



CCSBT-CC/2310/Info 01
(Originally CCSBT-EMS/2305/01)

Discussion Paper on Electronic Monitoring (EM) and Associated Systems

1. Introduction

Following discussions at the Third Meeting of the Technical Compliance Working Group (TCWG 3) and the Seventeenth Meeting of the Compliance Committee (CC 17)¹, CC 17 agreed the following Workplan item for 2023 - to:

“Convene an intersessional working group and meet virtually to consider some of the key EMS-related issues discussed at CC17, including data requirements for EM. The Executive Secretary and CC Chair are to prepare a discussion paper for the meeting and meeting outcomes are to be submitted to the ESC.”²

This discussion paper has been prepared by the Executive Secretary and CC Chair to provide relevant background material for the informal intersessional EM/S³ Working Group’s consideration. Currently the CCSBT does not have any agreed EM/S-specific guidelines or standards and only one Member has implemented EM/S to monitor its longline fisheries which catch Southern Bluefin Tuna (SBT).

It is proposed that the primary focus of this initial EM/S Working Group should be to broadly discuss the use of EM/S by CCSBT as an independent tool to collect and/or verify the information currently specified in CCSBT’s Scientific Observer Program Standards (SOPS)⁴. Discussions may include consideration of EM/S operational and data collection issues. Members may also wish to explore the possible use of EM/S to address potential information gaps that have not previously been resolved by using traditional human observers. A set of more specific objectives is provided below.

EM/S Working Group Objectives

The Executive Secretary and CC Chair envisage that the objectives of this Working Group should ideally be to discuss and then potentially agree and/or confirm:

- A set of draft high-level CCSBT Guiding EM/S Principles including:
 - A common understanding of EM/S and potentially draft definitions of EM/EMS;
 - Whether the use of EM/S by CCSBT Members is voluntary and can be used to complement human scientific observers; and

¹ **Attachment A** provides an oral report back on TCWG 3 by the CC Chair

² Paragraph 51 (dot-point 6) of CC17’s report clarifies that, “any work or future recommendations should be provided to the ESC for their consideration and input.”

³ The abbreviation EM/S is used to collectively refer to Electronic Monitoring and Electronic Monitoring Systems

⁴ Including for the collection and/or verification of information on SBT catch, effort and discards, as well as relevant information on interactions with Ecologically Related Species (ERS) such as the use of mitigation measures, and potential bycatch and/or releases.

- Whether EM/S information can be made available for assessing compliance e.g. compliance with some of CCSBT’s measures;
- A summary of meeting outcomes and any recommendations to provide to the next meetings of TCWG⁵, CC and ESC⁶ as appropriate, including any requests for advice; and
- A consideration and potential documentation of next steps.

To assist Working Group participants, this paper includes:

- Relevant background information (**Attachments A and B** and section 3 of this paper);
- A template document for Members to work towards populating with a proposed set of draft CCSBT high-level Guiding EM/S Principles including relevant definitions (**Attachment C**); and
- A table of the data elements currently required to be collected by CCSBT’s scientific observers⁷ with columns added (currently blank) to indicate if these elements can potentially be collected by EM/S (and when), and/or if they still need to be collected (**Attachment D**).

3. Background

3.1 What are Electronic Monitoring (EM) and EM Systems (EMS)?

It is important for CCSBT Members to have a common understanding of what constitutes Electronic Monitoring (EM) and Electronic Monitoring Systems (EMS) and to consider whether Members wish to refer to these elements separately or collectively.

In a paper⁸ Australia submitted to TCWG³⁹, “EM” and “integrated EM system” are described as:

“EM is a combination of hardware and software that collects records in an automated manner, which is closed to external or manual input (Dunn and Knuckey, 2013). On the vessel, EM technology consists of a central computer, combined with several gear sensors and video cameras that are capable of monitoring and recording fishing activities (McElderry, 2008; Ruiz et al., 2015). The records are stored and can be independently reviewed later onshore by an EM analyst for both management and compliance purposes. Typically, the footage is either used to census all, or review a proportion (which can then be extrapolated or raised), of fishing effort to estimate catch composition and/or to audit a proportion of fishing effort to verify fishing logbooks (Mangi et al., 2015). To improve readability, we use the term integrated EM system in this paper to jointly describe the technological (i.e. onboard camera and sensors) and logistical (i.e. on-shore analysis of records) aspects of EM.”

