Report of the 4th Session of the IOTC Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)

Online, 5 - 7 June 2024

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ACRONYMS

ABNJ	Areas Beyond National Jurisdiction
AIS	Automatic Identification System
ALDFG	Abandoned, Lost or otherwise Discarded Fishing Gear
ALB	Albacore tuna
BET	Bigeye tuna
BLM	Black marlin
BLT	Bullet tuna
BUM	Blue marlin
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
COM	Narrow-barred Spanish mackerel
CPCs	Contracting parties and cooperating non-contracting parties of the IOTC
CPUE	Catch Per Unit of Effort
DGCF	Directorate General of Capture Fisheries (Indonesia)
DFAD	Drifting FAD
DFAR	Department of Fisheries and Aquatic Resources (Sri Lanka)
DOI	Digital Object Identifier
EEZ	Exclusive Economic Zone
EM	Electronic Monitoring
EMS	Electronic Monitoring System
ERA	Ecological Risk Assessment
ETP	Endangered, Threatened, and Protected species
EU	European Union
FAD	Fish aggregating device
FAO	Food and Agriculture Organization of the UN
FIRMS	Fisheries and Resources Monitoring System
FOB	Floating OBject
FRI	Frigate tuna
GEF	Global Environmental Facility
GUT	Indo-Pacific king mackerel
GTA	FIRMS Global Tuna Atlas
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IEO	Instituto Español de Oceanografía (EU,Spain)
IFREMER	Institut Francais de Recherche pour l`Exploitation de la Mer (EU,France)
IOC	Indian Ocean Commission
IOTC	Indian Ocean Tuna Commission
IRD	Institut de Recherche pour le Développement (EU,France)
I.R. Iran	Islamic Republic of Iran

ISSF	International Seafood Sustainability Foundation
KAW	Kawakawa
LOT	Longtail tuna
MLS	Striped marlin
MMAF	Ministry of Marine Affairs and Fisheries (Indonesia)
NARA	National Aquatic Resources Research and Development Agency (Sri Lanka)
NJA	National Jurisdiction Area
OFCF	Overseas Fishery Cooperation Foundation (Japan)
OPAGAC	Organización de Productores de Atún Congelado (EU,Spain)
PET	Protected, Endangered and Threatened species
RAV	IOTC Record of Authorised Vessels
RFMO	Regional Fisheries Management Organization
ROS	Regional Observer Scheme
SC	IOTC Scientific Committee
SFA	Seychelles Fishing Authority (Seychelles)
SFA (fish)	Indo-Pacific sailfish
SSI	Species of Special Interest
SWO	Swordfish
Taiwan,China	Taiwan Province of China
USTA	Unité Statistique Thonière d'Antsiranana (Madagascar)
VMS	Vessel Monitoring System
WPB	Working Party on Billfish of the IOTC
WPDCS	Working Party on Data Collection and Statistics of the IOTC
WPEB	Working Party on Ecosystems and Bycatch of the IOTC
WPTmT	Working Party on Temperate Tunas of the IOTC
WPNT	Working Party on Neritic Tunas of the IOTC
WPTT	Working Party on Tropical Tunas of the IOTC
WCPFC	Western and Central Pacific Fisheries Commission
WWF	World Wide Fund for nature
YFT	Yellowfin tuna

STANDARDISATION OF IOTC WORKING PARTY AND SCIENTIFIC COMMITTEE REPORT TERMINOLOGY

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

Level 1: From a subsidiary body of the Commission to the next level in the structure of the Commission:

RECOMMENDED, RECOMMENDATION: Any conclusion or request for an action to be undertaken, from a subsidiary body of the Commission (Committee or Working Party), which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g., from a Working Party to the Scientific Committee; from a Committee to the Commission). The intention is that the higher body will consider the recommended action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally this should be task specific and contain a timeframe for completion.

Level 2: From a subsidiary body of the Commission to a CPC, the IOTC Secretariat, or other body (not the Commission) to carry out a specified task:

REQUESTED: This term should only be used by a subsidiary body of the Commission if it does not wish to have the request formally adopted/endorsed by the next level in the structure of the Commission. For example, if a Committee wishes to seek additional input from a CPC on a particular topic, but does not wish to formalise the request beyond the mandate of the Committee, it may request that a set action be undertaken. Ideally this should be task specific and contain a timeframe for the completion.

Level 3: General terms to be used for consistency:

AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 or level 2 above; a general point of agreement among delegations/participants of a meeting which does not need to be considered/adopted by the next level in the Commission's structure.

NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for future reference.

Any other term: Any other term may be used in addition to the Level 3 terms to highlight to the reader of and IOTC report, the importance of the relevant paragraph. However, other terms used are considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3, described above (e.g., **CONSIDERED**; **URGED**; **ACKNOWLEDGED**).

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EXECUTIVE SUMMARY

The 4th Session of the Indian Ocean Tuna Commission's (IOTC) Ad hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) was held online on Zoom from 5 - 7 June 2024. A total of 80 participants attended the Session (89 in 2023 and 104 in 2022). The list of participants is provided in Appendix I. The meeting was opened by the Chairperson, Dr Hilario Murua (ISSF) who welcomed participants.

The following are the recommendations from the WGEMS04 to the Working Party on Data Collection and Statistics, which are provided in Appendix V.

7.5 Revision of ROS minimum data requirements: Purse seiner specific data fields

WGEMS04.01 (para 53): The WGEMS **NOTED** that the revisions proposed by the purse seine subgroup have achieved consensus, hence the WGEMS **RECOMMENDED** that the proposed table and summary can be considered as the final product to be presented at the next WPDCS.

8.2 Revision of the WG Program of Work (2024–2028)

WGEMS04.02 (para 75) The WGEMS **RECOMMENDED** that the WPDCS consider and endorse the WGEMS Programme of Work (2024–2028), as provided in Appendix IV.

8.3 Next meetings

WGEMS04.03 (para 77): The WGEMS **NOTED** that the intersessional group produced a consolidated review of the ROS data fields for most gears and the general and gear-specific data fields were under extensive discussion during this meeting. However, consensus on some data issues has yet to be achieved, making it challenging to reach agreement through future online intersessional meetings. Therefore, the WGEMS **RECOMMENDED** holding an in-person meeting to resolve these issues and finalise changes to the data fields for each of the gears, which would facilitate the agreement on revised ROS data fields to be presented to the WPDCS and SC. The WGEMS **AGREED** to consult with the Chair of the WPDCS and the Secretariat regarding the allocation of one to one and a half days during the WPDCS meeting for this specific agenda item.

WGEMS04.04 (para 78): The WGEMS also **RECOMMENDED** that the WGEMS meet again in 2025 to continue to advance EM implementation by the IOTC members.

1. OPENING OF THE MEETING

1. The 4th Session of the Indian Ocean Tuna Commission's (IOTC) Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) was held online on Zoom from 5 - 7 June 2024. A total of 80 participants attended the Session (89 in 2023 and 104 in 2022). The list of participants is provided in Appendix I. The meeting was opened by the Chairperson, Dr Hilario Murua (ISSF) who welcomed participants.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

2. The WGEMS **ADOPTED** the Agenda provided at Appendix II. The documents presented to the WGEMS are listed in Appendix III.

3. BACKGROUND AND OBJECTIVES OF THE WORKING GROUP

3. The WGEMS **NOTED** a brief presentation provided by the Chair on the background and objectives of the current Working Group. The WGEMS **RECALLED** that Resolution 23/08, which established the Electronic Monitoring (EM) program standards (Appendix I of Res 23/08) as well as EM system and data standards (Appendix I I of Res 23/08), has requested the Scientific Committee to review the Regional Observer Scheme (ROS) minimum required data fields no later than 2024. Consequently, in its 2023 annual meeting, the SC **AGREED** to set up an intersessional working group to discuss and review the standards of minimum ROS data fields (see details in Section 4.2). This intersessional working group, convening interested WPDCS and WGEMS participants, has held several meetings between February and May 2024, including 2 online meetings to conduct a comprehensive review of ROS data fields for several major fishery groups (purse seines, longlines, gillnets, pole-and-lines, as well as for transshipments), with each fishery review led by a dedicated expert panel. One of the primary objectives of this meeting is to discuss the progress and results of the review work conducted by the intersessional working group.

4. DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE WGEMS

4.1 Any Relevant Outcomes from the 28th Session of the Commission

4. The WGEMS **NOTED** that the 28th Session of the Commission adopted Resolution 24/04 (which supersedes Resolution 22/04) on the Regional Observer Scheme which further elaborated on the potential use of EMS to complement or substitute the human observer coverage, provided that the ROS minimum mandatory data requirements are met. The WGEMS **NOTED** that the IOTC Scientific Committee is anticipated to make recommendations on the minimum mandatory ROS data reporting standards based on the outcomes from the ROS review of minimum data standards, which is being conducted by this working group.

4.2 Updates from the 26th Session of the Scientific Committee

5. The WGEMS **NOTED** the discussions held during the 2023 Session of the Scientific Committee and included in the SC26 report:

> *(para. 145) The SC **ACKNOWLEDGED** the discussions regarding the outcomes of the WGEMS, including feedback on the challenges required to collect ROS data through EMS, and the outputs of a desk study on alternative data collection mechanisms for IO artisanal fisheries.*
> *(para. 146) **ACKNOWLEDGING** that Res. 23/08 requires the revision of the ROS data fields, the SC **ENDORSED** the request of setting up an intersessional working group (either by correspondence, or remotely) convening interested WPDCS and WGEMS participants to discuss and review:*
>
> *(a) The scientific need for each ROS data field (as proposed by the ROS expert workshop of 2018)*
> *(b) The status (mandatory / mandatory when feasible / optional) of each ROS data field*
> *(c) The possibility of adding EMS-specific elements to the list of ROS mandatory data fields*
> *(d) The inclusion of proper mechanisms / classifications, within the ROS data fields, to better capture details on fins naturally attached to sharks*
> *(e) The summary of capabilities, advantages, and drawbacks of collecting ROS data fields through alternative methods such as EMS, human onboard observers, port-sampling, self-reporting, etc. (as well as a combination of these).*
>
> *And requested that this group to report to the next session of the WGEMS and WPDCS.*

6. The WGEMS **NOTED** that the work arising from this intersessional work group formed the basis for the current WGEMS meeting.

5. THE IOTC REGIONAL OBSERVER SCHEME

5.1 Current projects related to Electronic Monitoring and Electronic Reporting

7. The WGEMS **NOTED** the recent development of EM pilot projects in Kenya and Tanzania, supported by US funds and implemented by The Nature Conservancy in collaboration with national governments. The plan is to install EMS on longliners, purse seiners, and some trawlers. However, the group **ACKNOWLEDGED** that these latter vessel types may not catch tuna and tuna-like species within the IOTC area of competence.

8. The WGEMS **NOTED** that the projects in Kenya and Tanzania are conducted with the EM designer company Integrated Monitoring Inc., and rely on the use of the Starlink satellite constellation for transferring images and data directly from the vessels at sea. The WGEMS **ACKNOWLEDGED** that this approach may provide a powerful and promising method for reducing the logistical burden and risks associated with the management of hard drives (i.e., swaps, maintenance, transport), especially for longliners that spend extended periods at sea and often tranship at sea.

9. The WGEMS **NOTED** that live video streaming has been used in the French purse seine fishery as part of the 'oeil électronique' project, thanks to the VSAT satellite system. This system is used to check the quality of the images (e.g., dirty lenses) and the functioning of the video recording. However, the costs of transmission are very high, making it prohibitive to transfer the full records of videos collected during fishing trips for now.

10. The WGEMS **ACKNOWLEDGED** the presence of multiple EM projects currently underway in the Seychelles, including a compliance programme onboard large-scale purse seiners with the EM provider SATLINK which aims to estimate the total catch of tuna and tuna-like species for each fishing set conducted in the Seychelles National Jurisdiction Area (NJA).

11. The WGEMS also **ACKNOWLEDGED** that two pilot projects have recently been initiated in the Seychelles semi-industrial and large-scale longline fisheries to equip with EMS about 10 vessels in each fishery and to comply with the observer coverage set in Res. 24/04 for fishing vessels recorded on the RAV. The WGEMS further **NOTED** that these projects might use the Starlink technology as in Kenya and Tanzania.

12. The WGEMS **ACKNOWLEDGED** that the Department of Fisheries and Aquatic Resources (DFAR) of Sri Lanka has recently resumed the EM pilot project funded by the EU (2018-2021). This project was initially based on the EM technology of the Marine Instruments (MI) company, which has recently ceased all EM-related commercial activity. One of the two remaining EM equipment sets was installed on a longliner through a contract with a local company. Due to the lack of knowledge about the system and time constraints, some issues were encountered during the installation, and a sensor could not be fixed to the line hauler. Furthermore, there have been issues with the analysis of the collected data, as the MI data review software (Beluga) is no longer functional.

13. The WGEMS **CONGRATULATED** the DFAR for continuing the project, recognising the importance of the fisheries composed of medium-sized vessels in Sri Lanka and **SUGGESTED** contacting the company Archipelago, which has been associated with several of Marine Instrument's projects and might be able to support the DFAR.

14. The WGEMS was also **INFORMED** that some EM trials were conducted in 2019 in the Maldives on 14 pole and liners. While there were some technical challenges, the placement of the cameras enabled capturing all fishing operations effectively. The WGEMS **NOTED** that recording accurate fishing location was instrumental in identifying the fishing mode of each operation when used in combination with the VMS and the registry of anchored FADs. The WGEMS also **NOTED** that information on bait was very difficult to collect with EM.

6. EMS PROGRAMME IN IOTC

6.1 Update on CPCs EMS pilot projects and Programmes

15. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-06 on a Scoping study on cost-effective monitoring, control and surveillance data collection systems for small-scale/artisanal fisheries in the western Indian Ocean.

16. The WGEMS **CONGRATULATED** the authors for the workshop report which provides a comprehensive review of Electronic Fisheries Information System (eFIS) tools available for monitoring and reporting data in small-scale fisheries in the context of Monitoring, Control, and Surveillance (MCS) and Illegal, Unregulated, and Unreported

fishing (IUU), including general challenges, pros and cons of different approaches, and some insight on the benefits of eFIS for Fisheries Improvement Projects.

17. The WGEMS **ACKNOWLEDGED** that Indonesia was interested in conducting some EM trials for their small-scale fisheries and **QUERIED** whether specific information on the number of cameras, costs of individual units, as well as costs of maintenance and data review, could be made available to support CPCs willing to develop EM projects.

18. The WGEMS **NOTED** that the total costs per unit strongly depend on each project's technical specifications. The WGEMS **NOTED** that for example, camera prices may vary in the range of 150-2,500 USD depending on technical features such as resolution, image quality, and robustness. Some GoPro Hero4 cameras (priced at a few hundred USD) were used as part of an EM trial conducted on gillnet vessels ranging in length from 4-15 meters in Sri Lanka.

19. The WGEMS further **NOTED** that night vision cameras were required for fishing activities conducted by gillnetters, and that this requirement may necessitate some costly materials (e.g., cameras) and specific software for data review.

20. The WGEMS **NOTED** that the report does not include any information on sampling strategies in small-scale fisheries (e.g., number of vessels to equip with EMS, coverage of review) due to the large diversity of situations. Instead, the report mostly focuses on the tools, roadmap, and cost-benefits of electronic fisheries information system tools.

21. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-07 on Workshop report: Low-cost data collections and MCS tools in the South West Indian Ocean, including the following summary provided by the authors:

"The World Wide Fund for Nature (WWF) and SADC secretariat (South African Development Cooperation) held a technical workshop on low-cost data collection systems and MCS tools for small-scale fisheries in the South West Indian Ocean (SWIO) region from 15-17 November 2022 in Cape Town, South Africa. The workshop was attended by 66 participants, including representatives from 15 countries, independent experts, Civil Society Organizations (CSOs) and technology companies (Annex I, list of participants). The objectives of the workshop were to:

1. foster deeper understanding on low-cost data collection systems applicable for smallscale/artisanal fisheries which can address some of the challenges facing national monitoring, control and surveillance (MCS) systems in SWIO region
2. discuss their applicability in small-scale fisheries (SSFs) of the South Western Indian Ocean
3. advance the development of roadmaps for participating countries to expand the use of electronic tools"...
[see paper for full summary]

22. The WGEMS **CONGRATULATED** the authors for the workshop, which constitutes a major step in raising awareness of electronic tools for monitoring coastal fisheries in the Indian Ocean, **NOTING** that participants from Madagascar, Tanzania, Kenya, Mozambique, Comoros, and South Africa attended the workshop.

23. The WGEMS **NOTED** that the project is progressing well and is currently in the process of reaching out to technical providers and identifying the fishing vessels to be equipped. The objective is to equip a minimum of 10 vessels in Mozambique and 10 vessels in Madagascar, with a primary focus on multi-day, multi-gear fisheries targeting tuna and shrimp species.

24. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-08 on Trials for efficient Electronic Monitoring of fishing operations in gillnet tuna fisheries of Pakistan, including the following summary provided by the authors:

"The drift gillnet fisheries in the Northern Indian Ocean, particularly in Pakistan, play a crucial role in regional economies but pose significant management challenges due to the lack of comprehensive data on catch and bycatch. This study evaluates the feasibility and effectiveness of Electronic Monitoring Systems (EMS) in Pakistan's tuna gillnet fisheries. WWF-Pakistan initiated a phased crewbased observer program under the ABNJ Tuna Project to address data gaps, which evolved into a pilot project for electronic monitoring. The trials involved installing CCTV and Shellcatch technology on gillnet vessels to record fishing operations and bycatch events. The results showed that EMS could enhance data collection accuracy, verify crew-based observer data, and overcome the limitations of traditional onboard observer schemes. The study highlights the need for technological innovations, capacity building, and policy support to scale up EMS implementation for sustainable fisheries management in the Northern Indian Ocean. Key findings include the successful documentation of fishing activities, bycatch handling practices, and species composition, providing valuable insights for regional and global conservation efforts."

25. The WGEMS **CONGRATULATED** the authors for the work, which provides useful information on the capabilities of EMS to enhance the collection of data on medium-sized gillnetters, **AGREEING** that such systems could provide a

good source of information complementary with other data collection systems such as crew-based observations and samples of the landings.

26. The WGEMS **ACKNOWLEDGED** the value of the summary table provided in the paper detailing the criteria required for EMS in gillnet tuna fisheries, as well as the comparison between the use of CCTV cameras and ShellCatch technology, which highlighted the pros and cons of each method.

27. Regarding their expertise with EM and observations at sea, the WGEMS **ENCOURAGED** the authors to contribute to the ongoing review of the IOTC ROS fields that can be collected with EM for gillnet fisheries, including the identification of EM minimum requirements.

28. The WGEMS **NOTED** that the trials with the CCTV and ShellCatch systems were each conducted on a single vessel over 34 and 23 fishing days respectively. A scientific observer was present during the trials to record the catch by species and other fishing activities.

29. The WGEMS **NOTED** that only part of the CCTV footages could be reviewed due to some technical issues. Additionally, the camera used in the ShellCatch trials could not record most of the fishing operations which took place at night due to the absence of night vision and infrared technology. ShellCatch has since upgraded their system with enhanced night vision and other features, which should address the issue.

30. Despite the limitations in the dataset, the WGEMS **ENCOURAGED** the authors to quantitatively compare the occurrence of the species detected from the CCTV and by the observer.

31. The WGEMS **NOTED** that geo-referenced catch, effort, and size-frequency data have been collected in Pakistan for the year 2022 but not yet transmitted to the Secretariat due to administrative issues. The WGEMS **URGED** Pakistan to report the data at their earliest convenience.

7. REVISION OF ROS MINIMUM DATA REQUIREMENTS

7.1 Review of the reporting of ROS data fields

32. The WGEMS **NOTED** document IOTC-2024-WGEMS04-05 on Regional Observer Scheme data field reporting rates.

33. The WGEMS **NOTED** that this is a reference document which can be used to inform discussions about the ROS minimum data fields. **ACKNOWLEDGING** the low response rates for many mandatory ROS data fields, the WGEMS **NOTED** that understanding the reasons for these low response rates may help to determine whether these should in fact be mandatory fields or not, **NOTING** that there may be logistical or other issues causing the low reporting rates.

34. The WGEMS **NOTED** that there was insufficient time to extract information about the coverage of pole and line fisheries from the observer database but further **NOTED** that the Secretariat intends to complete the work including this fleet as soon as possible. The WGEMS **REQUESTED** the Secretariat to present an update document including the pole and line at the WPDCS.

35. The WGEMS **NOTED** that this document provides a summary of the data currently available in the ROS database but further **NOTED** that the Secretariat has received more data than is currently available in the ROS database but many of these data have been submitted in formats that cannot easily be input into the database such as in pdf format or aggregated over several trips. The WGEMS **NOTED** that many CPCs have been improving their submissions in recent years, with more using the required formats so these will be input into the database and there is hope that some will resubmit past data in suitable formats so they can also be included in the analysis.

36. The WGEMS **NOTED** the intention of the Secretariat to repeat this exercise routinely in an automated way to better monitor the contents of the ROS database. The WGEMS **REQUESTED** the Secretariat to continue with this work.

37. The WGEMS **NOTED** that a lot of work has been done to recover historical observer data from purse seine vessels which was relatively straightforward as there were not many vessels involved whereas there are many more longline vessels, so this exercise has not yet been conducted for that fleet.

38. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-12_rev2 on a brief review of current IOTC Regional Observer Scheme data fields, forms and relational database to support the work of the WGEMS and WPDCS.

39. The WGEMS **NOTED** that this is also a reference document intended to inform discussions about the gear specific data fields.

40. The WGEMS **NOTED** that the Record of Authorised Vessels (RAV) is updated annually and is considered to be accurate but further **NOTED** that this is managed as part of the Compliance team and so there is currently no process in place to correct any errors in data submitted on vessels. The WGEMS **NOTED** that the Secretariat has begun cross-checking the information on purse seine vessels with information available from ISSF, IMO, shipyards and national registries of CPCs and so the information about this fleet segment is considered to be accurate. The WGEMS **NOTED** that information on longline and other vessels is considered to be less accurate and mistakes have been found in the database but further **NOTED** the intention of the Secretariat to build a consolidated version of vessels listed in the RAV, starting with longline vessels followed by pole and line and gillnet vessels.

41. The WGEMS **NOTED** that much of the information currently required to be collected by observers on vessels is already available in the RAV and that any studies of changes in fishing technology would be done with data collected by institutes in collaboration with certain companies rather than by taking data from the ROS. For this reason, the WGEMS **AGREED** that the collection of much of the data on vessels should not be considered mandatory for collection by observers. Instead, the WGEMS **SUGGESTED** that the observers are provided with the information available on a vessel from the RAV before boarding and then verify this information with the crew so any changes are still recorded.

42. The WGEMS **NOTED** that currently the data fields that are required to estimate the observer coverage are not mandatory for collection and so **SUGGESTED** that this is revised so they are mandatory. The WGEMS **NOTED** that this may be due to inconsistencies between the requirements in various relevant Resolutions.

