IOTC-2022-WGEMS02-INF09

UPDATE FROM THE SCRS SUBGROUP ON EMS

Presentation from the SCRS EMS Subgroup for the

2ST MEETING OF THE ICCAT WORKING GROUP ON EMS

Online, 6-7 June 2022

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.*

- **This request started to be addressed by the Billfishes Species Group in 2021** (BILL meeting, March 2021)

SCRS EMS Subgroup – updates

- The SCRS provided an update during the 1st EMS meeting (28 Feb), with regards to the work achieved in 2021 and early 2022
  - Revision of literature with regards to EMS trials (mostly in comparison with HO)
  - Comparison of what can be achieved with EMS vs HO (using ST-09 fishery observer data)

- The work since has focused mostly on developing the minimum standards for Scientific pelagic LL fisheries

- Here we will provide the following:
  - Summary of the comparison between EMS and HO for scientific ICCAT data (from ST-09)
  - Status of the development of the pelagic LL minimum standards

NOTE: What we are presenting here is preliminary ongoing work – Not yet seen or adopted by the SC-STATS and SCRS

ST-09 – FISHING DATA

Most "Fishing caracteristics 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	Migth 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 migth 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

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 operation	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 advantadge of being able to look into detailed taxonomic caracteristics if needed.
		Targeted (Y/N)?	Yes	Possible	Possible but need integration with additional info from logbooks or the skiper
	Catches (retained)	Weight (kg)	Yes	Possible in some cases	Both HO and EMS could only do in vessels that have scales to weigth individual specimens. Most vessels don't have these onboard (some large LL only). If the vessles have scales, could put cameras facing the scales. Or there might be a way to conect the scales to the EMS directly
		Product type (cod)	Yes	Possible in some cases	Both HO and EMS could only do in vessels that have scales to weigth individual specimens. Most vessels don't have these onboard (some large LL only). If the vessles 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 recomendations 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 recomendations 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 recomendations 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

Collection of "Biological data" with EMS is more chalenging and will need adaptations

ST-09C DATA FIELDS			Collected by human observers?	Collected by EMS?	Notes
Specimens & fishing operations (FO)	Specimen Identifier	Unique specimen ID	Not applicable	Not applicable	Coding variable applied post-processing
		FO group ID	Not applicable	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 elasmos (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	Yes	Possible if the crew positions the specimens in front of a specific camera for measurements. Need for calibrated areas
		Size class type (cod)	Yes	Yes	
	Weight	Weight (kg)	Yes	Possible in some cases but need adaptations	Both HO and EMS can only do in vessels that have scales to weigth 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 migth be possible to put cameras facing the scales, or there might be a way to conect the scales to the EMS directly
		Product type (cod)	Yes	Possible in some cases but need adaptations	Both HO and EMS could only do in vessels that have scales to weigth individual specimens. Most vessels don't have these onboard (some large LL only). If the vessles have scales, could put cameras facing the scales. Or there might be a way to conect the scales to the EMS directly
	Samples obtained (Y/N)	Genetics (YN)?	Yes	No	Collection of samples by HO depends on the logistics onboard, specific studies objectives, etc
		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	The operation is visualized by seeing the surrounding water. If the catch is not hoisted but part of the body is seen, it is sometimes possible to reach the level of the genus (e.g., Alopias, Sphyrna). Also in leatherback turtles. In other species (e.g., hardsheel turtles, other fishes), if they are not hoisted to remove the hook it is more complicated to reach the species or even genus. Depends also on the cleanliness of the cameras and the release maneuver.
		Injuries (scale)	Possible in some cases	Possible in some cases	Inuries from depredation or from the fishing process can be seen sometimes. But if the specimens are released in the water it migth 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

Note: Some scientific importante aspects, such as biological samples, are simply not possible to take with EMS

Aspects related the EMS minimum standards for LL

Objectives of the EMS (Commission to decide details)

- At the SCRS level, the priority is **implementing EM systems that allow the collection of fisheries data that are usable for scientific purposes**.

- Should be designed in a way which **compliments, and to the extent possible is consistent, with what is currently collected by human observers**.

- EM systems may also be used for compliance and other purposes. As such, any EM system to be implemented should be done in a way that can address both scientific data collection and compliance objectives.

- **Note**: Scientific data often must be collected at a finer resolution (e.g. spatial, temporal) than would be required for compliance purposes. **In such a situation, meeting the minimum requirements needed for science, would likely allow use in both scenarios**.

Aspects related the EMS minimum standards for LL

Structure (who is responsible - Commission to decide details)

Option 1: Decentralized system:

- **Each CPC is responsible for the EM system implementation in its own fleets**, including the recordings, processing and data extraction, and submission of data to ICCAT
- **Similar to what currently exists for national human observer programs** for scientific purposes.
- Costs are borne by CPCs programme, so there would be **little financial costs for the Commission and less administrative burden on the ICCAT Secretariat**.
- Potential **issue with inconsistent implementation of the EM requirements across the ICCAT membership** – as has been the case with regard to the implementation of ICCAT's minimum standards for scientific observer programs (Rec. 16-14).

