REPORT OF THE MEETING OF THE WORKING GROUP ON ELECTRONIC MONITORING SYSTEMS (WG-EMS)
(Online, 28 February 2022)

1. Opening of the meeting and meeting arrangements

The Chair of the Working Group on Electronic Monitoring Systems (WG-EMS), Mr. Neil Ansell (European Union), opened the meeting. He and the ICCAT Executive Secretary welcomed the delegates to the first meeting of WG-EMS.

2. Nomination of Rapporteur

Ms. Katie Moore (USA) was appointed as rapporteur.

3. Adoption of Agenda

The Chair summarized the points on the revised agenda that was posted in advance of the meeting and opened the floor for any additional matters CPCs would like taken up under Agenda item 7 (Other matters). There were no requested additions, and the agenda was adopted (**Appendix 1**). The Chair thanked participants for submitting meeting materials in advance of the meeting in order to help make the meeting of the WG-EMS productive despite the limited duration.

The List of Participants is contained in **Appendix 2.**

4. Identification of objectives and purposes of applications of EMS in ICCAT fisheries

The Chair opened the agenda item and stated that group discussion would follow the four subpoints a) to d).

a) Relevant provisions of ICCAT measures that address EMS

The Chair introduced the List of ICCAT Recommendations and Resolutions with references to Electronic Monitoring Systems (EMS). A revised version was subsequently produced incorporating the recent measures adopted at the November 2021 Commission meeting and is attached in **Appendix 3**. He thanked the Secretariat for developing the document to help draw the WG-EMS's attention to the measures that have reference to EMS.

b) Brief update of the work done by the SCRS Technical Sub-Group EM (Electronic Monitoring)

The SCRS Chair thanked Dr Rui Coelho (EU) for Chairing the SCRS Technical Sub-Group EM (Electronic Monitoring) (TSG-EM) and invited him to present a summary of and answer any questions on the Sub-Group's work. Dr. Coelho presented an Update from the SCRS/SC-Stats Sub-Group on EMS. He explained that the process started in 2019, and tasks included collecting and analyzing past studies that compared the use of observers and EMS, describing the current knowledge on the topic, identifying knowledge gaps and needs for additional experimental trials, and reviewing draft EMS guidelines developed by the IMM, where needed. The 2021 work included a literature review, two online meetings, and intersessional work primarily focused on purse seines, although further work throughout 2022 was being directed to longline and gillnets fisheries. An SCRS technical document (Anon. 2021) is available that describes some early conclusions of the TSG-EM, including:

- EMS holds promise for resolving some problems with data gaps in fisheries monitoring, but it cannot substitute a human observer.

- Cameras record only what is in their field of view and cannot prioritize elements they record; while at-sea human observers can perform other tasks not covered by EMS, such as biological sampling.

- EMS needs to address the challenges associated with processing and analyzing very large volumes of data that will result.

- EMS must be able to meet both national and international requirements to ensure data collection, continuity, veracity and precision are not compromised and that scientists have the required data to ensure they can continue to provide accurate scientific advice to managers.

The TSG-EM has already had two meetings in 2022 and plans to have short meetings at approximately six-week intervals. The focus includes comparing what data and information can be obtained via EMS versus via human observers, identifying technical aspects (e.g., what needs to be within the field of the camera, what should be documented, etc.), comparing data fields against what can be collected, and then discussing adaptations that may be helpful. Based on the results of this work, the Technical Sub-Group has set a goal of proposing minimum standards, particularly for longline fisheries, to the WG-EMS by September 2022.

The EU asked the Chair of the TSG-EM if he thought one system could accomplish both the scientific and compliance objectives of EMS; or if two systems were needed. The response was no; two independent systems are not necessary but that the objectives of any particular EMS would need to be clearly defined. He noted that most systems to date have been implemented for compliance purposes. The TSG-EM Chair continued to emphasize the importance of the Commission defining the objectives of EMS so that the SCRS could provide more meaningful advice.

The United States thanked the Chair of the TSG-EM for the report and noted the utility of both EMS and human observers for compliance and data collection purposes to inform stock assessments. Clear minimum standards for gathering needed data, particularly in the current tropical tunas measure, are key. The United States also noted that it is important to recommend something that is possible but also practical in terms of cost and feasibility. The United States also asked how to best coordinate the expertise of both the TSG-EM and the WG-EMS.

