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Report on the Development of Electronic Monitoring Minimum Standards

WCPFC21-2024-17
7 November 2024

Submitted by the Chair of the ER and EM IWG

1. Executive Summary

The proposed Interim EM Standards are a package that includes: (1) a set of definitions; (2) technical standards for EM programs; (3) EM data fields to be generated through collection and analysis of EM records; and (4) EM program reporting requirements.

These proposed Interim EM Standards have been developed over the past 12 months based on extensive material provided by FFA members and information from other RFMOs. This work has involved several rounds of feedback received from intersessional work as well as online and hybrid meetings. There are a small number of outstanding matters that remain to be agreed.

Upon successful adoption of these standards by the Commission at WCPFC21, the Commission may wish to take the steps necessary to make them mandatory for those CCMs that use EM to meet certain obligations¹ and for those who wish to voluntarily use EM but wish for their EM data to be used for the work of the Commission.

Additionally, the Commission may wish to direct the ER and EM IWG to undertake further work. A range of potential focus areas have been identified including: (a) development of an EM program audit / assurance process to be applied where an EM program is being used to meet a CCMs obligations; and (b) development of EM standards for vessels receiving longline transshipments.

2. Purpose

This paper provides an update on recent and proposed future activities of the ER and EM IWG and the proposed Interim EM Standards for adoption by the Commission.

3. Background

The Commission in 2019 endorsed specific objectives for the Commission's EM Program, as outlined in paragraph 555 of the [WCPFC16 Summary Report](#) where it states:

"The objectives of the Commission Electronic Monitoring Program (EMP) shall be to collect verified catch and effort data, other scientific data, and additional information related to the fishery from the Convention Area and to monitor the implementation of the conservation and management measures adopted by the Commission".

This mirrors the objective of the Regional Observer Programme (ROP) in paragraph 4 of the ROP measure ([CMM 2018-05](#)).

At its 20th session, the WCPFC agreed to the following actions:

¹ For example, [CMM 2023-01](#) bigeye longline catch limits referenced in paragraphs 37-39, Table 3

The Commission noted the Report of the ER&EM WG (WCPFC20-2023-ERandEM-IWG-02) and agreed to adopt the Schedule of Work set out in Appendix 1 of the report (Attachment 5).

The Commission tasked the ER&EM WG to develop a set of interim EM standards for adoption at WCPFC21 in 2024.

The Commission noted the need for cooperation with IATTC in the development of EM procedures for WCPFC.

Further, in adopting an updated Tropical Tuna CMM ([CMM 2023-01](#)), EM was specifically called out in Table 3 of Attachment 1. The use of EM (or increased observer coverage) could allow some members an increased BET longline catch limit.

4. Work of the ER and EM IWG

Since taking over the role of Chair of the ER and EM IWG in mid-2023, the following engagement has occurred in the development of the Interim EM Standards² leading to the current paper.

- 17 August 2023: a circular from the Chair highlighting key documents produced within the IWG to date and seeking both written feedback and opportunities to speak with interested CCMs or Observers on future directions for the work of the IWG.
- 16 November 2023: WCPFC20 paper summarizing feedback received, general observations and a proposed Schedule of Work.
- WCPFC20: the Commission adopted the Schedule of Work and tasked the IWG to develop a set of Interim EM Standards for adoption at WCPFC 21 in December 2024.³
- 5 March 2024: an initial draft set of proposed Interim EM Standards was circulated for comment. These were based on parts of a broader set of FFA draft EM Standards provided to the Commission in late 2022⁴.
- 3 May 2024: the initial draft set of proposed interim EM standards was recirculated incorporating all feedback received. Further, IWG members were informed that a virtual session of the IWG would be held on 31 May 2024.
- 22 May 2024: further supporting information on more general EM-standard related matters was provided ahead of the virtual session.
- 31 May 2024: a virtual meeting of the IWG was held and included participants from 14 CCMs and 12 observer delegations.

² Please see <https://www.wcpfc.int/ERandEM-IWG> for further details

³ WCPFC20 Summary Report:

618. The Commission noted the Report of the ER&EM WG (WCPFC20-2023-ERandEM-IWG-02) and agreed to adopt the Schedule of Work set out in Appendix 1 of the report (Attachment 5).

619. The Commission tasked the ER&EM WG to develop a set of interim EM standards for adoption at WCPFC21 in 2024

⁴ [WCPFC19-2022-DP08](#)

- 27 July 2024: Chair’s proposal submitted to SC20⁵ and then presented on during the SC.
- 2 September 2024: the SC paper an updated cover note, was posted
- 24 and 28 September 2024: Meeting in the margins of TCC on with participants both in person and online.
- 13 October 2024: Further updated proposed EM standards circulated to IWG participants with feedback requested by 25 October 2024. This version also included proposed EM data standards and collation of relevant handling procedures already agreed by the Commission. Feedback was received from several CCMs and one Observer.

5. Proposed EM Standards

The proposed Interim EM Standards are a package that includes: (1) a set of definitions; (2) technical standards for EM programs; (3) EM data fields to be generated through collection and analysis of EM records; and (4) EM program reporting requirements.

These standards are provided as Appendices 1-4 and outstanding matters to be agreed are described in Table 1 below.

EM definitions (Appendix 1)

The EM definitions were originally based on those provided in a draft from FFA members and have been modified to reflect input from other RFMOs in some instances.

The key outstanding matter for the Commission is the definition on EM coverage as it could have an immediate impact on the expectations for those who use EM to meet the coverage requirements under CMM 2023-01.

EM technical standards (Appendix 2)

The EM technical standard covers a wide range of parts of an EM program including the EM system and implementation of an EM program.

To balance the need for Interim EM Standards to be useful to CCMs whilst also setting a clear bottom line for the Commission, the MuSCoW Method⁶ has been applied. Briefly, this approach assesses each individual requirement and determines which of these three priority levels is assigned to it:

- **MUST** – features that an EM System or EM Program must have or meet, i.e., they represent bottom-line requirements. Evidence for these ‘MUSTs could be subject to an assurance process;
- **SHOULD** – features that could be very useful to have, but are not strictly required at this time; and
- **COULD** – features that are much less critical but could provide greater assurance or reduce program costs.

⁵ [SC20-ST-WP-05](#)

⁶ The **MuSCoW method** is a prioritization technique used in management, project management and software development in order to reach a common understanding with stakeholders on the importance placed on the delivery of each requirement. For our application I have not included any ‘W – Won’t have’ requirements.

Further, the technical standards include two Annex's covering (1) guidance for running an EM program, and (2) the compilation of handling procedures relevant to collection of EM data – as outlined in various CMMs and Resolutions.

There are several outstanding matters to be agreed and, where there are differences over MUST/SHOULD/COULD, these are highlighted in Appendix 2. Details providing the rationale for the different positions is summarized in Table 1.

Minimum EM data requirements (Appendix 3)

The proposed minimum EM data requirements were originally developed by the Chair from an analysis of the Minimum ROP data requirements.

The updated Appendix 3 includes significant feedback from FFA members which are separated into two categories (1) Suggestions (in Orange) for certain fields to be dropped because there are already recommendations for their removal from the ROP data requirements; and (2) additional fields (in Blue) proposed.

Some comments on the proposed minimum EM data requirements are provided in Table 1.

EM Program reporting (Appendix 4)

It is proposed that there be reporting that provides a summary of an EM program and its implementation each year. These could be standalone reports or additional sections in the Annual Report Part 1. Any compliance matters highlighted through EM could be covered within the relevant sections of the Part 2 report.

Once decisions are made on what and how to report, then relevant report templates could be updated to reflect the changes.

6. Future Workplan

A future workplan for the ER and EM IWG was endorsed at TCC20 ([TCC20 Provisional Outcomes](#)). The plan included items for (1) prior to WCPFC21; (2) smaller items to be conducted in 2025; and (3) options for some larger pieces of work.

The two items for WCPFC21 have already been achieved through the circulation of proposed minimum EM data requirements on 12th October 2024, and the submission of this paper.

Resource requirements, including budgetary resources, should be considered at the point when the Commission decides to progress either (or both) of the options for larger pieces of work, e.g., the audit / assurance process and the development of EM standards for longline transshipment.

Table 1: Outstanding areas for agreement on Interim EM Standards based on the draft considered at TCC plus recent comments received from Japan, USA, Canada, FFA (on behalf of FFA members), and Pew Charitable Trusts.

