BACKGROUND INFORMATION FOR ERANDEM-IWG08 2 APRIL 2026

Western and Central Pacific Fisheries Commission

Comments on ERandEM IWG Proposed Assurance and Audit Process for EM Standards

ERandEMIWG08-2026-02_rev01a
26 March 2026

Overall Comments on the draft audit and assurance document

EU

I. Comments to document ERandEMIWG8-2026-02: Audit, EM Data Assurance and Verification Process

1. Data Quality Assurance of EM data and integrity of EM Systems (page 23)

From the proposed scenarios and while we are still reflecting on that, at this stage we would like to express a preference for the first one where the secretary is responsible. It seems likely that if this work is carried out by different CCMs or different third parties, there will be more difficult to have a harmonised implementation.

This method has the advantage of ensuring harmonised and consistent application and also offers greater transparency. Furthermore, centralising this work would be more efficient, reducing the overall workload and also the costs. If this scenario is selected, it is important to have strong safeguards in place to ensure objectivity, impartiality and transparency.

2. EM verification (page 26)

The following additional sources could be added for verification:

i. Transhipment declarations

Cross-references similar to those made with the fishing logbook and landing data

ii. Observer Data (At-Sea or Port Sampling)

In the event that there is a port observer programme or that there may be vessels equipped with EMS and human observers at the same time.

This possible simultaneity of EMS and human observer in the early stages of the EMS programme's development could also help to test and make necessary adjustments to the system.

iii. Port inspections

Similar to inspections at sea. Useful for verifying MS system integrity, the correct operation of the system in the trip to be landed or even previous trips, or looking for signs of tampering.

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II. Comments on EM interim minimum standards:

1. Sensors

Sensors are an effective tool for detecting fishing activity and can therefore assist in recording, transmission or storage and in the analysis phase. If sensors are not mandatory, perhaps a provision could be established to ensure that if some CMMs decide operating without them, this does not reduce the effectiveness of the system (e.g. that GPS allows fishing operations to be identified unequivocally, that all cameras record 24/7, that the amount of video produced does not weaken the analysis of EM data, etc.)

2. Definitions of "EM coverage" and "EM analysis rate"

We believe it would be more appropriate and effective to separate the metrics, which are independent concepts. Analysis rates must in all cases provide EMS data of sufficient quality and be effective in detecting non-compliance, regardless of the percentage of vessels equipped.

It should be noted that the fact of having an effective EMS on board already provides a deterrent against non-compliance. Combining the two concepts allows to reduce the number of vessels to be equipped (if the analysis rate is increased). The mixed approach could also lead to 100% of vessels equipped but a very low percentage of reviewed data, providing low quality data or lack of proper compliance oversight. Different revision rates would result in data of varying quality, creating potential problems for its use in science and management, and would also create an uneven playing field from a compliance point of view.

We are in favour of establishing separate and non-dependent parameters for "installation coverage" and "analysis rate". The establishment of the minimum "installation coverage" should be associated with risk factors or probability of non-compliance, and with the impact of these non-compliances or the impact that a fleet may have in general (for example, ships that tranship at sea should be 100% covered). The analysis rate should be the one that is considered effective so that, on any of the equipped vessel, appropriate quality data can be obtained and there is a high probability of detecting non-compliance with relevant CMM.

3. Establishment of a review protocol

With the minimum percentage of EMS data to be analysed from each trip and the strategy (based on risk analysis, random component, etc.), in line with the point mentioned above regarding the need for a harmonised approach to ensure the effectiveness of the system, the collection of quality data and a level playing field.

4. System Failure and Tamper Detection

General requirements for on-board EM components. Point 6: System health status

Including automatic real-time malfunction system alerts could be an effective measure and does not appear to be technically complex. It is mandatory in other RFMOs.

Duty to report technical failure should be mandatory within a short period of time (i.e. 24 hours) rather than 'as soon as practicable', addressing the risk of unjustified delays and legal uncertainty in case taking follow up action is necessary.

Shouldn't this requirement be the responsibility of the vessel's Master rather than the shipowner?

Measures in the event of technical failure, for example if the vessel must return to port, if the system must be restored before the next trip, if it can be temporarily replaced by a human observer, shouldn't they be standardised (the same for all CMMs) to ensure a level playing field, rather than leaving them to the discretion of each CMM?

5. EMS vs human observer

Clarify EM-human coverage rules. It is important to stress that EM does not aim at replacing human observers. A minimum coverage of human observer coverage should be maintained for gathering information that is not possible with EMS (e.g. biological samples) and also for allowing cross checking and identifying potential inconsistencies between the two tools.

TNC

1) Elevate from device-level checks to program-level authorization.
The draft reads as if the Secretariat/Commission would review detailed technical elements (e.g., cameras, sensors, etc). Instead, authorize national or fishery-level EM programs based on annual independent audits against Commission standards. This keeps the focus on whether programs reliably produce complete, accurate, and secure data, rather than prescribing specific tools.

2) Clarify Secretariat's role: standards-setter and coordinator, not technical auditor.
Secretariat responsibilities should include: maintaining EM standards and the audit rubric; accrediting qualified third-party auditors; receiving standardized audit summaries; reporting aggregated outcomes to TCC/Commission; and supporting capacity building. Secretariat-led vessel/system inspections should be out of scope to remain scalable and future-proof .

3) Lock in the core audit fundamentals; defer detailed checklists to guidance.
Agree now on the mandatory audit elements applicable to every program:

- Governance & documentation (VMPs, SOPs, duty of care, roles).
- Coverage & analysis rates; representativeness of reviewed effort.
- Data completeness, accuracy, and timeliness.
- Integrity & security (tamper evidence, chain of custody, confidentiality).
- Analyst qualifications & independence.
- System health monitoring & corrective actions.
- Reporting to WCPFC (format, cadence).

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Detailed field-by-field procedures, screenshots, and enumerated system readouts should be maintained as a non-binding Secretariat guidance document that can be updated as technologies evolve, without reopening the CMM

4) Keep requirements functional, not prescriptive.
Where the draft lists hardware specifics, replace with functional requirements tied to agreed data standards and quality thresholds. This protects innovation and avoids obsolescence while ensuring the Commission still receives the data it needs

SPC

ERandEM IWG Proposed Assurance and Audit Process for EM Standards:

The Audit is with respect to the EM provider/programme so the audit should check the provider's SOPs against the WCPFC EM SSPs. Just the example does read a bit like the individual vessels etc are being assessed, which is what the provider/programme should do as a part of its SOPs, the REMP audit is there to check that the provider has systems in place in that meet the requirements of the SSPs.