The Chair of the TSG-EM responded that there will be a significant increase in workload and capacity needs, including storage of raw images/videos for analysis, data extraction, and transmission to ICCAT, if EMS is implemented on a wide scale. On those topics the TSG-EMS has some expertise, and if expertise is needed from beyond the current Sub-Group, the Sub-Group will adapt its workplan accordingly. There is a lot of work that has been done on image analysis and quality control, and in most instances the SCRS would be able to fine tune the data extraction process.

The Chair noted the importance of clarifying what tasks should be done by the WG-EMS, and that the WG-EMS may provide insight on overall implementation and needs, costs, feasibility, and data confidentiality needs.

Regarding the development of minimum standards for each fishery, the EU asked if there would need to be a different set of minimum standards for compliance or scientific purposes.

The Chair of the TSG-EM stated that there could be two different standards, but it did not necessarily require two different systems, though the TSG-EM is a scientific group concerned with collection of scientific data (e.g., size distribution, species composition, discards, etc.).

Canada noted that minimum standards may not necessarily be universal, and instead may vary by fishery, species, or management measures. Rather than setting one set of minimum standards, it was contemplated that there could be guidance provided on what specific EMS minimum standards would be necessary to meet different fisheries and fisheries management goals. Canada noted that those who have expertise in what data (scientific or compliance) are needed may not be the experts regarding the technical aspects of the equipment. Another challenge is to translate the work of the WG-EMS into cooperation with the relevant Panel(s) when advising the Commission on developing or updating existing recommendations.

The Chair of the TSG-EM responded to Canada's comments to clarify that the Sub-Group is using the ST-09 form to guide its exercise of determining which aspects of ICCAT's current scientific observer coverage could be successfully supplemented by the use of EMS.

Japan agreed with the United States, Canada, and other CPCs by stating that EMS can have several objectives, including both scientific and compliance. Japan asked what data are beneficial or critical to scientific priorities and if the SCRS will prioritize what data items are to be collected by EMS. Japan noted that additional complexity means more expense and perhaps a system more prone to malfunction. The United States noted that some data elements are prescribed by management measures as Rec. 11-13 regarding bycatch and discards.

The Chair of the TSG-EM said that this has not yet been discussed but will take note of the request and discuss it with the TSG-EM.

Costa Rica and the United States raised the topic of whether EMS can supplant human observers (e.g., when it is not possible to have observers on board, during COVID, etc.). The United States highlighted that EMS should complement, and not replace, scientific observers. Discussion included one CPC acknowledging that some ICCAT measures, such as Rec. 16-14, specifically call for the use of human observers. Thus, any changes to those requirements would need to be vetted through PWG. Several participants and the Chair noted the value of learning from and taking into consideration the EMS work done in other RFMOs.

c) Compilation and evaluation of relevant reports and other information

The Chair informed meeting participants of the various reports and information that had been collated and made available in the meeting folder. He thanked the Secretariat for assisting in this regard and underlined the importance of keeping these meeting folders available intersessionally.

d) Current and potential pilot projects on the use of EMS

The Chair opened the floor and asked CPCs to present their experiences and information on current and developing initiatives

Japan provided an update on a trial involving three EMS from three countries to determine which is suitable for Japan's longline vessels. COVID delayed some efforts, and Japan is going to conduct more studies this year. Some key findings to date include:

- EMS has many applications but some malfunctions were not known during the trip (i.e., no data found after trip completion), could not be fixed at-sea (i.e., interference between the EMS and receiving system); technical support may not be available in-country; and some EMS are not sufficient at this time.

- EMS was conducive to short trips, but some long trips would result in significant data extraction that managers should take into account and their cost effectiveness.

Japan is looking into further identifying the malfunction causes and may have more details available for the WG-EMS meeting in June.

The United States presented an informational paper describing an EMS program implemented in the United States (**Appendix 4**). The paper describes the EMS required on U.S. commercial pelagic longline vessels, its systems specifications, data collection, and costs. The scientific capabilities of the system have not been fully investigated and while the system could likely be used to collect some types of data, it is currently used for compliance purposes. The project costs included initial installation and ongoing costs. The numbers are presented in a range due to the nature of various contracts providing services. The United States noted that the design of an EMS should be based on the purpose and objectives the system is designed for.