A more recent example of EM/S definitions is found in a paper¹⁰ provided to IOTC’s¹¹ 18th Working Party on Data Collection and Statistics (WPDCS18) by WGEMS¹² in November 2022. In this paper Electronic Monitoring (EM) and EM System (EMS) are defined

⁵ Technical Compliance Working Group

⁶ Extended Scientific Committee

⁷ As specified in CCSBT’s Scientific Observer Program Standards (SOPS)

⁸ Changes in logbook reporting by commercial fishers following the implementation of electronic monitoring in Australian Commonwealth fisheries, Emery et al., Marine Policy 104 (2019): 135-145

⁹ [CCSBT-TCWG/2210/BGD 01](#) – all associated references can be found in the paper

¹⁰ Refer to paper [IOTC-2022-WPDCS18-32](#)

¹¹ Indian Ocean Tuna Commission’s

¹² IOTC’s Working Group on Electronic Monitoring Standards

separately¹³. The definitions that IOTC's Scientific Committee (SC) is currently recommending to the IOTC Commission are as follows:

EM:

*The use of electronic devices to record fishing vessels' activities using video technology linked to a Global Position System (GPS), which may include sensors.*¹⁴

EMS:

*The system comprising the vessel and shore-based components for collecting, transmitting and reviewing EM records, reporting of EM data and implementing an EM Program.*¹⁵

The above IOTC definitions provide a useful distinction between the terms EM and EMS and could potentially be used as initial draft definitions for CCSBT's EM/S work, to be discussed and amended by Members as appropriate. Therefore, as a first step forward the Secretariat has placed these IOTC definitions in CCSBT's draft EM/S Guiding Principles template document (**Attachment C**) for further discussion.

3.2 Purposes for which EM/S have been used in Fisheries

To date, EM/S have been used in fisheries for various purposes. For example, EM/S has been used to obtain reliable information on catch and catch composition, to improve the quality of data on fishing activity¹⁶, to monitor and collect data on bycatch of protected species, avoiding theft of fish and/or gear and to improve operations at sea, to monitor safety at sea and labour conditions of the crew. EM/S has also been used to monitor compliance with rules and regulations, including limits on effort, discard bans, transshipment activity, and area/time closures, to expand the capability of flag States to monitor the activities of vessels under their jurisdiction, and to document good fishing practices and traceability in the fishing industry¹⁷ which may assist with market access.

3.3 Recent EM/S Developments in CCSBT

Recent EM/S developments within CCSBT have included that in August/September 2022, New Zealand submitted a proposal¹⁸ to ESC 27 to update CCSBT's Scientific Observer Program Standards (SOPS) to include Electronic Monitoring Systems (EMS) to meet monitoring requirements in SBT fisheries. In doing so, New Zealand noted that its proposal was, "*.... Meant to be a temporary solution that allows for the use of EMS, but New Zealand fully anticipates there will be additional work required in the future to develop more tailored and detailed standards for the use of EMS in CCSBT fisheries.*" Following positive discussions, ESC 27 recommended that the draft revised SOPS be adopted and that an additional agenda item specific to EMS be added to future meetings of the ESC (**Attachment B**). Both these recommendations were endorsed by the Extended Commission (EC 29).

¹³ These are considered to be "living" definitions

¹⁴ This currently recommended "EM" definition has been updated slightly since the November 2022 definition in paper [IOTC-2022-WPDCS18-32](#)

¹⁵ EM Program was defined in the same paper as, "*a process administered by a national or regional administration that regulates the use of EMS on vessels to collect and verify fisheries data and information responsible through an implementation of an EMS in a defined area and/or fishery*"

¹⁶ Including to verify and improve fisher logbook records

¹⁷ [Pp2-3 in the Fisheries and Agriculture Organisation of the United Nations \(UNFAO\) Technical Paper 664: Electronic Monitoring in Tuna Fisheries](#)

¹⁸ [CCSBT-ESC/2208/26](#)

Further, in October 2022, the Third Technical Compliance Working Group (TCWG 3) met with the meeting's focus being to:

“.... provide a forum for the exchange of EMS information as agreed by CC16. This may include examples of how EMS is used as a tool for vessel monitoring, e.g. of catch, bycatch, Ecologically Related Species (ERS) interactions, mitigation and transshipments. Discussion could also include the potential to use EMS in circumstances where human observers are not able to be deployed due to logistics, associated costs or extraordinary circumstances, etc, as well as information about potential challenges of implementation and EMS standards already in use or being developed by other organisations”.

The CC Chair's oral report back on TCWG 3 is provided at **Attachment A** for Members' reference.

3.4 Future EM/S Use in CCSBT

As mentioned in the introductory section of this paper, it is proposed that the focus of this initial EM/S working Group should be to consider the use of EM/S as an independent tool to collect and/or verify information currently required to be collected and recorded by human scientific observers in the SBT fishery. However, Members may also wish to consider a wider scope of EM/S application that could potentially be used to help strengthen the existing SOPS (as was previously considered in 2013 and 2014).

