



# Report of the 2<sup>nd</sup> Session of the IOTC Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)

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Online, 13 - 15 June 2022

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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)
OFCF	Overseas Fishery Cooperation Foundation (Japan)
OPAGAC	Organización de Productores de Atún Congelado (EU,Spain)
PET	Protected, Endangered and Threatened species
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

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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 an 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 2<sup>nd</sup> 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 13 - 15 June 2022. A total of 104 participants attended the Session (79 in 2021). 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 WGEMS02 to the Working Party on data Collection and Statistics, which are provided in [Appendix VI](#).

***Next meetings***

WGEMS02.01: The WGEMS **RECOMMENDED** that the WGEMS meet again in 2023 to ensure the successful delivery of the request by the Commission in Resolution 22/04 for the development of Electronic Monitoring Systems minimum standards by 2024, at latest. The WGEMS **PROPOSED** that this meeting once again take place in June. (Para. 99).

## 1. OPENING OF THE MEETING

1. The 2<sup>nd</sup> 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 13 - 15 June 2022. A total of 104 participants attended the Session (79 in 2021). 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 presentation described the various requirements on IOTC Resolutions in relation to the implementation of Electronic Monitoring Systems in IOTC. For example, [Resolution 11/04](#) on a Regional Observer Scheme and [Resolution 16/04](#) on the Implementation of a Pilot Project in view of promoting the Regional Observer Scheme of IOTC.

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

### 4.1 Outcomes of the 26th session of the commission

4. The WGEMS **NOTED** that the report of the 26<sup>th</sup> Session of the Commission was yet to be adopted and therefore no official feedback from the Commission was available at this stage. However, the Secretariat informed the WGEMS that within the preliminary text submitted to the Heads of Delegations that attended the Commission meeting, it was reflected that the Commission noted the recommendation by the SC to endorse the continuation of the WGEMS in the future and for the Commission to discuss if the WGEMS should remain under the WPDCS or report directly to the SC or CoC. The Commission also noted the Terms of Reference and Plan of Work for the WGEMS as endorsed by the SC. The Commission agreed that the WGEMS should continue to work under the WPDCS at this time.

### 4.2 Resolution 22/04 on a regional observer scheme

5. The WGEMS **NOTED** that Resolution On a Regional Observer Scheme was adopted at the 26<sup>th</sup> Session of the Commission and that the approved text of Resolution 22/04 is available in IOTC Circular [2022-35](#) on *Conservation and Management Measures adopted by the IOTC at its 26<sup>th</sup> Session*.
6. The WGEMS **ACKNOWLEDGED** that IOTC Resolution 22/04 *On a Regional Observer Scheme* will enter in force on 22 September 2022, and that until that date Resolution 11/04 still applies.
7. The WGEMS **NOTED** that Resolution 22/04 introduces a number of updates and additions to Resolution 11/04 (which it will supersede) and that these updates include, but are not limited to, the following aspects:
  - that for artisanal vessels the minimum coverage of 5% of total number of vessel trips (or total number of active vessels) be reached through monitoring at landing by field samplers;
  - that in the case of vessels covered by the Regional Observer Scheme, EMS be considered as a complementing or substituting source of information to reach 5% coverage, provided that minimum standards for EMS developed and agreed by the IOTC Commission are followed.
  - It requests the Scientific Committee, in collaboration with the Compliance Committee, to develop and agree on minimum standards for the use of EMS for purse seine, longline, bait boat (pole and line), handline and gillnet fleets by 2023 at the latest, including modalities for the substitution of human observer coverage by an EMS;
  - that port sampling be considered a viable source to complement EMS data and ensure all minimum ROS data elements are captured;
  - that a regional pool of observers be developed;



