SCRS/2022/165

REPORT OF THE SUB-GROUP ON ELECTRONIC MONITORING SYSTEMS: PROPOSAL OF DRAFT ICCAT MINIMUM TECHNICAL STANDARDS FOR EMS IN PELAGIC LONGLINERS

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SUMMARY

This report summarizes the work that has been carried out to date by the Sub-Group on Electronic Monitoring Systems, (EMS) since it was originally created in 2021. We provide a summary of the main conclusions of the work that was carried out, and also a proposal with the draft minimum technical standards for implementation of EMS in pelagic longliners in ICCAT fisheries. Finally, we provide a draft response to the Commission following the request contained in ICCAT Rec 19-05 (paragraph 20).

KEYWORDS: Electronic Monitoring Systems (EMS), Pelagic Longline Fisheries.

1. Introduction

ICCAT Recommendations 19-05 and 19-02 asked the SCRS to work with the Integrated Monitoring Measures (IMM) Working Group to develop minimum standards for Electronic Monitoring Systems (EMS). Within the SCRS this issue started to be addressed by the Billfishes Species Group in 2021, especially regarding pelagic longline fisheries. At the 2021 Billfishes intersessional meeting a EMS Sub-group was created dedicated to technical aspects of EMS and to address this Commission request.

It was noted that for purse seine fisheries there are already minimum standards agreed by the SCRS for fleets that voluntarily wish to adopt and implement those (see Ruiz et al. 2017 for the minimum standards for purse seine fisheries, and the Recommendations that are contained in the Reports of the SCRS in 2016 and 2017). As such, the Subgroup agreed that the focus within the Billfishes request and this Subgroup should be mainly on pelagic longline fisheries, while also noting that other fisheries (e.g., gillnets) also need to be addressed at a later stage.

The previous reports on the progress of this Subgroup are contained in paper SCRS/2021/165 (Anonymous, 2021). Progress of the Subgroup ongoing work has been presented to the Commission during the following meetings: 2021 Meeting of the IMM Group (online, 14-17 June 2021), 1st meeting of the ICCAT working group on EMS (online, 28 February 2022), and 2nd meeting of the ICCAT working group on EMS (online, 6-7 June 2022). Finally, and in order to have some harmonization between EMS that are being considered at the various t-RFMOs, presentations with the progress of this Subgroup have been presented to other t-RFMOS, namely IOTC (1st meeting of the IOTC Working Group on Electronic Monitoring, online, 15-18 Nov 2021) and IATTC (3rd Workshop of an EMS in the EPO IATTC, online, 25-27 April 2022).

In this paper we summarize the main progress and conclusions of this Subgroup work, and present a proposal with the draft Minimum Technical Standards for EMS in pelagic longliners in ICCAT fisheries. We also provide a draft response for the commission request within ICCAT Rec 19-05 (paragraph 20).

2. Summary of the work carried out by the Subgroup on EMS

After the creation of the EMS Subgroup at the Billfishes Species Group meeting in March 2021, the EMS Subgroup convener (Rui Coelho, EU.Portugal) created a mailing list with all the participants that communicated interest in being part of the Subgroup. The initial mailing list was created mainly from the participants at the 2021 Billfishes Species Group, that was then expanded in later 2021 at the SCRS Species groups meetings, informing all participants that anyone interested in joining should contact the convener by e-mail. All correspondence and exchange of documentation included all the interested participants that had communicated interest in being part of the EMS Subgroup. A list of the current Subgroup participants can be consulted in **Annex 1** of this report.

All the work carried out by the Group was done online, mostly with online meetings (Zoom platform) and having the documentation deposited in the ICCAT google drive repository. The various online meetings took place on the following dates: 13th May 2021, 16th July 2021, 20 January 2022, 17 February 2022 and 27 April 2022. Additionally, considerable inter-sessional work was carried out by working collaboratively on the documentation in the online repository.

2.1. Revision of previous works comparing EMS with Human Observers

During the 1st phase of the work that took place in earlier 2021, the Subgroup compiled a list of previous works focusing on EMS in comparison with human observers. Each paper was assigned a reviewer within the members of the Subgroup. The table with the revisions that were carried out can be consulted at:
https://docs.google.com/spreadsheets/d/1Ju8WQM-0flSxbw82prdHDX-lbg22yIFL/edit?usp=sharing&ouid=116962690323673350428&rtpof=true&sd=true

The main outcomes of these revisions were presented to the SCRS in 2021 under document SCRS/2021/165 (*Anonymous*, 2021).