In the FFA EM SSPs the comparison of EM data to other data sources is referred to as validation, specifically SSP 2B. 3. In the proposed Assurance and Audit process this is outlined as verification. Two separate definitions of EM Verification and EM Data Verification are provided in the paper. The second definition aligns with what is termed as validation in the FFA SSPs as Validation of EM data. Under proposed scenarios for Data Quality Assurance. The scenario that best fits the status of EM data processing in the region is Scenario 3. The SSPs also outline Third Party Audit, guidelines for that are yet to be developed for FFA Members

Assurance process:

Question 2. How many trips/sets should undergo secondary review?

As things stand currently and with no targeted analysis rate, the advice provided through the DCC was to review every set (100%) analysed by an EM Analyst. It may be beneficial in the beginning of this implementation in the WPCFC to target higher review levels, for assurance, and then potentially reduce, as appropriate. The selected sets could be randomly selected with additional sets triggered if unusual events occurred (rare species, extreme catches, etc.). The reduction in secondary review rate should be based on quantitative data suggesting minimal loss to data quality with reduced reviews.

Question 3. When should a review be conducted?

Initially, we suggest reviews to be done as frequently/early as possible to identify potential issues. Reviews will be conducted for each trip to verify data produced by an EM Analyst.

EM Verification:

Possible considerations for EM verification include:

i) use VMS data with time synchronisation and spatial alignment – given that the default reporting rate for VMS position is every 4 hours in the WCPFC, matching EM data to VMS would face critical challenges;

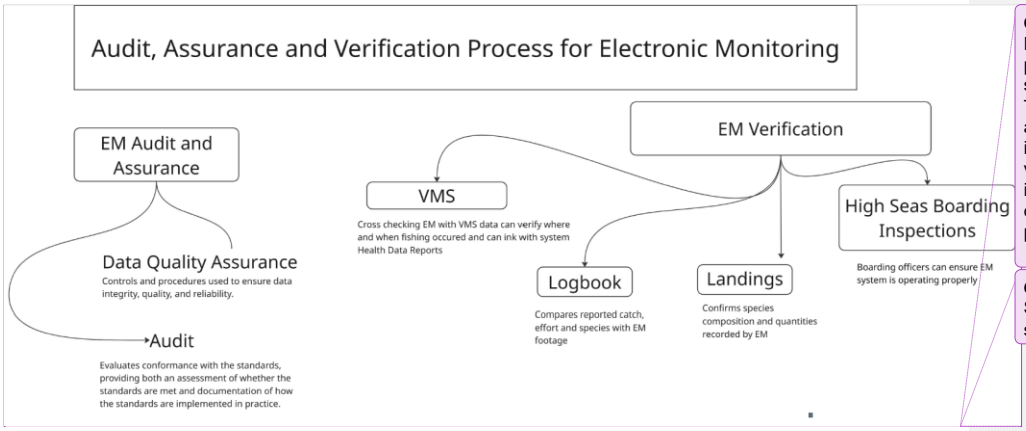
ii) cross-check with logbook data (this can be performed in Tufman2, for example), but unloadings data might be the most accurate (not currently required by the WCPFC);

iii) effort intensity could be monitored – but noting the current VMS algorithms might require refinement;

iv) when comparing across data sources (e.g., logbook, observer. VMS) the trip definitions must be clearly defined, and data should be parsed based on these definitions (i.e., port-port or port to and/or from transhipment, or transhipment to transhipment). We currently have important challenges matching data as the SSP receives incomplete information (e.g., no transhipment data to verify trip start/end), vessels use different time zones (e.g., UTC not consistent across all data sources, but that is improving), etc.;

Data performance for EM Service Providers. Are these % in alignment based on previous analyses from other similar fisheries? Have trial data informed these values?

* We have also made some minor editorial suggestions in the draft circulated, for clarity.



Commented [LH1]: SPC comments: The EM Programme audit is a very different procedure with its purpose that it meets the agreed WCPFC EM standards for operating a programme under the REMP. The Data quality assurance standards are that there is a verification process - i.e. an independent second data interpretation to check the EMA interpretation and a validation process - a confirming of the data against independent sources (VMS Logsheet etc). Th figure is confusing that the Dat QA and the Programme Audit process are together

Commented [LH2]: Diagram was updated to reflect SPC's comments re: terms, definitions and standardization.

SPC~ Text from the FFA SSPs, which are the basis of the process and protocols for QA. It is assumed to be a two-phase approach verification and validation. It seems pedantic but something we discovered in the ROP standards was that terms and definitions are agreed to and standardised early on. Otherwise, it creates some confusion and loopholes that can be exploited.

Verification — *"Was the data recorded correctly?"*
Verification checks that the data entered into the system matches the original source and that no mistakes occurred during collection, transcription, or data entry.

2. Validation — *"Does the data make sense?"*
Validation checks whether the data values are logical, realistic, and consistent with expected biological or operational limits.

The FFFA SSPs define these under SSP2b: EM Records Analysis and Quality Assurance

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VERIFICATION: is a second reading done by EM Reviewer [i.e. checking that the entries are consistent with a second interpretation, meet the requirements of completeness of reporting events, protocols for collection, identifying compliance incidents etc.]

VALIDATION: is the comparing of the data against independent sources, generally assumed to be a built-in process.
[This can be real time checks, i.e. start trip in VMS or against ranges also – realistic position/time = vessel speed etc]

The purpose of validation is to ensure that EM Data is consistent with other trip data such as VMS, eLogs, and
onboard observer reports. Validation should be performed on EM Data using the following analogous, independent
sources:

a. VMS will be used to validate time and position information.
b. Where available, eLogs and observer reports will be used to validate EM Data such as catch and species
information as well as violations or compliance issues.
c. VMS (and eLogs, where available) will be used to compare vessel and trip information.
d. Unloading, transhipment, boarding, and port inspection reports to verify total retained trip catch by species.
e. Automated AI analysis, where applicable.

EM Program Audit

SPC~ It is a programme audit, a check that they have acceptable process in place to meet the EM SSPs.
At the RFMO level, EM governance must operate at a scale that balances effective oversight with practical constraints. Given the large number of vessels operating under RFMO jurisdictions, it is not feasible for the Secretariat to audit EM implementation at the individual vessel level. Instead, governance and accountability are more efficiently achieved by auditing each member's data review center and EM programs. This approach allows the RFMO to verify that standardized procedures for data collection, review, quality control, and reporting are being applied consistently across members, while still enabling vessel-level issues to be identified through national systems.

Tools to assess whether minimum standards are being met could include structured questionnaires, similar to those used under the ROP, comprehensive high-level descriptions of each electronic monitoring (EM) program to support interpretation of specific questions, and supporting deliverables such as operating manuals, screenshots, and other documentation.

