Report of the 6th Session of the IOTC Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)

Online, 13 April 2026

DISTRIBUTION:

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ACRONYMS

AIS	Automatic Identification System
BET	Bigeye tuna
CPCs	Contracting parties and cooperating non-contracting parties of the IOTC
EM	Electronic Monitoring
EMS	Electronic Monitoring System
IOTC	Indian Ocean Tuna Commission
RAV	IOTC Record of Authorised Vessels
RFMO	Regional Fisheries Management Organization
ROS	Regional Observer Scheme
SC	IOTC Scientific Committee
VMS	Vessel Monitoring System
WPDCS	Working Party on Data Collection and Statistics of the IOTC
WWF	World Wide Fund for nature

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 6th 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 on 13 April 2026. A total of 41 participants attended the Session (43 in 2025, 80 in 2024, and 89 in 2023). The list of participants is provided in Appendix I. The meeting was opened by the Chairperson, Dr Don Bromhead (Australia) who welcomed participants. There were no specific recommendations from the meeting, but a number of key issues were discussed including:

- EM is increasingly being implemented across CPCs, with growing interest in its use for scientific data collection under the Regional Observer Scheme (ROS), particularly in fisheries with limited or no human observer coverage.
- With respect to the collection of mandatory IOTC ROS data fields, while EM provides continuous monitoring and can capture events sometimes missed by human observers, EM systems still have challenges as there are limitations regarding automatic species identification, collection of certain biological data (e.g. size, sex, maturity), and the detection of discards/releases occurring in the water.
- Research into solutions to improve EM systems and make them more efficient is ongoing. For example, research into artificial intelligence based approaches in EM, including automated event detection and size estimation, have demonstrated the potential of AI to improve the efficiency of EM data review in tuna fisheries in future. However, progress towards actual implementation of these AI applications is constrained by limited availability of large, well-annotated training datasets and ongoing technical challenges, particularly for the collection of good quality and species-specific data. Other research has demonstrated the potential for underwater camera systems to capture more accurate species level data on discards and cut-offs, a key deficiency for EM to date.
- Research based comparisons between EM, logbook, and observer data often reveal both strong agreement in some areas (e.g. retained catch) and notable discrepancies in others (e.g. discards and species level interactions with ETP species). EM data are increasingly being used to identify logbook and observer reporting inconsistencies and provide feedback to improve data quality.
- EM implementation challenges persist, including system costs, technical limitations (e.g. camera coverage, low-light performance), data processing requirements, and the time needed to resolve operational issues. Capacity constraints, particularly in smaller CPCs, further affect the pace of adoption.
- The group identified the importance of harmonising EM standards, reporting formats, and data requirements across RFMOs to improve efficiency and reduce duplication of effort, given that many fleets operate across multiple regions.
- Capacity building, including technical workshops and collaboration with service providers and research organisations, is critical to supporting EM implementation. The group noted that a second joint tuna-RFMO Electronic Monitoring (EM) Harmonization workshop is being organized in early 2027. The workshop will review progress made since the first workshop held in San Sebastian, assess developments in the implementation of EM programmes, address emerging issues such as AI, and consider the status of recommendations arising from the initial meeting. The workshop is also intended to support continued collaboration among RFMOs in advancing harmonized EM standards and implementation approaches
- There is strong interest in holding a dedicated IOTC workshop on EM after the second joint t-RMFO workshop to exchange and share knowledge pertaining to EM use (and lessons learned) in IOTC for fisheries monitoring, data collection, and compliance and to address how EMS-derived information can be structured and reported in accordance with IOTC data standards.The group discussed the possibility to hold the workshop adjacent to the Working Party on Data Collection and Statistics meeting in November 2027.

1. Opening of the Meeting

1. The 6th 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 on 13 April 2026. A total of 41 participants attended the Session (43 in 2025, 80 in 2024, and 89 in 2023). The list of participants is provided in Appendix I. The meeting was opened by the Chairperson, Dr Don Bromhead (Australia), 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. Decisions of the Commission Related to the Work of the WGEMS

3.1 Any Relevant Outcomes from the 28th Session of the Scientific Committee

3. The WGEMS **NOTED** paper IOTC–2026–WGEMS06–04 on the Outcomes of the 28th Session of the Scientific Committee.
4. The WGEMS **NOTED** the discussions held during the 2025 Session of the Scientific Committee and included in the SC28 report:

   *"(para. 237) The SC **NOTED** the report of the 5th ad hoc working group meeting on Electronic Monitoring Standards (IOTC - 2025-WGEMS05-R). The meeting was attended by 43 participants (cf. 80 in 2024).*

   *(para. 238) The SC **ACKNOWLEDGED** that the WPDCS conducted a comprehensive review of all ROS data fields for purse seine, longline, and pole-and-line fisheries but did not address the gillnet-specific fields due to the absence of gillnet fishery experts at the meeting."*

5. The WGEMS **NOTED** that usually the paper also discusses the outcomes of the Commission relevant to the WGEMS. However, as the Commission meeting was held before the WGEMS in 2025, there are no new updates from the Commission since the last WGEMS meeting.