At the 2021 SCRS meeting, it was decided that the EMS Subgroup should continue its work in later 2021 and during 2022, in order to report the final conclusions to the Sub-Committee on Statistics (SC-STATS) during the SCRS Species Groups Meetings in September 2022.

2.2. Comparison of what can be recorded with human observers versus EMS

The work of the Subgroup in later 2021 and early 2022 focused mostly on completing and discussing what data can be recorded with EM systems versus at-sea human observers. The starting point for this in the context of ICCAT pelagic longlines was the ICCAT form ST-09 that is currently used for reporting at-sea observer data (Form A on fishing activity, Form B on catches and Form C on samples).

The outputs of this comparative work are presented in **Annex 2** of this report.

2.3 Proposal of Draft ICCAT Minimum Technical Standards for EMS in pelagic longliners

Finally, the last phase of the work of the Subgroup was to create a draft proposal for ICCAT minimum standards for EMS in pelagic longline fisheries. This work took most of the time of the Subgroup in 2022.

This draft proposal is presented in **Annex 3** of this report.

2.4. EMS terminology

EMS uses specific terminology such as EM records, EM analysis, EM data, etc. It will be important in the near future to have such terminology clearly defined. In this document we do not provide specific definitions of terminology as the Subgroup has not addressed this issue. But we provide here links to the work of other t-RFMOS that can be used as a basis for ICCAT in the interest of t-RFMO harmonization, namely for IOTC[1] and IATTC[2].

4. Draft answer to Commission request (ICCAT Rec 19-05, paragraph 20)

Following the Commission request contained in Rec 19-05 (paragraph 20) a Subgroup within the Billfishes Species Group was created in 2021 to address this issue. The Subgroup noted that there are already minimum standards recommended by the SCRS for EMS on purse seine fisheries (Ruiz et al., 2017) which were endorsed by the Commission. The Subgroup then focused most of its work on pelagic longline fisheries, noting that other fisheries (e.g., gillnets) also need to be addressed in the future.

The Subgroup worked intersessionally during 2021 and 2022, focusing on the following items: revision of previous literature comparing human observers with EMS, comparison of what data can be collected by human observers versus EMS specifically for ICCAT pelagic longline fisheries (using ICCAT observer data form ST-09), and creating a draft proposal for ICCAT EMS minimum standards for pelagic longlines.

The summary of the main work and conclusions from this Subgroup was presented to SC-STATS in 2022 under document (SCRS/2022/165 – *this document*). **Annex 3** of that document provides specifically the draft proposal for ICCAT EMS minimum standards for pelagic longlines.

7. References

Anonymous, 2021.Report of the Sub-Group on Electronic Monitoring Systems from the Billfishes species group. SCRS/2021/165. Collect. Vol. Sci. Pap. ICCAT, 78(10): 5-9.

Ruiz, J., Krug, I., Justel-Rubio, A., Restrepo, V., Hammann, G., Gonzalez, O., Legorburu, G., Pascual-Alayón, P.J., Bach, P., Bannerman P., and Galán, T. 2017. Minimum standards for the implementation of electronic monitoring systems for the tropical tuna purse seine fleet. *Collect. Vol. Sci. Pap. ICCAT*, 73 (2): 818-828.

[1] https://iotc.org/documents/WGEMS/02/03

[2] https://iattc.org/GetAttachment/a5d41968-7690-4bf2-9089-809394a89752/C-21-03-Active_Electronic-Monitoring-System-(EMS)-Definitions.pdf

SCRS, 2016. Report of the Standing Committee on Research and Statistics (SCRS). Madrid, Spain, 3 to 7 October 2016.

SCRS, 2017. Report of the Standing Committee on Research and Statistics (SCRS). Madrid, Spain, 2 to 6 October 2017.

Annex 1: Current list of the EMS Sub-Group participants.

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Annex 2: Tables with comparison between what can be recorded with human observers versus EMS, using the current ICCAT ST-09 data fields. We provide here 3 tables, namely for each form (A, B and C) contained in file ST-09, specifically: Form A - fishing activity, Form B – Catches, Form C – Samples.