TNC: suggestion to include "pre-qualified in-person verification" as an option for verification.

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SPC ~ RE: other documentation. Probably more that they have a regular way of checking SSPs on all vessels within a licencing period. E.g. Vessels must have a Vessels Monitoring Plan, all cameras a re checked on eave unloading, EMA's are trained in all aspects of the role and ceritfied. Thre is a data quality process etc

Draft Questionnaire

Many thanks to New Zealand for initiating the development of a draft questionnaire below. The standard is described in the first column and the language in the second column describes how EM standards can be audited through prompts for a discussion and/or direct questions. New Zealand provided some examples of how they would answer the specific audit questions, and completed this process through the "sensor" standard. I have continued the formatting and entered the Specifications, Standards, and Procedures (SSP) language, and this is where I need your help.

General Questionnaire COMMENTS

Japan~ The current questionnaire appears to include both must and should requirements.
For several items based on should provisions, the level of detail requested may be useful in general, but it is unclear whether such information is actually necessary from an audit process perspective. We suggest that the IWG review whether these should-based questions are required for audit purposes. If these questions are retained, it may be appropriate to clearly mark them as "optional".

Task: 1) Review and provide feedback on this questionnaire 2) Comment directly in the questionnaire using track changes 3) *Please* help to fill it in the missing information for "How this standard could be audited". If each member would pick one or two standards to fill in, the questionnaire could be completed by the virtual meeting in April. Disregard the CMM example response~ leave these blank for now.

Standard	How this standard could be audited	NZ example response
On-board user interface: - MUST include a display on the vessel - MUST include software or hardware that shows EM system health status and real time images from installed cameras on the display - MUST allow only authorized users (e.g., EM Service Providers, EM service technicians) to adjust system configurations	Relatively simple requirement. Basically, looking for a description of the on-board user interface, what it shows and whether it can be used to adjust system settings. Could ask a question such as: *"Please confirm that an on-board user interface or display is installed on each*	As part of MPIs contract with the EM service provider, a 10" on-board display is required to be installed on each vessel. This display is installed in the wheelhouse at a position convenient for the skipper (taking account of available space and the need to

Commented [LH3]: EU suggestions:
- the control box must:
  - Control all onboard REM components
  - Store all REM data securely
  - Enable diagnostics and logging
  - Support secure data transfer and encryption

-(unless referenced elsewhere) add audit criteria for:

Control box security
Unique identification of storage devices
Encryption and access control

The control centre is a core compliance element. The audit questionnaire should explicitly assess control box security, storage integrity, encryption, and unique identification of storage media.

- COULD Include a keyboard, mouse, touchscreen, or other device to allow user inputs to the system	*vessel. Describe what is shown on the display - specifically whether it shows real time images and what EM system health status is shown. Comment on whether the onboard user interface can be used to adjust system configurations, and if so what controls are in place to enable only authorized users to adjust system configurations"*	ensure no electromagnetic interference with other vessel systems). This display turns on automatically when the control centre is powered on and shows a real time view from each of the cameras, as well as time, GPS co-ordinates, server ID and system health information (whether cameras are recording, proportion of available disk space remaining before footage is overwritten, amount of footage needing to be upload and network connectivity) – see an image of the display on page 10 of the Electronic Monitoring System Guide. The on-board display cannot be used to adjust system configurations. This can only be done remotely. Only MPI and the EM service provider have access to adjust system configurations remotely.

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Cameras: - An EM system MUST be outfitted with cameras to capture imagery of fishing activity - The number and position of cameras MUST be sufficient to capture necessary imagery to allow generation of the data fields set out in the EM data requirements.	Critical standard. Really a question of process – what is the process for ensuring camera set up (positioning / number) meets requirements during installation and what is the process for continually assessing camera set up to make sure it remains appropriate (given potential changes in vessel superstructure and/or operational practices). That being said some example screenshots of what is considered 'appropriate camera placement' and why could also be useful. *"Describe the processes followed to ensure camera set up (positioning and number) is sufficient to capture the necessary imagery. Comment on how this is done during installation and how camera set up is continually assessed to ensure it remains appropriate. Provide example screenshots from a representative subset of vessels demonstrating what is considered appropriate camera placement, describing why (i.e. what data fields can be obtained from which image)."*	As part of the contract with the EM service provider, cameras are required to be installed as appropriate (i.e. number of cameras and positioning) to enable view reviewers (EM analysts to collect the data attributes necessary to meet the monitoring objectives for MPIs monitoring objectives (taking into account the practical limitations of cameras). See Appendix One below. Following installation, footage from the first trip is reviewed. During this review, senior EM analysts, conduct a detailed review to verify that camera positioning is appropriate to enable the collection of the data attributes. Procedures for conducting this review can be found on page X of the Standard Operating Manual for Electronic Monitoring. If it is not possible to collect these data attributes during this review, then the vessel is revisited and camera setup adjusted as appropriate (i.e. cameras moved or additional cameras

		added). The vessel is then reassessed to check that the adjustment has achieved the desired outcome. During routine review, EM analysts continually assess camera placement following standard processes. If it is no longer possible to collect the required data attributes, then the vessel is visited and camera set up adjusted accordingly.
Standard	**How this standard could be audited**	**NZ example response**
Cameras: - Cameras MUST, capture imagery that meets image quality standards under typical fishing conditions that allow for an EM Analyst to generate the data fields set out in the EM data requirements. 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 - Should be capable of accommodating remote or onboard configuration of parameters to optimize camera functionality throughout a typical fishing trip	Another critical standard. To audit, you would need to understand the specifications of the image and see examples. *"Describe the image quality specifications. These must include resolution and frame rate but may also include bit rate, shutter speed and quantisation parameter. If footage quality can be varied then describe how this can be done and under what circumstances footage quality is varied. Provide example screenshots from typical fishing conditions (including night fishing) to demonstrate image quality."*	Footage is recorded at two different frame rates – 360p and 1fps and 720p and 10fps. Activity recognition algorithms running within the control centre then analyse each minute of 1fps footage to determine whether there is a human in frame of any camera (humans in frame being a proxy for fishing activity occurring). If a human is detected in frame of any of the cameras, then 720p/10fps footage from all cameras for that minute is tagged for upload from the vessel and made available to the EM Video Analyst.

Commented [LH4]: Chinese Taipei ~ add "As a minimum standard" to be consistent with the EM standard.

Commented [LH5]: Japan ~ Suggest deletion. For audit purposes, requirements should mirror the adopted Standard and should not introduce new elements outside it.