The EU presented a compilation of 32 different projects in which EU Member States have recently participated related to EMS. Over 35% of the pilot projects were designed with the goal of monitoring compliance with the EU discard ban landing policies. Over 34% of the pilot projects were attempting to comply with the observer schemes, in an attempt to understand and compare if the data obtained from EMS were reliable. Twenty-one percent of the projects were attempting to estimate discards, and 10% of the pilot projects were monitoring the bycatch of species (e.g., marine mammals and seabirds). In response to a question from a CPC, the EU noted that the projects outlined in the document were not limited to ICCAT species.

The EU presented a second document as a concept paper for a possible future pilot project with the main objective of using stereoscopic cameras during at-sea transfers (**Appendix 5**). The existing goal of the cameras is to evaluate the weight of the fish, and the pilot project would help examine minimum size restrictions and explore the use of artificial intelligence (AI) to automate data analysis at sea. The project is in concept form at this time, and the intention is to run it in the context of ICCAT. It was noted that such a pilot project would need approval by the Commission. Japan stated that this type of pilot project would be very important for management, as there is difficulty now in estimating ICCAT gross weight monitoring. Japan also announced it is currently using AI to evaluate caging activities and has a pilot project in the works for the 2022 season with Morocco. Japan will share results of this pilot project with the WG-EMS.

Morocco suggested that this topic needs to be taken up at Panel 2 or IMM because there are other CPCs (beyond those present at WG-EMS) that would be affected by any decisions related to the transfer of live bluefin tuna. Another CPC stated its support for trying to improve the way that catches are determined at time of capture by weight monitoring with cameras at first transfer rather than after towing and then calculating weight by the application of length-weight algorithms. The CPC stated that IMM may be in a better place to talk further about this discrete issue, and that they believed this WG-EMS was set up to look at EMS more broadly along with existing conservation and management measures (CMMs). The EU stated that the intent of the pilot project was to fix some of the issues that are currently known, not to rollout the technology and impose a new measure before the advantage of these tools are well known. The EU concurred that if the project needed to be discussed outside of WG-EMS that IMM would be an appropriate venue. If the pilot project was successful, then it could be discussed in Panel 2 for potential rollout.

In response to this discussion, CPCs and the Chair contemplated the broader role of the WG-EMS, particularly the extent to which the Working Group should be involved in the steering or designing of pilot projects or rather, serve the role of a policy forum to receive and review results from projects when advising on the overall implementation of EMS in ICCAT. While concluding this agenda item, the Chair also reminded the Group of existing measures where EMS was already foreseen (Recs. 19-02, 19-05.) for which the Group will need to support the work of IMM/PWG.

5. Recommendations for the development of implementation strategies and priorities in ICCAT fisheries

In regard to administrative logistics, the Chair informed the Group that it would be beneficial to continue to use and populate the meeting folders with informational papers or the Group can use an alternate platform if the Group wishes. He opened the floor to discuss potential strategies and priorities.

As previously mentioned, one CPC stated that one of the clear mandates for the WG-EMS is to consider next steps for EMS application to the tropical tunas and marlin fisheries, as those recommendations call for the use of EMS and have elements specifying minimum requirements.

Canada conveyed its view that the WG-EMS's role is not to authorize pilot projects, but to instead receive status reports on the pilot projects, offer suggestions while steering the overall consideration in ICCAT's work in this field. The EU concurred that the WG-EMS should not serve as the gatekeeper for studies but to act as a hub for anything EMS-related. The WG-EMS would collect and process information on EMS and serve as the bridge between scientific studies and the practical application of new technology. The EU stated that there are some short- and medium-term priorities for the WG-EMS, which include the existing ICCAT recommendations that task the development of EMS minimum standards (tropical tunas, marlin). Discussion included the WG-EMS prioritizing the establishment of minimum standards with an emphasis on application for compliance purposes to complement what has already been undertaken on the science side. This would be done fishery by fishery to capture the specifics of each fishery based on the needs on each.

Canada also noted that the WG-EMS should consider the issue of data generation and access. For example, if data generation may involve private third parties, the Commission would need to consider how the Secretariat would provide and manage data access. Canada also noted that WG-EMS should be mindful of CPCs' different technical abilities.

