



**Implementation of EMS and minimum standards in
ICCAT**

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*6th Workshop of an Electronic Monitoring System (EMS) in the Eastern Pacific Ocean (EPO)
(Online, 13/15 December 2023)*

ICCAT CICTA CICAA



SCRS EMS Subgroup - Background

- In 2019 ICCAT, established Recs 19-02 and 19-05 (pertaining to tropical tunas and billfishes):

The Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures (PWG), in cooperation with the SCRS, shall work to develop recommendations on the following issues for consideration at the 2021 annual meeting of the Commission:

*a) **Minimum standard for an electronic monitoring** system such as:*

(i) the minimum specification of the recording equipment (e.g. resolution, recording time capacity, data storage type, data protection)

(ii) the number of cameras to be installed at which points on board

*b) **What shall be recorded***

*c) **Data analysis standards**, e.g., converting video footage into actionable data by the use of artificial intelligence*

*d) **Data to be analyzed**, e.g., species, length, estimated weight, fishing operation details*

*e) **Reporting format** to the Secretariat*

*In 2020 **CPCs are encouraged to conduct trials** on electronic monitoring and report the results back to the PWG and the SCRS in 2021 for their review.*



SCRS EMS Subgroup

2019

ICCAT Comm requests SCRS to provide advice on EMS

2021

Creation of the EMS Subgroup
Revision of literature
(SCRS/2021/165)

2022

Longline fisheries:
Comparison EMS vs HO
Draft minimum standards
Adoption by the SCRS
(SCRS/2022/165)

2023

Purse Seines
Comparison EMS vs HO;
Draft minimum standard
Adoption by the SCRS
(SCRS/2023/151)

>= 2024

Continue work on EMS for other fleets of interest to ICCAT (smaller vessels, gillnets, coastal LL)

ICCAT Comm EMS WG

Creation of the Commission EMS WG, with a Subgroup for EMS Drafting

2022

Drafting of the ICCAT EMS Rec

2023

Nov 2023

Discussion and adoption of a final EMS Text by the ICCAT Commission



ST-09 – FISHING DATA (Form A)

Most “Fishing characteristics data” can be obtained with EMS

ST-09A DATA FIELDS			Possible to collect by human observers?	Possible to collected by EMS?	Notes
Fishing operations & fleets	Fish. Oper. (FO)	FO group ID	Not applicable	Not applicable	Coding variable applied post-processing
	Fleet attributes	Flag of Vessel (cod)	Yes	Yes	Obtained from EMS instalation ID
		Base port/zone	Yes	Yes	Obtained from EMS instalation ID
		Vessel (size class)	Yes	Yes	Obtained from EMS instalation ID
Temporal attributes	Year, month/trimester	Year	Yes	Yes	Need to assure the EMS system has a GPS or VMS included as standard
		T. Period (ID)	Yes	Yes	Need to assure the EMS system has a GPS or VMS included as standard
Geographical attributes	Resolution and position (Lat, Lon)	Square type (cod)	Yes	Yes	Need to assure the EMS system has a GPS or VMS included as standard
		Lat (centroid) (± dd.ddd)	Yes	Yes	Need to assure the EMS system has a GPS or VMS included as standard
		Lon (centroid) (± dd.ddd)	Yes	Yes	Need to assure the EMS system has a GPS or VMS included as standard
Effort attributes	All fishing gears	Gear group (cod)	Yes	Yes	
		Nº vessels	Not applicable	Not applicable	Grouping variable applied post-processing
		Nº Fish. Oper. (observed)	Not applicable	Not applicable	Grouping variable applied post-processing
		Fish Oper. Type (cod)	Yes	Yes	
		School type (cod)	Not applicable to LL	Not applicable to LL	Not applicable to LL
	Longline (LL) only	LL type	Yes	Yes	Possible with additional info from logbooks or the skiper. Should also be possible to detect the LL type/configuration with a camera recording the deployment
		Nº hooks (total)	Yes	Yes	Might be possible to get from logbooks. Could also count at deployment, as hooks/floats are seen with a deployment camera (but could be time consuming to count all hooks)
		No. hooks (observed)	Yes	Yes	
		Hook type (main)	Yes	Possible	Possible but need integration with additional info from logbooks or the skiper
		Set depth (hooks per basket)	Yes	Yes	Need to put cameras during deployment to count hooks between floats. Will also allow for total set effort (n hooks). Note that HBF might not be the best proxy for depth of setting
Mitigation measures (MM) on bycatch species	Seabirds	MM 1	Yes	Yes	Possible for EMS to detect some MM, like for example Tori line, night setting or painted bait.
		MM 2	Yes	Yes	Possible for EMS to detect some MM, like for example Tori line, night setting or painted bait.
	Other bycatch	MM 3	Yes	Yes	Possible for EMS to detect some MM, like for example Tori line, night setting or painted bait.
	Additional notes	Description (MM)	Yes	Yes	Optional field in ST-09. Possible to add information with any complimentary information