- that CPCs report on the adopted sampling schemes and on the protocols supporting their observer programmes to the IOTC Secretariat and the Scientific Committee;
  - that IOTC ROS observer manuals and data reporting forms are adopted by 2023;
  - that observers and observer programmes be bound to the IOTC ROS minimum standard data fields, data collection forms, species identification cards, observer manuals and data collection forms when carrying their duties;
  - that observer reports and observer data be submitted to the IOTC Secretariat following the IOTC observer reporting templates and standards, and that this information be provided to the IOTC Scientific Committee after aggregation to remove confidentiality aspects
8. The WGEMS **RECALLED** how the current definition of coverage in Resolution 11/04 as *fraction of observed operations / sets* prevents the IOTC Secretariat to verify of the reached coverage levels, in particular for longline fleets for which the total effort available to the Secretariat (in accordance with Res. 15/02) is expressed as number of deployed hooks instead.
9. The WGEMS **NOTED** that some CPCs which have longline fleets operating in the Indian Ocean, indicated a preference for using the number of observed sets, or alternatively the number of observed fishing days, as a measure of the level of observer coverage. The WGEMS were reminded, however, that information on total number of sets or fishing days for these fleets is not available to the Secretariat per Resolution 15/02.
10. For this reason, the WGEMS **ENCOURAGED** CPCs with longline fleets, until 15/02 is revised to submit effort units as fishing sets or days, to provide historical data summarising these metrics of (i) number of of total and observed sets and/or (ii) number of total and observed fishing days as total annual effort, **RECALLING** that this data is already shared through National Reports (despite not been considered a formal provision of annual fishery statistical data as per Res. 15/02).
11. The WGEMS **RECALLED** that both the WPDCS and the Scientific Committee repeatedly requested the adoption of a gear-specific definition of *observer coverage*, with the specific goal of overcoming these impracticalities.
12. The WGEMS **NOTED** that such gear-specific metrics are essential for scientific purposes, while the common metrics (sets) are practical for compliances purposes, hence it is sensible to produce both coverages.
13. Therefore, the WGEMS **SUGGESTED** to further explore how this issue, that is also pertinent to EMS, is addressed by the Regional Observer programmes currently implemented in other oceans, in addition to the relevant information available in paragraph 165 of the SC24(2021) report.
14. The WGEMS **NOTED** the lack of clarity regarding the prescription in Para. 18 of Resolution 22/04 that data be provided by 1°x1° square and month.
15. The WGEMS **NOTED** that if this prescription is to apply to observer data then it will introduce a significant loss of spatial-temporal resolution in the data submitted by CPCs, and in addition will require a complete revision of both the IOTC ROS data reporting templates and of the ROS regional database, which in turn handle data and relevant events down to their exact location in space and time.
16. In addition, the WGEMS **NOTED** that if this prescription shall apply to the information made available to the IOTC Scientific Committee, then it will be in disagreement with the requirements of Resolution 12/02 which indicates a lower level of spatial resolution of 5°x5° squares in the case of publicly disseminated longline data.
17. For these reasons and considering how this prescription could also impact on EMS data reporting, the WGEMS **SUGGESTED** that further clarity be made in this regard by the IOTC WPDCS and SC and if necessary, raised again by those bodies with the Commission.

## 5. THE IOTC REGIONAL OBSERVER SCHEME AND REGIONAL OBSERVER PILOT PROJECT

18. The WGEMS **NOTED** a presentation by the Secretariat ([IOTC-2022-WGEMS02-INF07](#)) which included an update on electronic data collection and reporting for the ROS and EMS, and **ACKNOWLEDGED** that the information presented is collated from a range of documents presented at various IOTC Working Parties since 2019.

### 5.1 Current projects related to Electronic Monitoring and Electronic Reporting

19. The WGEMS **ACKNOWLEDGED** that the ROS Pilot Project includes five different work streams which contribute to different aspects of the development of the ROS and of its enabling technologies, including EMS.

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20. The WGEMS **ACKNOWLEDGED** that two distinct EU-funded projects (GCP INT 305 and 322) contributed to the implementation of activities in support of the ROS, including a trial pilot on the implementation of EMS onboard small-scale gillnet / longline vessels in Sri Lanka.
21. The WGEMS **NOTED** that the EMS trial in Sri Lanka had to overcome technical and administrative issues, and was put on hold due to causes of *force-majeure* (CoViD-19 pandemic) and **ACKNOWLEDGED** that, notwithstanding these unforeseen circumstances, it completed in September 2021, although the installation of two units remains pending.
22. The WGEMS **NOTED** that few data and footage is available for trips completed at the beginning of the trial, due to unexpected interference between the EMS and onboard radio equipment and due to the excessive drainage of the main vessel batteries, which forced fishermen to switch-off the EMS for most of the duration of these trips.
23. The WGEMS **ACKNOWLEDGED** that interference with radio equipment can be common with small-size vessels such as those subject to the study, and that different solutions are often required on a vessel-by-vessel basis.
24. Also, the WGEMS **ACKNOWLEDGED** that the service provider has identified proper counter-measures to fully overcome the experienced technical issues.
25. The WGEMS **NOTED** the valuable outcomes of this project both in terms of experience gained and of training delivered.
26. The WGEMS **NOTED** that due to the lack of footage obtained during the trips, it has been difficult to fully train observers in analysing footage collected by EM systems, and **ACKNOWLEDGED** that further support might be required by Sri Lanka in particular for data analysis and reporting.
27. The WGEMS **NOTED** the current state-of-the-art regarding the development of electronic tools for ROS data collection and reporting, and **ACKNOWLEDGED** that these are built to take full advantage of the ROS XML data exchange format.
28. The WGEMS **NOTED** that the ROS XML data exchange format is the one, among the two proposed, that better handles the hierarchical structure of the ROS data fields and that for this reason it is primarily meant to be *machine* rather than *human-readable*.
29. The WGEMS **NOTED** that custom data exporter / extractors need to be designed in order for the ROS XML data exchange format to be integrated into current information systems supporting the collection and management of observer and / or EMS data (e.g., *ObServe*).
30. In this regard, the WGEMS **RECALLED** that the final version of the ROS XML data exchange format will be presented at the next WPDCS, and **ENCOURAGED EM** technology providers to engage with the IOTC Secretariat to explore available possibilities for the development of custom data extraction modules for EM data.
31. The WGEMS **NOTED** that CPCs which already handle ROS data in proprietary electronic formats can also take advantage of the *second* proposed ROS data exchange template (which is based on multiple tabular files) to provide information to the IOTC Secretariat for incorporation in the ROS regional database.
32. The WGEMS **NOTED** that some CPCs are already submitting ROS data collected through EMS, and that the ROS Regional Database has provisions to clearly separate EMS data from data collected by human observers.
33. The WGEMS **ENCOURAGED** CPCs to clearly identify which data are collected by human observers and which are collected by EMS when submitting observer data to the Secretariat.
34. The WGEMS **NOTED** that EMS data, cannot yet be considered as a full replacement for scientific observer data due to the fact that current EMS systems cannot collect all the mandatory ROS data fields.
35. The WGEMS **ACKNOWLEDGED** the status of development and implementation of the observer training programme which constitutes one of the major outcomes of the ROS pilot project, and that as of today has produced the following outputs:
- packages for the training of observer logistic coordination teams and scientific observers;
  - e-learning material;
  - observer guidelines and manuals;
  - revised observer data collection forms.
-