After the Chair summarized CPCs' discussions, the EU offered to lead the drafting of a prioritization/strategy paper, intersessionally. The paper would examine which fisheries would be prioritized for the development of EMS, and for what purpose that system would be designed. Several CPCs and the Chair thanked the EU and offered to participate in the drafting process intersessionally. The United States noted that it believed this Group's mandate is not to impose EMS on CPCs who would otherwise choose to deploy human observers, but rather for CPCs who elect to use EMS to meet minimum standards for EMS that this Group would develop. The United States also stated it is not this Working Group's role to decide on new requirements for specific fisheries, but that role, of course, belonged to the appropriate Panels as is normal practice in ICCAT.

Canada asked about general procedures and if the WG-EMS will be drafting minimum standards that would need to go to the PWG or panel for adoption, or straight to the Commission. The Chair responded that the WG-EMS will report to the PWG which may in turn propose resolution(s) or recommendation(s) for adoption by the Commission. The IMM, in cooperation with WG-EMS, is already mandated to make recommendations to the Commission on EMS minimum standards, so WG-EMS will closely coordinate with IMM as well.

The EU expressed its view that the WG-EMS work should not be limited to identifying minimum standards. More so, if results from EMS projects indicated value, it should be the role of the WG-EMS to recommend new or strengthened measures (scientific or compliance related) be adopted by the Commission. Other CPCs concurred on the advisory nature of the WG-EMS.

Canada noted that the development of minimum standards could be an iterative process, which would help to expedite operationalizing the EMS. The EU noted that an iterative process with periodic reviews of the system would allow for opportunities for improvements and inclusion of evolving technologies.

The Chair summarized that the EU offered to help lead a prioritization document via an intersessional process, and that there is agreement for an iterative approach with periodic reviews regarding the development and refinement of minimum standards.

6. Development of a workplan for 2022-2023

The Chair summarized the WG-EMS discussions by suggesting that a potential workplan would include intersessional work, collaboration between the TSG-EM and the WG-EMS, and for the WG-EMS to proceed on the development of minimum standards. He opened the floor for further ideas.

One CPC noted that one important task of the WG-EMS could be to review the purse seine minimum standards (Ruiz *et al.*, 2017), which were endorsed by the SCRS but not yet incorporated in any Commission recommendation. The Chair of the TSG-EM confirmed that the Sub-Group is currently focusing on minimum standards for pelagic longlines and is not planning on reopening the purse seine minimum standards. The TSG-EM reports to the Subcommittee on Statistics that meets in September 2022 to make decisions, but the TSG-EM can provide updates to the WG-EMS along the way.

Algeria asked about EMS utility in the live eastern bluefin tuna fishery, and the Chair stated that there is not a provision currently for EMS in that fishery.

Canada noted the 2022 calendar and resolution that set out the WG-EMS's role; the WG-EMS has to submit an annual progress report at least 30 calendar days prior to the Annual Meeting. Canada asked what we want to be able to report on, what deliverables we wish to submit, etc. The EU concurred regarding the value of agreeing on milestones and suggested preparation of a 2023-2024 plan for the WG-EMS's activities for submission to the Annual Meeting. The EU anticipated the WG-EMS to be long-standing, and a status report is appropriate. One CPC recommended that beginning work on minimum standards for both purse seine and pelagic longline fisheries should be an item on the agenda for the June meeting of the WG-EMS. The EU again volunteered to work intersessionally to create an initial draft of those minimum standards for discussion in June, with a possible goal of adoption at the Annual Meeting.

The Chair summarized that there will be intersessional work prior to the June meeting on both priorities and strategies papers, as well as draft minimum standards for pelagic longline and purse seine fisheries. In moving forward, the WG-EMS may look at the purse seine minimum standards (Ruiz *et al*., 2017) and would be mindful of the value of an iterative development review process of these standards.

The Chair agreed to work with the Secretariat with regard to the platform and process for document exchange within the WG-EMS to support intersessional work, and he encouraged the ongoing exchange of information regarding trials.

7. Other matters

The Chair opened the discussion, and no additional matters were suggested.

8. Adoption of report and closure

The Chair thanked the WG-EMS for a productive meeting so early in 2022 to inform the WG-EMS's next steps. It was agreed that the report would be adopted by correspondence, and the Chair adjourned the WG-EMS.