43. The WGEMS **NOTED** that when the WPDCS looks over the recommendations from this group, it should provide information on the implications of any changes to the Secretariat in terms of any potential changes to the operational running of the database and any additional work that may be required to accommodate any changes. The WGEMS **NOTED** that the capacity of the data team at the Secretariat is particularly limited at the moment so it would be useful for the Secretariat to be able to anticipate any changes to the work required under the ROS. The WGEMS further **NOTED** that the EU has offered funds to support the implementation of the ROS so the Secretariat intends to use these funds to further develop tools required to streamline the ROS data process.

44. The WGEMS **NOTED** that there are a variety of definitions regarding the ROS and EMS (adopted EMS definitions are available in Resolution 23/08) and the data fields that need to be updated, and further **NOTING** that the Secretariat is working to develop a glossary of terms, the WGEMS **NOTED** that it would be useful for the group to review these intersessionally, to harmonise them with other definitions from FAO and other tRFMOs, and to agree on a standardised set of terminology to be used across all CPCs.

45. The WGEMS **NOTED** that the 'general' fields could differ across the different gear types as the gear characteristics and fishing strategies are different.

7.2 General Data Fields

46. The WGEMS **NOTED** a summary comparing the revision of each gear subgroup on the general data fields across all the different gears. The WGEMS **NOTED** that overall, there is agreement between the various gears with some slight differences in the interpretation of some fields. The WGEMS **NOTED** that there are a few data fields or sections, such as 'Observer trip details', where there is no agreement but **NOTED** that they should be easily resolved during an in-person meeting. The WGEMS further **NOTED** that there are some discrepancies in each group's evaluation of whether a data field is needed for science or not, but again these should be easy to resolve.

7.3 Longline Specific Data Fields

47. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-11 on Revision of IOTC ROS fields by the longline subgroup, including the following summary provided by the authors:

"This document summarizes revisions of IOTC ROS fields' scientific need, reporting requirement, and capabilities of collecting by onboard observers, electronic monitoring, and alternative means, by the longline subgroup appointed by the WGEMS under the umbrella of the WPDCS."

48. The WGEMS **NOTED** the importance of observers collecting information relevant to the understanding of the dynamics of seabird bycatch, including information on key gear characteristics (e.g. including mass of weight and distance to hook). The WGEMS **NOTED** that there needs to be further discussion and agreement regarding whether that gear information is collected as part of the general gear configuration fields or in its current location under Species of Special Interest (SSI) fields. The WGEMS **NOTED** these kinds of issues might be more easily resolved in face-to-face discussions at the WPDCS.
49. The WGEMS **NOTED** that the longline fields subgroup held discussions around which fields are essential for observers to collect, versus fields that could be collected or provided by other means (e.g., national fishery administration). The WGEMS **NOTED** that for some fields intended to be collected for scientific analyses, in some cases these analyses might be better pursued via focused research programs and fishing trials, rather than by relying on observer data which can be very variable in quality. The WGEMS **NOTED** the significant concerns expressed by the Secretariat regarding the lack of quality checks and controls on observer data submitted to the Secretariat.
50. The WGEMS **NOTED** the very significant workloads that are imposed upon observers and stressed the need for the review to ensure that fields that observers (or EMS) are requested to collect are essential for science and underlined the need to reduce any requirement for data collection that will not have a clear benefit for future scientific analyses, where possible. This issue should be considered carefully by the WPDCS and SC with respect to the main purpose of the ROS, and whether there is a need to refocus the ROS to maximise the benefits that it can deliver to the Commission.
51. The WGEMS **AGREED** that progressing discussions to finalise the recommendations from the minimum data fields review process would best be achieved through face-to-face discussions and a dedicated one (or more) day session at the next WPDCS. The Chair of the WGEMS **AGREED** to contact the chair of the WPDCS to discuss this possibility.

7.4 Purse seiner specific data fields

52. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-10 on Revision of IOTC ROS purse seine fields collected for scientific needs, reporting requirements and current collection capabilities by electronic and onboard observers, including the following summary provided by the authors:

"This document summarizes the work of the purse seine subgroup on IOTC ROS purse data fields appointed by the WGEMS under the umbrella of the WPDCS. The scientific need, reporting requirements, and capabilities to be collected by onboard observers, electronic monitoring (EM), and alternative means (e.g., logbooks, ERS or national vessel registries) of current ROS data fields have been reviewed for large purse seiners operating in the Indian Ocean. We present here the key elements identified by the purse seine subgroup, including (1) data fields for which we suggest modifying the reporting requirement, (2) obsolete or superfluous data fields suggested to be removed, and (4) data fields that cannot be collected using current EM systems, along with the proposed alternative mean to collect them."

53. The WGEMS **NOTED** that the revisions proposed by the purse seine subgroup have achieved consensus, hence the WGEMS **RECOMMENDED** that the proposed table and summary are considered as the final product to be presented to the next WPDCS.
54. The WGEMS **NOTED** that routine observer data collection on the presence of a power block and a purse winch on large purse seiners (e.g., EU, Seychelles and Mauritius flags) was useful at the time of transition to these technologies as they can affect fishing efficiency, but that such routine data collection is not currently necessary, since large purse seiners are all equipped with these technologies. However, the WGEMS **NOTED** that these two data fields may still be relevant for smaller-scale purse seiners operating in the IOTC area. Such data fields are also useful for tracking past changes in the fishery to assess effort creep. The WGEMS therefore **SUGGESTED** that they should remain Optional to track past changes in onboard technologies for large purse seiners in historical data and to track future changes for other purse seiner fleets.
55. The WGEMS **NOTED** that EMS cannot systematically collect information on the FAD design or buoys using EM records and that PS Object detail data fields are optional in the ROS. The WGEMS further **NOTED** that the recently

adopted FAD register in Resolution 24/02 should be the primary source of information, rather than onboard or EM observer data, once this new reporting format is in place. The WGEMS also **NOTED** that at a national level, fishing fleets may still be interested in having such data collected by observer programs for MSC certification purpose (to allow comparisons between logbook and observer data).

56. **ACKNOWLEDGING** that data on weather and environmental conditions (currents, wind) collected on board by observers have rarely (if ever) been used, the WGEMS **NOTED** that such data fields could be useful for science in studies at national level but are not necessarily needed for routine reporting in the framework of the ROS. The WGEMS also **NOTED** that in cases when such information is required by fishing crews (e.g. in Electronic Reporting Systems of EU purse seiners), this routine data collection by observers is not well accepted by fishers who regularly question the usefulness of such data. Therefore, the WGEMS **AGREED** that these fields can be removed from the set of mandatory fields to be collected in the frame of the ROS but **NOTED** that they could be collected if needed in the framework of the national observer programs of CPCs.
57. The WGEMS **AGREED** that school sighting cues and school type should be disaggregated and **NOTED** that the latter should remain Mandatory to characterize and discriminate fishing strategy, while sighting cues, indicating what led to the school type, can remain Optional. The WGEMS further **NOTED** that the type of fishing set currently only considers two options in the IOTC glossary of terms - associated schools and free schools - and that a revision of the glossary could help to discriminate between types of associated schools (associated with floating objects, whale sharks, etc.).
58. The WGEMS **NOTED** that data fields related to sightings of cetaceans and whale sharks are currently Optional in the ROS for purse seine fisheries and further **NOTED** that such data fields are crucial to properly assess interactions with such sensitive species. The WGEMS therefore **AGREED** that, as proposed by the ROS purse seine intersessional subgroup, these data fields become Mandatory for scientific purposes. The WGEMS however **NOTED** that it remained unclear whether the section 'Sightings of cetaceans and whale sharks' should include both the interactions with the fishing gear (when individuals are encircled) and sightings in the surroundings of the vessel, which should be rediscussed at a later stage. The WGEMS also **NOTED** that a new form (Form-1IN) has been developed by the IOTC Secretariat specifically to report on interactions with ETP species.