ST-09 (FORM A) – FISHING ACTIVITY			**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 installation ID
		Base port/zone	Yes	Yes	Obtained from EMS installation ID
		Vessel (size class)	Yes	Yes	Obtained from EMS installation ID
Temporal attributes	Year, month/trimester	Year	Yes	Yes	Need to assure the EMS has a GPS or VMS included as standard
		T. Period (ID)	Yes	Yes	Need to assure the EMS 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 has a GPS or VMS included as standard
		Lat (centroid) (± dd.ddd)	Yes	Yes	Need to assure the EMS has a GPS or VMS included as standard
		Lon (centroid) (± dd.ddd)	Yes	Yes	Need to assure the EMS 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 longline fisheries
	Longline (LL) only	LL type	Yes	Yes	Possible with additional info from logbooks or the skiper. Should also be possible to detect the longline 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	Same as above
		Hook type (main)	Yes	Possible	Possible but might need integration with additional information 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 (nº 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 (FORM B) – CATCH			**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 should have one camera for the retained species and another for the area close to the vessel in cases the line is cut for discarding. For the retained catch, EMS 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	Possible but need integration with additional information from logbooks or the skipper
	Catches (retained)	Weight (kg)	Yes	Possible in some cases	Both Human Observers and EMS could only record weight in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (usually only some large longliners have those). If the vessels have scales, it might be possible to adapt cameras facing the scales. Or there might be a way to connect the scales to the EMS directly
		Product type (cod)	Yes	Possible in some cases	Both Human Observers and EMS could only record weight in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (usually only some large longliners have those). If the vessels have scales, it might be possible to adapt cameras facing the scales. Or there might be a way to connect the scales to the EMS directly
		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. Would 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. Would 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	

ST-09 (FORM C) – SAMPLES (OPTIONAL)			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 elasmobranchs (externally) and bony fishes only 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 Human Observers and EMS can only do in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (some large longliners). If the vessels have scales the Human Observer 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
		Product type (cod)	Yes	Possible in some cases but need adaptations	Both Human Observers and EMS can only do in vessels that have scales to weigh individual specimens. Most vessels don't have these onboard (some large longliners). If the vessels have scales the Human Observer 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
	Samples obtained (Y/N)	Genetics (YN)?	Yes	No	Collection of samples by Human Observers depends on the logistics onboard, specific studies objectives, etc. Not possible for EMS

		Otoliths (YN)?	Yes	No	Collection of samples by Human Observers depends on the logistics onboard, specific studies objectives, etc. Not possible for EMS
		Stomach (YN)?	Yes	No	Collection of samples by Human Observers depends on the logistics onboard, specific studies objectives, etc. Not possible for EMS
		Gonads (YN)?	Yes	No	Collection of samples by Human Observers depends on the logistics onboard, specific studies objectives, etc. Not possible for EMS
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*), and also for leatherback turtles. In other species (e.g., hard-shell turtles, other fishes), if they are not hoisted to remove the hook it is difficult to reach to the species and sometimes even genus level.
		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 Human Observers and EMS
	Others	Tag number	Yes	No	
		Notes	Yes	Yes	Any additional notes can be input both by Human Observers and EMS visualization

Annex 3:

Draft ICCAT Minimum Technical Standards for EMS in pelagic longliners

Objectives

For the SCRS, the priority for electronic monitoring systems (EMS) is to implement them in a way that will allow the collection of fisheries data that are usable for scientific purposes. They should be designed in a way that complements, and to the extent possible, is consistent with what is currently collected by human scientific observers. The SCRS also recognizes that EMS may also be used for compliance and other purposes. As such, EMS should be implemented in a way that can address both scientific data collection and compliance objectives. EMS intended to address both objectives should be designed to at least meet the requirements of the more demanding objective. For instance, scientific data often must be collected at a finer (e.g. spatial, temporal) resolution than would be required for compliance purposes. In such a situation, meeting the minimum requirements needed for science, would allow use in both scenarios.