4. The IOTC Regional Observer Scheme

4.1 Current projects related to Electronic Monitoring and Electronic Reporting

6. The WGEMS **NOTED** a summary of the electronic monitoring (EM) data currently held by the Secretariat, including developments following the update of the Regional Observer Scheme (ROS) Resolution in 2025 (Res. 25/06).
7. The WGEMS **NOTED** that the majority of EM data received to date has been provided by Australia since 2015. Following the revision of the ROS and the adoption of standardised IOTC reporting forms, Australia continues to submit data in its existing format, although this includes much of the required information. However, some data gaps remain, particularly in relation to biometric data and mitigation measures, which were acknowledged as ongoing limitations of EM systems.
8. The WGEMS **NOTED** that other CPCs are beginning to submit EM-related data. The European Union (Spain) is using the IOTC reporting forms, although similar gaps in biometric and mitigation data were identified.
9. The WGEMS **NOTED** that some biometric information is instead obtained through port sampling programmes for Australia and EU.
10. The WGEMS **NOTED** that Malaysia's report submissions are focused mainly at the trip-level with operational information (number of sets, location and dates) and with some effort data, but lack detailed information on catch, retention, and discards.
11. The WGEMS **NOTED** the outcomes of a recently held purse seine data reporting workshop, which focused primarily on FAD-related data issues and ROS implementation. The workshop also provided an opportunity to discuss

national observer programmes, including challenges in data collection and prioritisation. The WGEMS **NOTED** that purse seine observer coverage is over the minimum 5% required for reporting fleets, with most data derived from human observers rather than EM systems. While some EM implementation is known to be occurring, these data are not consistently submitted and often do not meet minimum data reporting requirements.

12. The WGEMS **NOTED** that a similar data reporting workshop for longline fisheries is planned for May, with the aim of addressing comparable issues in ROS reporting.

5. EMS PROGRAMMES/RESEARCH INITIATIVES IN IOTC

5.1 Update on CPCs EMS pilot projects and Programmes

13. The WGEMS **NOTED** paper IOTC-2026-WGEMS06-06 on "Improving marine fisheries transparency through electronic monitoring in the United Republic of Tanzania", including the following abstract provided by the authors:

"Most fisheries in the world lack reliable data about what happens on the water to inform and implement science-based management. The Indian Ocean is the second most productive tuna fishery in the world. Without effective monitoring and enforcement, fisheries will struggle to reach sustainability.

To fill data gaps and inform fisheries management, Deep Sea Fishing Authority (DSFA), in collaboration with The Nature Conservancy (TNC), will pilot electronic monitoring (EM)—the use of onboard video cameras, GPS, and sensors to automatically track and verify fishing activity onboard fishing vessels. Data is power, and EM data will supplement the existing the United Republic of Tanzania's (URT's) human observer program and potentially support Marine Stewardship Council (MSC) certification. EM will enhance transparency and help to manage and conserve URT's fisheries."

14. The WGEMS **NOTED** that an EM system had previously been installed by Satlink on one vessel by the fishery company and **NOTED** that this was scheduled for upgrading under the project. However, the upgrade was not implemented due to the project's suspension, but a new system is planned to replace the existing one, with improved capabilities for remote operation and data analysis.

15. The WGEMS **NOTED** that Tanzania is at an early stage of EM implementation and has not yet undertaken comparisons between EM and human observer data. The WGEMS **NOTED** that initial efforts will rely on the EM service provider and support from The Nature Conservancy to build capacity and better understand data review processes before conducting such analyses.

16. The WGEMS **NOTED** discussions on capacity development, including whether training national teams to review EM data is an effective strategy given the current scale of operations. The WGEMS **NOTED** that, due to the limited number of vessels, continued reliance on service providers is planned during the pilot phase until sufficient expertise and workload justify internalisation.

17. The WGEMS **NOTED** that full EM trials have not yet commenced, and therefore no direct assessment of species identification challenges has been undertaken. However, the WGEMS **ACKNOWLEGED** that species identification, particularly for animals remaining in the water, is a known challenge, and that future systems will need solutions (e.g. AI and/or other approaches) to improve performance.

18. The WGEMS **NOTED** that observer data are already being submitted and that EM data, once available, will need to align with ROS reporting requirements, including the use of standardised IOTC data fields. The WGEMS further **NOTED** that CPCs are required to include a description of their EM programmes within their national reports to the IOTC.

19. The WGEMS **NOTED** ongoing efforts by the Secretariat to support capacity building through technical workshops. While recent workshops have focused on ROS implementation, including purse seine and longline fisheries, it was acknowledged that the Secretariat plans to organise a dedicated workshop on EM data.

20. The WGEMS **NOTED** that this technical workshop would review recent developments in the use of Electronic Monitoring Systems (EMS) in Indian Ocean tuna fisheries. Over the past several years, several projects implemented by IOTC Members and partners have explored the application of EMS to support fisheries monitoring, data collection, and compliance with reporting requirements. The workshop would provide an opportunity to present the outcomes and lessons learned from these initiatives, including recent advances in the use of Artificial Intelligence to support image review and data processing. Discussions will also address how EMS-derived information can be structured and reported in accordance with IOTC data standards. In particular, the workshop would consider the implications of the recent recognition of EMS-derived observer data as an official source of Regional Observer Scheme data under IOTC Resolution 25/06.

21. The WGEMS **NOTED** expressions of support for such an initiative, including willingness from stakeholders to contribute and participate. The WGEMS also **NOTED** offers of bilateral support and knowledge sharing from CPCs with more advanced EM programmes, including Australia.

22. The WGEMS **DISCUSSED** the possibility of holding this workshop directly ahead of the WPDCS meeting as many of the participants to the workshop would also be present at WPDCS. However, the workshop timing was not fully confirmed.

23. The WGEMS **NOTED** IOTC-2026-WGEMS06-07 on “An update on electronic monitoring pilot in Kenya”, including the following abstract provided by the authors:

“Between 2023 and 2025, the government of Kenya tested Electronic Monitoring (EM) systems on three (3) industrial vessels operating within its EEZ. The goal of the pilot was to: (1) Demonstrate the validity and usefulness of EM as a monitoring tool; (2) Build solid working relationships among partners; (3) Generate reliable fisheries data that can be used for compliance, science, and training purposes; and (4) Enhance the institutional capacity of Kenya Fisheries Service (KeFS), Kenya Marine and Fisheries Research Institute (KMFRI) and partners to use EM to work towards a scaled up EM program.