	<DK comment – im not sure about this requirement. Footage quality is a combination of image quality, lens cleanliness and environmental conditions (light vs dark, sunstrike etc.). To fully assess whether footage is of sufficient quality to generate required data then would need to consider camera cleaning protocols, lighting requirements etc. Also a question of the screen on which the EM Analyst is working – you can have highest quality footage you like but if you are watching on a tiny screen then you will struggle to collect the data you need>	If no human is detected in frame for that minute, then only the 360p/1fps is uploaded. This is a mechanism used to control the volume of footage transferred and stored (and thus costs). Image quality parameters can also be varied remotely on a camera-by-camera basis by both the EM Service Provider and directly by MPI. Parameters that can be varied include resolution, frame rate, bit rate, quantisation parameter, shutter speed and the use of night vision (infrared) and the light level at which night vision is initiated. This ability enables image quality settings to be varied as appropriate to match the view from that camera – taking into account that higher image quality results in increased transfer and storage costs and higher processing capacity on the Yellowfin. For example improving image quality for those individual cameras where the highest quality image is needed (e.g. to identify fish species),

		reduced footage quality for those cameras where higher quality footage is not needed (e.g. cameras placed specifically to verify use of bird streaming lines), use of night vision for cameras covering areas of the deck not well-lit and adjustment of shutter speed to reduce horizontal banding on cameras located close to the vessels LED lights.
Recorded imagery - MUST 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 - MUST include a timestamp, location, and vessel identification information on the video or image	Simple standard. *"Describe what format video is recorded on and confirm that this format is able to be viewed by EM Video Analysts. Confirm that video imagery contains a timestamp, location and vessel identification embedded within the image and provide a screenshot to demonstrate*".	Video footage is transcoded on the control centre into H264 format which is able to be viewed by the EM Video Analyst through the Monitor Review Platform. A watermark is applied to footage as it is captured from each camera. This watermark contains the control centres serial number, the name of the vessel the footage was captured on, the GPS coordinates of the vessel at the time of capture, and which of the vessel's cameras captured the footage. The time of capture in UTC and the presentation timestamp are also appended to the end

Commented [LH6]: TNC: Supports the information captured here.

		of the watermark. The watermark is applied to the top-left corner of the footage, and is scaled according to the footage's resolution, so that it retains the same rough size and position across all pieces of footage. To aid in the visibility of the watermark in all recording environments, the watermark is displayed as white text with a black border. As the watermark is applied as and when footage is recorded, there is no way to remove the watermark from the footage once applied
Standard	**How this standard could be audited**	**NZ example response**
Geolocation Data and Device - A geolocation device MUST record vessel location coordinates and the associated date and time in a format capable of integration with EM Records. - 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 - 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	Simple standard. *"Confirm that a geolocation device is installed on each vessel and that location coordinates and date/time can be integrated with EM records"*	GPS data (including time) is collected and written to a JSON file while footage is being recorded. The data is collected through the control centres inbuilt GPS module. Location co-ordinates are collected through the control centres dedicated GPS antennae which is installed by the EM Service Provider. GPS antennas are weather and waterproofed, locked in place, and provide as much physical protection as

Commented [LH7]: TNC: Identifying as one of the most important EM standards that needs to be audited. Opportunity to have a requirement for VMS to cross-check geolocation.

Commented [LH8]: EU suggestion: pls use GNSS (that also includes GPS) across the document instead of GPS only.

- 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 - 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.		possible to avoid accidental damage GPS data is uploaded from the vessel when in network range and is integrated with footage within the review platform. If the vessel is not in network range then footage is cached and transferred when next within range.
Uninterruptible Power Supply - The EM system SHOULD include a UPS in the event that the main source of power is interrupted.	Simple requirement – could be a Y / N. If asking for details of the UPS then key factor is how long it can power the system for post power loss (although I could understand if CCMs could be reluctant to provide this). *"Does the EM system include a UPS? If so, please describe how long the UPS is able to power the EM system in the event of a power loss"*	During installation, EM service provider technicians perform individual vessel assessments and remediation activities (typically electrical system upgrades) to ensure a stable power feed for the system. The standard EM system deployed does not include a UPS. However, a version of the control centre has been developed containing a UPS able to power the entire system (including recording footage from all cameras) for approx. 18 minutes following main power loss. Control centres containing the UPS are available for deployment on specific vessels if required.

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Standard	How this standard could be audited	NZ example response
Sensors - EM systems SHOULD be outfitted with sensors, which may include the use of camera imagery as a synthetic sensor, to determine whether fishing activity is occurring, e.g., hydraulic or drum rotation sensors. 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	Sensors are essentially a way of controlling costs / privacy impacts by minimising the amount of irrelevant footage captured using a mechanism that is outside the direct control of the fisher (i.e. not through an on / off switch). Various ways of doing this (it's one of the simplest uses of AI) so would need the question to be quite open. Question of how much info is required given this is a 'should' requirement – but key aspects to understand would be whether sensors are used to initiate capture of footage or just movement of footage from the vessel (or both). If former, then it's important to understand what the run on times are (i.e. for how long the cameras keep recording after the sensor is triggered) and whether these can be adjusted. If the latter then, then interested to know whether there is any ability to 'recall' footage that hasn't been transferred. *"Does the EM system use sensors (including camera imagery as synthetic sensors) to initiate the capture and/or transfer of footage in any way? If so, briefly describe how the sensors operate including (where relevant)* - *What type of sensor is used*	As noted above, camera imagery is included as a synthetic sensor to determine whether fishing activity is occurring. Footage is recorded at two different frame rates – 360p and 1fps and 720p and 10fps. Activity recognition algorithms running within the control centre then analyse each minute of 1fps footage to determine whether there is a human in frame of any camera (humans in frame being a proxy for fishing activity occurring). If a human is detected in frame of any of the cameras, then 720p/10fps footage from all cameras for that minute is tagged for upload from the vessel and made available to the EM Video Analyst. If no human is detected in frame for that minute, then only the 360p/1fps is uploaded. This is a mechanism used to control the volume of footage transferred and stored (and thus costs).

Commented [LH9]: EU~ The EFCA REM Technical Guidelines emphasise that AI and sensor-based triggers support, but do not replace, human EM analysis. The audit framework should explicitly confirm that automated processes do not substitute analyst judgement. Could not find this explicitly.