ST-09 – CATCH DATA (Form B)

Most “Catch data” can be obtained with EMS, but there might be the need for some adaptations

ST-09B DATA FIELDS		Collected by human observers?	Collected by EMS?	Notes	
Catch composition by fishing op	Fish. Oper. (FO)	FO group ID	Not applicable	Not applicable	Coding variable applied post-processing
	Species (attributes)	Species (cod)	Yes	Yes	EMS could have problems with identification of bycatch that are not brought onboard, and in those cases higher level taxa ID is likely needed. As a standard, the EMS system should have one camera for the retained species and another for the area close to the vessel in cases they cut the line for discarding. For the retained catch EMS systems record video that can be seen many times, while human observers have the advantage of being able to look into detailed taxonomic characteristics if needed.
		Targeted (Y/N)?	Yes	Possible	
		Catches (retained)	Weight (kg)	Yes	
	Product type (cod)		Yes	Possible in some cases	Both HO and EMS could only do in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (some large LL only). If the vessels have scales, could put cameras facing the scales.
	Number (catch number)		Yes	Yes	
	Discards (Number)	Dead (DD)	Yes	Possible in some cases	Important to be collected (even for some management recommendations and compliance issues). The EMS would need cameras or other systems in specific positions to determine specimen condition at release. Need video and not only still images. Requires review of all relevant video footage to get total numbers
		Alive (DL)	Yes	Possible in some cases	Important to be collected (even for some management recommendations and compliance issues). The EMS would need cameras or other systems in specific positions to determine specimen condition at release. Need video and not only still images. Requires review of all relevant video footage to get total numbers
		Unknown	Yes	Yes	Important to be collected (even for some management recommendations and compliance issues). The EMS would need cameras or other systems in specific positions to determine specimen condition at release.
	Sampling (data)	Nº sampled	Yes	Yes	

Note: many types of scientific data collected by observers are possible to collect through EMS, but some are much more labor intensive to obtain (e.g. reviewing many hours of video footage, placing catch in specific places for measurements, cameras at specific locations for discards, etc).



ST-09 – BIOLOGICAL DATA (form C)

Collection of “**Biological data**” with EMS is more challenging and will need adaptations

Note: Some scientific important aspects, such as biological samples, are not possible to take with EMS Detailed data as sex of individuals is also not possible, only in a few very occasional cases of elasmobranchs

ST-09C DATA FIELDS		Collected by human observers?	Collected by EMS?	Notes	
Specimens & fishing operations	Specimen Identifier	Unique specimen ID	Not applicable	Coding variable applied post-processing	
		FO group ID	Not applicable	Coding variable applied post-processing	
		Species (cod)	Yes	Yes	
Biological data (observed)	Sex	Sex (cod)	Yes	Possible in some cases	With observers it is possible for elasmobranchs (externally) and bony fishes when they are eviscerated; With EMS might be possible for elasmobranchs with specific specimen position by the crew and cameras
		Size	Length (cm)	Yes	
	Weight	Size class type (cod)	Yes	Yes	Both HO and EMS can only do in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (some large LL only). If the vessels have scales the HO can take weights directly. For EMS might be possible to put cameras facing the scales, or there might be a way to connect the scales to the EMS directly
		Weight (kg)	Yes	Possible in some cases but need adaptations	
		Product type (cod)	Yes	Possible in some cases but need adaptations	
		Samples obtained (Y/N)	Genetics (YN)?	Yes	
	Otoliths (YN)?		Yes	No	Collection of samples by HO depends on the logistics onboard, specific studies objectives, etc
	Stomach (YN)?		Yes	No	Collection of samples by HO depends on the logistics onboard, specific studies objectives, etc
	Gonads (YN)?		Yes	No	Collection of samples by HO depends on the logistics onboard, specific studies objectives, etc
	Release attributes and others	Condition (external injuries)	Released (YN)?	Yes	Possible in some cases
Injuries (scale)			Possible in some cases	Possible in some cases	Injuries from depredation or from the fishing process can be seen sometimes. But if the specimens are released in the water it might be difficult for both HO and EMS
Others		Tag number	Yes	No	
		Notes	Yes	Yes	Any additional notes can be input both by HO and EMS visualization