Structure (who is responsible)

While there are several possibilities for the EMS program structure, the SCRS will discuss two: decentralized and centralized programs. A "decentralized system," is where each CPC is responsible for EMS implementation in its own fleets, including the recordings, processing, data extraction and summarization, and submission of data to ICCAT (based on minimum standards to be adopted by the Commission). This is similar to what currently exists at the level of national observer programs for scientific purposes in ICCAT, where each CPC is responsible for their own programs and for reporting the required data to ICCAT. Since the cost of implementing this approach would be borne by the CPCs, there would be little financial costs for the Commission to develop or implement the program and a lower administrative burden for the ICCAT Secretariat. A potential issue, however, is inconsistent implementation of the EMS requirements across the ICCAT members – as has been the case with regard to the implementation of ICCAT's minimum standards for scientific observer programs (Rec. 16-14).

Another approach to EMS is to establish a "centralized system" that would be coordinated at the ICCAT Secretariat level. The benefits of this approach include a more consistent implementation of EMS requirements across the ICCAT members. It might also benefit CPCs who lack the resources to set up their own local EMS databases and auditing infrastructure. There are, however, significant challenges that would be associated with this approach, particularly related to the financial costs to the Commission and the administrative burden for the ICCAT Secretariat. Among others, issues regarding data sharing and confidentiality would also need to be addressed.

It is clear that there are important trade-offs associated with the approach selected. In addition, as has been done in the case of human observer programs in ICCAT fisheries, it may also be feasible to develop a combination of the two approaches depending on data and compliance needs of the fishery. These questions and tradeoffs should be further considered by scientists and managers. Taking into consideration data needs and given the significant financial costs and other challenges associated with the implementation of centralized EMS however, the sub-group focused its work on the development of input related to a decentralized system. That said, a centralized program or combination of approaches could be considered in the future. The sub-group acknowledges, however, that such a structure or combination of approaches would require substantial additional work, as well as financial and administrative resources.

Periodic reviews

Electronic Monitoring systems should undergo regular evaluations to ensure they reach the outlined objectives. These periodic reviews also give the opportunity to incorporate new technologies (i,e., improved cameras, artificial intelligence) as they become available, as well as to update 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.

Standards described in this document

1) Standards for onboard EMS 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 reporting to ICCAT;
4) Standards for data protection and potential privacy issues.

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

Electronic Monitoring systems have to be capable to resist rough conditions at-sea with minimum human intervention. In many cases, proper maintenance and inspection can only be achieved at port, in-between long fishing trips.

The vessel owner/operator is responsible for notifying the national authority and/or the EMS service provider if their EM system is not functioning properly.

The EMS must be linked to a receiver (e.g., GPS, GNSS) which records vessel location, speed, and heading information, and is directly and continuously logged by the control box. The receiver must be installed and remain in a location where it continuously receives a strong signal.

The EMS should have a battery backup system with capacity to provide power if the main power source from the vessel fails, to allow proper shutdown of the system and not corrupt the data.

Access to administrative configuration tools and data must be password protected. The EMS must be proof against any manual data input or external data manipulation, and record any attempt to tamper with the equipment or the archived data.

The specifications for selecting, installing, operating, and maintaining EMS and their equipment (cameras, sensors, data storage devices, etc.) onboard vessels should be based on performance standards rather than being prescriptive in terms of pure technical requirements.

The video cameras must be mounted and placed so as to provide clear and unobstructed views of the areas that are being covered (see example table below). There must be sufficient lighting to clearly illuminate the area and the individual specimens captured. If vessels fish at night and use artificial lights to illuminate the deck, the quality of images under these circumstances should be checked to ensure there isn't excessive glare.

Longline vessels should be equipped with a sufficient number of cameras to allow data collection to the required standards (see table below for example of a 4-camera system), with sufficient resolution to determine the number, species, sizes and other details of the capture, and processing operations.

Crew should ensure that all specimens that are caught, even those that are released, are handled in a manner that enables the video system to record such specimens to the extent possible.

In most cases video will be the primary data collection method, but it may be possible for some CPC's to collect the data needed for ICCAT submission using still images. Whichever the chosen method, the quality of the data must be sufficient to allow species identification and detailed measurements of specimens. To allow this, it is suggested that cameras recording video must have a resolution of no less than 720p, with a minimum frame rate of 5-10 FPS. Where still images are captured, it is suggested they are captured with a resolution of no less than 2MP, with a rate of image capture determined by the characteristics of each fishery. For both data collection methods, there will be different implications for data storage which will need to be considered by the CPCs at the point of implementation.