7.5 Pole and Line Specific Data Fields

59. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-13 on Preliminary evaluation of the ROS and EMS data fields for the Pole and Line fishery.
60. The WGEMS **ACKNOWLEDGED** the work of Pole and Line (PL) small working group on reviewing the minimum ROS data fields and EM capabilities in collecting ROS data fields onboard these vessels and **NOTED** that the work is preliminary with intersessional work planned prior to WPDCS to finalize it through consultation with other CPCs with PL fisheries.
61. The WGEMS **NOTED** that some of the data field descriptions should be changed to capture PL operations and that some of the existing minimum data fields for PL are not applicable or practical, and some are difficult to capture with EM due to operational aspects of the fishery. The WGEMS further **NOTED** that some of the data fields are not relevant to scientific requirements or related to species of interest to IOTC.
62. The WGEMS **NOTED** the pilot EMS program implemented for the Maldives PL fishery in 2019 had considerable success but has since been halted due to financial constraints.
63. The WGEMS **NOTED** that the EMS program in the Maldives is incorporated with the VMS onboard vessels, hence the location of vessels can be tracked and as a result, associated fishing around aFADs can be ascertained by vessel location. However, the WGEMS **NOTED** that it is not possible to capture school sighting cues of free-swimming schools with the trialled EMS program.
64. The WGEMS **NOTED** that depredation is rare in PL fisheries and it is not practical to capture this information under the ROS or using EM as depredated species are not generally landed on deck and predators are not often sighted.
65. The WGEMS **NOTED** the proposal to remove data fields related to bait species from ROS data fields, as bait species are not managed by IOTC, and the information is not used and required for the scientific work of the IOTC. The WGEMS further **NOTED** that bait related information is recorded under national programs and scientific sampling programs.

7.6 Gillnet Specific Data Fields

66. The WGEMS **NOTED** that, to date, no specific work has been done to review the data fields related to gillnet fisheries but further **NOTED** that the WGEMS Chair is still working to engage scientists from CPCs with these fisheries in this work.

7.7 Transhipment Specific Data Fields

67. The WGEMS **NOTED** that there are limited data fields to be collected by the ROS in relation to transhipments – only vessel ID, date, time and position fields are required. The WGEMS further **NOTED** that these data are only required to be collected by a scientific observer when there is no observer onboard the reefer vessel, which is rare. However, this did occur when observers could not be deployed during the COVID-19 pandemic. The WGEMS **NOTED** that collection of these data is only useful for compliance purposes in order to identify illegal transhipments which are thought to be rare.

68. The WGEMS **NOTED** the potential for the use of drones in monitoring transhipments but **NOTED** that while it might technically be possible, a lot of training would be required for observers to be able to operate these.

69. The WGEMS **NOTED** the potential of new techniques for sexing fish that involve analysing hormones in blood samples. These techniques would eliminate the need to open the fish to examine the gonads for sex determination.

8. PLAN AND FUTURE MEETINGS

8.1 Updated roadmap to implement EM Programme in IOTC

70. The WGEMS **NOTED** that information on EM projects (pilots and ongoing) conducted in tuna fisheries of the Indian Ocean and elsewhere is generally scattered, and outcomes are available from technical reports that are not easily accessible.

71. The WGEMS **NOTED** that it might be useful to create:
    - An overview of the projects conducted in the Indian Ocean and other oceans with some general information (number of vessels, gears, EM provider, duration, context (e.g., FIP), funding, etc.)
    - A list of EM providers with the main pros and cons (like in document IOTC–2024–WGEMS04–06)
    - An open repository on EM scientific articles, reports, and conference proceedings (e.g., PEW)
    - A review of the main outcomes of the pilots to define best practices and guidance to any CPC that would be interested in developing an EM project, including information on costs of equipment, maintenance, and review, and
    - ToRs for an inter-RFMO meeting, including other RFBs such as ICES, to compare progress on implementation, commonalities between data minimum requirements, standards and exchange formats between companies, identification of unobtainable information with EM, etc., and possibly work on a global, standard terminology and glossary that could be considered in the context of the Coordinating Working Party on fishery statistics of the FAO.

72. The WGEMS **NOTED** that the ISSF is involved in a project funded through Common Oceans focusing on the harmonisation of EM standards adopted or being drafted by tuna-RFMOs, and **ENCOURAGED** the project participants to provide updates on the progress at the next sessions of the WGEM and the WPDCS.

73. The WGEMS **NOTED** that there are ongoing discussions about organising a joint tRFMO meeting which would cover a variety of topics including stock assessments, MSE and ecosystems and bycatch issues and **NOTED** that it might be useful to include EM under these meetings.

8.2 Revision of the WG Program of Work (2024–2028)

74. The WGEMS **NOTED** paper IOTC-2024-WGEMS04-03 on the WGEMS Program of Work (2024–2028).

75. The WGEMS **RECOMMENDED** that the WPDCS consider and endorse the WGEMS Programme of Work (2024–2028), as provided in Appendix IV.

8.3 Next Meetings

76. The WGEMS **NOTED** that the work of reviewing the minimum standard for ROS data fields, undertaken by the intersessional working group, would benefit from broader involvement of the IOTC scientific community, which has

extensive fisheries expertise. The WGEMS **AGREED** that the intersessional working group will produce an information paper on the progress achieved and present it to the forthcoming species working party meetings to obtain feedback from experts in these species. The WGEMS also **AGREED** that, if possible, the main findings should be distributed to the wider IOTC scientific community to obtain further inputs.

77. The WGEMS **NOTED** that the intersessional group produced a consolidated review of the ROS data fields for most gears and the general and gear-specific data fields were under extensive discussion during this meeting. However, consensus on some data issues has yet to be achieved, making it challenging to reach agreement through future online intersessional meetings. Therefore, the WGEMS **RECOMMENDED** holding an in-person meeting to resolve these issues and finalise changes to the data fields for each of the gears, which would facilitate the agreement on revised ROS data fields to be presented to the WPDCS and SC. The WGEMS **AGREED** to consult with the Chair of the WPDCS and the Secretariat regarding the allocation of one to one and a half days during the WPDCS meeting for this specific agenda item.

78. The WGEMS also **RECOMMENDED** that the WGEMS meet again in 2025 to continue to advance EM implementation by the IOTC members.

9. OTHER BUSINESS

9.1 Nomination of the Chair and Vice-Chair of the WGEMS

Chairperson

79. The WGEMS **NOTED** that Dr. Hilario Murua's (ISSF) first term as Chairperson concluded at the end of the WGEMS meeting in 2023. According to the IOTC Rules of Procedure, the election for the Chair for the next two-year period should have occurred at that time; however, it was inadvertently omitted from the meeting agenda. Consequently, Dr. Murua chaired over this meeting, effectively beginning the first year of his second term.

80. Therefore, the WGEMS was consulted regarding the agreement on Dr. Murua's chairmanship for this working group. Dr. Murua has received unanimous support to continue in the role of Chairperson for his second term for the biennium 2024-2025.

Vice-Chairperson

81. The WGEMS **NOTED** that Dr. Don Bromhead's (Australia) first term as Vice Chairperson concluded at the end of the WGEMS meeting in 2023. According to the IOTC Rules of Procedure, the election for the Vice Chair for the next two-year period should have occurred at that time; however, it was inadvertently omitted from the meeting agenda.

82. Therefore, the WGEMS was consulted regarding the agreement on Dr. Bromhead's Vice-Chairmanship for this working group. Dr. Bromhead has received unanimous support to continue in the role of as the Vice Chairperson for his second term for the biennium 2024-2025.

9.2 Review of the draft, and adoption of the Report of the 4th Session of the WGEMS

83. The report of the 4th Session of the Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (IOTC–2024–WGEMS04–R) was ADOPTED via correspondence.