References

Anonymous. 2021. Report of the Sub-Group on Electronic Monitoring Systems from the Billfish Species Group. Collect. Vol. Sci. Pap. ICCAT, 78 (10): 5-9.

Ruiz J., Krug I., Justel-Rubio A., Restrepo V., Hammann G., Gonzalez O., Legorburu G., Alayon P.J.P, Bach P. Bannerman P., Galán T. 2017. Minimum Standards for the Implementation of Electronic Monitoring Systems for the Tropical Tuna Purse Seine Fleet. Collect. Vol. Sci. Pap. ICCAT, 73 (2): 818-828.

Appendix 1

Agenda

1. Opening of the meeting and meeting arrangements
2. Nomination of Rapporteur
3. Adoption of agenda
4. Identification of objectives and purposes of applications of EMS in ICCAT fisheries:
    a) Relevant provisions of ICCAT measures that address EMS
    b) Brief update of the work done by the SCRS Technical Sub-Group EM (Electronic Monitoring)
    c) Compilation and evaluation of relevant reports and other information
    d) Current and potential pilot projects on the use of EMS
5. Recommendations for the development of implementation strategies and priorities in ICCAT fisheries
6. Development of a workplan for 2022-2023
7. Other matters
8. Adoption of report and closure

Appendix 2

List of participants[1*]

CONTRACTING PARTIES

ALGERIA
Hentour, Abderrahmane
Ministère de la Pêche et des Productions Halieutiques, Route des quatre canons, 16000
Tel: +213 559 139 817, Fax: +213 214 33161, E-Mail: abdou.hentour@gmail.com

CANADA
Browne, Dion
Senior Compliance Officer, Fisheries and Oceans Canada, PO Box 5667, 81 East White Hills Road, St. John's, NL, Ottawa ON A1C5X1
Tel: +1 709 772 4412; +1 709 685 1531, E-Mail: dion.browne@dfo-mpo.gc.ca

Kay, Lise
Policy Advisor, Fisheries and Oceans Canada, 200 Kent Street, Ottawa, ON K1A 0E6
Tel: +1 343 542 1301, E-Mail: Lise.Kay@dfo-mpo.gc.ca

Kerwin, Jessica
Large Pelagic Resource Manager, Fisheries and Oceans Canada, 200 Kent Street, Ottawa, ON K1A 0E6
Tel: +1 613 291 7480, E-Mail: jessica.kerwin@dfo-mpo.gc.ca

CHINA, (P. R.)
Sun, Haiwen *
Director, Division of Distant Water Fisheries, Bureau of Fisheries, Ministry of Agriculture and Rural Affairs, Nº 11 Nongzhanguan Nanli, Chaoyang District, 100125 Beijing
Tel: +86 10 5919 2966, Fax: +86 10 5919 3056, E-Mail: bofdwf@126.com

Feng, Ji
Shanghai Ocean University, 999 Hucheng Huan Rd, 201306 Shanghai
Tel: +86 159 215 36810, E-Mail: 276828719@qq.com; f52e@qq.com

Wang, Yu
150qingta, 100141 Beijing
Tel: +86 138 103 15976, E-Mail: wangyu315911@163.com

Zhu, Jiangfeng
Professor, Shanghai Ocean University, College of Marine Sciences, 999 Hucheng Huan Rd., 201306 Shanghai
Tel: +86 21 619 00554; +86 156 921 65061, Fax: +86 21 61900000, E-Mail: jfzhu@shou.edu.cn

EGYPT
Atteya, Mai
Production Research Specialist, New Cairo
Tel: +201 003 878 312, Fax: +202 281 117 007, E-Mail: janahesham08@gmail.com

Badr, Fatma Elzahraa
Fish Production Specialist, Agreements Administration (GAFRD), 210, area B - City, 5th District Road 90, 11311 New Cairo
Tel: +201 092 348 338, Fax: +202 281 117 007, E-Mail: fatima.elzahraa.medo@gmail.com

Shawky, Doaa Hafez
International Agreements Specialist, Foreign Affairs Specialist, New Cairo
Tel: +201 017 774 198, Fax: +202 281 117 007, E-Mail: doaahafezshawky@yahoo.com; gafrd_eg@hotmail.com

EUROPEAN UNION
Aláez Pons, Ester
International Relations Officer, European Commission - DG MARE - Unit B2 - RFMOs, Rue Joseph II - 99 03/057, 1049 Brussels, Belgium
Tel: +32 2 296 48 14; +32 470 633 657, E-Mail: ester.alaez-pons@ec.europa.eu

[1*] Head Delegate.