36. The WGEMS **ACKNOWLEDGED** that this specific work stream is funded by the EU through the GCP INT 322 project, with the aim of supporting the establishment of observer programmes and training, as well as piloting the adoption of the IOTC ROS e-tools and methodologies in voluntary CPCs.
37. The WGEMS also **NOTED** that the training provided by the service provider to the four pilot countries has reached an advanced stage for some of them (Kenya, Sri Lanka) and is progressing well for the remaining (Indonesia and Tanzania).

## 6. EMS PROGRAMME PROGRESS IN TUNA RFMOs

### 6.1 IATTC

38. The WGEMS **NOTED** the presentation ([IOTC-2022-WGEMS02-INF08](#)) made by the IATTC Secretariat which provided information on EMS used in tuna fisheries in the Eastern Pacific Ocean, relating to structure, IATTC workplan, and pilot EM studies. The presentation summarized the steps taken for the implementation of EM in the EPO, as well as the main results of the EM trials conducted onboard purse seine and longline fleets.
39. The WGEMS **THANKED** the author for sharing the IATTC experience on EMS with the Working Group.
40. The WGEMS **NOTED** that three EM specific workshops have already been conducted, and that recommendations agreed through these workshops on the institutional structure, goals and scope of the EMS, and management considerations (coordination and compatibility, confidentiality, compliance, equipment, coverage, and review rate), will be presented for their adoption during the next IATTC Annual Commission Meeting 2022. The WGEMS further **NOTED** that a fourth Workshop on technical standards and data collection priorities will be held in late 2022.
41. **NOTING** that the IATTC currently uses the buoy identifier as FAD identifier and that the long serial number of the buoys cannot be easily identified with EM, the WGEMS **NOTED** that the IATTC Secretariat has been exploring technologies for remotely retrieving the buoy identifier in a low-cost and efficient way. It is also noted that it is working with buoy manufacturer help to track the buoys positions.
42. The WGEMS **NOTED** that on purse seiners, when comparing catches of target tunas estimated by the observers and with EM, total quantities could be accurately estimated through the EMS based on brailing operations. However, results on the species composition showed substantial differences, especially for yellowfin and bigeye tunas caught in association with FADs, with the WGEMS **NOTING** that the most challenging issue encountered in the IATTC EM trials was the ability to differentiate juvenile yellowfin tunas from bigeye tunas from the video footage.
43. The WGEMS **NOTED** that in the IATTC EM trials on purse seiners, the EM analysts (who review EM records) tried to replicate the sampling protocol followed onboard by the at sea observers, and WGEMS **AGREED** on the importance of having clear and standardized footage review protocols.
44. The WGEMS **NOTED** that during the IATTC EM trials on purse seiners, a significant positive relationship was found between the counts of sharks by EM analysts and by at sea observers. However, the relationship varied among EM analysts. In this regard, the WGEMS **NOTED** that the experience of the analyst as well as the time devoted to the footage review are key elements that should be taken into account for any comparative analysis.
45. The WGEMS **NOTED** that the IATTC is discussing the potential extension of human observer coverage (now 100% only on large purse seiner) in the future large to longliners (12m above), small purse seine vessels, and all transshipments; which could be covered by EMS in the future. The IATTC is also discussing the use of EM to validate logbook data (concerning discards in particular) and to provide feedback and improve the quality of these data.