This update details the operational successes and technical challenges encountered during the pilot, highlighting its alignment with existing IOTC electronic monitoring standards. Preliminary results demonstrate the system's effectiveness in enhancing data transparency, which has directly informed Kenya’s commitment to achieving full transparency and compliance across its entire industrial fishing fleet by 2030. The presentation will conclude with key lessons learned to support other IOTC member states in the development and integration of domestic EM frameworks.”

24. The WGEMS **NOTED** observations comparing EM and human observer data, with EM recording a higher number of catch/interaction events than human observers. The WGEMS **DISCUSSED** the possible reasons for this disparity, including observer fatigue or complacency, while noting that no definitive explanation has been identified. The WGEMS **NOTED** that, despite training, human observers may miss certain events that are captured by continuous EM systems.

25. The WGEMS **NOTED** that comparisons between EM and human observer data were conducted across multiple trips for each vessel. The WGEMS further **NOTED** that observer coverage is not consistent across all longline operations, resulting in gaps in human observer data. Even when observers are present, EM systems were found to capture additional events that may be missed by crew or observers.

26. The WGEMS **NOTED** that species identification accuracy from EM footage in Kenya was estimated at approximately 70%, highlighting both the potential and current limitations of EM systems for species-level identification. The WGEMS **NOTED** challenges related to the identification of bycatch species that are released directly in the water without being brought onboard. The WGEMS **NOTED** that, in some cases, species can still be identified from EM footage during handling prior to release, although this remains a limitation. The WGEMS **NOTED** that advances in AI may help improve species identification under these conditions.

27. The WGEMS **NOTED** information on EM system deployment in Kenya, including the installation of EM on a limited number of vessels (three longline vessels and one trawler vessel), operating primarily within national waters with occasional fishing on the high seas. Data collection is currently conducted using hard drives, with parallel trials of

satellite-based transmission underway, aiming to develop a hybrid system. The WGEMS **NOTED** that Kenya plans to scale up EM coverage, including the objective of achieving full fleet coverage in future phases.

28. The WGEMS **NOTED** that observer coverage varies by fishery, with higher coverage in some sectors and limited or absent coverage in others, such as longline fisheries. This variability contributes to differences in data availability and comparability between EM and observer datasets.

29. The WGEMS **NOTED** IOTC-2026-WGEMS06-08 on "An update on electronic monitoring pilot in Seychelles", including the following abstract provided by the authors:

> *"The government of Seychelles has been testing EM systems in country since 2016 and in 2020 made a commitment to use EM to support its Monitoring, Control and Surveillance team. Since 2020, Seychelles Fisheries Authority has developed an in-country EM Data Review Center to review and analyze the EM data on its domestic purse seine fleet and is moving to scale EM across its longline fleet. EM scaling in country is supported by Seychelles' Fisheries and Aquaculture Bill, 2025 which specifies that EM systems are now legally required on all fishing vessels."*

30. The WGEMS **NOTED** that in Seychelles, EM is currently being used primarily for compliance purposes, with discussions underway on its potential future use for collecting data under the Regional Observer Scheme (ROS), particularly in longline fisheries where onboard observers are not deployed, however, capacity constraints remain a key challenge for implementation.

31. The WGEMS **NOTED** Seychelles' request for support in integrating EM data into the e-MARIS system and **DISCUSSED** how EM requirements, including Vessel Monitoring Plans (VMPs), are currently incorporated within compliance frameworks.

32. The WGEMS **NOTED** that EM standards are not yet available as standalone guidance, but are included as annexes to existing Resolutions, and that the Secretariat intends to further structure this documentation to better support CPC data submissions.

33. The WGEMS **NOTED** progress by Seychelles in developing its EM programme, including plans to commence deployment in the industrial longline fleet. The WGEMS **NOTED** that equipment installation is expected by the end of May, with initial data anticipated by June. The WGEMS **NOTED** that findings from the programme have not yet been widely shared with stakeholders, and that workshops are planned to present results and inform future implementation, including consideration of the balance between compliance and scientific objectives.

34. The WGEMS **DISCUSSED** the potential for using EM data to cross-reference logbook and observer data to improve data quality. The WGEMS **NOTED** that initial analyses are being conducted to compare EM data with logbook records, including estimation of total catch and identification of discrepancies that may indicate unreported discards. Cross-validation with observer data has not yet been undertaken.

35. The WGEMS **NOTED** interest in adopting risk-based or sub-sampling approaches to EM data review, as implemented in Australia, where all trips on all vessels are recorded but only a proportion (approximately 10% in the case of Australia) are reviewed in detail, ensuring at least partial coverage across vessels. This approach was recognised as a means of reducing analytical costs while maintaining monitoring coverage and improving fisher logbook reporting.

36. The WGEMS **DISCUSSED** the implications of reduced review frequency, **NOTING** that insufficient monitoring or weak enforcement could create incentives for non-compliance. The WGEMS **NOTED** that effective implementation of sub-sampling approaches relies on strong compliance frameworks, including appropriate penalties. In this context, the WGEMS **NOTED** that Australia applies a graduated approach, combining education with enforcement measures and significant penalties where non-compliance (with accurate logbook reporting) persists.