	(mechanical vs synthetic); - *Whether sensors initiate footage capture and/or transfer of footage from the vessels;* - *If initiating footage capture, what the camera 'run on' times are (i.e. for how long the cameras keep recording after the sensor is triggered) and whether run-on times are customisable;* - *If controlling footage capture, whether there is any ability to retrieve and review footage that has not been transferred from the vessel;* - *What processes are used to assess whether sensors are accurately detecting fishing activity; and* - *Whether a logfile of reading from system sensors in stored in a similar manner to time and geolocation information."*	

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Standard	How this standard could be audited	CMM response
Control centre (*this should be at the top, will fix in next version*) - The EM system control centre: 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 securely. To secure EM records, the system SHOULD be equipped with applications such as user logins, EM record encryption and firewalls. h. MUST store all EM Records on storage devices and in formats that are compatible or can be readily translated into formats that are compatible with CCMs DRC hardware and EM review software.		
Standard	**How this standard could be audited**	**CMM response**
Communication system a. The EM System SHOULD have or integrate with at least one network communication system that enables the	*China~ This is a key requirement in the audit of an electronic monitoring (EM) system. The audit focus is not limited to*	

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 to the extent possible, supports remote access to the EM system by the EM Service Provider or their designated service technicians. b. The network communication system(s) SHOULD be a widely used and globally recognized technology, such as: -3G, 4G, or 5G cellular networks. -Wi-Fi -Satellite communications. 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.	*confirming whether communication equipment is installed onboard. More importantly, it is to verify whether the communication system can continuously support the regular transmission of data required by the EM system, system status verification, and any necessary remote technical support.* *During the audit, the following aspects should typically be examined in particular:* *Example audit question:* *"Please describe the communication system used by the vessel's electronic monitoring system and explain how it meets the requirement to regularly transmit system health data, still images, sensor data, and geolocation data to the data review center. In particular, please address:*** *What communication methods are installed or integrated on each vessel (e.g., cellular network, Wi-Fi, satellite communications, etc.);* *What types of data are transmitted through the communication system,*	

	and how the transmission frequency is configured; *How the system verifies that the above data have been successfully transmitted to the data review center;* *Whether the system buffers data in the event of communication failure, network unavailability, or bandwidth limitations, and automatically retransmits the data once communication is restored;* *Whether the system includes a contingency or backup option for transmission diagnostics through the vessel's local network (e.g., Ethernet port or Wi-Fi).* *Where possible, please provide supporting evidence, such as system health data transmission records, examples of still image uploads, transmission logs, or relevant screenshots of the system interface."* *The audit of this standard should focus on the conformity of component selection and the reliability of actual operation. The core objective is to verify that hardware exposed to the elements has been selected as fit for purpose, with protection ratings (IP code) and robust design*	

	features appropriate to the actual environmental risks associated with its installation location. The audit may be conducted through a review of equipment technical specifications and post-installation operational records, without the need for destructive testing. *Example audit question:* *"Please describe the weather-resistance design of the electronic monitoring system hardware components installed on deck or in other locations exposed to the natural environment, and explain how they meet the requirement for reliable operation under fishing vessel operating conditions. In particular, please address:*** *•Which electronic monitoring hardware components are installed in exposed environments, such as cameras, sensors, junction boxes, connectors, or other external equipment;* *•What dust- and water-ingress protection ratings apply to each of the above components, and whether different protection classes have been selected according to the installation location;*	

	•Whether higher-rated equipment, such as IP67 or IP68, is used in locations expected to be frequently exposed to seawater, wave splash, or high-humidity conditions; *•Whether equipment enclosures, brackets, fasteners, and connection assemblies are designed to provide corrosion resistance, impact resistance, and vibration resistance;* *•What measures are applied during installation and subsequent maintenance to inspect sealing integrity, mounting security, and visible signs of wear or deterioration;* *•Whether procedures are in place for recording, repairing, and replacing equipment in the event of water ingress, corrosion, loosening, or physical damage.* *Where possible, please provide supporting documentation, such as equipment technical specifications, installation photographs, or maintenance records."*	
Standard	**How this standard could be audited**	**CMM response**

Weather Resistance 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.	*The audit of this standard should focus on the conformity of component selection and the reliability of actual operation. The core objective is to verify that hardware exposed to the elements has been selected as fit for purpose, with protection ratings (IP code) and robust design features appropriate to the actual environmental risks associated with its installation location. The audit may be conducted through a review of equipment technical specifications and post-installation operational records, without the need for destructive testing.* *Example audit question:* *"Please describe the weather-resistance design of the electronic monitoring system hardware components installed on deck or in other locations exposed to the natural environment, and explain how they meet the requirement for reliable operation under fishing vessel operating conditions. In particular, please address:*** *•Which electronic monitoring hardware components are installed in exposed environments, such as cameras, sensors, junction boxes, connectors,*	

	or other external equipment; *•What dust- and water-ingress protection ratings apply to each of the above components, and whether different protection classes have been selected according to the installation location;* *•Whether higher-rated equipment, such as IP67 or IP68, is used in locations expected to be frequently exposed to seawater, wave splash, or high-humidity conditions;* *•Whether equipment enclosures, brackets, fasteners, and connection assemblies are designed to provide corrosion resistance, impact resistance, and vibration resistance;* *•What measures are applied during installation and subsequent maintenance to inspect sealing integrity, mounting security, and visible signs of wear or deterioration;* *•Whether procedures are in place for recording, repairing, and replacing equipment in the event of water ingress, corrosion, loosening, or physical damage.* *Where possible, please provide supporting documentation, such as equipment technical specifications, installation photographs, or maintenance records."*	

Standard	**How this standard could be audited**	**CMM response**
Tamper Resistant and Tamper Evident a. The onboard hardware MUST be robust and tamper evident to mitigate the risk of intentional sabotage or malfunctions. This MUST 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.		
Standard	**How this standard could be audited**	**CMM response**
Compatibility with Other OnBoard Equipment 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).		
Standard	**How this standard could be audited**	**CMM response**
Compatibility with DRC Review Software 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.		
Standard	**How this standard could be audited**	**CMM response**

Commented [LH10]: TNC: EM installer to confirm that encryptions (file, physical locks) have been placed in the software and hardware.

The power system be hardwired into the power source or enclosed with bolts, instead of having an accessible plug/outlet system.

To include a checklist for an observer, HSBI inspector.

Commented [LH11]: EU suggestion: Here it seems only one analysis software will be used, which normally it is not the case

Capable of Spatial Calibration An EM system SHOULD have capability for spatial calibration for accurate image and fish length measurements.		
Standard	**How this standard could be audited**	**CMM response**
System Health Status 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). 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 include details of EM system processes, including, but not limited to: 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 error 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 b. System SHOULD undertake		

Commented [LH12]: EU suggestion: This should be linked to the type of cameras used, so in the camera section it needs to be specified cameras used should be compatible with spatial calibration for length measurements

Commented [LH13]: EU suggestion: consider combining with the similar info located towards the top the table?