Matter	Feedback received	Chair’s comments
<p>Definitions EM coverage definition</p>	<p>Japan: In the case of EM, recording itself is meaningful in a sense that fishing activity could be reviewed and analyzed wherever necessary (e.g. suspected violation). Therefore, it is meaningful to calculate coverage in terms of recording.</p> <p>Pew: change recorded to monitored.</p> <p>Canada: add ‘registered’ to vessels</p> <p>FFA members: seeking clarification as to whether the text “Note that this” Is meant to remain.</p>	<p>The Commission will likely need to decide whether EM coverage, for the purpose of meeting any obligation, relates to the proportion of fishing effort for which EM records were collected or the proportion of fishing effort for which EM data was generated.</p> <p>The analogous quantity to observer coverage is the proportion of fishing effort for which EM data was generated.</p> <p>I am comfortable with the minor changes proposed by Pew and Canada and propose to include all the text for the avoidance of doubt.</p>
<p>Definitions UPS definition</p>	<p>FFA members: add “sufficient”</p>	<p>I am comfortable with the minor change proposed by FFA members</p>
<p>On-board system component 1. Control centre d and h</p>	<p>Pew 1.d: Suggest changing to “EM records required to be generated” to “EM Records required to be recorded” to be consistent with definition and to avoid confusion with generation of EM data</p> <p>Canada 1.h: MUST not SHOULD</p>	<p>I am comfortable with the change proposed by Pew and Canada.</p>
<p>On-board system component 3. Cameras d, e, f</p>	<p>FFA members 3d: MUST – there needs to be some means to recalibrate cameras whether remotely or by having crew manually adjust. If you are unable to calibrate, you should expect loss of data or unusable imagery.</p>	<p>3.d: This requirement relates to ‘optimizing performance’ – not ensuring functionality. I do not think there is a need for crew to be involved in this nor for external access for an EM provider. I am comfortable with COULD.</p>

Matter	Feedback received	Chair's comments
	<p>Canada 3e: To ensure efficient transfer and review, compatibility should be a requirement. We request to include MUST here.</p> <p>FFA members 3f: MUST. There are implications for compliance and the need to attribute records/imagery to specific vessels and specific times. We understand this is a mandatory requirement at IATTC = EM records shall include, at a minimum, location, date vessel ID, and time stamps, and to the extent possible, integrate with other data collection and monitoring tools (eg. sensor)</p>	<p>3.f: A timestamp is unlikely to override the need for a formal 'chain of custody' process for linking footage to auxiliary data (location and time etc.) but understand that (if done properly) it makes it easier for reviewers and users of EM records. Provided the integration of Geolocation device information is a MUST, I am comfortable with a SHOULD.</p>
<p>On-board system component</p> <p>6. Sensors</p>	<p>Japan: strongly prefers to use "COULD" consistently for sensor related provisions, as was the case in the IATTC.</p> <p>Canada: Supports SHOULD</p> <p>USA: Supports SHOULD</p> <p>FFA members: SHOULD</p>	<p>This section has been simplified since TCC to address concerns that sensors were to be used for detecting activities other than the strict deployment and retrieval of fishing gear.</p> <p>An EM system without any sort of sensor (either on the longline drum or based on pattern recognition) could be extremely inefficient and expensive to operate due to unnecessary footage collection and may impact on the quality of the EM data. This requirement should be a SHOULD.</p>
<p>General Requirements for onboard EM Components</p> <p>6. System Health</p>	<p>USA: Supports "The log file SHOULD .."</p>	

Matter	Feedback received	Chair's comments
<p>Installation, operation, and service of onboard EM systems</p> <p>1. EM system installation</p>	<p>Japan suggests some edits to this sentence, as indicated in track-change, (change ensure that to encourage)</p> <p>Some CCMs including Japan expressed that it is difficult to take legally binding measure onto EM Service Provider. Japan appreciates Chair's effort to convert following section into the Annexed guideline. However, this sentence seems to suggest legally binding obligation, which should be fixed.</p>	<p>I am comfortable with the change – also suggest changing shall to SHOULD.</p>
<p>Installation, operation, and service of onboard EM systems</p> <p>2. Vessel monitoring plan</p>	<p>Pew: Support the suggestion of MUST, for consistency between RFMOs, and to assist crew in determining their obligations in respect to duty of care</p> <p>Canada supportive of MUST as this is important for HSBI</p> <p>USA Supports MUST</p> <p>FFA members: Agree with Chair that this is a MUST. Also note that this is mandatory for ICCAT</p>	<p>Note: that while it is not a MUST for the IATTC, EM cannot be used in the EM for meeting obligations.</p> <p>Given that it is a requirement in other RFMOs I support it being a MUST.</p>
<p>Installation, operation, and service of onboard EM systems</p> <p>3. Field and technical support services</p>	<p>Japan: same comment as for EM system installation</p> <p>Canada: SHOULD</p>	<p>I am comfortable with the change – also suggest changing shall to SHOULD.</p>
<p>Data review centres</p>	<p>Japan still prefers COULD for all items (i – iv) under this section c (display)</p>	<p>EM analysis software without these features could be extremely inefficient and expensive to operate and may</p>

Matter	Feedback received	Chair's comments
1. EM analysis software (c)	<p>USA prefers MUST</p> <p>FFA members: FFA Members: (c) FSM position at TCC20 was that this has to be MUST because you need to see the vessel tracks and match these to the vessel EM records. Synchronised imagery is also important and allows the analyst to look for events missed on one camera to be detected on another during review. FFA Members support this position.</p>	<p>impact on the quality of the EM data. These requirements should be a SHOULD.</p>
<p>Data review centres</p> <p>1. EM analysis software (d, e, and f)</p>	<p>Japan prefers SHOULD for all of d, e, f</p> <p>FFA members d: MUST – calibration is important and we do see this as a MUST and especially if the system is to measure and collect data relating to the length of fish. EMS also have the capability to calibrate cameras remotely if communication systems are available</p> <p>FFA members e: Software MUST have this annotation capability, especially if it is not automated in order to assist with the analysis.</p> <p>FFA members f: MUST as we see the ability to extract and save segments of video and sensor data when needed, as crucial for various reasons including for compliance review and monitoring</p>	<p>I am comfortable with SHOULD for all three, however, I would not want a system without these features.</p>

Matter	Feedback received	Chair's comments
	<p>Canada: MUST for f</p> <p>USA: supports SHOULD (d), MUST (e), and SHOULD (f)</p>	
<p>Data review centres</p> <p>3. EM analysts</p>	<p>USA Supports option 1, but including the second bullet point from option 2</p> <p>FFA members: still under consideration</p>	
<p>Data review centres</p> <p>5. Storage of EM records and EM data</p>	<p>Pew: Clarification needed: Is this the national EM program, or the WCPFC EM Program requirements?</p>	<p>This should say 'in accordance with any WPCFC audit requirements'</p>
<p>Annex 1: Guidelines for administration of an EM program</p> <p>Field services (c)</p>	<p>Japan suggests some edits to this sentence, as indicated in track-change. (adding 'to the extent practicable')</p> <p>Some EM Service Provider could be small-scale and have limited number of staff. This condition could force those staffs to react anytime including outside their working hour, that will undermine their working condition seriously.</p> <p>USA: Supports "The EM Program MUST respond to EM service providers in a reasonable</p> <p>Further, we don't envisage fulltime monitoring of EM operation from land-based stations. System malfunctions would only result in a reduction of EM coverage rate.</p>	<p>I am comfortable with the change.</p>

Matter	Feedback received	Chair's comments
<p>Annex 2: Existing WCPFC Catch handling procedures</p>	<p>Japan appreciates Chair's effort to compile this information. Having said so, we wonder if this Annex 2 is strictly necessary as a part of EM standard. Since we will need to agree on EM standard in a limited time slot during the annual meeting, this Annex 2 could be omitted.</p>	<p>This annex simply provides details of relevant matters already agreed by the Commission. I would prefer to keep this annex, but happy to reconsider how this is framed. Currently the framing is <i>"Until the adoption of minimum EM data standards, these requirements SHOULD be considered when determining camera number and positions"</i></p>
<p>Appendix 3: Minimum EM data requirements</p>	<p>FFA members: We note there is work currently underway by the IWG-ROP and that certain fields in the ROP MSDFs are currently proposed for removal. These fields have been highlighted in orange (in Appendix 3), and we recommend that the outcomes of the IWG-ROP's work be considered in this context.</p> <ul style="list-style-type: none"> • Our view is that for EM fields (appendix 3), the ROP MSDF is the starting point and must be collected. However, for fields marked as "NO" in the "Proposed EM Data Fields" column, FFA Members are considering these. Generally, a "NO" is warranted if the field cannot be captured through EM. Some of these fields may require further discussion to determine if they are important but could be collected through alternative methods. • Consideration is also being given to potentially critical fields that may need to be added. FFA Members are currently assessing whether any additional fields should be included 	<p>Subject to confirmation from the IWG ROP decisions I am comfortable to reflect those changes here.</p>