### 6.2 ICCAT

46. The WGEMS **NOTED** the presentation ([IOTC-2022-WGEMS02-INF09](#)) made by the ICCAT Secretariat which details the update on the progress and planning from the ICCAT Sub-group on EMS.
47. The WGEMS **NOTED** that the ICCAT EMS subgroup started working in 2021, with the aim of addressing a specific EMS request included in the [REC 19-02](#), where work has been mainly focused on longline.
48. The WGEMS **NOTED** that the ICCAT Standing Committee on Research and Statistics (SCRS) work has focused mostly on the comparison of what can be collected through EMS and observers, and developing the minimum standards for scientific data collection on longline fisheries. The summary of the comparison between EMS and human observers for scientific data (based on ICCAT standard ST-09 template) shows that most "Fishing characteristics data" and "catch data" can be obtained with EMS. However, collection of "Biological data" with EMS is much more challenging and will need additional crew work and development in conjunction with EMS. Thus, these comparisons

suggest that EM can fill certain data gaps and can be used as a complement to human observers, but not as a complete replacement. Thus, the SCRS recommends maintaining certain human observer coverage, i.e., 5%, that would allow, for example, biological sampling.

49. The WGEMS **NOTED** that the SCRS will propose in September (to the SubCom statistics) a set of standards that include: (i) standards for onboard EM system technology, including equipment and camera system requirements, installation, and maintenance, (ii) standards for data storage requirements and what data are subject to those provisions, (iii) standards for data collection, review, and transmission to ICCAT, and (iv) standards for data protection and potential privacy issues.
50. The WGEMS **NOTED** that some of the minimum standards proposed by the SCRS are similar to the draft standards proposed in the IOTC, which indicates some kind of harmonization among tuna RFMOs.
51. The WGEMS **NOTED** that even if the SCRS is more focused on science data, ICCAT standards could accommodate information that cover both compliance and science.
52. The WGEMS **NOTED** that the SCRS has proposed flexible standards that are not prescriptive provided that the EM meets minimum requirements, and that these standards should be periodically reviewed. For instance, the SCRS proposed a 4-camera system for longliners although the WGEMS **NOTED** that it is only an example that must be adapted or tailored to each specific vessel or fleet.

### 6.3 WCPFC

53. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-INF02](#) that presented the Electronic Monitoring Program Standards Specifications and Procedures (SSP) for the WCPFC.
54. The WGEMS **NOTED** that the WCPFC Electronic Reporting and Electronic Monitoring Working Group ([ERandEMWG](#)) is drafting a CMM on EM, which is expected to be adopted in 2023, describing the overarching requirements for the operation and functioning of the EM Program. The WGEMS **NOTED** that the WCPFC approach may result in a CMM focused on the program, and some Standards specification and procedures (SSP) as annex. Work is in progress, but some proposals already exist for some EMS management subcomponents;
- Confidentiality – Existing WCPFC data rules and non-disclosure provide the precedent.
  - Compliance – Convention and Observer program provide the precedent, where observers monitor CCMs adopted by the Commission and the data can be used for compliance purposes.
  - Equipment – Should be tamper Evident. Precedent set in the VMS CMM that the system needs to be tamper evident but will also depend on the technology of the EM system itself.
  - Coverage and Review Rate – 100% coverage is an important factor affecting behavioural change, which has direct correlation with increased confidence in logbook data.
55. The WGEMS **NOTED** the difficulty of designing a common program involving different members and very different fisheries; from members already having 100% EM coverage to some members having 100% observer coverage on some fleets.
56. The WGEMS **NOTED** that in the WCPFC, even if EMP objectives are still pending to be formally accepted, it is expected that the EMP will cover both scientific and compliance components and there is a need to balance the different objectives and measures. However, in the IOTC the purpose is currently only scientific as per Resolution 22/04. EMS is aimed to help achieve the minimum observation coverage provided that the SC adopted EM minimum standards.
57. The WGEMS **NOTED** that some CPCs in the WCPFC (i.e., Australia) have replaced observers by 100% EM coverage in the longline fleet. The Australian EM program is complemented with some port sampling to obtain data that cannot be collected with EMS (e.g., size/biological sampling). There is a protocol in place to receive the footage (in hard discs) and identified all fishing operations. Automatic identification of fishing operations is automatically done based on sensor data and post analysis. Then, a random number is generated for each fishing set and the independent EM Service Provider reviews a randomly selected 10% of the fishing sets.
58. The WGEMS **NOTED** that in some Antarctic fisheries, the EM review is based on a random selection of some whole fishing trips rather than operations within trips, and that this has been shown to be an efficient means to improve fishing practices.

59. The WGEMS **NOTED** that Australia has shown that in the case of its EM program, the implementation of EM cameras on longline vessels has had a positive effect on the quality of the data reported in the logbooks, particularly for bycatch, protected species and discard data, which benefits the scientific analyses and management decisions that utilize logbook data.
60. The WGEMS **NOTED** that in the Australian EM program, the footage (i.e., raw EM records) is stored for a duration of six months while the subsequent EM data (derived from the footage) are stored forever.
61. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-INF01](#) describes the FFA Regional Longline Fisheries EM policy. The purpose of EM in FFA member countries is to complement other monitoring tools in place in the region. The WGEMS **NOTED** that the development of the EMP of the FFA member countries and the WCPFC EMS are occurring concurrently and that one will feed into the other.
62. The WGEMS **AGREED** that the technological standards should, where appropriate, be developed in a common way across tuna RFMOs while the program standards (e.g., review rate) could be specific for each RFMO.