In October 2013, CC 8 discussed options for strengthening CCSBT's SOPS¹⁹ noting that the earlier CCWG 2 meeting²⁰ there had been, *“strong support for strengthening the existing CCSBT SOPS instead of having a centralised regional scientific observer program”*. One option discussed at CC 8 (paper CCSBT-CC/1310/17) was to potentially add an overall objective to the existing SOPS:

“To collect and provide information for verifying compliance with relevant CCSBT conservation and management measures.”

In April 2014, CCWG 3 further discussed options for strengthening CCSBT's SOPS and it was again noted that, *“scientific observer data may assist in verifying compliance with CCSBT conservation and management measures”*²¹. However, at that time, some Members considered that verification of compliance should not be listed as an objective of the SOPS due to potential implications for the safety of observers. Using EM/S would alleviate those human safety concerns and could potentially pave the way for now strengthening the SOPS through broadening its general objectives.

4. Discussion: High-Level EM/S Guiding Principles for CCSBT

In 2022, ESC 27 (paragraph 150 – refer to **Attachment B**) noted that:

“More work was required to develop tailored and detailed measures on the use of EMS”.

Taking into account ESC 27's note above, an initial list of discussion topics and questions for this Working Group to discuss is provided below (A – E). Discussion of these points should help Members to consider key points about how EM/S could be used within a CCSBT context in future. It is hoped that by exploring these topics Members will be able to populate

¹⁹ Refer to the Background section of [Paper CCSBT-CC/1310/17](#)

²⁰ The 2nd Meeting of the Compliance Committee Working Group held in May 2013

²¹ Paragraph 19, dot-point 1 of the Report of [CCWG 3](#)

and agree a set of draft high-level EM/S Guiding Principles (**Attachment C** – template) which can in turn be provided to other CCSBT meetings as appropriate.

A. Definitions

- What are EM and EMS?
- Should CCSBT define EM/EMS and how?

B. Primary Objectives of EM/S

- Is EM/S use to be voluntary?
- Is the information collected by EM/S to be made available for assessing compliance with CCSBT Conservation and Management Measures (CMMs) as well as for scientific purposes?
- If utilised, is EM/S being used to replace, and/or to complement the use of human observers?

Note ESC 27's report (paragraph 148) stated that:

“There was a general view that if EMS is to be included in the SOPS, then Members should be permitted to use: (1) only human observers; (2) only EMS; or (3) a combination of both human observers and EMS.”

- How should a standardised scientific observer coverage rate be calculated when using EM?

Paragraph 150 of ESC 27's report stated:

“The meeting further noted that:

- *Members using EMS required recognition of the use of EMS data as an alternative to human observer data in order for EMS data to count towards the 10% target for observer coverage;*
- *The method to calculate the coverage of EMS data has not been clarified.”*

Section 10 of the current SOPS specifies that:

“Data from EMS may be used to contribute to the 10% target for observer coverage set out in this document. Members using EMS should report its implementation to ESC to review including the items related to EMS in this document.”

Taking this into account, Members could discuss potential options for calculating scientific observer coverage rates including the:

- Proportion of a fleet collecting EM data;
 - Proportion of SBT fishing trips where EM was fully operational;
 - Level of observation of a particular fishing event (*i.e.* setting, hauling, sorting);
 - Proportion of footage reviewed;
 - Any other relevant factors.
- If using EM/S, should it be a requirement to demonstrate that the information it can collect is at least as robust as the equivalent information collected by human observers?

- Should there be compatibility with other RFMOs in terms of an EM/S approach? Compatibility may be considered in broad overarching terms such as definitions of EM/EMS or it may be considered on a more detailed level such as compatible data standards.
- Will EM/S only be used on longline vessels catching SBT?²²

C. Information Objectives

- Is EM/S being used as the primary data collection tool or is its primary function to verify information collected through other means/logbook data?
- Are there compliance information gaps not currently addressed by human observers that could be addressed by EM/S?

D. EM Data Review Objectives

- Should the review of EM footage be random, representative, or risk-based or a combination of approaches?²³
- For footage reviewed by onshore observers/analysts, should they be required to have similar training and qualifications and independence/integrity as required for at-sea scientific observers?
- Can AI (Artificial Intelligence) be used to contribute to the review of EM footage?

E. Security, Privacy and Confidentiality

- Must it be demonstrated that the EM/S data collected at-sea is tamper-proof?
- Are there circumstances where individual footage or confidential information captured by EM/S might be submitted to the Secretariat or shared with other Members?

5. Detailed Examination of SOPS Data Requirements: Which Elements can Potentially be Collected by EM/S

Once Members have discussed and developed some draft high-level Guiding Principles, an important next step will be to conduct a more detailed analysis of which required SOPS data elements can be directly collected and/or derived from EM/S data.