5.2 *Update on EMS project/initiatives (EM data collection congruence, image recognition by artificial intelligence, EM record analysis software, etc.)*

37. The WGEMS **NOTED** paper IOTC-2025-WGEMS05-09 on "Employing an innovative underwater camera to improve electronic monitoring in the commercial Gulf of Mexico reef fish fishery", including the following abstract provided by the authors:

> *"Vessel electronic monitoring (EM) systems used in fisheries around the world apply a variety of cameras to record catch as it is brought on deck and during fish processing activities. In EM work conducted by the Center for Fisheries Electronic Monitoring at Mote (CFEMM) in the Gulf of Mexico commercial reef fish fishery, there was a need to improve upon current technologies to enhance camera views for accurate species identification of large sharks, particularly those that were released while underwater at the vessel side or underneath the hull. This paper describes how this problem was addressed with the development of the first known EM system integrated underwater camera (UCAM) with a specialized vessel-specific deployment device on a bottom longline reef fish vessel. Data are presented based on blind video reviews from CFEMM trained reviewers of the resulting UCAM video footage compared with video from only the overhead EM cameras from 68 gear retrievals collected from eight fishing trips. Results revealed that the UCAM was a successful tool for capturing clear underwater video footage of released large (>2m) sharks to enable reviewers to improve individual species identification, determination, and fate by 34.4%. This was particularly important for obtaining data on incidental catches of large protected shark species. It also provided clear underwater imagery of the presence of potential predators such as marine mammals close to the vessel, more specifically bottlenose dolphin (Tursiops truncatus) during gear retrieval, which often damaged or removed catch. This information is intended to assist researchers in need of gathering critical data on bycatch in close proximity to a vessel in which conventional overhead EM cameras are limited."*

38. The WGEMS **NOTED** that, although the work was conducted in a non-tuna fishery, the issues addressed are widely applicable to tuna fisheries. This is particularly the case regarding a key gap in EM - the recording of species discarded/released or cut off in the water. The paper was welcomed as highly relevant to improving bycatch data collection.

39. The WGEMS **NOTED** that the approach was developed in partnership with volunteer fishers to address limitations in bycatch and discard data. Early EM systems using fixed focal length cameras were constrained in their ability to support species identification due to limited visibility. A stabilised underwater camera system was subsequently trialled; initial designs proved too fragile for commercial use, but a revised, haul-mounted system deployable between fishing operations was successfully tested.

40. The WGEMS **NOTED** that the system was deployed across multiple trips, with cameras used on a subset of fishing events. Comparative analyses between UCAM and standard EM approaches indicated improved identification of large shark species, limited differences in general catch data and size-class distributions, enhanced assessment of condition at capture and short-term fate, increased detection of certain species, and improved determination of sex and maturity in some cases, although this was sometimes still constrained by camera positioning.

41. The WGEMS **DISCUSSED** the applications and limitations of UCAM systems, **NOTING** their potential to improve documentation of released catch, including vulnerable species, and to support research and monitoring objectives. No gear entanglement issues were reported, reflecting iterative system development and close collaboration with vessel operators.

42. The WGEMS **NOTED** that UCAM systems can provide additional insights into the condition and fate of Endangered Threatened and Protected (ETP) species and may help address depredation, including interactions with cetaceans, which has implications for both fisheries sustainability and economic performance. Underwater cameras may support documentation of depredation events affecting catch and bait, providing evidence for mitigation measures or compensation claims.

43. The WGEMS **NOTED** the potential application of UCAM systems in surface tuna longline fisheries, particularly for assessing the species identity, condition and behaviour of vulnerable bycatch species and informing intervention decisions. However, implementation of UCAM imposes additional costs, and as such uptake will depend on clearly demonstrated benefits and value for money.

44. The WGEMS **NOTED** that performance under low-light conditions was initially found to be limited, but additional trials were conducted (though not presented by the authors) and were found to be successful when used in combination with floodlights. The WGEMS further **NOTED** that a newer model of underwater camera equipped with integrated LED lighting exists and, although not used in the trials presented, may improve performance further.

45. The WGEMS **DISCUSSED** the broader potential of UCAM systems to improve species identification for cutoffs and discards in particular, support research applications such as tagging and behavioural studies, and provide insights into gear selectivity. The WGEMS **NOTED** that while size estimation using grid systems or stereoscopic cameras may be feasible, practical implementation may prove challenging, particularly in large-scale fisheries such as tuna fisheries.

46. Overall, the WGEMS **ENCOURAGED** participants from CPCs and EM providers to consider developing trials of UCAM approaches in IOTC tuna fisheries.

47. The WGEMS **NOTED** paper IOTC-2026-WGEMS06-10 on “DigiWaves: testing and supporting the development of AI-assisted remote electronic monitoring for tropical tuna longline fisheries based in La Réunion”, including the following abstract provided by the authors:

“The development of Electronic Monitoring Systems (EMS) within the Indian Ocean Tuna Commission (IOTC) framework is currently structured around a set of priority objectives, including the revision of Regional Observer Scheme (ROS) minimum data requirements, the implementation of pilot projects across fleets, and the development of interoperable and scalable monitoring architectures. This study provides a detailed operational assessment of an EMS deployed onboard a Réunion-based pelagic longliner (Reder Mor), and evaluates how this initial implementation contributes to progressing towards these objectives. Results demonstrate that, while EMS systems can effectively document fishing operations and provide continuous observational coverage, significant gaps remain in their ability to meet ROS minimum data requirements, particularly regarding species identification, bycatch monitoring, and gear-related data. These limitations are consistent with broader findings within the IOTC WGEMS process, which highlight the challenges of collecting certain data fields through EMS alone and emphasise the need for hybrid data collection approaches combining electronic monitoring, human observation, and complementary data sources. Within this context, the DigiWaves project represents a structured response to these challenges, aiming to integrate artificial intelligence, multisource data fusion, and interoperable data frameworks to improve data quality, reduce analytical workload, and support compliance monitoring. This case study contributes directly to this roadmap by providing empirical evidence on system limitations, operational constraints, and pathways for improvement under real fishing conditions. This work sets EMS as a key component of a broader digital monitoring ecosystem under development within the IOTC framework.”