APPENDIX I
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APPENDIX II
MEETING AGENDA

Date: 5-7 June

Location: Online

Venue: Zoom

Time: 12:00 – 16:00 (Seychelles time) daily

Chairperson: Dr. Hilario Murua, **Vice-chair**: Dr. Don Bromhead

1. **OPENING OF THE MEETING** (Chairperson)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chairperson)
3. **BACKGROUND AND OBJECTIVES OF THE WORKSHOP** (Chairperson)
4. **DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE WGEMS**
   - 4.1. Any Relevant Outcomes from the 28th Session of the Commission
   - 4.2. Updates from the 26th Session of the Scientific Committee
5. **THE IOTC REGIONAL OBSERVER SCHEME (ROS)** (IOTC Secretariat)
   - 5.1. Current projects related to Electronic Monitoring and Electronic Reporting (all)
6. **EM PROGRAMME INITIATIVES IN IOTC**
   - 6.1. Update on CPCs EMS pilot projects and Programmes
7. **REVISION OF ROS MINIMUM DATA REQUIREMENTS**
   - 7.1. Review of the reporting of ROS data fields (Secretariat)
   - 7.2. Intersessional work
   - 7.3. General Data Fields
   - 7.4. Longline Specific Data Fields
   - 7.5. Purse Seiner Specific Data Fields
   - 7.6. Pole and Line Specific Data Fields
   - 7.7. Gillnet Specific Data Fields
   - 7.8. Transshipment Specific Data Fields
8. **PLAN AND FUTURE MEETINGS** (Chairperson and Vice-chairperson)
   - 8.1. Updated roadmap to implement EM Programme in IOTC
   - 8.2. Revision of the WG Program of Work (2024–2028)
   - 8.3. Next meetings
9. **OTHER BUSINESS**
   - 9.1. Nomination of the Chair and Vice-Chair of the WGEMS
   - 9.2. Review of the draft, and adoption of the Report of the 4th Session of the WGEMS

APPENDIX III
LIST OF DOCUMENTS

Document	Title
IOTC–2024–WGEMS04–01a	Draft Agenda for the 4th Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC–2024–WGEMS04–01b_rev1	Draft Annotated Agenda for the 4th Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC–2024–WGEMS04–02_rev1	List of Documents for the 4th Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC–2024–WGEMS04–03	WGEMS Programme of Work (2024 – 2028) (Secretariat)
IOTC–2024–WGEMS04–04	Outcomes of the 28th Session of the Commission and the 26th Session of the Scientific Committee (Secretariat)
IOTC–2024–WGEMS04–05	Regional Observer Scheme Data fields reporting rates (Secretariat)
IOTC–2024–WGEMS04–06	Scoping study on cost-effective monitoring, control and surveillance data collection systems for small-scale/artisanal fisheries in the western Indian Ocean (R. Wanless)
IOTC–2024–WGEMS04–07	Workshop report: Low-cost data collections and MCS tools in the South West Indian Ocean (WWF and SADC Secretariat)
IOTC–2024–WGEMS04–08_rev2	Trials for efficient Electronic Monitoring of fishing operations in gillnet tuna fisheries of Pakistan (S. A. Razzaque, U. Shahid, A. Sfeir and R. Wanless)
IOTC–2024–WGEMS04–09	The extent to which the data fields required for monitoring transhipments under the ROS can be collected through electronic monitoring (J. M. Clark)
IOTC–2024–WGEMS04–10	Revision of IOTC ROS purse seine fields collected for scientific needs, reporting requirements, and current collection capabilities by electronic and onboard observers (P. S. Sabarros, K. Briand, A. Maufroy, M. L. Ramos, J. Ruiz and G. Wain)
IOTC-2024-WGEMS04-11	Revision of IOTC ROS fields by the longline subgroup (S. Tsuji, D. Bromhead, T. Emery, P. S. Sabarros, S. Jiménez, L. Ramos, R. F. Wu)
IOTC-2024-WGEMS04-12_rev2	A brief review of current IOTC Regional Observer Scheme (ROS) data fields, forms and relational database to support the work of the WGEMS and WPDCS (A. Maufroy)
IOTC-2024-WGEMS04-13	Revision of IOTC ROS pole and line fields collected for scientific needs, reporting requirements, and current collection capabilities by electronic and onboard observers (M. Haleem, M. Ahusan, M. Shimal, A. Shifaz, H. Sinan)

APPENDIX IV

PROGRAMME OF WORK FOR THE AD HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS (2024–2028)

The Program of Work consists of the following, noting that a timeline for implementation would be developed by the SC once it has agreed to the priority projects across all of its Working Parties:

Table 1. Priority topics for obtaining the information necessary to deliver the necessary advice to the Commission. Resolution 11/04 and 16/04 elements have been incorporated as required by the Commission.

		Timing				
Topic	**Sub-topic and project**	**2024**	**2025**	**2026**	**2027**	**2028**
Items considered to be of high priority						
1. EMS data fields	Review of the fields that are required under the ROS but are logistically difficult to collect for EMS (and /or human observers) and their utilisation for scientific and management purposes.					
2. Capacity building	Capacity building to develop and implement National EMS Programs.					
3. EMS Pilot Projects	Facilitation of EMS pilot projects in IOTC fisheries (LL, PS, PL, GN, and others) to ensure that ROP minimum data requirements are collected by EMS Cross validation of EM information with other data sources Identify needs and encourage pilots for new electronic tools and systems. Provide guide for the capabilities of EMS to collect ROS data requirements and how they may be collected in the future (include examples as to how annex II of EM System and Data Standards can be improved).					
Items considered to be of medium to low priority						

4. Develop guidelines on development of EM programmes	• An overview of the projects conducted in the Indian Ocean and other oceans with some general information (number of vessels, gears, EM provider, duration, context (e.g., FIP), funding, etc.) • A list of EM providers with the main pros and cons (like in document IOTC–2024–WGEMS04–06) • An open repository on EM scientific articles, reports, and conference proceedings (e.g., PEW) • A review of the main outcomes of the pilots to define best practices and guidance to any CPC that would be interested in developing an EM project, including information on costs of equipment, maintenance, and review, and • ToRs for an inter-RFMO meeting, including other RFBs such as ICES, to compare progress on implementation, commonalities between data minimum requirements, standards and exchange formats between companies, identification of unobtainable information with EM, etc., and possibly work on a global, standard terminology and glossary that could be considered in the context of the Coordinating Working Party on fishery statistics of the FAO.					
5. Review EM Minimum data Standards	Agree on or revise: • Definitions • Minimum technical specifications and equipment • Data collection (including EM capabilities to collect ROP minimum data requirements) and storage • Data transfer and logistical specifications • Data analysis specification and data submission • EM maintenance and functioning, • EM data analysis, validation and quality control specifications • Roles of EM users					

6. Review of EM Programme Standards	Agree on or revise: • Objectives and Scope of the Programme • Institutional structure and management • EMS coverage and data review coverage • Roles and responsabilities • Specifications and Procedures • Timeframe for EMS implementation • Accreditation of EMS Systems/vendors • Data confidentiality, access and use • EMS Program cost					
7. Compatibility and Interoperability	Compatibility of IOTC databases and other collection platforms (e.g. VMS) Interoperability among different vendor's EMSs					
8. Development of tools and innovative strategies	Innovative collection of data which may include Artificial Intelligence and Machine learning for EMS data analysis as well as other methods that are identified by the WG.					

APPENDIX V
CONSOLIDATED RECOMMENDATIONS OF THE 4TH SESSION OF THE AD-HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS

Note: Appendix references refer to the Report of the 4th Session of the Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (IOTC–2024–WGEMS04–R)

7.5 Revision of ROS minimum data requirements: Purse seiner specific data fields

WGEMS04.01 (para 53): The WGEMS **NOTED** that the revisions proposed by the purse seine subgroup have achieved consensus, hence the WGEMS **RECOMMENDED** that the proposed table and summary can be considered as the final product to be presented at the next WPDCS.