²² Note that CCSBT Members primarily target SBT using either longline, purse seine or pole and line gear and occasionally also catch SBT by rod and reel, trolling or as a trawl bycatch; towing vessels are also used in the farming sector

²³ The current SOPS specifies the following: “Observer coverage, including the selection of EMS data for review, should therefore be representative of different vessel-types in distinct areas and times”, with additional clarification provided for footnote 1 of the SOPS

The Secretariat has developed a table (**Attachment D**) that could be filled in to indicate:

- which of the data elements specified within Attachment 1 of CCSBT's SOPS can potentially be collected by or derived from EM/S or collected by alternative methods²⁴,
- at what point the information might be collected, and
- whether it remains necessary to collect each data element currently listed.

Since the data specified in the SOPS are primarily aimed at supporting CCSBT's various scientific processes, the Secretariat anticipates that the ESC (or a sub-working group) would likely have the expertise best needed to fill in this table. As such, Members could consider requesting ESC's assistance to complete **Attachment D**. However, this EM/S Working Group may be able to provide some input, including whether EM/S usage should potentially be contemplated for use on vessels other than longliners, *e.g.* for purse seine, pole and line or cage towing vessels.

6. Proposed EM/S Working Group Outputs

It is proposed that the EM/S Working Group:

- Progress the development and agreement of a set of initial draft high-level Guiding Principles (**Attachment C**) and provide these to TCWG 4, CC 18 and ESC 28 to consider, provide input to and potentially endorse as appropriate;
- Consider the table of data elements required to be collected according to CCSBT's SOPS (**Attachment D**), amend it if appropriate, and potentially forward it to ESC 28 with a request that ESC (or a technical sub-group) consider and complete the table based on its scientific expertise;
- Submit a summary of all EM/S Working Group agreed outcomes to ESC 28 as noted in the CC's 2023 Workplan, as well as to TCWG 4 and/or CC 18 as appropriate; and
- Consider and draft a list of recommended next steps to progress EM/S in a CCSBT context.

Prepared by the Secretariat

²⁴ For example, port sampling could be used to collect biological information (especially in the case of non-distant water fishing fleets) such as otoliths and gonad samples. Information collected by CCSBT's Catch Documentation Scheme (CDS) might also be an alternative and/or complementary data source.

Excerpt from the CC 17 Meeting Report (2022)

Agenda Item 4. Report from the Technical Compliance Working Group (TCWG)

51. The Chair provided an oral report of the third meeting of the Technical Compliance Working Group (TCWG 3) which was held immediately before this CC meeting. The Chair noted that:

- The meeting was the first opportunity for Members and observers to discuss the potential role EM could play in the SBT fishery.
- This followed a positive discussion and recommendation from the ESC to the EC that the draft revision of the Scientific Observer Program Standards (SOPS) from the ESC be adopted by the EC and that EM be added to future meetings of the ESC.
- The meeting discussed very useful papers and presentations from Members and observers on their experience trialling and implementing EM. A number of different systems were presented which provided a useful overview of the technology and approaches currently available. It was however acknowledged that the technology and associated software are continuing to evolve.
- He was impressed with Members engagement, with all Members and observers actively participating in the meeting discussion. It seems that all Members are interested in EM as an option for the future.
- The meeting acknowledged that there are a range of potential gains and losses associated with the use of EM compared to using human observers and that alternative information sources (such as the CDS) should be looked at to offset some of the limitations of EM.
- The meeting agreed to recommend to the CC that an intersessional working group be established and meet virtually to consider some of the key issues discussed, including data requirements for EM, and that the Executive Secretary and CC Chair prepare a discussion paper for this meeting. Further, it was agreed that any work or future recommendations should be provided to the ESC for their consideration and input.
- Having reviewed meeting commitments for 2023 with the Executive Secretary, the Chair proposed that Members aim to hold the virtual meeting in May 2023, which will then allow time for the meeting output to be consolidated and submitted to the ESC.

Excerpts from the ESC 27 and EC 29 Meeting Reports

Report of ESC 27 (2022)