The EMS 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 for the videos to record 24h/day, but only when relevant operations are taking place. For longline vessels, the EMS should be capable of initiating video recording, and record only during the period of gear deployment (aft camera) and gear retrieval operations (work deck, processing area, surrounding water cameras) (see Table 1 below for an example of camera locations/specifications). Electronic monitoring systems must continue to record for at least 30 minutes after the end of the haulback operation to ensure that there are recordings of the processing or discarding of all the specimens captured. The capability of initiating and ending the recording can be controlled by sensors that continuously monitor the hydraulic pressure signal and drum rotation sensors; these hydraulic pressures from the sensors should be recorded and stored by the control box.

The system must include a control box that receives and stores the raw data provided by the sensors and cameras.

A wheelhouse monitor must include a user interface to provide information about the functioning of the system and for the vessel operator to monitor the control box, and cameras. This can include details such as current date and time (synchronized via GPS/GNSS), vessel location, current hydraulic pressure reading, presence of a data disk, percentage used of the data disk, and video recording status.

The EMS should have a self-diagnostic test for functionality of the system components, and record the outcome of the tests.

Table 1: Example of a four-camera system EMS deployment for pelagic longlines.

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)
		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?

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

The control box must contain data storage systems adequate for the trip duration that each national program is designed to cover. Each vessel must have sufficient storage space for the specific trip duration.

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.

The 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.

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

Raw data (i.e, video recordings) will be managed by each CPC, which can designate a contracted EM service provider for its national program.

The review of the video footage for extraction of the data to be submitted to ICCAT should be done by the CPCs authorities directly, and/or by a contracted EM service provider assuring that EM records are analysed by a qualified and experienced EM analysts.

Each CPC must assure that the EMS should be able to collect, to the extent possible, the observer data that is required to be submitted to ICCAT (ST-09) or any subsequent update of the form.

Electronic Monitoring systems cannot fully replace all the functions of human scientific observer programs, such as biological sampling. Given that, EM should be used as a complement or supplement to such programs, and a minimum human observer coverage should still be maintained for scientific purposes. This is currently 5-10% for most ICCAT fisheries, although the SCRS has indicated in the past that higher coverages would be more appropriate.

The EMS analyses and data extraction require trained EMS analysts. One potential source are trained observers with at-sea experience, who are familiar with the fisheries and species identification. There may be the need for CPCs to train EMS analysts for their programs. The ICCAT Secretariat might be involved in providing standardized training for EMS analysts or signoff/approve training programmes implemented by each CPC, to improve and harmonize the data processing and extraction from the various national programs.

The analysis software should make entering the EMS records and generating the EM data as automatic as possible. This should include, among others, location, date, and time stamps on any activity identified by the cameras, as well as user-friendly tools to directly include information regarding the processed EMS data or reports, and generally expedite the EMS data analyses.

For measurements to be taken, catch will need to be positioned by the crew on one or more calibrated areas. A calibrated area is an area of known size, such as a hatch or area of the deck, that can be defined in the EMS analysis software (see example in **Fig. 1** below).

Fig. 1: 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 being measured. This image is provided as an example from a non-tuna fishery. For tuna and tuna-like fisheries, the defined areas will have to be larger to accommodate larger species.

Once data is collected, it should be subject to a quality control (QC) procedure, as is standard with most observer programmes, to ensure data quality. This procedure should be defined by each CPC and be repeatable. It may be necessary for minimum standards/requirements to be set for this procedure by the Commission.

Any conversion factors (e.g., length-length or length-weight) used by the CPCs must be reported to ICCAT and they should be the conversion factors adopted by the SCRS, when available.

CPCs are responsible for reporting the data to the ICCAT Secretariat using the ICCAT ST-09 electronic form, or any other forms that in the future might be developed and approved by the SCRS for EMS data reporting. Submission of EMS data should comply with the Task 1, 2, and 3 data submission deadlines established by the SCRS and adopted by the Commission.

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 issues related to the privacy or confidentiality of the data will depend on national regulations and legislation. In a decentralized system, only the CPC that is responsible for the collection of the data has access to the original recordings. Those original data are therefore managed directly by each CPC national authority.

Data submitted to the Secretariat should follow the ICCAT Rules and Procedures for the Protection, Access to, and Dissemination of Data.