

Training

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

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

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

Data quality

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

Standardized species-specific length-weight and weight-number conversion factors, based on peer-reviewed research results and/or empirical data, should be developed by the IATTC staff, approved by the Commission as needed, and updated as necessary.

[2] This would involve expanding existing programs or creating new ones at national, or perhaps regional, level.

Format

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

Where the Commission has identified the need for IATTC staff or contractors to review and process of EM records, including their conversion into EM data, these records should be transmitted to the IATTC Secretariat within 30-days following the end of a trip. Flag CPCs should also ensure that owners and operators may provide EM records immediately upon request where the Commission has established the obligation of such provision in the framework of the IATTC EMS program.

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

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.

Appendix 2. A first assessment of data fields that should be collected, at a minimum, for the purse seine fishery, based on SAC-11-10 and the pilot project D.2.a.

TRIP INFORMATION		
Depart port	Port name and country, date/time, position (latitude and longitude, in decimal degrees).	
Arrival port	Port name and country, date/time, position (latitude and longitude, in decimal degrees).	
VESSEL ACTIVITY		
Position and speed	Every 2 seconds (based on some EM equipment capability), but no less than 60 min.	
SET INFORMATION		
	Set type.	
Set start	Date/time, position (latitude and longitude, in decimal degrees).	
Rings up	Date/time.	
Set end	Date/time, position (latitude and longitude, in decimal degrees).	
Wind speed	Recorded in Beaufort scale.	
Malfunctions	Date/time, description of any major malfunction that stops or delays the setting maneuver.	
CATCH AND DISCARD		
	Target species	**Non-target species**
Species Id.	Total catch and discards, as feasible as EM technology allows. Combined catch may be reported where species identification is not possible.	Sharks, lamnid sharks, whale shark, mobulid rays, billfishes, scombrids, carangids, triggerfishes, sea turtles, sea birds, and marine mammals, where each individual will be identified to the lowest taxonomic resolution possible (i.e., species), as feasible as EM technology allows. In cases where species identification is not possible, the animal may be identified to a broader taxonomic resolution (e.g., genus, family).
Size	Weight categories shall be used whenever possible (i.e., small 2.5 kg. - 15 kg).	Wherever possible, individuals shall be measured to the nearest cm as follows: sharks in total length, billfishes in post-orbital fork length, fishes in fork length, rays in disc width, turtles in curved carapace length. In cases where individual measurement is not possible, the animal may be classified by size category (i.e., small, medium, large) following IATTC observer practices.
Condition		When possible, the estimated condition of the individual when caught, brought on deck and released.
Tag		When possible, the tag recovery information recorded.
Fate	Catch retained and discarded, by species, in metric tons.	When possible, the fate of the individual brought on deck (e.g., retained, discarded, etc.)
Floating objects/FADs		
Deployments	Date/time, position (latitude and longitude, in decimal degrees).	
Retrievals	Date/time, position (latitude and longitude, in decimal degrees).	
Visits	When possible - Date/time, position (latitude and longitude, in decimal degrees)	
Buoy ID	When possible – alphanumeric code of the satellite buoy attached	

Appendix 3. A first assessment of data fields that should be collected, at a minimum, for the longline fishery, based on SAC-11-10.

The ability of EM to collect the data specified in C-19-08 (option (i)) is summarized in Appendix 3 of SAC-11-10. However, the staff has no practical experience of EM on longline vessels and, since fisheries are region-specific, it will be in a better position to assess the capabilities of EM on longline vessels after the proposed pilot study (Project C.2.b) is completed. For the purposes of this document, and although it could be revised in the future, the recommendations of the IATTC staff on the observer data fields for longliners that EM should collect, at a minimum, are as follows:

TRIP INFORMATION	
Depart port	Port name and country, date/time, position (latitude and longitude, in decimal degrees).
Arrival port	Port name and country, date/time, position (latitude and longitude, in decimal degrees).
VESSEL ACTIVITY	
Position and speed	Every 2 seconds (based on some EM equipment capability), but no less than 60 min.
SET INFORMATION	
Set start	Date/time, position (latitude and longitude, in decimal degrees).
Set end	Date/time, position (latitude and longitude, in decimal degrees).
Hauling start	Date/time, position (latitude and longitude, in decimal degrees).
Hauling end	Date/time, position (latitude and longitude, in decimal degrees).
Haul direction	Start to end; end to start.
Blue-dyed bait used	Yes – No.
Baskets or floats	Total number used in the set.
Hooks	Total number used in the set.
Wire traces on any branch lines	Yes – No.
Shark lines	Number of branch lines running directly off the longline floats or drop lines.
CATCH AND DISCARD OF TARGET AND NON-TARGET SPECIES	
Species id.	The species identification of each individual caught, where each individual will be identified to the lowest taxonomic resolution possible (i.e., species), as feasible as EM technology allows.
Size	Size of each individual caught, using the recommended measurement approach and the appropriate measurement code (standard, furcal, post-orbital, width of the disc, etc.) for the species.
Condition	The estimated condition of the individual when caught, brought on deck and released.
Fate	Fate of the individual brought on deck (e.g., retained, discarded, etc.)
Tag	Tag recovery information recorded.
Catch interaction	The type of catch interaction (e.g., entangled, hooked internally, hooked externally, interaction with vessel only.)