48. The WGEMS **NOTED** that in La Reunion, EMS has been installed onboard one vessel to date and involves continuous onboard video recording which is analysed by humans. This EMS is supported by human observers onboard some vessels and cross-validation with VMS and Electronic Recording and Reporting Systems (ERS) data. While EMS provides valuable information on fishing effort and some elements of catches/interactions, for the purposes of ROS data collection requirements (in particular morphometric data), it is implemented along with human observers where possible to be integrated with human-based monitoring systems.

49. The WGEMS **NOTED** that species identification from video remains a key challenge and is not always possible. The DigiWaves project, funded under Horizon Europe, aims to accelerate the transition toward integrated, AI-assisted fisheries monitoring through large-scale collaboration and the development of automated video analysis tools.

50. The WGEMS **NOTED** that in La Reunion, bycatch species are often released without being brought onboard and may therefore not be detected by onboard cameras. The WGEMS **SUGGESTED** that bringing bycatch alongside the vessel could improve visibility to cameras, although this would require adjustments to current crew practices.

51. The WGEMS **NOTED** that EMS can support human-driven data collection, particularly in longline fisheries, and contribute to hybrid monitoring systems. However, further innovation and increased application of AI are needed to improve efficiency, performance and scalability of EMS.

52. The WGEMS **DISCUSSED** operational and technical challenges associated with EMS implementation. The WGEMS **NOTED** that additional camera perspectives, such as closer views of catch, could improve data quality, but system maintenance and troubleshooting remain resource-intensive, with hardware modifications potentially taking several months.

53. The WGEMS **NOTED** that EMS may provide an alternative monitoring solution for vessels unable to carry human observers, with potential to improve data collection in certain fleets but still need to be improved in order to achieve more complete observation and analysis, especially for bycatch species. **NOTING** that many French longliners operating around La Reunion are unable to accommodate onboard observers, the WGEMS welcomed efforts to implement EM systems in this fleet, which are expected to enhance data collection and coverage within the framework of the ROS.

54. The WGEMS **ENCOURAGED** researchers and fishing companies to undertake similar trials in other tuna fisheries, recognising their potential to address species identification challenges and improve the overall quality and reliability of fisheries data.

55. The WGEMS **NOTED** paper IOTC-2025-WGEMS05-05 on "The capability of electronic monitoring to measure logbook reporting performance and improve data for scientific analysis", including the following summary provided by the authors.

"ABARES undertook an analysis of congruence between EM and logbook data reported in the ETBF at the individual vessel level. The analysis identified that there can be significant variation in congruence between logbook and EM reported data at the vessel-level. The paper highlights and discusses the value of vessel level analyses in identifying vessels with general (i.e. universal) or specific (e.g. particular species) logbook reporting deficiencies and/or issues with individual vessel EM systems (e.g. camera placement). This is information which:

- *Managers can use to undertake education or compliance actions to improve vessel level, and therefore fleet level, improvements in both logbook and EM data reporting.*
- *Scientists can use to identify and filter out data reported by vessels for which there is perhaps less confidence in its reliability for use in a given scientific analysis (e.g. CPUE standardisation).*

We will also describe how the implementation of EM can enable fishery managers to implement individual vessel-based accountability approaches to management, using the AFMA seabird management approach as an example."

56. The WGEMS **NOTED** that when comparing EM data with logbook records for yellowfin tuna, the differences in retained catch between the two data sources were approximately 10%, indicating good overall agreement.

57. However, the WGEMS **NOTED** substantial discrepancies in discard reporting, with higher discard levels recorded in logbooks than in EM data. This pattern was consistent across multiple species, although some vessel-level variability was observed.

58. The WGEMS **NOTED** variability in the reporting of endangered threatened and protected (ETP) species interactions, with EM identifying interactions that were not recorded in logbooks for some vessels. The WGEMS further **NOTED** that EM analysts face challenges in identifying all discards and ETP interactions to species level, and that EM cannot yet capture all data required under the Regional Observer Scheme (ROS).

59. The WGEMS **NOTED** that EM can support fisheries monitoring by identifying fleet-wide and vessel-specific reporting issues, enabling the exclusion of unreliable logbook data from analyses, and enhancing vessel-level accountability and management.

60. The WGEMS **NOTED** that differences between EM and logbook data reflect observed discrepancies rather than an absolute reference point, and that vessel-level variability is an important consideration.

61. The WGEMS **NOTED** that EM data are used to provide feedback to fishers on logbook accuracy, with reports generated by service providers and communicated through management agencies to improve reporting quality over time. The WGEMS NOTED that agreement between EM and logbook data may help to identify vessels with high-quality reporting, supporting the selection of reliable data subsets for analyses such as CPUE. While not yet

applied to CPUE, this approach was identified as a potential area for future work, including applications in turtle bycatch research.

62. The WGEMS **SUGGESTED** that measures of accuracy be incorporated to better characterise indicators of incongruence between logbook and EM data.

63. The WGEMS **NOTED** that analyses in Australia are often conducted at the vessel level, including CPUE analyses undertaken by CSIRO to support harvest strategy development, and that vessel-level insights from these types of congruence analyses could be used to improve the robustness of CPUE estimates.

64. The WGEMS **NOTED** a presentation providing an overview of the three following papers which have been published in scientific journals.