8.2 Revision of the WG Program of Work (2024–2028)

WGEMS04.02 (para 75) The WGEMS **RECOMMENDED** that the WPDCS consider and endorse the WGEMS Programme of Work (2024–2028), as provided in Appendix IV.

8.3 Next meetings

WGEMS04.03 (para 77): The WGEMS **NOTED** that the intersessional group produced a consolidated review of the ROS data fields for most gears and the general and gear-specific data fields were under extensive discussion during this meeting. However, consensus on some data issues has yet to be achieved, making it challenging to reach agreement through future online intersessional meetings. Therefore, the WGEMS **RECOMMENDED** holding an in-person meeting to resolve these issues and finalise changes to the data fields for each of the gears, which would facilitate the agreement on revised ROS data fields to be presented to the WPDCS and SC. The WGEMS **AGREED** to consult with the Chair of the WPDCS and the Secretariat regarding the allocation of one to one and a half days during the WPDCS meeting for this specific agenda item.

WGEMS04.04 (para 78): The WGEMS also **RECOMMENDED** that the WGEMS meet again in 2025 to continue to advance EM implementation by the IOTC members.

APPENDIX VI
SUMMARY OF GEAR SUB-GROUP DECISIONS

Purse Seine

[Extract of paper: IOTC-2024-WGEMS04-10]

1. Reporting requirements to be modified for purse seine

1.1. Mandatory fields proposed to be Optional

Gear specifications and general gear attributes:

- ***Power block*** and ***Purse winch*** provide useful information on fishing efficiency but are present on board all modern large purse seiners. A systematic check is therefore not relevant in 2024. We then propose to make them Optional.
- Most data fields in the *PS general gear attributes* provide useful information on fishing efficiency but the design and characteristics of purse seines has been stable for a long time. These data fields are also not used in routine for science purposes anymore. ***Maximum length of the net***, ***Maximum depth of the net***, ***Bag stretched mesh size***, ***Mid-net stretched mesh size***, and ***Maximum brail capacity*** are therefore recommended to be Optional.

Fishing operations:

- ***School sighting cues and school types*** should be disaggregated into 2 separate fields. ***School sighting cues*** should become Optional, whereas ***School type*** can remain Mandatory.
- To calculate the total set duration, ***Time skiff onboard*** should be preferred to ***Time net pursed***. Therefore, ***Time net pursed*** would become Optional while ***Time skiff onboard*** would become Mandatory.

Tag details:

- All data fields (***Tag release***, ***Tag recovery***, ***Tag type***, ***Tag number***, ***Tag finder***, and ***Well***) are proposed to become Optional. This should be aligned with other gears.

1.2. Optional fields proposed to be Mandatory

Fishing operations:

- To calculate the total set duration, ***Time skiff onboard*** should be preferred to ***Time net pursed***. Therefore, ***Time net pursed*** would become Optional while ***Time skiff onboard*** would become Mandatory.

Cetaceans and whale sharks' sightings:

- All data fields (***Sighting occurred before setting***, ***Species***, ***Number sighted***, and ***Caught inside the net***) should become Mandatory because they are necessary for science to assess interactions with these sensitive species.

2. Fields to be removed

- ***Skiff power*** in the *PS gear attributes* section has never been used in any analyses, thus, we propose that it is removed.
- ***Beaufort*** in the *PS fishing operations* section is obsolete in the sense that weather or sea conditions can now be easily obtained using satellite or modeling data products. It should therefore be removed.
- *PS support vessel details* fields (***Support vessel presence***, ***Support vessel name***, and ***Support vessel participation***) are obsolete since the practice of using the support vessel to aggregate fish is not standard anymore for large purse seiners. These data fields should therefore be removed.
- *PS details on current* fields (***Current direction***, ***Current speed***, and ***Current depth***) should not be collected through the ROS and should therefore be removed.

3. ROS fields requiring an alternative mean of collection to EMS

- Most fields in the *PS general gear attributes* (***Maximum length of the net***, ***Maximum depth of the net***, ***Bag stretched mesh size***, ***Mid-net stretched mesh size***, and ***Maximum brail capacity***) are not collectable with EMS and would require information from the crew, the fishing company or consultation of other reporting means (e.g., Electronic Reporting Systems).

- In *PS fishing operations*, ***School sighting cues, School size***, ***First Detection method***, ***Maximum closing net depth*** cannot be collected by EM observers and would therefore require to be alternatively collected by the fishing crew. None of these data fields are however recommended to be Mandatory. Should they be needed for specific projects, specific data collection tools could be put in place.
- In *PS object details*, it is not possible to retrieve the information on the instrumented buoy (***Buoy ID*** and ***Buoy equipped with artificial lights***) using current EM systems and it would be difficult to assess the structure of Floating Objects (***Artificial FAD design)*** depending on the type of interaction (deployment or visit). This is not limited to EM as onboard observers encounter similar issues to collect information on FOB structure and other sources of information, such as the FOB logbook or data collection in FAD building facilities, in case FADs are built on land.
- In the *PS cetaceans and whale sharks' sightings* section, fields such as ***Sighting occurred before setting***, ***Species***, ***Number sighted***, and ***Caught inside the net***, cannot be collected using current EM systems except under specific circumstances, for instance when a whale shark can be sighted from the surface while in the net or when maneuvers of the net to release the individuals can be observed. The detection of whales is also very challenging as only the dorsal fin and back, and eventually blow, can be seen if they come to the surface. Such information could be retrieved from logbooks.
- ***Weight*** in the *PS catch details* section is Mandatory but cannot be estimated measured using current EM systems. In the case of target species, the total weight by species is normally provided by the crew (logbook) or port sampling. For bycatch species (retained or discarded), weight by species is based on length-to-weight conversion where length is visually estimated (EM length measurements would not be precise if not done in calibrated areas).
- *For PS Additional details on non-target species*, the ***Condition at capture/release*** is difficult to assess using EM systems because of the relatively low rate of frames per second and the fact that individuals can only be observed for a few seconds.
- In the *PS biometric information* section ***Sampling methods for the collection of biological information*** and ***Length 1*** are Mandatory but may require further improvement for EM with appropriate calibrated methodology to obtain more robust estimations. Depending on the program, length measurements are obtained using visual estimates (the least precise) or digital measurement tools (which precision depends on the proper calibration). ***Maturity stage*** and ***Biological data sample*** are impossible to collect with EMS.
- Fields in *PS tag details* (***Tag release***, ***Tag recovery***, ***Tag type***, ***Tag number***, ***Tag finder***, and ***Well***) cannot be collected with EM and would require assistance from the fishing crew (data collection, retrieved tags brought back to port, etc.).
- In *PS Daily activity information* (***Date***, ***Time***, ***Position***, ***Activity***, and ***Comments***), only fishing sets and operations on objects can be readily monitored using EM systems. Events such as transit or searching can be difficult to monitor using EM systems, especially if no clear pattern can be detected on the trajectory of the vessel. Such information can be alternatively collected on board, either by the onboard observer or by the fishing crew.

Longline

[Extract of paper: IOTC-2024-WGEMS04-11]

This document summarizes revisions of IOTC ROS fields' scientific need, reporting requirement, and capabilities of collecting by onboard observers, electronic monitoring, and alternative means, by the longline subgroup appointed by the WGEMS under the umbrella of the WPDCS.

1. General principle of the ROS fields:

- The LL subgroup considered that the data items to be included in this document should indicate those required to collect with objective manner, either with human on-board observer (HO), electronic monitoring (EMS), or port sampling, and report to the Secretariat
- Each CPC is responsible to determine the most appropriate data collection procedure(s). While the current resolution only covers the industrial fleet, it should be considered to apply this list to all fleets, including those who do not collect logbook information.
- The list mainly focused the items to be collected directly through HO and EMS. The information that reporting requirement is determined elsewhere is removed from this list.
- In this document, "Mandatory" means that CPC should collect relevant information through human HO, or EMS, or in combination with supplementary data collection procedure(s) (e.g. port sampling/ inspections, VMS, logbook) as needed.
- Criteria to make "Mandatory" included: either essential for data management and/ or scientific analysis, or included in the Resolution and its evaluation of impacts required, under the condition where reasonable level of data collection can be assumed by both HO and EMS in combination with supplementary procedure(s).