Matter	Feedback received	Chair's comments
Appendix 3: Minimum EM data requirements	<p>FFA members: Recommend the following additional fields (coloured blue in the updated Annex):</p> <ul style="list-style-type: none"> • WCPFC RFV VID • EM Trip ID • Name of Receiving vessel (in case of transshipment) • Total number of sets conducted • Catch event date and time • Catch event locations 	<p>I note that some of these are only easily done with specific features in the EM analysis software.</p> <p>Might an additional camera be required to have certainty to determine a transshipment vessel?</p>
Appendix 3: Minimum EM data requirements	<p>Japan: It is impossible to detect from the EM footage <u>[and should not be a proposed EM data field]</u>.</p> <ul style="list-style-type: none"> - Mainline material - Branch line material(s) - Use of wire trace - Hook type - Use of weighted branch lines - Line stick use - Tag recovery information <p>Bait species only distinguishable only at high level (e.g. finfish, squid, or others)</p>	<p>Some of these fields are primarily important for scientific purposes whilst other relate to obligations under CMMs.</p> <p>The ability to collect this information could be improved through specific camera placement and review protocols.</p> <p>I agree that collection of bait information may only be possible at a high level.</p>

Matter	Feedback received	Chair's comments
<p>Appendix 3: Minimum EM data requirements</p> <p>Time and location information on the start and end of set and haul</p>	<p>USA We agree this information needs to be recorded but wonder if alternative methods of recording would also suffice.</p>	<p>Yes, the standards need only determine what is recorded and the format – the proposal for how to record it is only a suggestion.</p>
<p>Appendix 3: Minimum EM data requirements</p> <p>Hook number in basket for captures</p>	<p>USA Clarification needed on if the "hook number, between floats" metric is intended for every catch item (100's per set) or just species of concern.</p>	<p>As a starting point this would be the same as is required for observer data collection.</p>
<p>Appendix 3: Minimum EM data requirements</p> <p>"Lose any fishing gear " To "Discharge any oil"</p>	<p>USA These four metrics would likely be difficult to determine and quantify, especially based on camera placement.</p>	<p>I agree. The question is whether we want this information to be collected if it is detected</p>
<p>Appendix 4: Interim EM program reporting requirements</p>	<p>FFA Members comment: We want to ensure that this report is separate from a requirement to submit the EM data (in Appendix 3). We see the EM data similar to the ROP data, would be submitted on a more routine basis. FFA Members seek clarity on this issue.</p>	<p>I would expect the EM data to be submitted as for ROP data. There may be a delay between receiving the EM records and generating EM data – this may need to be discussed further in the context of CMM2023-01</p>
<p>Appendix 4: Interim EM program reporting requirements</p> <p>including the presence of an EM system in the submission of vessel details to the WCPFC Record of Fishing Vessel</p>	<p>FFA Members comment: Greater clarity is needed on this and what it means in relation to CMM 2022-05 concerning the RFV SSP. Does this mean the RFV SSP will be amended to include a field where CCMs indicate a presence/absence of an EM system for each vessel?</p>	<p>Yes, that is my understanding of the proposal made by Korea (I believe)</p>

Matter	Feedback received	Chair's comments
<p>Appendix 4: Interim EM program reporting requirements</p> <p>Attestation</p>	<p>Pew: Strongly suggest these edits <i>[remove the ability for reporting on any MUST components not achieved and intended steps to achieve them],</i></p> <p>which would make it a requirement to meet all MUSTs in order to satisfy WCPFC reporting requirements. The remaining MUSTs in the Standards should be considered the bare minimum requirements to meet to ensure an effective EM program.</p> <p>FFA members: FFA Members comment: There is a lack of clarity as to why a MUST requirement would not be met, particularly when the expectation is that a CCM uses EM to fulfil its obligations, for eg. under CMM 2023-01. We expect that if a CCM is using EM to meet this obligation, that the CCM confirm and has the confidence that its EM program meets the requirements. If not, what does this mean?</p>	

Table 2: Proposed future workplan for the ER and EM IWG endorsed at TCC20.

Task	Working approach	Timing	Date to WCPFC
Proposed minimum EM data fields and standards	EREMIWG intersessional and SSP	Oct-Nov 2024	WCPFC21 (Nov-24)
Interim EM standards paper	EREMIWG intersessional	Oct-Nov 2024	WCPFC21 (Nov-24)
Review and/or develop templates for Part 1 EM program reporting and other parts of the EM standards where standardized reporting would be of value to members.	EREMIWG with SC and TCC review	Feb-Oct 2025	WCPFC22 (Dec 25)
Advice on potential changes to the interim EM standards to improve harmonization across RFMOs (based on outcomes of the ABNJ Tuna II “ <i>Electronic Monitoring Tuna RFMO Minimum Standards Harmonization Workshop</i> ” to be held in Dec-2024)	EREMIWG with SC and TCC review	Feb- Oct 2025	WCPFC22 (Dec 25)
Review EM data requirements based on relevant CMM requirements not already covered in the ROP minimum data fields	EREMIWG and ROP IWG with SC and TCC review	Feb- Oct 2025	WCPFC22 (Dec 25)
Develop a proposed assurance / audit process for EM standards for longlining based on ROP audit model	EREMIWG / WCPFC-Secretariat with SC and TCC review	TBC	TBC
Initiate work on EM standards for carrier vessels conducting transshipment for longline vessels.	EREMIWG and TS IWG with SC and TCC review	TBC	TBC

Index to Appendices relating to Proposed EM Standards

The proposed Interim EM Standards are a package that includes the following Appendices:

- (1) a set of definitions;
- (2) technical standards for EM programs;
- (3) EM data fields to be generated through collection and analysis of EM records; and
- (4) EM program reporting requirements.

Appendix 1: Terms and Definitions

Ancillary Logs - Data records from the EM system that are supplemental to the EM Records, such as a record of changes in system configurations and settings and a summary of system health checks performed.

Artificial Intelligence (AI) – A machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. Artificial intelligence systems use machine and human-based inputs to (A) perceive real and virtual environments; (B) abstract such perceptions into models through analysis in an automated manner; and (C) use model inference to formulate options for information or action.

Control Centre - The EM control centre is a computer and software system that records and stores information from EM System components (e.g., video, sensor data, GPS data, system log data) and also controls the operation of onboard EM system components.

Data Review Centre (DRC) - A facility or entity with supporting software platform(s) used to analyse EM records and generate EM data. This could be a standalone facility or a designated space within the premises of the fisheries administration.

Designated Installer or Service Technician - A person or entity authorised by an EM Service Provider to install or service an EM System.

EM Analyst - A person qualified by the appropriate EM Program provider to analyse EM records and generate EM data in accordance with the EM standard and analysis procedures.

EM Analysis - See EM Records Analysis/Interpretation.

EM Analysis Rate - The proportion of e-monitored records that are analysed to generate EM data.

EM audit requirements - the WCPFC agreed standards and procedures to be followed by an EM program in order to support the WCPFC agreed audit and assurance process. The requirements may include standards on processes such as EM record and EM data retention.

EM Certifier - An individual or organisation which has been approved by the appropriate authority to inspect and approve EM systems for use.

EM Coverage -[The proportion of vessels or fishing effort that are recorded by the EM Program. Note that this definition not analogous to the commonly used definition of observer coverage. The analogous quantity can be determined by multiplying the EM coverage rate by the EM analysis rate.](#)

EM Data - Data generated through analysis of EM records.

EM data requirements – the WCPFC agreed minimum data fields with associated data standards that must be generated from EM records and ancillary logs.

EM Program - A national or regional program responsible for managing the use of EM systems to independently collect and generate fisheries data and information. This is different to the WCPFC EM Program.

EM Records - Footage (still images and video) and sensor data (if applicable) recorded by an EM System that can be analysed to generate EM Data. Sensors may include any number of sensors (e.g., hydraulic sensors) that are part of the EM equipment and whose data is recorded on the vessel as part of the EM system.

EM Records Analysis - The process of an EM Analyst reviewing EM records to generate EM Data.

EM Service Provider - A provider of EM technical and logistical services. An EM Program may have multiple EM Service Providers and they may provide different services within the program (e.g., onboard hardware, DRC software, DRC review services).