SCRS Minimum Technical Standards for EMS in LL and PS

Standards described in this presentation in the following slides

- *1) Standards for onboard EM system technology, including equipment and camera system requirements, installation and maintenance;*
- *2) Standards for data storage requirements and what data are subject to those provisions;*
- *3) Standards for data collection, review and transmission to ICCAT;*
- *4) Standards for data protection and potential privacy issues.*



SCRS Minimum Technical Standards for EMS in LL and PS

1) Standards for onboard EM system technology, including equipment and camera system requirements, installation and maintenance

- Capable to **resist rough conditions at-sea with minimum human intervention.**
- Linked to a **receiver which records for e.g., coordinates, speed, and heading data** (e.g., GPS).
- **Battery backup** with capacity to allow proper shutdown and not corrupt the data if power from the vessel fails.
- **Proof against any manual data input or external data manipulation**, and record any attempt to tamper with the equipment or the archived data.
- Specifications for EMS should be based on performance standards rather than being too prescriptive in terms of pure technical requirements.
- Cameras must be placed to **provide clear, unobstructed views of the areas that are being covered.**
- Vessels should be equipped with a sufficient number of cameras to allow data collection to the required standards (examples in next slides)



SCRS Minimum Technical Standards for EMS in LL

- Example of a 4 camera set-up for pelagic LL vessels scientific EMS

Camera location	Action covered	Possible data collected
Aft of the boat	Setting operation	Set position, date, time
		Total number of hooks, hook types, hooks between floats
		Bait type/species
		Bait ratio (%)
		Mitigation measures used (painted bait, tori lines, line weight)
Work deck	Catch at hauling	Species ID/composition
		Specimen sizes
	Condition (dead/alive)	
	Fate (retained/discarded)	
	Discarding (if hauled before discarded)	Predators observed
		Discards by set
Processing area	Catch while processing	Discards ID/composition
		Species ID/composition
		Total catch by set
		Specimen sizes
		Sex
		Weights?
Surrounding water area	Discarding (if discarded in the water)	Product type (fresh/processed)
		Discards by set
		Discards ID/composition
		Condition of discards?



SCRS Minimum Technical Standards for EMS in Purse Seines (TT)

Example of a 7-camera set-up for Purse seine vessels (targeting TT) scientific EMS

- (note that some locations might need more than 1 camera, e.g., conveyor belt)

Cameras location	Action covered	Possible data collected
Work deck (Port side)	Brailing	Total catch by set
	Tuna discards	Total tuna discards by set
	Bycatch handling	Bycatch estimation
Work deck (Starboard side)	Bycatch handling	Bycatch estimation
In-water purse seine area	Brailing	Total catch by set
	Bycatch handling of big species (E.g., whale sharks, manta rays)	Total bycatch by set Best practices
	Bycatch release of big species (whale sharks, manta rays...)	Total bycatch by set Best practices
Foredeck or amidships	FAD activity (e.g., deploying, replacement, reparation)	Total number of FAD activities by trip and FAD design.
Well deck and conveyor belt	Catch well sorting	Species composition
	Bycatch discarded, released or retained	Total bycatch by set Species composition



SCRS Minimum Technical Standards for EMS in LL and PS

1) Continuation: Standards for onboard EM system technology, including equipment and camera system requirements, installation and maintenance

- Crew should ensure that all specimens caught, even the discards, are **handled in a manner that enables the video to record such specimens.**
- Assumed that most cases will be **using video are the primary data collection** method, but it **may be possible for some CPC's to collect the data with still images.**
- **Quality of the data must be sufficient to allow species ID and detailed measurements of specimens.**
- Suggested video with a minimum 720p resolution, and a minimum of 5-10 FPS. For still images, suggested a minimum resolution of 2MP, with a rate of image capture determined by the characteristics of each fishery
- System should be **independent from the crew** (exception of some basic maintenance such as periodically cleaning the camera lenses).
- Can **have sensors and be capable of recording** only during the period of operations that must be recorded according to ICCAT requirements (e.g., setting, brailing, sorting, discarding, FAD deployment-retrieval-visit)