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. 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.		
Standard	**How this standard could be audited**	**CMM Response**
EM system installation CCMs SHOULD 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). The vessel owner or their designated representative: a. MUST provide information 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.		
Standard	**How this standard could be audited**	**CMM response**

Commented [LH14]: TNC: Identifying as one of the most important EM standards that needs to be audited.

Commented [LH15]: EU~ in the VMP

Vessel Monitoring Plan		NZ example response
a. Vessel owner or EM Service Provider MUST complete a Vessel Monitoring Plan and submit it to the CCMs DRC for approval. b. A copy of the approved Vessel Monitoring Plan SHOULD be maintained aboard the vessel at all times during fishing operations. 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: 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 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: • MUST include the number and		

Commented [LH16]: TNC: Identifying as one of the most important EM standards that needs to be audited. VMP to be submitted to the Secretariat
A copy to be held on board for vessel inspectors at port or on the highseas.

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: ○ 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: • Verifying system functionality at the		

Commented [LH17]: China~
Because this requirement may be interpreted differently across EM providers, it may be useful to clarify: what constitutes an acceptable spatial calibration capability; how calibration is to be performed and verified; what level of measurement accuracy is expected for fish length estimation; whether recalibration is required after camera repositioning, hardware replacement, or vessel modifications; and what records or evidence should be available for audit and assurance purposes.
III. Supplementary explanation regarding the "Spatial c alibration capability" section
Location of modification: This modification serves as a supplement to the explanatory guidelinesof the overall questionnaire. Considering that different EM service pr oviders may interpret this requirement differently, it is r ecommended to add explanatory text in the general ins tructions of the questionnaire or directly within the audit explanation section for "spatial calibration capability."

The new content primarily proposes that, to avoid incon sistent responses caused by differing interpretations a mong service providers, the following questions should be further clarified:
What constitutes an acceptable spatial calibration capa bility?
How should calibration be implemented, and how can t he effectiveness of the calibration be verified?
When used for fish length measurement, what level of measurement accuracy must be achieved?
Is recalibration required under the following circumstan ces: camera repositioning; hardware replacement; or m odifications to the vessel's hull or installation environme nt?
What records or evidence should be retained to satisfy audit and quality assurance requirements?

beginning and at regular intervals throughout the duration of each trip 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		
Standard	**How this standard could be audited**	**CMM Response**
Field and Technical Support Services The vessel owner/operator: 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. The EM Program: i. MUST define vessel responsibilities in the event of system malfunctions that describe the steps that must be taken under different failure scenarios. SHOULD respond to EM Service Providers or vessel owners/operators in a timely manner.		

Commented [漁對18]: Amended to be consistent with the EM Standard.

Commented [LH19]: EU suggestion: this seems redundant, already specified above that that the system MUST store and SHOULD transmit system health status information.

Commented [漁對20]: Amended to be consistent with the EM Standard.

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Standard	How this standard could be audited	CMM Response
EM Analysis Software The DRC MUST use EM analysis software to facilitate the generation of EM Data from EM Records. The EM analysis software: 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. SHOULD be able to display EM analysed output: 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 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). e. SHOULD allow the EM Analyst to create annotations to mark events		

Commented [LH21]: TNC: Identifying as one of the most important EM standards that needs to be audited.

where fishing activity occurred within the EM records. f. SHOULD 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)		
Standard	**How this standard could be audited**	**CMM response**
EM Analysis Workstations 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: 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		

Commented [漁對22]: Amended to be consistent with the EM Standard.

to commercially sensitive information.		
Standard	**How this standard could be audited**	**CMM Response**
EM Analysts The use of EM software to generate EM Data from EM Records MUST be conducted by EM Analysts. The EM Analysts: • MUST complete an appropriate training program which covers materials including (but not limited to): species ID, basic fishing practices, and EM review processes). • EM analysts MUST/MUST not be employees of a fishing company involved in the observed fishery or have other direct conflicts of interest. 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).		
Standard	**How this standard could be audited**	**CMM response**
A system to monitor EM System health on vessels a. The EM Program SHOULD have a health monitoring system to receive and display near real-time information of onboard EM System health status (System Health Status), this SHOULD include still images to verify functionality of onboard cameras (System Health Status) and geolocation data (Geolocation device). 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.		

Commented [LH23]: TNC: Identifying as one of the most important EM standards that needs to be audited. Potential to have an accredited list of EM analysts approved by the WCPFC - similar to VMS or observers from the ROP.

c. The health monitoring system SHOULD be able to display the latest geolocation of all covered EM Systems on a map.		
Standard	**How this standard could be audited**	**CMM Response**
Storage of EM records and EM data EM records and associated EM data MUST be retained in accordance with any WCPFC audit requirements.	**See question below**	

Questions for audit process

Please feel free to comment throughout this document anywhere you see fit, I am just listing outstanding questions I could think of to make sure we addressed all aspects of the audit/assurance process. Feel free to add your own questions for the IWG too!

1. How long should EM records and associated EM data be retained?

SPC ~This may be a national requirement, but presumably to meet the WCPFC Min Data Standards and Processes. The records may have a different lifespan to the data. But data may need to be given a life span in raw versus aggregated form.

Japan~ Consistent with ICCAT and IOTC, retention periods should defer to national regulations. EM footage requires significant storage capacity, so flexibility is important, while processed EM data can be kept longer.

IATTC EM Chair ~ SPRFMO just adopted an accreditation procedure based on its observer procedure. We noted that the evaluator could audit records but did not mandate retention times, though we also have language that explicitly allows SPRFMo to set records retention times in the future.

ICCAT mandates, "Once footage is reviewed, it shall be stored for at least 3 years, except if national data retention regulations require a shorter period. When the system is to be used for enforcement purposes, the data collected by the EMS shall be stored for as long as necessary until the possible infringement proceedings have been finalized."

TNC: Recommend that data be retained for at least 1 year; be aligned with any timelines that may be stipulated in the RFMO compliance process; or aligned with national food safety requirements.

Chinese Taipei ~ If this is for audit purposes, then the period between audits could be considered.

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2. Recognizing that these assessments can largely be conducted through document review and remote virtual consultations, are there specific circumstances under which in-person audits would be necessary or would provide additional value?

SPC ~ Perhaps to audit DRC SSPs

TNC: Suggest that this can take a hybrid approach, allowing in-person reviews when deemed necessary or on a set timeline.

3. What specifics should the comprehensive high-level descriptions of each electronic monitoring (EM) program include?

SPC~Maintenance of independence of DRC, EMAs etc.

TNC: Recommends to include: monitoring objectives, overview of who and what is captured and why, roles and responsibilities, coverage and review rates, how it will be reported to the WCPFC, how the integrity is protected, how it's verified, how it's enforced.