EM analysis software – any software used by an EM Analyst to generate EM data. This software is often provided by the EM Service Provider and can include a range of features that facilitates the efficient work of the EM Analyst.

EM System - All the vessel and shore-based components supporting the generation, storage, transmissions, analysis and reporting of EM Records.

Event - An occurrence in the EM Records that is enumerated into EM data.

Fishing - as defined in WCPFC Convention Article 2(d)

Fishing Trip – The period between either (a) a vessel’s departure from port after unloading part or all of the catch to transit to a fishing area, or (b) a vessel recommences fishing operations or transits to a fishing area after transshipping part or all of the catch at sea, and the time that the vessel either (c) returns to port to unload part or all of its catch, or (d) ceases fishing operations to tranship part or all of its catch at sea.

Geolocation device - A device that is used to capture information on vessel position that can also be used to determine vessel speed and heading.

Independent - with respect to audits - no financial or current employment interest with the DRC

Regional Agency - A regional or sub-regional organisation that may support CCM national EM Programs and EM Systems.

Review for Data Quality - The verification process of re-analysing/interpreting a portion of previously analysed EM records to determine completeness, adherence to protocols, and accuracy of the EM Data produced by the EM Analyst.

Sensors - EM systems may be equipped with a variety of integrated sensors that can provide additional information on fishing activity, trigger activation or adjustment of configurations of cameras, and identify points of interest to expedite EM video review. This may include “synthetic sensors” that use camera imagery used to capture imagery of fishing activities.

Uninterruptible power supply (UPS) - Provides power to the system and enables controlled shutdown in the event of a power loss so as to preserve the security and integrity of data ¹.

¹ [CMM 2014-02](#) Annex 1 (5) “ALCs fitted to fishing vessels must be protected so as to preserve the security and integrity of data referred to in para 1.”

User interface - A display that communicates EM system status messages and provides views of onboard cameras.

Vessel Monitoring Plan (VMP) - A document describing how an electronic monitoring system is specifically positioned and configured on a vessel (e.g. camera placement with images of camera views and types and locations of sensors) to allow effective monitoring of fishing activity and accurate generation of EM Data specified by the EM Program.

Vessel Operator - any person who is in charge of, directs or controls a vessel, charterer and master.

Appendix 2: Technical EM standards

Onboard EM Systems

Onboard EM Systems comprise all vessel components supporting the acquisition of and reporting of EM Records. Onboard EM Systems ~~shall~~**MUST** be configured such that they allow generation of the data fields set out in the EM data requirements. The core EM System components covered in these Specifications, Standards, and Procedures (SSPs) are: control centre, user interface, cameras, geolocation device, uninterruptible power supply, sensors, and communication system. Together, these components ensure that required information is collected, including system health status, to support fisheries management and enforcement objectives.

On-board EM System component	SSP
1. <i>Control centre</i>	<p>The EM system control centre:</p> <ol style="list-style-type: none"> a. MUST control all onboard EM hardware components. b. MUST be able to connect to the vessel's power source and sustain this power source throughout the duration of the fishing trip. c. MUST store and SHOULD transmit system health status information. d. MUST have sufficient storage capacity for all EM Records required to be generated [during a fishing trip] until EM Records are transmitted to a DRC for review. e. SHOULD have sufficient backup storage to mitigate potential data loss. f. SHOULD have unambiguous and unique identification of storage devices (e.g., barcode on hard drives). g. MUST allow EM records to be transmitted, stored or accessed surelysecurely. To secure EM records, the system SHOULD be equipped with applications such as user logins, EM record encryption and firewalls. h. [MUST / SHOULD] store all EM Records on storage devices and in formats that are compatible or can be readily translated into formats that are compatible with DRC hardware and EM review software.

On-board EM System component	SSP
2. <i>User interface</i>	<p>The onboard user interface:</p> <ul style="list-style-type: none"> a. MUST include a display on the vessel. b. MUST include software or hardware that shows EM system health status and real time images from installed cameras on the display. c. MUST allow only authorised users (e.g., EM Service Providers, EM service technicians) to adjust system configurations. d. COULD Include a keyboard, mouse, touchscreen, or other device to allow user inputs to the system.
3. <i>Cameras</i>	<ul style="list-style-type: none"> a. An EM system MUST be outfitted with cameras to capture imagery of fishing activity. b. The number and position of cameras MUST be sufficient to capture necessary imagery to allow collection generation of the data fields set out in the EM data requirements. c. Cameras MUST, capture imagery that meets image quality standards under typical fishing conditions that allow for an EM Analyst to collect generate the data fields set out in the EM data requirements. As a minimum standard²: <ul style="list-style-type: none"> 1. Frame rate MUST be no lower than 5 frames per second (fps) for any imagery requiring identification of species; and 2. Resolution MUST be no lower than 720p for any imagery requiring identification of species. d. [MUST/COULD] be capable of accommodating remote or onboard configuration of parameters to optimise camera functionality throughout a typical fishing trip; <p>Recorded imagery:</p>

² Other camera configurations (e.g. shutter speed, bitrate etc.) may vary to balance collection of adequate footage versus storage and transmission costs

On-board EM System component	SSP
	<ul style="list-style-type: none"> e. [MUST/SHOULD] be recorded in a widely used and accessible video or image file format, such as MP4 or JPEG, or other compression standards that are able to be viewed. f. [MUST/SHOULD] include a timestamp, GPS location, and WCPFC VID (vessel identification information) on the video or image.
<i>4. Geolocation data and device</i>	<ul style="list-style-type: none"> a. A geolocation device³ MUST record vessel location coordinates and the associated date and time in a format capable of integration with EM Records b. The geolocation device MUST be installed and remain in a location in accordance with the manufacturer’s guidelines such that the device can reliably function. c. The EM system COULD transmit geolocation data and associated date and time, and vessel identification information to DRCs on a regular basis, as defined by the relevant program requirements, throughout the duration of a fishing trip in a format compatible with DRC software. d. The EM system COULD be able to verify whether transmissions of geolocation data and associated date and time, and vessel identification information to DRCs are successful. e. If the EM system is unable to transmit geolocation data due to a communication error, it SHOULD store geolocation data and automatically send it as soon as practically possible after communication is restored.
<i>5. Uninterruptible power supply</i>	The EM system SHOULD include a UPS in the event that the main source of power is interrupted.

³ The EM system may use an existing geolocation device on type-approved hardware on the vessel (e.g., VMS) or have its own geolocation device.

On-board EM System component	SSP
6. <i>Sensors</i>	<p>a.—EM systems [SHOULD/COULD] be outfitted with sensors, which may include the use of camera imagery as a synthetic sensor, to capture information <u>determine whether about</u> fishing activity <u>is occurring, e.g., hydraulic or drum rotation sensors</u>. These may include, but are not limited to:</p> <p>b.—Pressure sensors</p> <p>c.—Hydraulic or drum rotation sensors</p> <p>d.—Temperature sensors</p> <p>e.—Door open/closed sensors</p> <p>f.—Proximity sensors</p> <p>g.—RFID readers</p> <p>h.a. _____ If the EM system is outfitted with sensors, then it SHOULD be capable of generating and recording a log file of readings from system sensors stored in a similar manner to time and geolocation information.</p>
7. <i>Communication system</i>	<p>a. The EM System SHOULD have or integrate with at least one network communication system that enables the reliable and regular transmission (e.g., daily or weekly, hourly) of near-real-time data on system health (including still images for EM system status verification when prescribed by the program requirements), sensors (if applicable), and geolocation to DRCs during all fishing activity, and <u>to the extent possible</u>, supports remote access to the EM system by the EM Service Provider or their designated service technicians.</p> <p>b. The network communication system(s) SHOULD be a widely used and globally recognized technology, such as</p> <ol style="list-style-type: none"> i. 3G, 4G, or 5G cellular networks. ii. Wi-Fi iii. Satellite communications.

On-board EM System component	SSP
	<ul style="list-style-type: none">c. The EM system COULD be able to verify whether transmissions of data on system health (including still images), sensors, and geolocation to DRCs are successful.d. The EM System SHOULD have ethernet or any other communication system allowing data transfer and remote access to the system via the onboard connection.