SCRS Minimum Technical Standards for EMS in LL and PS

1) Continuation: Standards for onboard EM system technology, including equipment and camera system requirements, installation and maintenance

- Include a **control box that receives and stores the raw data provided by the sensors and cameras.**
- Include a wheelhouse monitor with a user interface to **provide information about the functioning of the system and for the vessel operator to monitor the control box, and cameras .**
- The EMS should have a **self-diagnostic test for functionality of the system components,** and record the outcome of the tests



SCRS Minimum Technical Standards for EMS in LL and PS

2) Standards for data storage requirements and what data are subject to those provisions

- Must contain **data storage systems adequate for the trip duration** that each national program is designed to cover.
- Regulations relating to **data storage and transmission should be flexible as new technology may allow for different ways of storing or transmitting data** that are less logistically challenging or more efficient.
- System must be **verified to be functioning properly before the start of each trip, remain powered on and positioned correctly for the duration of each trip.**



SCRS Minimum Technical Standards for EMS in LL and PS

3) Standards for data collection, review and transmission to ICCAT

- EMS should be able to collect the observer data that is required to be submitted to ICCAT (ST-09).
- EMS cannot fully replace all the functions of human scientific observers, such as biological sampling. EMS should be used as a complement or supplement to such programs, and a minimum human observer coverage should still be maintained for scientific purposes.
- There may be the need for CPCs to train EM analysts for their programs. ICCAT Secretariat might be involved in providing standardized training programmes to be followed by each CPC.
- Size measurements:
 - For LL: should be taken more easily in LL (both target and bycatch).
 - For PS (target species), the catch is very large and processed quickly, so it is difficult to take sizes onboard. Better to rely on sampling in port at this point.
 - For PS (bycatch) (e.g., sharks, turtles) it might be possible to take size measurement.
 - On all cases (LL and PS), specimens need to be positioned by the crew onboard in one or more calibrated areas (example provided in next slide)



SCRS Minimum Technical Standards for EMS in LL and PS

3) Standards for data review and transmission to ICCAT

- **Example of a calibrated hatch onboard a commercial fishing vessel.** These areas will vary from vessel to vessel, depending on available surfaces and the species (sizes) being measured.



(Source: CEFAS)



SCRS Minimum Technical Standards for EMS in LL and PS

3) Standards for data review and transmission to ICCAT

- Based on a **decentralized system**. The CPCs are responsible to analyze the recording and extract the data to be submitted to ICCAT.
- Data should be subject a **quality control (QC) procedure**, as is standard with most observer programmes.
- **Submission of EMS data should comply with the Task 1, 2, and 3 data submission forms and deadlines** established by the SCRS and adopted by the Commission.



SCRS Minimum Technical Standards for EMS in LL and PS

4) Standards for data protection and potential privacy issues

- With a decentralized program, **the aspects relative to potential privacy issues of the crew depend on national regulations and legislation.**
- In such a system, **only the CPC that is responsible for the collection of the data has access to the original/raw video recordings.**
- What is **submitted to ICCAT is the data extracted from those original recordings.**
- Data submitted to the Secretariat should follow the **ICCAT Rules and Procedures for the Protection, Access to, and Dissemination of Data**



ICCAT Recommendation adopted in the ICCAT Plenary meeting in Nov 2023 (PWG 415B/2023)

Main points agreed by ICCAT:

- **Decentralized system:** each CPC runs its own program and submits data to ICCAT (similar to ICCAT Obs prog)
- Minimum data requirements and standards for **both compliance and scientific purposes:** LL and PS.
- EMS is **optional for CPCs:** EMS is “just another tool” that can be used for CPCs to achieve the requirements established in other ICCAT management obligations.
- For scientific purposes, **CPCs need to maintain the minimum human observer coverage** (established in the Obs. Program Standards from 2016 - 5% for most generic cases), and EMS can only be used as a supplement.
- Provides the **technical details on the EMS minimum requirements:** but not too prescriptive, based mostly on standards to be achieved.
- CPCs need to **develop and provide “Vessel Monitoring Plans (VMP)” and “EMS Domestic Plans”**, specifying how EMS is used by their vessels/fleets and managed by the national authorities to achieve the requirements.
- **Financial support** for EMS implementation in developing countries
- **Periodic reviews every 4 years**
- Engage in **coordination on EMS activities and programs with other tuna RFMOs**



Thank you!