4. What other supporting documents besides operating manuals and a screenshots, be provided to the Commission?

SPC~Training units and curriculum

TNC: Recommends that internal controls and QAQC approach be added. Information that the EM system is legally authorized, that the equipment meets the defined standards, and that the data are secure and auditable.

Japan~ Japan is concerned about the substantial workload associated with translating supporting documents into English. Japan therefore requests that any required documents be limited to those strictly essential for audit.

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Data Quality Assurance (Secondary Review)

The aim of a data quality assurance process is to establish the accuracy of the data produced by an EM data review analyst and EM system integrity through **verification** and **validation** processes.

EM Data Verification: The process of evaluating the completeness and compliance of a collected data set against the required data fields, format, protocols and normal range of expected results.

Data verification Processes include the secondary review of EM data by an EM data quality reviewer to verify:

- Completeness of data fields and formats
- Critical Incident assessment
- Truth of unusual events
- Technique of established protocols followed

TNC: The representativeness of the fleet/fishing activities
recommends that it is important to ensure this captures that the EM review is being conducted randomly across the entire fleet so that we are confident that the data being generated is representative of the entire fishery and that a flag state is not just "good actors"

EM Integrity Verification: The process of verifying that EM systems are functioning correctly throughout a trip. This includes checking for video gaps, dirty camera lenses, and if warranted, sensor failure and ensuring the system was activated at the dock before departure.

Proposed scenarios for Data Quality Assurance of EM data and integrity of EM Systems

What are the pros/cons of each scenario? Which one do you prefer?

Japan~ Further information would be helpful, including examples from other RFMOs and implications for the Commission budget for each scenario.

1. *Secretariat Assurance*
    - Secretariat is responsible for reviewing and re-analyzing a percentage of each CCM's EM footage. The review could be done by trained Secretariat staff or a third party.
    - Specific footage would be requested by the Secretariat (either by a random selection of sets/trips or a more representative sample of sets/trips) and sent either to the Secretariat, to the Secretariat to pass on to the third-party, or directly to the third-party.
    - If analysis was done by a third-party, results could be reported in a variety of ways, in increasing levels of specificity.

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2. *CCM-directed Third-Party Assurance*
    - CCM is responsible for contracting an independent third-party (i.e., one that is not involved in the domestic EM program) to complete the assurance process.
    - The Secretariat could require that specific sets/trips be analyzed (as above), or the CCM or third-party could be required to select a random or representative sample of sets/trips
    - The CCM would provide the footage to the third-party
    - As above, the results could be reported to the Commission, either by the third-party directly or through the CCM, in a variety of ways, in increasing levels of specificity.

TNC: Suspect that this is the most effective option given the specialized nature of the work, the capacity requirements, and the need for independence. The independent third party could be a pre-approved auditor,accredited by the Commission.

3. *CCM Assurance*
    - CCM is responsible for completing the assurance processes and ensuring it is done by individuals that were not involved in the initial analysis.
    - The Secretariat could require that specific sets/trips be analyzed (as above), or the CCM could be required to select a random or representative sample of sets/trips
    - As above, the results could be reported to the Commission by the CCM, in a variety of ways, in increasing levels of specificity.

SPC ~ This is the most practical and similar to ROP debriefing process. If this then the DRC needs to demonstrate independence from the fleet/or flag?

Questions for assurance process

Please feel free to comment throughout this document anywhere you see fit, I am just listing outstanding questions I could think of to make sure we addressed all aspects of the assurance process. Feel free to add your own questions for the IWG too!

1. **Does the IWG want to develop metrics* to "score" the secondary reviewed EM data?**
    a. What is a reasonable threshold for acceptable data?
    b. What are the consequences/implications if the accuracy threshold is not met?

Examples of metrics used in other EM programs can be found in **Attachment 1*

Japan~ Suggest postponing discussions on such metrics. It is premature to set them before data collection and initial analyses clarify the likely range of differences and their causes.

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SPC~ We determine for Observers if the data are complete, correct, recoverable etc by field. Probably the same process. Re (b.) This should be done by field so if some fields are inaccurate others may still be acceptable for other purposes

TNC: re: 1. Would recommend that a scoring metric be developed for quality and system performance monitoring, but not to be used to penalize based on raw data scores.

2. How many trips/sets should undergo secondary review?

a. *Full* secondary review of all data from a trip?
b. *Partial* (50%, 20%, 10%, 5%) of the trip?
c. How selected? Random?
d. First year X amount, year 2 less than X amount, etc?
e. Any other ideas?

SPC ~ 2.(a) Initially the review should be a full review as the monitoring coverage is so low, that QA is critical. If higher monitoring coverage is attained then based on statistics this could be adjusted. But the PIRFO observer programmes aim for full debriefing coverage, why should EM be different? 2. (e.) EM coverage should be scalable to be increased as situations warrant, vessels with histories of infractions or avoiding monitoring such as high seas fleets should carry an added burden. Similarly if there are incidents of high levels of SSI catch in an are Em monitoinrg could be increased.

TNC: Auditors should determine appropriate secondary review needed to achieve audit goals based on fishery characteristics, data coverage, review rates, and probabilities of occurrence with fishing events. For some fisheries this might look like a random audit of 5% of all reviewed/analyzed sets. If it is necessary for Commission to specify a secondary review rate, then I would keep it at the minimum statistical amount needed to detect nonconformance and ensure data quality and security goals are met.

3. When should secondary review be conducted?

a. Monthly, quarterly, annually?

4. If the secondary results are submitted to the Commission, how often?

a. How can the Commission use these reports to ensure quality of data and integrity of data systems?

Japan~ Monthly or quarterly reviews may be unrealistic for distant-water fleets with long trip durations.

SPC~ RE 3.(a) Before final submission of the trip data. 4 (a.) The QA results should be 'attached' to the data for the data users to access if needed. This should be for every field. Debriefing evaluations are attached to observer data in TUFMAN2 for PIRFO trips

TNC: RE: 3. recommends that data should be reviewed quarterly or annually, but not less than annually, as long as it is representative of the activities and not all from one set/trip/month. Should countries have audited programs that have issues, the secretariat should retain the right to ask for audits at higher

frequency to ensure corrective action. RE 4. Recommends that results be submitted to the Commission on an annual basis aligned with ARP1 and ARP2.

EM Verification

Japan~ Need further clarification on the purpose of EM Verification, considering that data accuracy is ensured through the Data Quality Assurance process.
TNC: Caution that this section may be going too far into prescribing methodologies for auditing and compliance verification.
Chinese Taipei ~ We would appreciate clarification on the purpose and difference between Verification and Assurance. If the purpose is to safeguard data quality, we would like to explore the possibility of incorporating these two processes. This would allow the working group to focus on the audit process to evaluate each program's capability in data assurance or verification.
A process to assess accuracy of a set of data using analogous but independently collected sources to substantiate the veracity of data and information. Please comment throughout the document for each proposed cross-check.