General Requirements for onboard EM Components

<p>1. <i>Weather Resistance</i></p>	<p>EM hardware components that are utilized on deck and are exposed to the elements (e.g., sensors and cameras) MUST be sufficiently dust and water resistant (e.g., IP66) and durable (e.g., corrosion, impact, and vibration resistant) to operate reliably under the range of conditions expected in their location on fishing vessels. IP67 or IP68 SHOULD be used for those locations where significant water contact is expected.</p>
<p>2. <i>Tamper Resistant and Tamper Evident</i></p>	<ol style="list-style-type: none"> a. The onboard hardware MUST be robust and tamper evident to mitigate the risk of intentional sabotage or malfunctions. This shallMUST include physical and/or software features. b. The EM System SHOULD feature a login history tool which allows the tracking of information on when and by whom system configuration settings have been accessed offering insights into possible tampering attempts.
<p>3. <i>Compatibility with Other On Board Equipment</i></p>	<p>The EM System SHOULD be capable of functioning in close physical proximity to other onboard electrical and hydraulic equipment (i.e., EM System operations MUST not be materially impacted by the presence of other onboard electrical equipment and MUST not materially impact the proper functioning of other onboard electrical equipment).</p>
<p>4. <i>Compatibility with DRC Review Software</i></p>	<p>All EM Records generated by the EM system MUST be in a compatible format, or be able to be converted into a compatible format, to allow the ingestion of the EM Records into an analysis software being used.</p>
<p>5. <i>Capable of Spatial Calibration</i></p>	<p>An EM system SHOULD have capability for spatial calibration for accurate image and fish length measurements.</p>
<p>6. <i>System Health Status</i></p>	<p>The system SHOULD execute a system health test either automatically or when initiated by user and MUST provide a visual signal on the display that the system is operational (i.e., it should be obvious, simply by looking at the display, whether or not the system is working properly).</p> <ol style="list-style-type: none"> a. The EM system MUST be able to generate a log file that allows an EM program to determine the operational health status of the system. The log file [SHOULD/COULD] include details of EM system processes, including, but not limited to:

	<ul style="list-style-type: none"> i. System power up ii. System shutdown planned iii. System shutdown unplanned (e.g., power cut) iv. Camera connectivity v. Camera recording start and stop times (planned) vi. Camera recording error⁴ vii. Available hard drive space viii. Sensor connectivity, if applicable ix. Sensor recording start and stop times (planned) , if applicable x. Sensor recording error-, if applicable xi. Activation and deactivation of recording triggers (e.g., vessel speed, drum rotation sensors, geofencing, and time scheduled), if applicable <p>b. System SHOULD undertake regular system health checks throughout the duration of the fishing trip at a frequency defined by the EM Program and MUST show malfunction alerts (errors and warnings) on the display of the user interface (Onboard User Interface) of the control centre.</p> <p>c. The EM system COULD be able to capture and store single frame images from each onboard camera on a regular basis (e.g., timed intervals, such as hourly, or on event triggers such as geofences) to show that cameras are operational, not obstructed, obscured, or displaced.</p>
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⁴The appropriate time interval may require regular review and updating.

Installation, Operation, and Service of onboard EM Systems	
Requirement	SSP
1. <i>EM system installation</i>	<p>CCMs [SHOULD/MUST] ensure that their EM Service Provider or their designated installer complies with the relevant EM standards. To this end, CCMs are encouraged to refer to Annex 1 (voluntary guidelines for EM system installation). [SHOULD</p> <p>The vessel owner or their designated representative:</p> <ol style="list-style-type: none"> a. MUST provide information⁵ describing the vessel configuration and systems to facilitate EM system installation. b. MUST make the vessel and appropriate personnel (such as engineers, fishing master, multilingual staff, etc.) available and provide the EM Service Provider unfettered access, including to the ship’s power supply, to complete EM system installation.
2. <i>Vessel Monitoring Plan</i>	<ol style="list-style-type: none"> a. Vessel owner or EM Service Provider MUST complete a Vessel Monitoring Plan, and submit it to the EM Program for approval. b. A copy of the Vessel Monitoring Plan [MUST/SHOULD] be kept on board the vessel. c. Vessel Monitoring Plans MUST be updated and submitted to the EM Program at a frequency determined by the EM Program and anytime changes are made to information or requirements outlined in the VMP (e.g., new vessel contact information, change in EM System configuration, change in catch handling guidelines). d. The Vessel Monitoring Plan: <ol style="list-style-type: none"> i. MUST include contact information for the EM Service Provider, vessel owner(s), and vessel operator(s), and base manager(s) (if applicable). ii. MUST include general vessel information as specified in the EM data requirements

Installation, Operation, and Service of onboard EM Systems

Requirement	SSP
	<ul style="list-style-type: none"> iii. MUST include a diagram, description, and photo(s) of the vessel layout that identifies where key fishing activities will occur on the vessel (e.g., hauling, sorting, discarding) and COULD include measurements of all items, tools, or areas on the vessel that EM to support estimation of lengths of fish caught. iv. A description of the EM setup: <ul style="list-style-type: none"> ● MUST include the number and location of cameras including images of their installation location and an image from each camera’s perspective, and include nighttime images, as appropriate, to demonstrate sufficient lighting. ● MUST include a description and image of the location of all other components of the installed EM system (e.g., geolocations system, EM control system, sensors, power supply). ● MUST include relevant details of system configuration settings, including: <ul style="list-style-type: none"> ○ Camera configuration settings (e.g., frame rates, resolution, bitrate) ○ Sensor units and threshold values, if applicable ○ Data recording frequencies and/or sensor triggers for recording, if applicable ○ Software and Firmware versions ○ Spatial calibration settings, if applicable v. MUST include any catch handling procedures required to ensure that EM Records allow collection of the data fields set out in the EM data requirements (e.g., handling in view of cameras, allowable discard locations). [See Annex 2 for references to existing catch handling procedures] vi. MUST include vessel duty of care responsibilities to prevent system malfunctions and ensure effective operation of the system, such as: <ul style="list-style-type: none"> ● Verifying system functionality at the beginning and throughout at regular intervals throughout the duration of each trip

Installation, Operation, and Service of onboard EM Systems	
Requirement	SSP
	<ul style="list-style-type: none"> ● Instructions for cleaning camera lenses vii. MUST include vessel responsibilities in the event of system malfunctions that describe the steps that must be taken. viii. MUST include details of what steps, if any, are required to ensure the transmission of the EM Records to the DRC.
3. Field and Technical Support Services	<p>CCMs [SHOULD/MUST] ensure that their EM Service Provider or their designated installer complies with the relevant EM standards. To this end, CCMs are encouraged to refer to Annex 1 (voluntary guidelines for Field and Technical Support Services).</p> <p>The vessel owner/operator:</p> <ul style="list-style-type: none"> a. MUST follow duty of care responsibilities described in the Vessel Monitoring Plan. b. MUST report EM system malfunctions to the appropriate contact as outlined in the Vessel Monitoring Plan. This should be done as soon as is practicable, and include details of the date, time, and, if possible, the geolocation when the malfunction was first detected. c. MUST follow vessel responsibilities outlined in the Vessel Monitoring Plan in the event of system malfunctions. <p>The EM Program:</p> <ul style="list-style-type: none"> a. MUST define vessel responsibilities in the event of system malfunctions that describe the steps that must be taken under different failure scenarios. b. [SHOULD-/MUST] respond to EM Service Providers or vessel owners/operators in a timely manner.

SSP: Data Review Centres

A data review centre (DRC) is an entity with access to supporting EM analysis software used by EM analysts to analyse EM Records and generate EM Data. DRCs may serve individual CCMs, subregional groupings, or the entire WCPFC membership. They may also be administered by individual CCMs members, a sub-regional or regional body, or a third-party (commercial) provider. This SSP is not specific to any DRC structure and covers the required infrastructure (hardware and software) to analyse EM Records.

DRC Component	SSP
<p><i>1. EM Analysis Software</i></p>	<p>The DRC MUST use EM analysis software to facilitate the generation of EM Data from EM Records. The EM analysis software:</p> <ul style="list-style-type: none"> a. MUST be compatible with the file types, data structures, syntax, and semantics of EM Records that will be analysed with the software. b. SHOULD be the latest version of analysis software, including security patches c. [MUST/SHOULD/COULD] be able to display EM analysed output: <ul style="list-style-type: none"> i. Display the vessel track on a map based on geolocation data integrated in the EM Records, with an option to display the geolocation data of each vessel. ii. Display synchronised imagery from all cameras simultaneously with zoom capability and other relevant imagery features. iii. Display a visual timeline with sensor readings or status, if applicable. iv. Display synchronised sensor data (including vessel heading and speed) and video imagery simultaneously, if applicable. d. [SHOULD/MUST] be able to spatially calibrate an image and measure the length of species brought onboard as required by the EM Program (e.g. through a digital measuring tool in the EM analysis software).