2. Fields proposed for modifications:

- [GENERAL/ OBSERVER IDENTIFICATION] ***All items*** – modify filed names and descriptions to include data analyst identifications for EMS.
- [GENERAL/ OBSERVED TRIP SUMMARY] ***Number of fishing events / sets conducted by the vessel while the observer was on-board*** and ***Number of fishing events / sets observed*** – modify the field name and description to make applicable to EMS processed data set.
- [Longline/ LL SETTING OPERATIONS - MITIGATION MEASURES] ***Bait species*** – Reference table should be reviewed and updated as appropriate.
- Biometric information: In order to accept supplemental information collected through port-sampling/ post-trip inspection, standard method to link trip-based information with other detailed information collected HO/ EMS should be developed.

3. Fields to be removed

- ***All fields*** in [GENERAL/ Vessel Identification] CPCs should report the information in this section through the Register of Active Vessels. Vessel IOTC number should be kept for data management purpose.
- [GENERAL/ VESSEL OWNER & PERSONNEL] ***Registered owner*** and ***Charter/Operator***. CPCs should report the information in this section through the Register of Active Vessels (RAV).
- [GENERAL/ VESSEL Attributes] ***Tonnage***, ***Length overall***, ***Hull material***, ***Main engines (make and power)***, and ***Fish storage capacity***. CPCs should report the information in this section through the RAV. The RAV need to modify to include fish storage capacity, if this information needed.
- [General/Vessel electronics] ***Weather facsimile –*** out of dated.
- [General/OBSERVED TRIP SUMMARY] ***Number of days in the fishing area*** – ambiguous, also retrievable from VMS data.
- [Longline/ LL GENERAL GEAR ATTRIBUTES] ***Mainline Material***, ***Mainline Length***, and ***Mainline Diameter*** -- no scientific value, duplicate at event level data collection.
- [Longline/ LL SETTING OPERATIONS] ***VMS on*** – MCS issue.
- [Longline/ LL - HAULING OPERATIONS] ***Method(s) to stun fish*** – no scientific relevance.

4. Pending fields with no consensus

- [GENERAL/Observer trip details] Although this information is useful for operational management of HO, need of this section in the ROS fields was questioned but no consensus made. Majority view is that this section is for identifying start and end of observation dates and location, which is easily extractable from the detailed data submitted. Therefore some

considers it not necessary to require this infomation separately. Although this information is useful for operational management of human observer program, it will not have relevance when selecting the footage for analysis radomly from whole operations in the case of EMS.

- [GENERAL/ VESSEL OWNER & PERSONNEL] ***Fishing master*** and ***Skipper –*** currently not in the RAV, general agreement on the importance of this information, but no consensus on the proper way to report without causing confusion.
- [GENERAL/Vessel trip details] The CPC program operator hold this information, not necessarily relevant to HO nor EMS data. The need of this section in the ROS fields was questioned but no consensus made. Large discrepancy in views on potential utility of this information. In any case, clear definition of "trip" need to be agreed. It should be noted that the end date and location of trip information would not be accessible to "observers" unless disembarkation occur at the same time/location.
- [Longline/ LL FISHING EVENT] ***Set Number –*** no consensus on wether ID should be allocated to all operations regardless observation/ analysis.
- Gear configuration in "LL SETTING OPERATION" section: Discrepency in views on what is the minimum necessary information to describe the longline gear configuration that can be monitored by combination of objective data collection, which include ***vessel speed***, ***line setter speed, mainline set length, brachline clip on time, buoys clip on time, distance between branchlines, floatline length, total radio/ dhan buoys set***, and ***attached lights***.
- Branchline weighting information: Currently, this information is under the MITIGATION MEASURES. Two approaches, a) to record Y/N (as current), and b) to include this as a part of branchline configurations, were discussed but no conclusion was made. Same arguments in treatment of hook types and utilisation of other appendices. If taking the approach a), the reporting responsibility should be CPC's, not observers.
- [Longline/ Catch ID vs LL - SPECIMEN INFORMATION]: further clarification needed in the way of applying “Catch-ID” and “specimen-ID”.

Pole and Line

[Extract of paper: IOTC-2024-WGEMS04-13]

1. Mandatory fields proposed to be optional

- **Special Equipment or Machinery**: As this field is not being used for CPUE standardization, *Live Bait Tanks Capacity* we propose to keep this optional.
- **Fishing Operation:** With the current EM technology, *School Sighting Cues* and *School Types* may not be possible to detect. We suggest making this field optional, to be revised at a later date. VMS data can be used to ascertain fishing around aFADs as there is a registry of aFADs installed.
- **Depredation Details**: *Depredation Source* is not possible to be recorded for each specimen, as depredated specimen will not be landed on deck. This fish will be eaten whole most of the time. *Predators Observed* will also not be possible to record with EM.
- **Catch Details:** During a fishing event, the catches will be landed on deck and put in the holds within a matter of minutes. Hence, it is not possible for EM to record the *Number* and *Weight* of the individual specimens as described. This information can be collected through port sampling and logbooks, and the total weight of the catches can also be estimated.

2. Mandatory fields not applicable

- **Fishing Operations:** *Sampling Protocol* – the as described is not applicable as in this fishery poles are used to fish, instead of lines as stated.

3. Other Suggested changes to the Data Fields

- **Observed Trip Summary:** As pole and line fishing trips are significantly shorter compared to any other gear type trips, we suggest including the option of recording the *Number of days searching* and *Number active fishing days* fields in *hours* as well, whenever applicable
- **Tuna Fishing Event:** Fishing during pole and line fishing trips are recorded as I. So, we suggest renaming the *Set Number* as such.
- **Vessel Daily Activity Information:** The vessel activity *Time* should be recorded as at the start of every fishing activity and every two hours from sunrise to sunset or until the end of the trip. The vessel *Position* should be recorded as at the start of every fishing activity and every two hours from sunrise to sunset or until the end of the trip

4. Fields that are Mandatory which are difficult to record with EM

Catch details:

- *Species* of each fish brough onboard is impossible to record with the technology available right now as the catch will be, almost immediately, put in the hold after it is brough on deck.
- As pole and line fishing events are very short (in most instances this is a matter of minutes) it would be near impossible for EM to record the *Fate* of each catch.
- In pole and line fishing trips the human observers we have onboard also use their experience to determine the species composition of tuna species. This is based on a number of factors such as school type etc. For EM we will have to use a similar approach to ascertain species composition as it is a high volume fishery that a lot of action takes place over a short period of time. The electronic logbook reports that will be submitted before the catch is landed will also be used to tease out species composition. So, having the *Sampling Methods for Obtaining Total Catch Estimates per Species* mandatory will be a challenge

5. Fields suggested to be removed

- **Vessel Daily Activity Information**: Suggest removing the *Activity* field under this section. Trip start and end time, as well as the fishing event start and ends times are already being recorded, which are the relevant data to be recorded for pole and line fishing trips
- **Bait Biometric Information**: As bait biometric information is not collected as part of tuna stock research and as bait is not a species managed by IOTC, *fields under this section* should be removed.
- **Bait Tag Details:** As bait tagging activities are not possible and as bait is not a species managed by IOTC, *fields under this section should be removed*.

- **Bait Fishing Event, Bait Catch Details, Bait Specimen Information, Bait Additional Details on Non-Target Species and Bait Additional Catch Details on SSIs:** As bait is not a species managed by IOTC, *fields under these section* should be removed.