Agenda Item 19. Other Matters

146. New Zealand submitted paper CCSBT-ESC/2208/26, a proposal to update SOPS to incorporate electronic monitoring. It had drafted a proposal for the use of electronic monitoring systems (EMS) to meet monitoring requirements in SBT fisheries. In drafting the proposal, New Zealand had noted the value that EMS brings to monitoring of fisheries with the potential to review footage of up to 100% of catch, if required. EMS also adds considerable value in monitoring of ecologically related species bycatch and the use of mitigation devices. Furthermore, EMS can provide coverage where historically it has been difficult to do so, such as on smaller vessels and during the COVID-19 pandemic. The proposal is meant to be a temporary solution that allows for the use of EMS, but New Zealand fully anticipates there will be additional work required in the future to develop more tailored and detailed standards for the use of EMS in CCSBT fisheries.
147. New Zealand drew attention to the fact that, as per section 6 of appendix 1 (revised CCSBT Scientific Observer Program Standards), Members are responsible for ensuring representative information and sampling when placing observers on board vessels, or when selecting EMS footage for review. While EM will not provide biological sampling, New Zealand considers that this requirement is partially superseded by the CDS which provides length and weight data for the fishery. New Zealand further considers that the monitoring of fishing activity by EMS will appreciably exceed that which can logistically be provided by observers, a benefit which outweighs the cost of potentially reduced scientific observer sampling.
148. There was a general view that if EMS is to be included in the SOPS, then Members should be permitted to use: (1) only human observers; (2) only EMS; or (3) a combination of both human observers and EMS.
149. The ESC discussed issues related to using data from EMS compared to data from human observers. Advantages of using EMS noted by Members included:
- The quality of catch and bycatch data reported by fishermen using EMS is improved appreciably;
 - EMS can cover 100% of the fleet with monitoring coverage flexible, and can be done retrospectively; and
 - EMS coverage was not impacted by the COVID-19 pandemic, whereas some Members had struggled to place human observers on their fleets.
- Concerns with EMS data noted by Members included:
- Certain information, such as biological samples, are more difficult to obtain, particularly for distant water fleets;
 - Some Members have very little experience with or knowledge of EMS; and

- It has not yet been reported how the type and quality of EMS data compares to human observer data.
150. The meeting further noted that:
- Members using EMS required recognition of the use of EMS data as an alternative to human observer data in order for EMS data to count towards the 10% target for observer coverage;
 - More work was required to develop tailored and detailed measures on the use of EMS; and
 - The method to calculate the coverage of EMS data has not been clarified.
151. The ESC made some minor revisions to the draft revised SOPS provided by New Zealand and recommends that the revised SOPS at **Attachment 13** be adopted by the EC.
152. Members agreed that EMS activities should be reported to the ESC in Member's National Reports, in the relevant areas of Section 7 and Annex 1 of the ESC annual report template. The information reported should include:
- How EMS has been implemented, particularly in the context of the CCSBT Scientific Observer Program;
 - How observer coverage has been calculated;
 - What information previously collected by human observers is no longer collected; and
 - What information cannot be collected by EMS.
153. Members further agreed that additional papers could be submitted to the ESC if there were any technical issues to report.
154. The meeting recommended that an additional agenda item specific to EMS be added to future meetings of the ESC, to consider new information on EMS and the protocols in use.

Report of EC 29 (2022)

82. The EC adopted the report of the ESC and endorsed its recommendations (including the recommended revisions to the CCSBT Scientific Observer Program Standards), noting that the new scientific research proposals under the SRP (and included as components of the ESC's work program) would be further considered in the FAC and that the recommendations on the TAC and Research Mortality Allowance would be discussed further at Agenda Item 7.

High Level EM/S Guiding Principles for CCSBT

The following reflects outcomes of the virtual EM Workshop held on 17-18 May 2023.

CCSBT Definition(s)

Electronic Monitoring (EM):

The use of electronic devices to record fishing vessels' activities using video technology linked to a Global Position System (GPS), which may include sensors.

Electronic Monitoring Systems (EMS):

The system comprising the vessel and shore-based components for collecting, transmitting and reviewing EM records, reporting of EM data and implementing an EM Program.¹

Primary Objectives of EM/S

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Information Objectives

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Data Review Objectives

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Security, Privacy and Confidentiality

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¹ EM Program was defined by IOTC in paper [IOTC-2022-WPDCS18-32](#) as, "a process administered by a national or regional administration that regulates the use of EMS on vessels to collect and verify fisheries data and information responsible through an implementation of an EMS in a defined area and/or fishery"

Table of CCSBT's Scientific Observer Program Standards (SOPS) Data Requirements: Which Elements may Potentially be Collected by EM/S & When?

A. Background

This attachment provides a list of the SOPS data fields currently required to be collected by Members by their national scientific observer programmes.

Section B below provides a template that could be filled in to concisely summarise:

- Column 1: Is it currently feasible to collect the information by EM/S? (Yes or No)
- Column 2: If feasible, can the data element be collected by EM/S at set-up, real-time or calculated/derived from data collected by EM/S?
If not able to be collected by EM/S, can the data element instead be collected either by pre/post-trip inspection/discussion or by an alternative methodology?
- Column 3: If the data element is currently utilised and still needs to be collected.