DRC Component	SSP
	<ul style="list-style-type: none"> e. [SHOULD/MUST] allow the EM Analyst to create annotations to mark events where fishing activity occurred within the EM records. f. [SHOULD/MUST] be able to extract and save segments of video and sensor data, including extraction and saving of still images and the ability to extract short duration video clips of catch. g. MUST be able to produce EM Data into a format compatible (or that can easily made compatible) with agreed EM data requirements for incorporation into WCPFC databases. h. SHOULD be able to import EM records (and related sensor, if applicable, and annotated data) from systems of other EM Service Providers. i. SHOULD have the ability to change the playback speed of the footage (e.g., 0.5x, 1x, 2x, 6x, 8x, 10x)
<p><i>2. EM Analysis Workstations</i></p>	<p>The DRC MUST have EM analysis workstation(s) where EM Analysts will use EM analysis software to generate EM Data from EM Records. The EM analysis workstation:</p> <ul style="list-style-type: none"> a. MUST have hardware and software, or cloud-based platforms that enable effective EM analysis b. MUST have reliable data transmission capabilities sufficient for efficient streaming or download/upload of data required for EM Records analysis, reporting of EM Data, and storage of EM Records. c. MUST have proper ergonomics that support analyst well-being, quality, and efficiency. d. MUST be designed to minimize the risks to commercially sensitive information.
<p><i>3 EM Analysts</i></p>	<p>The use of EM software to generate EM Data from EM Records MUST be conducted by EM Analysts.</p> <p>The EM Analysts:</p> <p>OPTION 1</p>

DRC Component	SSP
	<ul style="list-style-type: none"> • <u>MUST complete an appropriate training program which covers materials including (but not limited to): species ID, basic fishing practices, and EM review processes).</u> • <u>EM analysts MUST/MUST not be employees of a fishing company involved in the observed fishery or have other direct conflicts of interest.</u> <p><u>OPTION 2</u></p> <ul style="list-style-type: none"> • <u>EM Analysts MUST be independent and impartial and qualified in accordance with criteria approved by the Commission.</u> • <u>Training should cover the EM analysis process and relevant topics identified from the Agreed Minimum Standards and Guidelines for the Regional Observer Program (https://www.wcpfc.int/wcpfc-regional-observer-program-standards%20latest ;pg 12).</u>
<p><i>4. A system to monitor EM System health on vessels</i></p>	<ol style="list-style-type: none"> a. The EM Program SHOULD have a health monitoring system to receive and display near real-time information of onboard EM System health status (<u>System Health Status</u>), this SHOULD include still images to verify functionality of onboard cameras (<u>System Health Status</u>) and geolocation data (<u>Geolocation device</u>). This system may be part of the DRC. b. If applicable, the onshore health monitoring system MUST receive any malfunction alerts (errors and warnings) that have been generated from the onboard health monitoring system. c. The health monitoring system SHOULD be able to display the latest geolocation of all covered EM Systems on a map.

DRC Component	SSP
<i>5. Storage of EM records and EM data</i>	EM records and associated EM data MUST be retained in accordance with any WCPFC audit requirements.

Annex 1: Guidelines for administration of an EM program

EM system installation

The EM Service Provider or their designated installer SHOULD:

- a. coordinate installation with the vessel owner or their designated representative.
- b. install an onboard EM system that meets the performance standards described in onboard EM System Component and General Requirements.
- c. ensure the onboard EM system meets the performance standards described in onboard EM System Component and General Requirements through system tests.
- d. provide the necessary information for the vessel owner/operator or their designated representative to complete a Vessel Monitoring Plan (Vessel Monitoring Plans) or complete the Vessel Monitoring Plan on behalf of the owner/operator.
- e. brief the vessel operator and crew member(s) and provide documentation on EM system operation, maintenance, and procedures to follow during regular operation and in the event of a system malfunction (Vessel Monitoring Plans).
- f. MUST submit notification to the relevant EM Program of system installation in the agreed form that attests to the system functionality and its conformance with the performance standards described in onboard EM System Component and General Requirements.

Field and technical support services

The EM Service Provider, in a timely manner, SHOULD:

- a. Communicate with vessel operators and the relevant EM Program to coordinate service needs, resolve specific program issues, and provide feedback on program services.
- b. Provide maintenance and support services, including software and firmware updates, such that all installed EM systems perform according to the performance specifications described in onboard EM System Component and General Requirements and that field services are scheduled and completed with minimal delays to minimise disruption to fishing operations.
- c. Provide technical assistance to vessels upon request on EM system operations, diagnosing causes of system malfunctions, and providing assistance for resolving malfunctions. This assistance SHOULD be available 24 hours a day, seven days a week, year-round. This service must be provided in the relevant languages as defined in the program specifications.
- d. Submit to the relevant EM Program, and the EM Certifier, where appropriate, reports of all requests for technical assistance from vessels and service calls that include:
 - i. The name and designation of the vessel point of contact
 - ii. The date(s) and time a request for service was made.
 - iii. The date(s) and time(s) when the EM Service Provider called or visited the vessel to provide technical assistance.

- iv. A description of the issue.
- v. A description of how the issue was resolved, including actions completed during all service calls or visits in response to the request for service.
- vi. The date and time the issue was resolved.

Annex 2: Existing WCPFC Catch handling procedures

Mandatory and non-mandatory catch handling practices are incorporated into several Conservation and Management Measures and also reflected in ‘Best handling practices and guidelines’.

Until the adoption of minimum EM data standards, these requirements SHOULD be considered when determining camera number and positions. It goes without saying that the placement of cameras on a vessel will impact on the ability of EM analysts to generate EM data that would be necessary to monitor the implementation of, and compliance with, these requirements.

At the time of preparing these EM Standards, these were some of the applicable requirements for WCPFC catch handling procedures:

CMM2022-04 [Sharks]

Para 19 “**CCMs shall ensure** that sharks that are caught and are not to be retained, are hauled alongside the vessel before being cut free in order to facilitate a species identification. **This requirement shall only apply when an observer or electronic monitoring camera is present, and should only be implemented taking into consideration the safety of the crew and observer.** “[Emphasis added]

Para 20 “Beginning on January 1, 2024, for sharks that are caught by longline vessels and are not retained, **CCMs shall require** their fishing vessels to release these sharks as soon as possible, taking into consideration the safety of the crew and observer, using the following guidelines:

- (1) Leave the shark in the water, where possible; and
- (2) Use a line cutter to cut the branchline as close to the hook as possible.”

CMM2019-05 Mobulid rays

Para 4 “**CCMs shall prohibit** their vessels from retaining on board, transshipping, or landing any part or whole carcass of mobulid rays caught in the Convention Area.”

Para 5 “**CCMs shall require** their fishing vessels to promptly release alive and unharmed, to the extent practicable, mobulid rays as soon as possible, and to do so in a manner that will result in the least possible harm to the individuals captured. **CCMs should encourage** their fishing vessels to implement the handling practices detailed in Annex 1, while taking into consideration the safety of the crew.”

CMM2018-04 Sea turtles

Para 4 “**CCMs shall require fishermen** on vessels targeting species covered by the Convention to bring aboard, if practicable, any captured hard-shell sea turtle that is comatose or inactive as soon as possible and foster its recovery, including giving it resuscitation, before returning it to the water. **CCMs shall ensure** that fishermen are aware of and use proper mitigation and handling techniques, as described in WCPFC guidelines.”

CMM2018-03 Seabirds

Para 11 “**CCMs are encouraged** to adopt measures aimed at ensuring that seabirds captured alive during longlining are released alive and in as good condition as possible and that wherever possible hooks are removed without jeopardizing the life of the seabird concerned. Research into the survival of released seabirds is encouraged.”

Resolution 2005-03 Non-target species

Para 2 “Any such non-target fish species that are not to be retained, shall, to the extent practicable, be promptly released to the water unharmed.”

See also the following safe handling and/or release guidelines:

- Sharks
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2022-04-2>
- Manta and mobulid rays
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2019-05>
- Sea turtles
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2018-04-1>
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2018-04-1>
- Seabirds
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2018-03>
- Cetaceans
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2011-03-2>
 - <https://cmm.wcpfc.int/supplementary-info/supplcmm-2011-03-1>

Orange = fields recommended by the IWG-ROP (refer to TCC20-2024-19) for removal from the ROP MSDF

Blue = FFA Members additional proposed EM Min data fields

Appendix 3: Minimum EM data requirements

The ROP minimum data fields were chosen to form the basis of the Minimum EM data fields (what is collected) and requirements (exactly how it is recorded, e.g., format). New fields have been **proposed** where there is the need for an EM-version of a ROP field which is no longer relevant (e.g., details of the EM analysts as a replacement for details of the ROP observer) or a clear **gap** in the ROP fields.