Broche, Jerome
Deputy Head of unit D.4, European Commission DG MARE, Fisheries Control and Inspections, Rue Joseph II 99, B-1049 Brussels, Belgium
Tel: +32 229 86128, E-Mail: jerome.broche@ec.europa.eu

Costica, Florina
DG Mare, Rue Joseph II, 99, 1040 Brussels, Belgium
Tel: +32 493 540 902, E-Mail: florina.costica@ec.europa.eu

Khalil, Samira
European Commission, DG Maritime Affairs and Fisheries, Unit B-1 "International Affairs, Law of the Sea and RFOs", J II - 99 3/74, Brussels, Belgium
Tel: +32 2 298 03 39; +32 229 11111, E-Mail: samira.khalil@ec.europa.eu

Miranda, Fernando
DG MARE, Joseph II St, 99, B-1000 Brussels, Belgium
Tel: +322 299 3922, E-Mail: fernando.miranda@ec.europa.eu

Villar Arribi, Cora
DG MARE, Rue Joseph II, 79, 1000 Brussels, Belgium
Tel: +32 229 90481, E-Mail: Cora.VILLAR-ARRIBI@ext.ec.europa.eu

Abad González, Javier
Secretaría General de Pesca, C/ Velázquez, 147, 28002 Madrid, Spain
Tel: +34 690 842 899, E-Mail: jabad@mapa.es

Amoedo Lueiro, Xoan Inacio
Biólogo, Consultor Ambiental, Medio Mariño e Pesca, Pza. de Ponteareas, 11, 3ºD, 36800 Pontevedra, Spain
Tel: +34 678 235 736, E-Mail: tecnico@fipblues.com; lueiro72consultant@gmail.com

Ansell, Neil
European Fisheries Control Agency, Avenida García Barbón 4, 36201 Vigo, Spain
Tel: +34 986 120 658; +34 698 122 046, E-Mail: neil.ansell@efca.europa.eu

Attard, Nolan
Fisheries Research Unit Department of Fisheries and Aquaculture, 3303 Marsa, Malta
Tel: +356 795 69516; +356 229 26894, E-Mail: nolan.attard@gov.mt

Bonnieux, Antoine
Armement CFTO, France
E-Mail: antoine.bonnieux@cfto.fr

Boulay, Justine
Bureau du contrôle des pêches, Fisheries Control Unit, Direction des Pêches Maritimes et de l'Aquaculture, Directorate for Sea Fisheries and Aquaculture, Ministère de l'Environnement, de l'Energie et de la Mer, Ministère de l'Agriculture et de l'Alimentation, Tour Séquoia, 1 place Carpeaux, 75000 Paris, France
Tel: +33 140 819 555, E-Mail: justine.boulay@agriculture.gouv.fr

Briand, Karine
Orthongel / Institut de Recherche pour le Développement IRD, Avenue Jean Monnet CS30171, 34203 Sète, Cedex, France
Tel: +33 499 573 204, E-Mail: karine.briand@ird.fr

Canive Pinedo, Itziar
DataFish, Spain
E-Mail: icanive@datafishts.com

Coelho, Rui
Researcher, Portuguese Institute for the Ocean and Atmosphere, I.P. (IPMA), Avenida 5 de Outubro, s/n, 8700-305 Olhão, Portugal
Tel: +351 289 700 508, E-Mail: rpcoelho@ipma.pt

De Ramón Castejón, Vicente
SATLINK, Carretera de Fuencarral, Arbea Campus Empresarial Edificio 5 Planta Baja, 28108 Alcobendas, Madrid, Spain
Tel: +34 91 327 2131, E-Mail: vdr@satlink.es

Eliasen, Peter Jørgen
Senior consultant, Ministry of Food, Agriculture and Fisheries, Sustainable Fisheries, Fisheries Policy, Slotholmsgade 12, 1216 Copenhagen, Denmark
Tel: +452 261 5937, E-Mail: pejoel@mfvm.dk