Note that CCSBT's SOPS include a preamble that:

*"For observer coverage provided by EMS, not all of the information below will be readily available; therefore, as much detail as possible should be provided based on the below descriptions of data type/format."*¹

Table 1 provides a set of categories that could be used to fill in column 2 of the tables in Section B.

Table 1

How/when is the information collected?		Description
Method of Collection	Abbreviation	
EM/S Set-up	EM-Setup	Information can be collected by EM/S. Information is hard-coded or recorded on EMS when the EMS equipment is installed on the vessel.
EM/S Real-time	EM-Real	Information can be collected by EM/S. Information is automatically generated by the EM/S components in real-time and stored.
EM/S Calculated	EM-Derived	Information can be collected by EM/S. Information is derived/calculated using data gathered by EM/S.
Pre- or Post-trip	Pre/Post Trip	The information cannot be collected by EM/S. Pre- or post-trip data collection – the information could be collected and reported from a pre- or post-trip onsite inspection of the vessel and discussion with the owner/captain/crew.
Alternative methodology	Other	The information cannot be collected by EM/S or pre/post trip inspection/discussion. The information could be collected by an alternative methodology <i>e.g.</i> port sampling.

¹ See the note at the top of Attachment 1

B. Type and Format of Scientific Observer Data to be collected

(extracted from Attachment 1 of the CCSBT SOPs)

A) Details of the observed vessel and gear

The vessel details are recorded only once for an entire trip.

All fishing:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Vessel's Name			
• Vessel's Call-sign			
• Vessel's Flag			
• Name of the Captain			
• Name of the fishing master			
• Year vessel built			
• Engine brake power (kw/hp)			
• Overall length (metres)			
• Gross tonnage (tonnes)			
• Number of people in crew (all staff, excluding observers)			
• Total freezer capacity (cubic metres)			
• Fuel capacity (tonnes)			

Instrumentation and electronic fishing equipment:

Instrumentation	Is present - Yes/No (or code)	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
GPS				
Radio direction finder				
Radar				
Weather Fax				
Track plotter				
NOAA receiver				
Sounder (1=colour monitor, 2=monochrome monitor, 3=printer)				
Sonar (1=scanning, 2=PPI)				
Doppler current monitor				
Sea surface temperature recorder				
Bathy-thermograph				
Bird radar				

² Indicate using one of the abbreviations in Table 1, i.e. either EM-Setup, EM-Real, EM-Derived, Pre/Post-Trip or Other

Longliners only:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Can data be obtained by EM/S (Yes/No)
Material of mainlines (Nylon, Cotton thread, Other)			
Material of branchlines (Nylon, Cotton thread, Type of trace, Other)			
Material of buoylines (Nylon, Cotton thread, Other)			

Purse seiners only:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Capacity of power block			
• Capacity of purse winch			
• Lengths and depths of all nets on board including expanded figure			
• Mesh sizes of nets on board			
• Number of net skiffs on board			

B) Summary of the observed trip

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
Observer's name			
Observer's organisation			
Date observer embarked (translatable to 24 hour clock, UTC to the day)			
Date observer disembarked (translatable to 24 hour clock, UTC to the day)			

C) Comprehensive catch, effort and environmental information for each set

This information is recorded for each set [while the observer is on-board a vessel], regardless of whether the set/haul was actually observed.

All fishing:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Date and time at start of Set (translatable to 24 hour clock, UTC)			
• Date and time at end of Set (translatable to 24 hour clock, UTC)			
• Date and time at start of Retrieval (translatable to 24 hour clock, UTC)			
• Date and time at end of Retrieval (translatable to 24 hour clock, UTC)			
• Location at start of Set (latitude+N/S and longitude+E/W to a minute of accuracy)			
• Wind speed (with unit) and direction (N, NNE, NE, etc.) of the operation			
• Time of wind measurement for operation (e.g. Noon, start of set etc.)			
• Sea surface temperature (degrees Celsius, to 1 decimal place) at start of Set ³			
• Intended target species ⁴			

Longlining:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Location at end of Set (latitude+N/S and longitude+E/W to a minute of accuracy)			
• Direction of line set (e.g. straight, curved) ⁵			
• Actually used mainline length (km)			
• Actually used branchline length (m)			
• Actually used buoyline length (m)			
• Intended depth of the shallowest hook (m)			
• Intended depth of the deepest hook (m)			
• Type of hooks			
• Number of hooks			
• Number of baskets			

³ It is sufficient to collect the temperature at the start of a set – i.e. at the time the location and wind are measured (e.g. Noon, start of set, etc.).

⁴ All species should be reported with FAO species codes, or using National codes and providing a translation table to FAO species codes. Individuals should be identified as far as possible to species level.