Note: The current draft does not yet have all the technical detail necessary for EM data requirements (see https://www.wcpfc.int/doc/data-05/e-reporting_ssps for an example for ER standards for logbook reporting versus ROP data fields <https://www.wcpfc.int/system/files/Table-ROP-data-fields-instructions.pdf>), but this will be prepared once feedback has been received on the proposed EM data fields.

WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
GENERAL VESSEL AND TRIP INFORMATION FOR ALL VESSEL TYPES			
Name of vessel	Name of vessel. This information would normally be linked to a VESSEL reference database (e.g. WCPFC RFV) which will ensure consistency/standardisation.	The EM system should have linkages to the information submitted to the WCPFC Record of Fishing Vessels to be consistent with these vessel registers. If the IMO or WCPFC VID is provided, then there is no need to provide the other vessel identification data. If the IMO, WCPFC VID and/or FFA VID are not provided, then the EM data provider needs to provide other data (Vessel Name, Flag State Registration and IRCS to uniquely identify the vessel).	YES
Flag State Registration Number			YES
International Radio Call Sign			YES
Vessel Owner/Company			NO
Hull markings consistent with CMM 2004-03			NO
“WCPFC Identification number” WIN markings consistent with CMM 2004-03		NO	

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Blue = FFA Members additional proposed EM Min data fields

WIN format for markings consistent with CMM 2004-03			NO
International Maritime Organization 'IMO' or Lloyd's Register number 'LR'			YES
WCPFC RFV VID			YES

WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
VESSEL TRIP INFORMATION			
EM trip ID	Trip identifier. This value must be unique.	generated by the source system and could for example be formatted as follow: VESSEL NAME + TRIP DEPARTURE DATE	YES
Date and time of departure from port	The UTC date and time the vessel DEPARTS a port to start its fishing trip. If the vessel is departing from a carrier vessel after an at sea transshipment, the UTC date and time of the departure from a carrier vessel will be used.	Dates must be ISO 8601 standard and UTC. Latitude and Longitude coordinates must be ISO 6709 standard. The international standard of Location Code (UNLOCODE) for PORTs must be used.	YES
Port of departure	Port of DEPARTURE (UNLOCODE) for when a vessel starts a new trip from a port. If the vessel is departing from a carrier vessel after an at sea transshipment, this field will be "AT SEA" and the coordinates of the 'at sea' departure MUST be provided.		YES
Date and time of return to port	YES		YES

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Blue = FFA Members additional proposed EM Min data fields

Port of return	<p style="text-align: center;">YES</p> <p><i>If the vessel END the trip AT SEA (through transshipment), this field will be "AT SEA" and the coordinates of the 'at sea' MUST be provided.</i></p>		YES
Name of receiving vessel	<p>For when the vessel is engaged in a transshipment activity. This field only required when start or end of trip is 'AT SEA'</p> <p><i>Consider vessel unique identifier. (could potentially include WCPFC RFV VID)</i></p>	Entered into EM records analysis system by EM Analyst.	YES
Total number of sets	Total number of sets conducted by the vessel during the trip.	Generated by EM system based on sensors or vessel speed or by another method used by the EM service provider.	YES

WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
OBSERVER INFORMATION			
Observer name			NO
Nationality of observer			NO
Observer provider -country and or organization			NO
Date, time and location of embarkation			NO
Date, time and location of disembarkation			NO

Orange = fields recommended by the IWG-ROP (refer to TCC20-2024-19) for removal from the ROP MSDF

Blue = FFA Members additional proposed EM Min data fields

EM ANALYSIS INFORMATION (NEW SECTION)			
EM Analyst (name and code)	EM Analyst's who produced EM data.	This SHOULD be generated by the EM analysis software to ensure standardization.	YES
EM program	EM program provider code e.g. FJEM (Fiji E-Monitoring Program).	Generated by the EM analysis soft. It should adhere to the format "xxEM" where xx is the ISO two-letter code of the CCM providing the data.	YES
EM analysis software	Software name and version of the system used to analyse the EM records.	Generated by the EM analysis software	YES
EM Service Provider	The name of the EM technical service provider for the EM records analysis software.	Generated by the EM analysis software	
EM analysis start date and time	The date and time when the analysis of the EM records STARTED [at the trip level]	This SHOULD be generated by the EM analysis software based on EM analyst activity	YES
EM analysis end date and time	The date and time when the analysis of the EM records ENDED [at the trip level]	This SHOULD be generated by the EM analysis software based on EM analyst activity	YES
EM review type	A place holder field to reflect that EM reviews may have different strategies with different fields collected (e.g., a full review vs a review to verify bycatch mitigation use)	This SHOULD be generated by the EM analysis software based on EM analysts tasking	YES

Orange = fields recommended by the IWG-ROP (refer to TCC20-2024-19) for removal from the ROP MSDF

Blue = FFA Members additional proposed EM Min data fields

WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
CREW INFORMATION			
Name of captain			NO
Nationality of captain			NO
Identification document			NO
Name of fishing master			NO
Nationality of fishing master			NO
Identification document			NO
Other crew			NO
Total number of crew			NO
VESSEL ATTRIBUTES			
Vessel cruising speed			NO
Vessel fish hold capacity			NO
Freezer type			NO
Length (specify unit)			NO
Tonnage (specify unit)			NO
Engine power (Specify unit)			NO
Radars			NO
Depth Sounder			NO
Global Positioning System (GPS)			NO
Track Plotter			NO

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Weather Facsimile			NO
Sea Surface Temperature (SST) gauge			NO
Sonar			NO
Radio/ Satellite Buoys			NO
Doppler Current Meter			NO
Expendable Bathythermograph (XBT)			NO
Satellite Communications Services (Phone/Fax/Email numbers)			NO
Fishery information services			NO
Vessel Monitoring System			NO

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WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
LOGLINE INFORMATION			
VESSEL ATTRIBUTES			
Refrigeration Method			NO
GENERAL GEAR ATTRIBUTES			
Mainline material		May not be detectable depending on camera placement	YES
Mainline length			NO
Mainline diameter			NO
Branch line material(s)		May not be detectable depending on camera placement	YES
SPECIAL GEAR ATTRIBUTES			
Wire trace	The vessel uses wire traces on some or all their lines	Trip level: Indicate Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES
Mainline hauler	Most long line vessel will have an instrument that hauls the lines in after it has been set- some very small vessels may haul line by hand.	Trip level: Indicate Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement -	YES
Branch line hauler	Some long line vessels may use special haulers to coil the branch lines.	Trip level: Indicate Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES
Line shooter		See Deep setting line shooter below	NO
Automatic bait thrower	Most vessels manually throw the branch lines with the bait away from the wash, especially if the bait is vulnerable to bird strikes. However there are a number of vessels that use automatic bait throwers so the bait is constantly thrown away from the wash at a determined distance.	Trip level: Indicate Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES

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Automatic branch line attached	Most lines are attached manually at a regular distance along the mainline by a crewman, however some vessels may have an automatic branch line mechanisms that attaches the branch at regular intervals	Trip level: Indicate Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES
Hook type		Set level: hook type or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES
Hook size			NO
Tori Line (Changed WCPFC12)		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES
Side setting with bird Curtain and weighted branch lines (Changed WCPFC12)		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation M	YES
Weighted branch lines- (Added WCPFC9)		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES
Shark lines (Added WCPFC12)		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement	YES
Blue dyed bait		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES
Distance between weight and hook (in metres),		Set Level: Estimate, or 'Could not be determined' recognising it may not be detectable depending on	YES

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(Added WCPFC9)		camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	
Deep setting line shooter (Changed WCPFC12)		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES
Management of offal discharge Added WCPFC12)	Dumping offal to attract seabirds away from hooks, or not dumping offal	Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES
Strategic offal disposal (Changed WCPFC12)		See management of offal discharge	NO
Hook shielding device		Set Level: Yes, No, or 'Could not be determined' recognising it may not be detectable depending on camera placement if the vessel is using alternative seabird mitigation methods or is not required to use seabird mitigation	YES