#### **6.4 Other RFMOs**

63. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-INF01](#) on the FFA Regional Longline Fisheries Electronic Monitoring Policy.

## **7. EMS PROGRAMME INITIATIVES IN IOTC**

### **7.1 Review of CPCs EMS pilot projects and programmes**

64. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-06](#) on a Progress report of EMS trials by Japan.
65. The WGEMS **THANKED** the authors for the presentation and **ENCOURAGED** other CPCs to share their experience with EMS to the WGEMS in the future.
66. The WGEMS **NOTED** the outcomes of the trials and **ACKNOWLEDGED** that each system had advantages and disadvantages. The Authors noted that their decision on a final system would likely be guided by the requirements of the RFMOs. The system that best allows the CPC to provide information in the format required by the RFMOs would be identified as the most suitable.
67. The WGEMS **NOTED** the observation that interference between the EMS and onboard radio systems was quite common amongst the various options, especially if the EMS had a communication device. It was further **NOTED** that a failure in the auto transmission by the system was only apparent in one of the trialed options.
68. The authors stressed that although most of the data collected by onboard observers was possible to be collected by the EMS, not all of the data could be collected this way. They advised that Managers need to have a larger role in deciding the effective use of EMS as they would need to decide the kinds of data that are required from these systems.
69. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-04 Rev1](#) on the Global Electronic Monitoring Accelerator supporting Industry and Government Leadership in EM Program Design and Implementation.
70. The WGEMS **THANKED** the authors and welcomed this industry led initiative to improve EM design and implementation.
71. The WGEMS **NOTED** that there are vessels in the Indian Ocean involved in the Phase I of the project and that currently this is based on the WCPFC draft standards. The WGEMS **NOTED** that there would likely be significant overlap with these standards and what IOTC requires. The authors noted that all data captured can be processed and reported in any way required by the various RFMOs.
72. The WGEMS also **NOTED** a parallel initiative that is aiming to improve species identification using artificial intelligence. An open-source library of images is available at fishnet.ai. Contributions to this library were welcomed by the authors. Trials are also underway to use AI to speed up the data review process and validate or audit logbook entries.



## 8. EMS PROGRAMME STANDARDS

### 8.1 EMS related terms and definitions

73. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-03](#) on Electronic Monitoring related Terms and Definitions, including the following background information provided by the authors:
- *The endorsed IOTC WGEMS Terms of References (see Appendix IV of IOTC-2021-WGEMS01-R) identify the need to develop and adopt EM related terms and definitions. Ideally, EM related terms and definitions adopted by the IOTC should align and harmonize with the definitions that have been adopted in other tuna RFMOs (e.g., IATTC C-21-03).*
74. The WGEMS **NOTED** that this paper includes definitions used in different RFMOs and those presented in 2020 for minimum standards for EM in IOTC fisheries.
75. The WGEMS **NOTED** that it would be helpful to engage with EM providers who have developed a consortium for defining standards and may have developed their own set of definitions, further **NOTING** that harmonisation with these stakeholders as well as with other RFMOs would be beneficial.
76. The WGEMS **NOTED** that there may be an element of the upcoming ABNJ Tuna Project Phase II relating to EMS which could help to provide a platform for discussing these definitions between RFMOs as part of the Kobe harmonisation work.
77. The WGEMS **NOTED** that the finally adopted version of definitions will be a living document and so it will be updated if there are any changes to the definitions and **NOTED** that this document has been developed in order to facilitate conversations around EMS.
78. The WGEMS discussed and **AGREED** to definitions for a range of terms including Monitoring, Electronic monitoring system, EM program, EM data standards, EM records, EM data, EM equipment and EM review.
79. The WGEMS **NOTED** that further discussion was required however, regarding whether the professionals employed to review EM footage should be referred to as EM “analysts”, “reviewers” or “observers”, given the differing common interpretations of the terms analysts and observers in particular.
80. The WGEMS also **AGREED** that it may be appropriate to split out the term “EM coverage” into two separate components being “EM installation coverage” and “EM effort coverage” which are both important elements of EMS overall fishing coverage but describe quite distinct aspects, being the proportion of vessels in a fleet that have EMS and then the proportion of fishing fleet effort that was recorded by EMS. This is separate to the “EMS review rate” which is the percentage of the total fishing effort that is to be reviewed to produce EM data. The final use and/or definition of these terms requires further discussion.
81. The WGEMS **NOTED** several suggested revisions for the document, but the group could not agree on a final version of the document, however, the WGEMS **AGREED** on a intersessional plan of work to produce a consolidated version to be presented at the next meeting of the WPDCS with the aim of adopting these definitions.

### 8.2 IOTC Regional EM Programme Standards

82. The WGEMS **NOTED** that this was discussed along with section 8.3 below.

### 8.3 IOTC Regional EM Programme Data Standards

- 8.3.1 EM Data Standards (systems, collection, storage, transmission, review and analysis, reporting, etc.)

83. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-INF03](#) on the Terms of Reference for the WGEMS.
84. The WGEMS **NOTED** that these Terms of Reference had been endorsed by the SC and noted by the Commission. As such they are considered suitable for guiding the future work of the WGEMS.
85. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-05](#) on Minimum standards for designing and implementing Electronic Monitoring systems in Indian Ocean tuna fisheries, including the following abstract provided by the authors:

*“Electronic monitoring (EM) using cameras and other sensors is a proven technology that has been widely used for various purposes on fishing vessels, primarily in industrial fleets. EM systems include equipment that tracks a*

*vessel's position and activity, together with cameras that record key aspects of the fishing operations. EM has been used extensively for this purpose to obtain reliable information on catches and their composition, as well as to monitor and collect data on bycatches of Endangered, Threatened and Protected (ETP) species.” – See document for full abstract*

86. The WGEMS **NOTED** that the paper presented is a revised version of the paper which was presented to the WPDCS in 2020 (IOTC-2020-WPDCS16-18).
87. The WGEMS **NOTED** that with the recent inclusion of the use of EMS in the Resolution relating to the ROS (Resolution 22/04), it is particularly important to understand the full ability of EMS to collect the ROS data fields and the degree to which EMS data can be supplemented with data from landing sampling programmes in order to meet both the minimum mandatory and the full data collection requirements of the ROS. A desktop study of landing sampling capability would be useful to assist this consideration.
88. The WGEMS **NOTED** that an issue with supplementing EMS with port sampling is the difficulty in linking the fish measured to a specific operation set and time, and **NOTED** that this issue needs to be considered.
89. The WGEMS **SUGGESTED** that the tables noting the capabilities of EM to meet the ROS minimum data fields should be updated over time using information from EM providers and complementary sources.
90. The WGEMS **NOTED** that gillnet fisheries are not well covered by EMS but that Pakistan have run a successful pilot “crew-based” observer project which they hope to restart under the upcoming ABNJ tuna project phase II with the intention that this can inform the roll-out of this type of scheme to other CPCs who have large gillnet fleets.
91. The WGEMS **NOTED** that the recently adopted Resolution 22/04 did not specify an increase to the minimum level of coverage required for CPCs but some members of the WGEMS **SUGGESTED** that the minimum coverage could be increased to around 20%, with the authorisation of EMS within 22/04 providing a way to contribute to increased observer coverage under the ROS.-
92. The WGEMS **NOTED** that there has been a confusion with the standards to date with the nomenclature relating to ‘mandatory’ and ‘optional’ for reporting but further **NOTED** that the nomenclature was revised during WPDCS17 to make it clear that ‘optional for reporting’ in fact means that these fields must be collected and reported when possible.
93. The WGEMS **NOTED** that, while EMS is expected to serve as an alternative tool for data collection for some CPCs that have difficulties in deploying human observers, there may be issues with lack of capacity and funds for those CPCs which would delay their adoption of EMS (which is not mandatory under 22/04) if IOTC EMS Program Standards and IOTC EMS Data Standards are too demanding, and further **NOTED** that this working group may wish to consider how to incentivise such CPCs to consider implementing EMS.

## 9. PLAN AND FUTURE MEETINGS

### 9.1 Roadmap to implement EM Programme in IOTC

94. The WGEMS **AGREED** to a intersessional plan of work and **NOTED** that the Chair would distribute three documents in the coming weeks for WGEMS revision:
- the Electronic Monitoring (EM) related terms and definitions,
  - the IOTC EM Program Standards, and
  - the IOTC Electronic Monitoring System (EMS) and Data Standards
95. The Chair confirmed that deadlines for comments on each of these documents, as well as each step of the process for reaching agreement on their contents, would be communicated by email along with the documents ([Appendix IV](#)). The WGEMS **NOTED** the ambition to have a consolidated and hopefully agreed set of documents to present to the WPDCS in November. This process would be finalized during a 1 – 2-day inter-sessional meeting of the WGEMS in the first week of November.

### 9.2 Revision of the WG Program of Work (2023–2026)

96. The WGEMS **NOTED** paper [IOTC-2022-WGEMS02-INF04](#) on the WGEMS Program of Work (2023–2026).
97. The WGEMS **NOTED** that the workplan had only just been agreed and endorsed and therefore no changes were envisioned at this stage ([Appendix V](#)).

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### **9.3 Next Meetings**

98. The WGEMS **NOTED** that an intersessional 1 or 2 day online meeting of the WGEMS would be held in the first week of November as noted in paragraph 94 above.
99. The WGEMS **RECOMMENDED** that the WGEMS meet again in 2023 to ensure the successful delivery of the request by the Commission in Resolution 22/04 for the development of Electronic Monitoring Systems minimum standards by 2024, at latest. The WGEMS **PROPOSED** that this meeting once again take place in June.

## **10. OTHER BUSINESS**

### ***10.1 Review of the draft, and adoption of the Report of the 2<sup>nd</sup> Session of the WGEMS***

100. The report of the 2<sup>nd</sup> Session of the Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (IOTC–2022–WGEMS02–R) was **ADOPTED** via correspondence.