Proposed ways to use VMS to cross-check EM data?

- Time synchronization and spatial alignment
    - Interpolate VMS positions if pings are sparse (e.g., every 30–60 min) so they line up with EM events like set start/end.

  TNC: Confirmation that EM GPS is functioning accurately could also be reflected under system heatlh.

- Cross-check effort intensity
    - Number of sets (EM) vs inferred fishing events (VMS speed + turning angle analysis)
    - Duration of sets/hauls (EM timestamps vs VMS-derived activity windows)

If EM shows fewer sets than VMS-inferred fishing events, that may point to:

- 🚩 Missed EM annotations
  Camera downtime
  Intentional underreporting

- Support EM review prioritization
    - Flag EM trips where VMS shows unexpected fishing behavior
    - Prioritize review when:
        - Fishing occurs near boundaries
        - Unusual patterns (very short sets, odd locations)

- VMS gaps coincide with EM camera outages

- System Health Data Reports
  - Vessels already transmit VMS positions via: satellite terminals (Iridium, Inmarsat, Argos, etc.) and sometimes cellular when near shore. EM systems could connect to the same satellite terminal, and
  - Health information embedded in VMS messages transmitted with every VMS position report.
  - Secretariat Ingests VMS + EM health data together and displays vessel status on dashboards
    - 🚩 Chronic camera outages
      Suspected tampering
      Repeated power interruptions

Proposed ways to use logbooks to cross-check EM data?

The value is in comparing the two systematically, not expecting a perfect match.

1. Set occurrence, timing and location
   - Logbook set reported: yes/no
   - Set date and time vs EM timestamps
   - Number of sets per trip

If EM shows fewer sets than VMS-inferred fishing events, logbook set with no EM evidence, large time offsets that may point to:

- 🚩 Simple reporting errors
  Misunderstood set numbering
  Potential unreported fishing

2. Cross-check catch and bycatch
   - Species presence/absence
   - Order-of-magnitude catch counts
   - Retained vs discarded proportions

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Proposed ways to use landings data to cross-check EM data?

EM is what was caught and handled at sea while Landings is what entered the market.
The gap between them tells a story. This may be a valuable tool for EM and transshipment.

1. Compare EM-derived retained catch with landed weights. Small differences are normal. Big structural differences are not.
    - Species presence/absence:
        - Landed species not seen on EM
        - EM-observed retained species not landed
    - Order-of-magnitude consistency:
        - EM suggests 2–3 t tuna, landing shows 200 kg (🚩)
    - Composition:
        - Species mix proportions broadly align

2. Detect unreported discarding or high grading
   Patterns to look for:
    - EM shows:
        - Frequent discarding of marketable fish
        - Selective retention by size or quality
    - Landings show:
        - Narrow size ranges
        - Lower total weight than EM envelope suggests

🚩 This combination can indicate: High grading, Unreported transshipment, Misreporting at landing

3. Fleet and vessel level trend analysis
   Aggregate over time:
    - EM-retained vs landed ratios by vessel
    - Species-specific conversion stability
    - Sudden shifts in landing composition

🚩 This combination can indicate: One vessel consistently landing less than EM predicts, steep-changes after regulation updates, outliers relative to peer vessels

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Proposed ways to use high seas boarding inspections to cross-check EM data?

1. Cross-check vessel activity state
2. Compare retained catch onboard vs EM expectations
3. Validate EM system integrity

BACKGROUND INFORMATION FOR ERANDEM-IWG08 2 APRIL 2026

Attachment 1

Below is an example of re-analysis metrics used by the Nature Conservancy in support of The Tuna Transparency Pledge (TTP), an initiative led by The Nature Conservancy (TNC) with support from a variety of NGO, industry, and governmental collaborators to achieve 100% on-the-water monitoring—via electronic monitoring (EM) and/or human observers—across all industrial tuna fishing vessels.

Catch Events

EM Service Providers are expected to meet the following data performance standards for catch events, which will be validated through the third-party audit process.

Catch Type	**Data Element**	**Required Alignment with Third-Party Audit Review**
Total	Total count of retained catch events	+/- 5%
Total	Total count of non-retained catch events	+/- 5%
Target Species	Total count of retained target catch	+/- 5%
Target Species	Total count of retained target catch by species	+/- 10%
Target Species	Total count non-retained target catch	+/- 10%
Target Species	Total count non-retained target catch by species	+/- 20%

Primary Non-Target Species	Total count of retained primary non-target catch	+/- 5%
Primary Non-Target Species	Total count of retained primary non-target catch by group (e.g., tuna, billfish)	+/- 5%
Primary Non-Target Species	Total count of retained primary non-target catch by species	+/- 10%
Primary Non-Target Species	Total count of non-retained primary non-target species	+/- 10%
Primary Non-Target Species	Total count of non-retained primary non-target catch by group (Tuna, billfish)	+/- 10%
Primary Non-Target Species	Total count of non-retained primary non-target catch by species	+/- 20%
Secondary Non-Target Species	Total count of secondary non-target catch by group (e.g., tunas, billfishes, rays, other bony fishes)	+/- 25%
ETP Species	Total ETP Catch Events	+/- 10%
ETP Species	Total turtle catch events	+/-10%
ETP Species	Total shark catch events with species brought onboard identified to the species level	+/- 10%

ETP Species	Total shark catch events not brought onboard identified to the lowest order practicable	+/-20%
ETP Species	Total seabird catch events	+/- 20%
ETP Species	Total marine mammal catch events by species	+/- 10%

RAW EM VIDEO AND DATA STANDARDS (Example cont'd)

No more than 20% of the sets selected for review may have EM system or video quality issues flagged that prevent a full review of the set. EM quality issues due to crew failure to meet their EM duty of care or vessel monitoring obligations will not be included in this calculation. If the quality of raw EM video and data falls below this standard, the EM Service Provider must develop an improvement plan. This plan must be presented to the EM Program Coordinator who will approve implementation. If raw EM video and data quality continue to fall short of this quality standard, the fishing company/vessel may withhold payment for sets that are of insufficient quality for EM review and the supply chain sponsor withholds incentives for supplying raw material caught with EM.

A typical longline vessel will make approximately 180-250 sets per year which means that an average of 36-50 sets per vessel will be flagged for EM review. Based on this "typical vessel" and quality standard, between 9-12 sets selected for review may have insufficient quality for accurate analysis and be replaced with a substitute set for review and still meet the performance criteria.