65. The WGEMS **NOTED** the first paper IOTC-2026-WGEMS06-12 on "Using deep learning to automate the detection of bird scaring lines on fishing vessels", including the following abstract provided by the authors:

"Bird-scaring lines (BSLs) are an essential on-vessel bycatch mitigation device to reduce seabird interactions with fishing gear, such as the baited hooks of longline vessels. To ensure compliance with the behaviours required to operate successful BSLs, Electronic Monitoring (EM) cameras installed on fishing vessels can facilitate monitoring of commercial fishing activities. This study proposes an Artificial Intelligence and Machine Learning (AIML) framework based on a state-of-the-art deep learning computer vision approach called Faster RCNN to detect BSLs using vessel Electronic Monitoring (EM) video footage. The experiments include comprehensive analysis for detecting BSLs during daytime and night-time using footage from tuna longline vessels, under various weather conditions. Results show that a detection precision of 0.87 can be achieved. This valuable AIML tool can significantly reduce the time and costs associated with reviewing human EM footage, expand coverage, and automatically identify events for compliance checks and endangered species monitoring."

66. The WGEMS **NOTED** the second paper IOTC-2026-WGEMS06-13 on "Deep learning methods applied to electronic monitoring data: automated catch event detection for longline fishing", including the following abstract provided by the authors:

"Electronic monitoring (EM) systems have become functional and cost-effective tools for the conservation and sustainable harvesting of marine resources. EM is an alternative to on-board observers, which produces video segments that can subsequently be reviewed by analysts. It is currently used in a range of fisheries. There are two major challenges to the widespread adoption of EM. One is the large storage requirement for the video footage recorded and the other is the long time required by analysts to review the video footage. We propose an automated catch event detection framework to address these challenges. Our solution, based on deep learning techniques, automatically extracts video segments of catch events, which substantially reduces storage space and review time by analysts. Here, we demonstrate the framework using video footage from three longline fishing trips. The system recalled nearly 100% of the catch events across all trips."

67. The WGEMS **NOTED** the third paper IOTC-2026-WGEMS06-14 on "Fishing event detection and species classification using computer vision and artificial intelligence for electronic monitoring", including the following abstract provided by the authors:

"Fisheries regulations require detailed catch reporting on commercial fishing vessels. Vital components for the sustainable management of fish stocks include a robust estimate of the number of fish caught and the species composition. Catch recording is often done manually by human observers on fishing vessels. Human observers are costly, and consistent data streams can be subject to observer availability and the weather. On-vessel cameras (electronic monitoring, EM) are a growing alternative to human observers. However, on-land human auditors are required to review hundreds of hours of videos recorded during fishing trips that can last for weeks. In this paper, a framework is presented to automatically detect fish in EM videos, count the total fishing events, and classify the fish species. For this purpose, a deep learning and computer vision-based model is developed to efficiently detect fish and fishers onboard a vessel. Secondly, a vision-based tracking pipeline tracks the detected fish and counts the total fishing events in the videos. Thirdly, the extracted fishing events are classified through a deep learning based fish species classifier, to provide the distribution of different fish species caught for a fishing trip. For our experiments, the datasets were prepared using the electronic monitoring data of multiple fishing trips of a fishing

vessel. The videos were recorded on Australian longline vessels targeting tunas and billfish. For the fish detection task, video frames were extracted and labelled manually to provide a digital ground-truth. For the fish species classification task, hundreds of fish images of multiple species were cropped to provide a training dataset for the fish classifier. For the fish counting task, manual counts for the fishing events of individual fish species were generated for the test fishing trips. The developed fish and fisher detector achieves a mean Average Precision of 87.0 % for fish and 94.0 % for fishers on test video frames. The fishing event detection pipeline achieves an Average Precision of 81.0 % and an Average Recall of 74.5 % on test videos. The fish species classifier achieves an Accuracy (Top-1) of 91.11 % for the classification of cropped fish images and 89.05 % for the classification of extracted fishing events from the videos. Experimental results show that our proposed computer vision and artificial intelligence-based solution for video analysis has great potential to automate the auditing process from electronic monitoring footage and contribute to the sustainable management of fish stocks."

68. The WGEMS **NOTED** that AI systems show good agreement with human observers for certain measurements, such as fish length, and may outperform observers where measurement protocols are inconsistently applied. In the example from the Patagonian toothfish fishery, direct fish-by-fish comparisons between observer measurements and AI-generated size estimates showed strong correspondence when cameras were positioned directly over the measuring station. The WGEMS further **NOTED** that observer measurements may underestimate length if fish are not correctly positioned, whereas AI systems can account for body curvature and provide more consistent estimates.

69. The WGEMS **NOTED** that these studies show that AI-enabled workflows can significantly improve efficiency by automatically identifying and bookmarking catch events, allowing reviewers to navigate large video datasets more effectively. While real-time detection is technically feasible, human validation remains necessary to ensure data quality.

70. The WGEMS **DISCUSSED** the performance and limitations of AI systems, **NOTING** that the availability of large, well-annotated training datasets, particularly for the issue of species identification remains a major bottleneck due to the time, cost, and data ownership constraints associated with generating accurately labelled data. Although publicly available datasets could accelerate development, access is currently limited.

71. The WGEMS **NOTED** ongoing work on species identification tools being conducted by Overseas Fishery Cooperation Foundation of Japan in association with IOTC which was presented to the WPDCS in 2025. The WGEMS **NOTED** that the IOTC scientific community could help to contribute to this work by providing and annotating photos and video data with accurate scientific information. The WGEMS **NOTED** that still images may offer a more cost-effective alternative for developing training datasets and **NOTED** that the Secretariat intends to try to develop an image database.