⁵ Codes will be used to describe the type of line set, e.g. S=straight, C=curved, U=u-shaped.

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Seabird mitigation measure used:			
○ Line weights used (Y/N)			
○ Mass of added line weight (where applicable)			
○ Distance between weight and hook (where applicable)			
○ Number of tori lines used (where applicable)			
○ Estimate of the aerial coverage achieved by tori lines (m)			
○ Night setting with minimal deck lighting (Y/N)			
○ Bait thrower/line shooter used (Y/N)			
○ Dyed Bait (Y/N)			
○ Details about management of offal			
○ Underwater setting chute (Y/N)			
○ Side setting (Y/N)			
○ Haul mitigation (Y/N)			
▪ Branch line/snood haulers			
▪ Brickle curtain			
▪ Water cannon			
○ Other mitigation measures used			
• Distance between baskets, beacons, buoys, or floats as is appropriate to the operation (m)			
• Percentage of bait by bait categories that were Fish, Squid, Artificial, and Other			
• Bait status (live or dead)			
• Total number by species ⁴ of SBT, and other tuna and tuna-like species caught, retained or discarded.			
• Total processed weight (kg) and Processed State ⁶ by species ⁴ of SBT, and all other species caught.			

⁶ As per processing codes identified in the CCSBT CDS Resolution.

Purse Seining:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Spotter plane used (Y/N). If used:			
○ Time (translatable to 24 hour clock, UTC) and location aircraft began search			
○ Time (translatable to 24 hour clock, UTC) and location aircraft ended search			
○ Number, location of schools spotted by aircraft			
○ Estimated size of each school spotted by the aircraft			
○ Total searched distance			
• Bird Radar used (Y/N)			
• Logbook number and type			
• Start and end Time spent for searching (from xx:xx to yy:yy translatable to 24 hour clock, UTC), location and total searched distance			
• School finder (plane/vessel)			
• Chumming boat used (yes/no)			
• Chum status (Alive/Dead)			
• Amount of chum used			
• Start and end time for chumming (translatable to 24 hour clock, UTC)			
• Start and end time for net shooting (translatable to 24 hour clock, UTC)			
• Start and end time for net hauling (translatable to 24 hour clock, UTC)			
• Start and end location for net shooting			
• Start and end location for net hauling			
• Light attraction used (yes/no)			
• Total of wattage of lights used			
• Start and end time for light attraction			
• School type (e.g., shoaling/surface, FAD/debris associated)			
• Length (m) of net set			
• Height (m) of the net			
• Number of net skiffs used			
• Date and time that transfer to tow cage commenced			
• Identification number of the tow cage to which the SBT were transferred			
• Name of Carrier Boat that received the fish			
• Estimated catch per set, species composition			
• Estimated weight (kg) and/or number by species of SBT and other species caught			
• Estimated weight of SBT caught alive			
• Estimated weight and/or number of SBT dead during operation			

Cage Towing:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Name of carrier boat			
• Tow cage identification number			
• Cage depth (metres)			
• Cage ring diameter (metres)			
• Cage mesh size (in centimetres)			
• Cage has second or predator net (Y/N)			
• Number of divers used			
• Chute fitted in cage (Y/N)			
• Effective tow speed (km/hour)			
• If the catch was received from fishing operations, then for each catcher boat from which SBT were transferred, record:			
○ Name of catcher boat			
○ Call sign of catcher boat			
○ Date and time (translatable to 24 hour clock , UTC) transfer started			
○ Estimated weight of SBT transferred (tonnes)/dead SBT before transfer			
• If the catch was received from another tow cage, then, record:			
○ Name of the carrier boat from which the SBT came			
○ Identification number of the tow cage from which the SBT came			
○ Date and time (translatable to 24 hour clock, UTC) transfer started.			
○ Estimated weight of SBT transferred (tonnes)/dead SBT before transfer			
• Date and time (translatable to 24 hour clock, UTC) and place that tow finished			
• Total weight of SBT mortalities per day from commencement of towing to end of transfer to farm			
• Total number of SBT mortalities per day from commencement of towing to end of transfer to farm			

D) Observed catch information

This relates to the catch that was recorded during the hauling process.

Longlining:

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Date and time at the start of the observation period (translatable to 24 hour clock, UTC)			
• Date and time at the end of the observation period (translatable to 24 hour clock, UTC)			
• Number of hooks observed			
• Total number by species ⁴ of all species caught and retained during the observed period ⁷			
• Total processed weight (kg) by species ⁴ and Processed State ⁶ of all species caught and retained during the observed period			
• Total number and weight when possible (whole weight, in kilograms) by species ⁴ of all species caught but discarded during the observed period and life status ^{7,8} .			