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WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
EFFORT INFORMATION FOR THE SET			
Date and time of start of set	When the first buoy is thrown into the water	Auto-generated by the EM system due to the linking of EM records to time and geolocation data	YES
Latitude and Longitude of start of set			YES
Date and Time of end of set	When the last buoy is thrown into the water		YES
Latitude and Longitude of end of set			YES
Total number of baskets or floats			YES
Number of hooks per basket, or number of hooks between floats		PROTOCOL is to count hooks from first 3 baskets, middle 3 baskets and last 3 baskets and the average HOOKS per BASKET (successive floats) can then be determined.	YES
Total number of hooks used in a set		Could be automatically derived from hooks per basket and number of baskets	YES
Line shooter speed			NO
Length of float-line			NO
Distance between branch-lines			NO
Length of branch-lines			NO
Time-depth recorders (TDRs)			NO
Number of light-sticks		Lights stick used: Yes, No, 'Could not be determined'	
Target species			NO
Bait Species		PROTOCOL is to review the BAIT used during the analyses conducted over the setting of the first 3 baskets, the middle 3 baskets and the last 3 baskets. This should be possible using appropriate placement of the camera mounted to view the SETTING process	YES
Date and time of start of haul	When the first buoy is thrown from the water		YES

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Latitude and Longitude of start of haul		Auto-generated by the EM system due to the linking of EM records to time and geolocation data	
Date and time of end of haul	When the last buoy is retrieved from the water		YES
Latitude and Longitude of end of haul			
Total amount of baskets, floats monitored by observer in a single set	The total number of floats or baskets monitored by the EM Analyst in a single HAUL		YES

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WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
INFORMATION ON CATCH FOR EACH SET			
Hook number, between floats	The hook number that the fish is caught on count hooks from the last float hauled on board to next float hauled on board		YES
Species code			YES
Length of fish		Estimate, or 'Could not be determined'. Not all vessels, EM systems and EM analysis software may have this capability. Further, this may require specific catch handling practices. It is recommended that the SSP provide advice on the coverage required for stock assessment catch verification purposes	YES
Length measurement code		Details of the length measurement approach, if applicable, should be included in the EM program description	YES
Gender		EM Analyst declaration. Not possible for most species (use U-unknown). Can collect sharks and rays sex, for example, if shown ventrally. Some other species may be possible (e.g. mahi mahi and opah).	YES
Condition when caught		EM Analyst declaration	YES
Fate		EM Analyst declaration	YES
Condition when released		EM Analyst declaration	YES
Tag recovery information			NO
Catch event date and time	UTC date and time (to the nearest second) of the catch event (as recorded by the EM equipment)	Field automatically generated by EM system when the EM analyst records the catch coming onboard or if landed at all, when it is struck off, released or discarded	YES
Catch event latitude and longitude	Latitude and longitude of each catch (ISO 6709 standard)	Field automatically generated by the EM system. Minimum resolution of position is 1/1000 of a minute.	YES

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WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
SPECIES OF SPECIAL INTEREST Marine Reptiles, Marine Mammals, Sea Birds, Designated Shark Species			
GENERAL INFORMATION			
Type of interaction	Details of the gear interaction with the SSI. For example, hooking position for marine turtles and sharks.	EM	YES
Date and time of interaction		Auto-generated by the EM system due to the linking of EM records to time and geolocation data	YES
Latitude and longitude of interaction			YES
Species code of marine reptile, marine mammal, or seabird.			YES
LANDED ON DECK			
Length		Estimate, or 'Could not be determined'. Not all vessels, EM systems and EM analysis software may have this capability. Further, this may require specific catch handling practices. It is recommended that the SSP provide advice on the coverage required for stock assessment catch verification purposes	YES
Length measurement code		Details of the length measurement approach, if applicable, should be included in the EM program description	YES
Gender		EM Analyst declaration. Not possible for most species (use U-unknown).	YES

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Estimated shark fin weight by species			NO
Estimated shark carcass weight by species			NO
Condition when landed on Deck		EM Analyst declaration	YES
Condition when released		EM Analyst declaration	YES
Tag recovery information		Yes, NO or 'Could not determine'	YES
Tag release information			NO
INTERACTION WITH VESSEL OR GEAR ONLY			
Vessel's activity during interaction			NO
Condition observed at start of interaction			NO
Condition observed at end of interaction			NO
Description of interaction			NO
Number of animals sighted			NO

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WCPFC ROP MINIMUM STANDARD DATA FIELD	DESCRIPTION	NOTES ON EM PROTOCOL	PROPOSED EM DATA FIELD
EM TRIP MONITORING SUMMARY (Did the vessel)			
Was an observer onboard the vessel		YES/NO	YES
Inaccurately record vessel positions on vessel log sheet for sets, hauling and catch; (Yes No)		EM programs could use EM data to verify ER data	NO
Inaccurately record retained 'Target Species' in the vessel logs; (Yes No)		EM programs could use EM data to verify ER	NO
Inaccurately record 'Target Species' discards; (Yes No)		EM programs could use EM data to verify ER	NO
Inaccurately record retained By catch species (Yes No)		EM programs could use EM data to verify ER	NO
Inaccurately record By-catch species discards; (Yes No)		EM programs could use EM data to verify ER	NO
record species inaccurately (Yes No)		EM programs could use EM data to verify ER	NO
Interact with a non-target species		Could be automatically populated from EM data	YES
high grade the catch; (Yes No)		EM programs could use EM data to verify ER	NO
Fail to comply with any Commission Conservation and Management measure; (Yes No)		YES/NO (details if YES)	YES
fish in areas where it is not permitted to fish; (Yes No)		This can be addressed using VMS	NO
fail to report vessel position to countries, where required, when entering and leaving an EEZ (crossing to or from an EEZ into or out of the High Seas (Yes No)			NO
transfer or tranship fish from, or to,			YES

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another vessel (Yes No)			
request that an event not be reported by the observer; (Yes No)			NO
Did the operator or any crew assault, obstruct, resist, delay, refuse boarding to, intimidate or interfere with observers in the performance of their duties (Yes No)			NO
Did the operator fail to provide the observer, while on board the vessel, at no expense to the observer or the observer's government, with food, accommodation and medical facilities of a reasonable standard equivalent to those normally available and medical facilities of a reasonable standard equivalent to those normally available to an officer on board the vessel .(Yes No)			NO
use a fishing method other than the method the vessel was designed or licensed; (Yes No)			NO
lose any fishing gear; (Yes No)			YES
abandon any gear; (Yes No)			YES
dispose of any metals, plastics, old fishing gear or chemicals;(Yes No)			YES
discharge any oil; (Yes No)		YES/NO, 'Could not determine' based on camera placement	YES
fail to stow fishing gear when entering areas where they were not authorized to fish; (Yes No)			NO

Appendix 4: Interim **WCPFC** EM program reporting requirements

CCMs SHALL include **report** the presence of an EM system in the submission of vessel details to the WCPFC Record of Fishing Vessel.¹

Any CCM using EM and **submission of submitting** EM data to meet WCPFC requirements MUST provide the following reporting in their Annual Report Part 1²:

Description of the EM program

EM program component	Explanatory notes
Attestation	<i>EITHER</i> a confirmation that the EM program and EM system meets all the MUST requirements in the EM Standards <i>OR</i> a description of those components that do not and the intended steps to achieve the requirement in the EM Standards.
Vessel monitoring plans	Examples of the Vessel monitoring plans used in the program to be provided. Would show where camera number and placement differ across vessels in the program (e.g. different sized vessels or vessels fishing in different parts of the Convention Area where different camera configurations are required to achieve the monitoring objectives).
Vessel owner / crew responsibilities	A description of the obligations on the vessel owner/operator with respect to the EM system and program, e.g., cleaning or maintenance and how to respond to mechanical or technical failures of the EM system.
EM record transmission / retrieval	Description of how EM records are retrieved from the EM system.
WCPFC CMM procedures	If applicable, any specific features of the EM system and EM program put in place to monitor the implementation of, and compliance with, obligations under a WCPFC CMM.

¹ An amendment to the CMM 2022-05 Standards, specifications and procedures for the WCPFC RFV would be required to support implementation.

² For any CCM that **voluntarily** chooses to use EM for WCPFC fisheries and submits EM data to support the work of the Commission, it is recommended that this information be provided to allow the necessary context for the use of any EM data.

Description of the implementation of the EM program

EM program component	Explanatory notes
EM coverage levels	By year: EM coverage in terms of both vessel numbers (number and proportion of vessels with operating EM systems) AND Total fishing effort (number and proportion of fishing events for which EM records were collected)
EM analysis rates	By year: EM analysis rate expressed as a proportion of EM coverage for fishing events (i.e., proportion of EM records reviewed to generate EM data).
EM data submission summary	By year: Summary of key data included in the EM data submission, e.g., number of captures of species of special interest, number of size measurements.
EM data quality and review summary	Summary of observations where issues, which impacted the quality of the EM data, were noted by EM analysts e.g., technical, mechanical, specific circumstances and/or catch handling.