6. Plan and Future Meetings

6.1 tRFMO EM Harmonisation update

72. The WGEMS **NOTED** paper IOTC-2026-WGEMS06-11 on "Electronic Monitoring Minimum Standards Harmonization workshop report", including the following abstract provided by the authors:

"The Electronic Monitoring (EM) Minimum Standards Harmonization Workshop, held in San Sebastián, Spain in December 2024, brought together 24 experts representing tuna regional fisheries management organizations (t-RFMOs), EM technology providers, and industry observers under the Common Oceans Tuna Project. The primary objective of the workshop was to conduct a technical review of existing EM standards across t-RFMOs, explore best practices and identify areas for potential harmonization. This initiative aimed to enhance the

implementation of EM systems, particularly in under-monitored fisheries, while maintaining high data integrity and compliance standards."… [see paper for full abstract]

73. The WGEMS **NOTED** a set of recommendations arising from the workshop which were identified as relevant for future reviews of EM implementation and the development of standards, noting that a formal review of EM is required under the relevant Resolution. The recommendations are as follows:

- Make specific elements mandatory to be included in Vessel Monitoring Plans (VMPs)
- Continue to allow EM to replace/complement observers in the ROS
- Consider the possibility of using EM/ROS for compliance purposes (as is done in other RFMOs)
- Strengthen interoperability requirements
- Clarify EM data ownership
- Introduce a cross-RFMO audit and certification framework
- Make "near-real-time Automatic System Malfunction/Tampering Alerts" mandatory

74. The WGEMS **NOTED** that the workshop was helpful in facilitating comparisons between RFMOs, improving understanding of differences in data collection systems. While some challenges were encountered in retrieving and analysing data in certain RFMOs, the WGEMS **NOTED** that there are substantial commonalities in EM and ROS data frameworks, as well as similarities in fishing operations, including fleets operating across multiple ocean regions. The WGEMS **NOTED** that greater harmonisation of EM systems and reporting templates across RFMOs could reduce the burden on data collectors and improve efficiency, and encouraged further consideration of how best to align approaches and share best practices.

75. The WGEMS **NOTED** discussions on Vessel Monitoring Plans (VMPs) and **NOTED** that the submission of VMPs is currently mandatory at IOTC, both vessel specific, by July 1st of each year, and fleet level summary VMPs through National Reports to the Scientific Committee, as stipulated under the Resolution 23/08 on the Regional Observer Scheme (ROS). The WGEMS **NOTED** that the Secretariat currently receives descriptive information on EM implementation rather than structured data from these VMPs, and that these submissions are not yet incorporated into a centralised database. The WGEMS **ENCOURAGED** CPCs implementing EMS to improve and continue submission of VMPs, which would improve understanding of how EM systems are implemented across CPCs.

76. The WGEMS further **NOTED** that while submission of a VMP for each vessel, and a fleet level summary, is required by Resolution 23/08, the specific elements to be included in these VMPs are not mandatory in Annex 3 (i.e., the term "should" is used instead of "shall" and recommendations are given) and not fully standardised. The WGEMS **NOTED** the need to define mandatory components of VMPs more clearly to ensure consistency and completeness. The WGEMS also **NOTED** that Annex 3 of the existing Resolution will be required to be amended.

77. The WGEMS **NOTED** the importance of providing guidance to CPCs that have not yet developed VMPs and encouraged participants to engage with one another to share examples and approaches.

78. The WGEMS was **INFORMED** that a second joint tuna-RFMO Electronic Monitoring (EM) Harmonisation workshop is being organized in early 2027. The workshop will review progress made since the first workshop held in San Sebastian, assess developments in the implementation of EM programmes, address emerging issues such as AI, and consider the status of recommendations arising from the initial meeting. The workshop is also intended to support continued collaboration among RFMOs in advancing harmonized EM standards and implementation approaches.

79. The WGEMS **NOTED** that various potential topics have been identified for discussion at the workshop: (i) further harmonisation opportunities in Vessel Monitoring Plan (VMP) templates and EM programme descriptions; (ii) approaches to cost-effective footage review, including the use of artificial intelligence; (iii) development of audit and assurance frameworks; and (iv) harmonization of EM data submission forms. Tuna RFMOs EM Working Groups have also been invited to provide updates on their EM priorities for 2026–2027 to help shape the workshop agenda.

80.The WGEMS **AGREED** that the IOTC specific technical workshop on EM data and implementation to support CPC's EM implementation, and described in paragraphs 19-22, be held following this joint tuna RFMO EM harmonization workshop together with the WPDCS in 2027.

6.2 Updated roadmap to implement EM Programme in IOTC

81. The WGEMS **NOTED** that several EM pilot projects have been presented in recent years and **ENCOURAGED** the continuation of this work.

82.The WGEMS **NOTED** that to date, the Secretariat has still only received EM data from Australia, Spain (for some longline trips) and Malaysia (but this doesn't cover all the mandatory requirements) despite Resolution 25/06 allowing CPCs to use EM to complement their onboard observers to raise their coverage levels.

83.The WGEMS **NOTED** that the Secretariat has started to receive VMPs and has received these from Australia and Malaysia so far. The WGEMS further **NOTED** that other CPCs have confirmed that they have EM programmes in their National Reports including Australia, Seychelles, EU (particularly Spain, France and Italy), Tanzania and Kenya who are running pilot projects, and Oman who are starting to develop a system but this is not yet fully implemented.

6.3 Revision of the WG Program of Work (2027–2031)

84.The WGEMS **NOTED** paper IOTC-2026-WGEMS06-03 on the WGEMS Program of Work (2026–2030) and made a number of amendments to update the Programme of Work to cover 2027-2031.

85.The WGEMS **RECOMMENDED** that the WPDCS consider and endorse the WGEMS Programme of Work (2027–2031), as provided in Appendix IV.

6.4 Next Meetings

86.The WGEMS **NOTED** no intersessional work has been identified as being required and, accordingly, no additional meetings will be convened prior to the 2027 WGEMS meeting.