**APPENDIX I**  
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**APPENDIX II**  
**MEETING AGENDA**

**Date:** 13-15 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. Outcomes of the 26<sup>th</sup> Session of the Commission
  - 4.2. Resolution 22/04 *On a Regional Observer Scheme*.
- 5. THE IOTC REGIONAL OBSERVER SCHEME AND REGIONAL OBSERVER PILOT PROJECT** (IOTC Secretariat)
  - 5.1. Current projects related to Electronic Monitoring and Electronic Reporting (IOTC Secretariat)
- 6. EM PROGRAMME PROGRESS IN TUNA RFMOs**
  - 6.1. IATTC (IATTC Secretariat)
  - 6.2. ICCAT (ICCAT Secretariat)
  - 6.3. WCPFC (WCPFC Secretariat)
  - 6.4. Other RFMOs
- 7. EM PROGRAMME INITIATIVES IN IOTC**
  - 7.1. Review of CPCs EMS pilot projects and Programmes
- 8. EM PROGRAMME IN IOTC**
  - 8.1. EM related terms definitions
  - 8.2. IOTC Regional EM Programme Standards
    - 8.2.1. Objectives
    - 8.2.2. Scope
    - 8.2.3. Institutional arrangements and structure
    - 8.2.4. Observer coverage
    - 8.2.5. Roles and responsibilities
  - 8.3. IOTC Regional EM Programme Data Standards
    - 8.3.1. EM capabilities to collect ROS Minimum Data Standards
    - 8.3.2. EM Data Standards (systems, collection, storage, transmission, review and analysis, reporting, etc.)
- 9. PLAN AND FUTURE MEETINGS** (Chairperson and Vice-chairperson)
  - 9.1. Roadmap to implement EM Programme in IOTC.
  - 9.2. Revision of the WG Program of Work (2023–2026)
  - 9.3. Next meetings
- 10. OTHER BUSINESS**
  - 10.1. Review of the draft, and adoption of the Report of the 2nd Session of the WGEMS

**APPENDIX III**  
**LIST OF DOCUMENTS**

<b>Document</b>	<b>Title</b>
IOTC–2022–WGEMS02–01a	Draft Agenda for the Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)
IOTC–2022– WGEMS02–01b	Draft Annotated Agenda for the Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)
IOTC–2022– WGEMS02–02	List of Documents for the Ad-Hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS)
IOTC–2022– WGEMS02–03	Electronic Monitoring related Terms and Definitions (WGEMS chairs and Secretariat)
IOTC–2022– WGEMS02–04	Global Electronic Monitoring Accelerator supporting Industry and Government Leadership in EM Program Design and Implementation (Michelin M, Moffett J, Gilmer B, Anderson C, Heberer C, Zimring M and Mudge JT)
IOTC–2022– WGEMS02–05	Minimum standards for designing and implementing Electronic Monitoring systems in Indian Ocean tuna fisheries (Murua H, Fiorellato F, Ruiz J, Chassot E and Restrepo V)
IOTC–2022– WGEMS02–06	Progress report of EMS trials by Japan (Morita H)
<b>Info documents</b>	
IOTC–2022– WGEMS02–INF01	FFA Regional Longline Fisheries Electronic Monitoring Policy
IOTC–2022– WGEMS02–INF02	WCPFC discussion draft on Standards, Specifications and Procedures (SSP) for the WCPFC Electronic Monitoring Program
IOTC–2022– WGEMS02–INF03	Terms of Reference for the WGEMS
IOTC–2022– WGEMS02–INF04	Work Plan for the WGEMS (2022-2025)
IOTC–2022– WGEMS02–INF05	(Re)defining ambiguous terms to support the work of RFMOs on Electronic Monitoring Systems (Orthongel and IRD)
IOTC–2022– WGEMS02–INF06	E-monitoring Implementation: National Experience The Federated States of Micronesia & Australia (Federated States of Micronesia and Australia)
IOTC–2022– WGEMS02–INF07	Current projects related to Electronic Monitoring and Reporting (IOTC Secretariat)
IOTC–2022– WGEMS02–INF08	An Electronic Monitoring System for Tuna Fisheries in the EPO: Structure, IATTC Workplan, and Pilot EM Studies (IATTC)
IOTC–2022– WGEMS02–INF09	Update from the SCRS Subgroup on EMS (ICCAT)

## APPENDIX IV

## CHAIRS LETTER ON THE PROPOSED INTERSESSIONAL WORK OF THE WGEMS

**Communication from the WGEMS Chair Regarding Planned Activities agreed during the WGEMS02 meeting (13-15 June, 2022)**

Dear IOTC WGEMS Participants,

Thank you for your active participation and continued engagement in the work of the IOTC WGEMS. As agreed at the WGEMS02 meeting, I am writing to you to set out the planned approach for the WGEMS intersessional work throughout 2022 prior to the IOTC Working Party on Data Collection and Statistics (29 November – 3 December) and the Scientific Committee (5-9 December) to ensure successful delivery of the request by the Commission in **Resolution 22/04 on Regional Observe Scheme** for the development of Electronic Monitoring Systems minimum standards by 2024, at latest.