Aspects related the EMS minimum standards for LL

Structure (who is responsible - Commission to decide details)

Option 2: Centralized system:

- A system that would be **coordinated at the Secretariat level**.
- Benefits are **more consistent implementation across the ICCAT membership**.
- More significant challenges associated with this approach, particularly related to the **financial costs to the Commission and the administrative burden on the Secretariat**.
- Issues of data sharing and **confidentiality (e.g., raw videos) would also need to be addressed**.

There are important trade-offs associated with the approach selected, which should be further considered by scientists and managers.

In consideration of data needs and given the significant financial costs and other development and implementation challenges associated with a centralized EM system, the sub-group has focused on the development of input related to a decentralized system

Aspects related the EMS minimum standards for LL

Periodic reviews

- EM systems should have **regular evaluations** to ensure it reaches the objectives outlined.
- These also **give opportunity to incorporate new technologies** (i,e., improved cameras, artificial intelligence) as they become available, as well as updated and incorporate new objectives.
- A **review framework should also allow a faster implementation** of the updated minimum standards, that can be reviewed and adapted as needed in the future.

Aspects related the EMS minimum standards for LL

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.*

Aspects related the EMS minimum standards for LL

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 EM systems **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** (we provide an example of a 4-camera system next)

Aspects related the EMS minimum standards for 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; hooks between floats
		Bait type/species
		Bait ratio (%)
		Some MM (painted bait, tori lines, line weight)
Work deck	Catch at hauling	Species ID/composition
		Specimen sizes
		Condition (dead/alive)
		Fate (retained/discarded)
		Predators observed
	Discarding (if hauled before discarded)	Discards by set
		Discards ID/composition
Processing area	Catch while processing	Species ID/composition
		Total catch by set
		Specimen sizes
		Sex
		Weights?
		Product type (fresh/processed)
Surrounding water area	Discarding (if discarded in the water)	Discards by set
		Discards ID/composition
		Condition of discards?

Aspects related the EMS minimum standards for LL

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 to the extent possible**.
- 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**.
- System should be **independent from the crew during the trip**, with the exception of some basic maintenance such as periodically cleaning the camera lenses.
- It is in general not necessary to record 24h/day, but only when relevant operations are taking place, to save storage space. The EM system **could have sensors and be capable of recording** only during the period of gear deployment (aft camera) and gear retrieval (work deck, processing area, surrounding water cameras).
- The system should have a wheelhouse monitor with a **user interface for the vessel operator to monitor the control box, cameras** and provide information about the system.

Aspects related the EMS minimum standards for LL

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**.

Aspects related the EMS minimum standards for LL

3) Standards for data review and transmission to ICCAT

- In decentralized system, **raw data/images is managed by each CPC**.
- **Review of the video footage is done by the CPCs** authorities and/or by a contracted EM service provider.
- Each CPC national program must **assure that the observer data required by ICCAT (ST-09) should, at minimum, be collected by the EM system**.
- EM systems cannot fully replace all the functions of human-based scientific observer programs. Given that, **EM should be used as a complement or supplement to such programs (not full replacement)**, and a **minimum Human Observer observer coverage should still be maintained for scientific purposes (e.g., 5%)**.
- There may be the **need for CPCs to train EM analysts for their programs**. ICCAT Secretariat might be involved in providing standardized training for EM analysts or signoff/approve training programmes followed by each CPC.
- For size measurements to be taken, **catch will need to be presented by the crew onboard in one or more calibrated areas** (example provided in next page)

Aspects related the EMS minimum standards for LL

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.

Aspects related the EMS minimum standards for LL

3) Standards for data review and transmission to ICCAT

- Once data is collected it should be subject a **quality checking (QC) procedure**, as is standard with most observer programmes, to ensure data quality.
- **CPCs are responsible for the data transmission to the ICCAT Secretariat**.
- The **electronic ICCAT ST-09 form should be used**, or any other forms that are in the future developed and approved by the SCRS for EM reporting.

Aspects related the EMS minimum standards for LL

4) Standards for data protection and potential privacy issues

- With a decentralized program, in which each CPC is responsible for the implementation, recordings, extraction of data, and submission of data to ICCAT, **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 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**

Next steps (ongoing work in 2022)

- **Continue the work and present the final recommendations to the SCRS in 2022**:
  - The Subgroup **continues to work in 2022** (frequent ~2h meetings, every 5-6 week and intersessional work)
- **Aim to finalize work on:** Final document with these technical specifications of minimum standards that were blriefly presented here (nº of cameras and location, etc)
- **The final recommendations from the Subgroup will be presented to the SCRS/SC-STATS in September 2022.**

Thank you

Questions?
Suggestions?