7. OTHER BUSINESS

7.1 Date and place of the 7th Session of the WGEMS (Chairperson and IOTC Secretariat)

87.The WGEMS **NOTED** the preference to maintain the usual mid-April timing for the WGEMS. The WGEMS further **NOTED** that the final meeting schedule for 2027 will be prepared by the SC and Commission.

8. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 6TH SESSION OF THE WGEMS

88.The report of the 6th Session of the Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (IOTC–2026–WGEMS06–R) was **ADOPTED** via correspondence.

APPENDIX I
LIST OF PARTICIPANTS

CHAIRPERSONS					
Title	**First name**	**Last name**	**Organisation**	**E-mail**	**Contracting Parties & Cooperating Non-Contracting Parties (CPC)**
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APPENDIX II
MEETING AGENDA

Date: 13-14 April 2026
Location: Online
Venue: Zoom
Time: 12:00 – 16:00 (Seychelles time) daily
Chairperson:Dr. Don Bromhead, **Vice-chair**: Dr. Hilario Murua

1. **OPENING OF THE MEETING** (Chairperson)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chairperson)
3. **DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE WGEMS** (IOTC Secretariat)
   - 3.1. Updates from the 28th Session of the Scientific Committee
   - 3.2. Any Relevant Outcomes from the 30th Session of the Commission
4. **THE IOTC REGIONAL OBSERVER SCHEME (ROS)** (Chairperson and IOTC Secretariat)
   - 4.1. Current projects related to Electronic Monitoring and Electronic Reporting (all)
   - 4.2. Revision of ROS programme standards (all)
5. **EM PROGRAMME/RESEARCH INITIATIVES IN IOTC (Chairperson)**
   - 5.1. Update on CPCs EMS pilot projects and Programmes
   - 5.2. Update on EMS project/initiatives (EM data collection congruence, image recognition by artificial intelligency, EM record analysis software, etc.)
6. **PLAN AND FUTURE MEETINGS** (Chairperson and Vice-chairperson)
   - 6.1. tRFMO EM Harmonisation Update
   - 6.2. Updated roadmap to implement EM Programme in IOTC
   - 6.3. Revision of the WG Program of Work (2027–2030)
   - 6.4. Next meetings
7. **OTHER BUSINESS** (Chairperson)
   - 7.1. Date and place of the 7th Session of the WGEMS (Chairperson and IOTC Secretariat)
8. **REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 6TH SESSION OF THE WGEMS** (Chairperson)

APPENDIX III
LIST OF DOCUMENTS

Document	Title
IOTC-2026-WGEMS06-01a	Draft Agenda for the 6th Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC-2026-WGEMS06-01b	Draft Annotated Agenda for the 6th Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC-2026-WGEMS06-02	List of Documents for the 6^{h} Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) (Secretariat)
IOTC-2026-WGEMS06-03	WGEMS Programme of Work (2027– 2030) (Secretariat)
IOTC-2026-WGEMS06-04	Outcomes of the 28th Session of the Scientific Committee (Secretariat)
IOTC-2026-WGEMS06-05	The capability of electronic monitoring to measure logbook reporting performance and improve data for scientific analysis (T. Emery, R. Noreiga, M. Parsa, D. Bromhead and T. Timmiss)
IOTC-2026-WGEMS06-06	Improving marine fisheries transparency through electronic monitoring in the United Republic of Tanzania (A. D. Mhukula)
IOTC-2026-WGEMS06-07	An update on electronic monitoring pilot in Kenya (B. Kiilu, E. Kimani, A. Nadal, D. Obiero, E. Fondo and R. Laplante)
IOTC-2026-WGEMS06-08	An update on electronic monitoring pilot in Seychelles (L. Gabriel)
IOTC-2026-WGEMS06-09	Employing an innovative underwater camera to improve electronic monitoring in the commercial Gulf of Mexico reef fish fishery (C. Neidig, M. Lee, G. Patrick and R. Schloesser)
IOTC-2026-WGEMS06-10	Testing and progressive integration of AI-assisted electronic monitoring in tropical tuna longline fisheries: operational feedback from La Réunion in the context of IOTC EMS objectives and DigiWaves (E. Geffroy)
IOTC-2026-WGEMS06-11	Electronic Monitoring Minimum Standards Harmonization workshop report (FAO)
IOTC-2026-WGEMS06-12	Using deep learning to automate the detection of bird scaring lines on fishing vessels (D. Acharya, M. Saqib, C. Devine, C. Untiedt, L. R. Little, D. Wang and G. N. Tuck)
IOTC-2026-WGEMS06-13	Deep learning methods applied to electronic monitoring data: automated catch event detection for longline fishing (M. Qiao, D. Wang, G. N. Tuck, L. R. Little, A. E. Punt and M. Gerner)
IOTC-2026-WGEMS06-14	Fishing event detection and species classification using computer vision and artificial intelligence for electronic monitoring (M. Saqib, M. R. Khokher, Z. Yuan, B. Yan, D. Bearham, C. Devine, C. Untiedt, T. Cannard, K. Maguire, G. N. Tuck, L. R. Little and D. Wang)
Information papers	
IOTC-2026-WGEMS06-INF01	The capability of electronic monitoring to measure logbook reporting performance and improve data for scientific analysis (T. Emery, R. Noreiga, M. Parsa, D. Bromhead and T. Timmiss)

APPENDIX IV

PROGRAMME OF WORK FOR THE AD HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS (2027–2031)

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 25/06 and 23/08 elements have been incorporated as required by the Commission.

		Timing				
Topic	**Sub-topic and project**	**2027**	**2028**	**2029**	**2030**	**2031**
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. The fields for gillnet fisheries still have not been fully reviewed					
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 • Collaboration with other t-RFMOs , 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 responsibilities • 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. Don to provide some text – considering other innovations such as UW cameras					