Purse Seining:

The entire purse seining shooting and hauling operation should be observed

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
• Date and time at the start of the observation period (translatable to 24 hour clock, UTC)			
• Date and time at the end of the observation period (translatable to 24 hour clock, UTC)			
• Estimated % of school caught			
• Estimated weight (tonnes for SBT, kg for all other species ⁴) and/or number by species of SBT, and all other species caught, retained or discarded including life status ^{7,8}			
• Weight of SBT mortalities from commencement of fishing to end of transfer to cage			
• Number of SBT mortalities from commencement of fishing to end of transfer to cage			
• Number of species identified as escaped from commencement of fishing to end of transfer to cage			
• Number by species identified as discarded from commencement of fishing to end of net hauling			

⁷ This includes target species (such as SBT) and all bycatch species such as seabirds, sharks, marine reptiles etc.

⁸ Individuals that are discarded with significant injuries and are not considered likely to survive should be included in the number of dead individuals.

Cage Towing:

[The observer] must observe or conduct each mortality count during the period of the tow.

Data/ information field name	Can the data be obtained by EM/S (Yes/No)	When can the Information be Collected? ²	Is it still necessary to collect this field? (Y/N)
<ul style="list-style-type: none"> Date and time at the start of the observation period (translatable to 24 hour clock, UTC) 			
<ul style="list-style-type: none"> Date and time at the end of the observation period (translatable to 24 hour clock, UTC) 			
<ul style="list-style-type: none"> Total weight of SBT mortalities per day from commencement of towing to end of transfer to farm 			
<ul style="list-style-type: none"> Total number of SBT mortalities per day from commencement of towing to end of transfer to farm 			

NONE OF THE FOLLOWING SOPS DATA ARE ABLE TO BE GATHERED BY EM/S

These data fields would need to be collected by an “Alternative methodology” or perhaps some of the tag recovery information is no longer required to be collected.

E) Biological measurements of individual fish. Biological measurements are only required for SBT, but where possible, effort should be made to measure other species.

For the purposes of SBT analyses, accurate size measurements of SBT are required. SBT should be selected in a manner to ensure within strata randomness. For example, for large numbers of fish caught in a single operation (e.g., a purse seine vessel) a systematic sampling may be appropriate

The actual number of fish should be spread throughout as many separate fishing operations as possible. For example, it is nearly always the case that sampling 20 fish (randomly) from 10 operations is much better than sampling 200 fish from every 10th operation. The required actual number of samples should be re-evaluated from time to time and as needs change.

- Species⁴
- Life status category⁹
- Length (for SBT, fork length measured on straight length, rounded up to the centimetre¹⁰)
- Length unit
- Length code (fork length, eye fork, etc.)
- Length, lower jaw-fork length
- Whole weight (kg), if possible. This is the measured weight before processing as opposed to a calculated whole weight.
- Processed weight (kg)
- Processed State⁶
- Sex (F=female, M=male, I=indeterminate, D= not examined)
- Samples taken, specifying:
 - A unique identification number given to the sample
 - The type of samples taking, including: whole specimen, or samples of otoliths, scales, vertebrae, stomach, muscle, tissue, gonads, feathers, bird bands etc.)
 - Any additional details that may explain the capture of the sample (e.g. for seabirds the specific mitigation at the time of capture).

F) SBT Tag recovery information

Some of the data recorded here duplicates data that already exists in the previous categories of information. This is necessary because tag recovery information may be sent separately to other observer data.

- Observer's name
- Vessel's name
- Vessel's call sign
- Vessel flag
- Collect and provide the actual tags
- Tag colour
- Tag numbers (The tag number is to be provided for all tags when multiple tags were attached to one fish. If only one tag was recorded, a statement is required that specifies whether or not the other tag was missing)

⁹ The observer program will, as a minimum, distinguish the following life status categories: dead and damaged; dead and undamaged; alive and vigorous; and unknown.

¹⁰ Length should be rounded (not truncated) to the nearest centimeter. For example, 62.4cm becomes 63cm and 62.5cm becomes 63cm (63 cm for both cases).

- Date and time of capture (UTC)
- Location of capture (latitude+N/S and longitude+E/W to 1 minute of accuracy)
- Length (fork length, rounded up to the nearest centimetre¹⁰)
- Processed Weight (kg.)
- Processed State⁶
- Details of samples taken, specifying:
 - A unique identification number given to the sample,
 - The type of samples taking, including: whole specimen, or samples of otoliths, scales, vertebrae, stomach, muscle, tissue, gonads, etc.)
- Sex (F=female, M=male, I=indeterminate, D=not examined)
- Condition of recaptured fish and their life status
- Whether the tags were found during a period of fishing that was being observed (Y/N)
- Reward information (e.g., name and address where to send reward).