As you will recall, the WGEMS agreed to further work on/review intersessionally (i) the Electronic Monitoring (EM) related terms and definitions, (ii) the IOTC EM Program Standards, and (iii) the IOTC Electronic Monitoring System (EMS) and Data Standards so as to provide a consolidated and, if possible agreed set of documents by the WGEMS, for the upcoming IOTC WPDCS meeting.

Please find attached with this email the above mentioned three documents on (i) the EM related terms and definition, (ii) the IOTC EM Program Standards, and (iii) the IOTC EMS and Data Standards for your revision. These documents were reviewed during the WGEMS meeting and some comments are already included in these documents. For the EM related terms and definition document, the definitions marked in green were agreed by the group. As such participants should focus on those definitions where agreement was not reached and are marked in yellow.

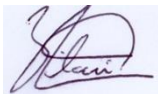
The WGEMS agreed workplan is the following:

<b>When</b>	<b>What</b>	<b>WGEMS Participant Action</b>
<b>Week June 20</b>	WGEMS revised (i) EMrelated terms and definition, (ii) the IOTC EM Program Standards, and (iii) the IOTC EMS and Data Standards circulated to the WGEMS participants.	Comments from participants due by 1 September 2022
<b>1-16 September 2022</b>	Chair to incorporate comments and suggestions to produce consolidated versions of these 3 documents.	No action required.
<b>16 September 2022</b>	Revised consolidated documents incorporating all comments circulated to WGEMS participants	Further comments from participants by 18 October 2022.
<b>2-4 November (tbd)</b>	1-day online WGEMS meeting to discuss the consolidated documents in advance of the WPDCS meeting.	Attendance at the online discussion meeting.
<b>14 November</b>	Consolidated documents from WGEMS submitted to the WPDCS meeting by the Chair	No action required

Please submit your comments/suggestions to the documents by the time specified in the table above directed to the Chair, Dr. Hilario Murua ([hmurua@iss-foundation.orgmailto:](mailto:hmurua@iss-foundation.orgmailto:)), and copy the Vice-Chair, Dr Don

Bromhead ([Don.Bromhead@awe.gov.au](mailto:Don.Bromhead@awe.gov.au)), Secretariat Science Manager, Dr. Paul de Bruyn ([Paul.DeBruyn@fao.org](mailto:Paul.DeBruyn@fao.org)), and Data Coordinator, Mr. Fabio Fiorellato ([Fabio.Fiorellato@fao.org](mailto:Fabio.Fiorellato@fao.org)). Please distribute this email to all relevant scientist/manager working on EMS in your country and/or organization.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Hilario Murua', is placed on a light blue rectangular background.

Dr. Hilario Murua



## APPENDIX V

## AD HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS (2023–2027)

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.

Topic	Sub-topic and project	Priority	Ranking	Lead/ Participation	Timing				
					2023	2024	2025	2026	2027
1. 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	High	3	Scientist					
	Cross validation of EM information with other data sources								
	Identify needs and encourage pilots for new electronic tools and systems.								
2. EM Minimum data Standards <sup>1</sup>	Agree on definitions	High	2	Scientist, vendors, experts, stakeholders and managers					
	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								

<sup>1</sup> To be discussed at a first WGEMS expert workshop with the participation of scientist, experts, vendors and stakeholders.

Roles of EM users									
3. EM Programme Standards <sup>2</sup>	Objectives and Scope of the Programme	High	1 (In parallel with Item 2)	Managers, scientist, experts.					
	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								
	4. Compatibility and Interoperability				Compatibility of IOTC databases and other collection platforms (e.g. VMS)	Medium	4	Secretariat/ scientist	
	Interoperability among different vendor's EMSs	Medium	5	Secretariat/ scientist					
5. Development of tools and innovative strategies	Artificial Intelligence and Machine learning for EMS data analysis	Low	7	Scientist/ Secretariat					
6. Capacity building	Capacity building	High	6	Secretariat/ Scientist/ managers					

<sup>2</sup> To be discussed at a second WGEMS expert workshop between managers, scientist, and stakeholders.

**APPENDIX VI**  
**CONSOLIDATED RECOMMENDATIONS OF THE 2<sup>ND</sup> SESSION OF THE AD-HOC WORKING GROUP ON THE  
DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS**

*Note: Appendix references refer to the Report of the 2<sup>nd</sup> Session of the Ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (IOTC-2022-WGEMS02-R)*

***Next meetings***

WGEMS02.01: The WGEMS **RECOMMENDED** that the WGEMS meet again in 2023 to ensure the successful delivery of the request by the Commission in Resolution 22/04 for the development of Electronic Monitoring Systems minimum standards by 2024, at latest. The WGEMS **PROPOSED** that this meeting once again take place in June. (Para. 99).