Fernández Despiau, Estrella
Inspectora de Pesca, Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, Secretaría General de Pesca, S.G. Control e Inspección, C/ Velázquez, 147 - 3ª planta, 28002 Madrid, Spain
Tel: +34 91 347 84 40, E-Mail: efdespiau@mapa.es

Gatt, Mark
Ministry for Agriculture, Fisheries, Food and Animal Rights Fort San Lucjan, Triq il-Qajjenza, Department of Fisheries and Aquaculture, Malta Aquaculture Research Centre, Fort San Lucjan, MRS 3303 Marsaxlokk, Malta

Goujon, Michel
ORTHONGEL, 5 Rue des Sardiniers, 29900 Concarneau, France
Tel: +33 2 9897 1957; +33 610 627 722, Fax: +33 2 9850 8032, E-Mail: mgoujon@orthongel.fr

Grgić, Damir
Ministry of Agriculture, Croatia
E-Mail: damir.grgic@mps.hr

Jansons, Kārlis
Latvia
E-Mail: karlis.jansons@vvd.gov.lv

Ktoridou, Sylvia
101 VITHLEEM, STROVOLOS, 1416 Nicosia, Cyprus
Tel: +357 228 07830, E-Mail: sktoridou@dfmr.moa.gov.cy

Kyriacou, Yiannos
DFMR, 101 Vithleem, 4116 Nicosia, Cyprus
Tel: +357 996 76942, E-Mail: ykyriacou@dfmr.moa.gov.cy

Lanza, Alfredo
Ministero delle Politiche Agricole Alimentari, Forestali e Del Turismo, Direzione Generali della Pesca Maritima e dell'acquacoltura - PEMAC VI, Via XX Settembre, 20, 00187 Rome, Italy
Tel: +39 331 464 1576; +39 646 652 843, Fax: +39 646 652 899, E-Mail: a.lanza@politicheagricole.it

Legorburu, Gonzalo
Avd. Ribera de Axpe 50, Edificio Udondo 3º - 2, 48950 Erandio Bizkaia, Spain
Tel: +34 944 361 710, E-Mail: glm@digitalobserver.org

Loisel, Fanny
Chargée de mission, Bureau du contrôle des pêches, Fisheries Control Unit Direction des Pêches Maritimes et de l'Aquaculture, Directorate for Sea Fisheries and Aquaculture, Ministère de l'Agriculture et de l'Alimentation, Tour Séquoia, 75020 La Défense (Paris), France
Tel: +33 140 819 331, E-Mail: fanny.loisel@agriculture.gouv.fr; fanny.loisel@hotmail.fr

Martinez de Lagos Guevara, Estíbaliz
DataFish, Spain
E-Mail: emartinez@datafishts.com

Maufroy, Alexandra
ORTHONGEL, 5 rue des sardiniers, 29900 Concarneau, France
Tel: +33 649 711 587, Fax: +33 2 98 50 80 32, E-Mail: amaufroy@orthongel.fr

Nonga, Olivier
Armement VIA OCEAN, 6 Rue des Chalutiers, 29900 Concarneau, France
Tel: +33 623 835 691, E-Mail: ononga@boltonfood.com

Nuevo, Miguel
European Fisheries Control Agency (EFCA), Avenida Garcia Barbon 4, 36201 Vigo, Pontevedra, Spain
Tel: +34 698 122 058, E-Mail: miguel.nuevo@efca.europa.eu

Palud, Pierre
Armement VIA OCEAN, 6 rue des chalutiers, 29186 Finistère Concarneau, France
Tel: +33 608 765 806, Fax: +33 298 971 658, E-Mail: ppalud@boltonfood.com

Papachristou, Elisavet
150 Syggrou Av., 17671 Athens, Greece
Tel: +302 109 287 171, E-Mail: epapachristou@minagric.gr; syg016@minagric.gr

Ruiz Gondra, Jon
AZTI-Tecnalia, Txatxarramendi z/g, 48395 Sukarrieta (Bizkaia), Spain
Tel: +34 94 6574000; +34 667 174 375, Fax: +34 94 6572555, E-Mail: jruiz@azti.es

Sabarros, Philippe
IRD, UMR MARBEC, Ob7, Avenue Jean Monnet, CS 30171, 34203 Cedex, France
Tel: +33 625 175 106, E-Mail: philippe.sabarros@ird.fr

Seguna, Marvin
Chief Fisheries Protection Officer, Ministry for Agriculture, Food and Animal Rights Fort San Lucjan, Triq il-Qajjenza, Department of Fisheries and Aquaculture, Ghammieri Ingiered Road, MRS 3303 Marsa, Malta
Tel: +356 229 26918, E-Mail: marvin.seguna@gov.mt

Simao, Ana Paula
DGRM, Avenida Brasilia, 1449-030 Lisbon, Portugal
Tel: +351 213 025 121, E-Mail: asimao@dgrm.mm.gov.pt

Thasitis, Ioannis
Department of Fisheries and Marine Research, 101 Vithleem Street, 2033 Nicosia, Cyprus
Tel: +35722807840, Fax: +35722 775 955, E-Mail: ithasitis@dfmr.moa.gov.cy; ithasitis@dfmr.moa.gov.cy

White, Maeve
Seafisheries Policy and Management Division, Department of Agriculture, Food and the Marine, National Seafood Centre, Clogheen, Clonakility, P85 TX47 Co Cork, Ireland
Tel: +35 323 885 9490, E-Mail: maeve.white@agriculture.gov.ie

GABON
Boupana Bola, Bernice Carol
BP: 9498, Libreville Estuaire
Tel: +241 075 39220, E-Mail: carolboupana@gmail.com; caroligaboughi@outlook.fr

GHANA
Ayivi, Sylvia Sefakor Awo
Senior Manager, Ministry of Fisheries and Aquaculture Development, Fisheries Scientific Survey Division, P.O. Box BT 62, Tema
Tel: + 233 2441 76300, Fax: +233 3032 008048, E-Mail: asmasus@yahoo.com

Bannerman, Paul
Ministry of Fisheries and Aquaculture Development, Marine Fisheries Research Division, P.O. Box GP 630, GA 231 Tema
Tel: +233 244 794859, Fax: +233 302 208048, E-Mail: paulbann@hotmail.com

Yeboah, Joseph
Assistant Director, Fisheries Commission, GP 630 Accra
Tel: +233 277 713 552, E-Mail: korankyejy@yahoo.com

Yeboah, Richard
Principal Manager, Fisheries Commission, GP 630 Accra
Tel: +233 544 622 944, E-Mail: richkyeboah@gmail.com

HONDURAS
Cardona Valle, Fidelia Nathaly
Colonia Lomo Linda Norte, Avenida FAO, edificio SENASA, 11101 Tegucigalpa Francisco Morazán
Tel: +504 877 88713, E-Mail: investigacion.dgpa@gmail.com

JAPAN
Daito, Jun
Manager, Japan Tuna Fisheries Co-operative Association, 31-1, Eitai 2-Chome, Koto-ku, Tokyo 135-0034
Tel: +81 356 462 382, Fax: +81 356 462 652, E-Mail: daito@japantuna.or.jp

Ito, Kohei
Assistant Director, International Affairs Division, Resources Management Department, Fisheries Agency of Japan, 1-2-1 Kasumigaseki, Tokyo Chiyoda-ku 100-8907
Tel: +81 3 3502 8204, Fax: +81 3 3504 2649, E-Mail: kohei_ito060@maff.go.jp

Miura, Nozomu
Assistant Director, International Division, Japan Tuna Fisheries Co-operative Association, 2-31-1 Eitai Koto-ku, Tokyo 135-0034
Tel: +81 3 5646 2382, Fax: +81 3 5646 2652, E-Mail: miura@japantuna.or.jp; gyojyo@japantuna.or.jp

Morita, Hiroyuki
Assistant Director, Responsible for the JCAP-2 Programme, International Affairs Division, Resources Management Department, Fisheries Agency of Japan, 1-2-1 Kasumigaseki, Chiyoda-Ku, Tokyo 100-8907
Tel: +81 3 3502 8460, Fax: +81 3 3504 2649, E-Mail: hiroyuki_morita970@maff.go.jp

Nagai, Daisaku
Manager, Japan Tuna Fisheries Co-Operative Association, 31-1, EITAI 2-CHOME, Koto-ku, Tokyo 135-0034
Tel: +81 356 462 382, Fax: +81 356 462 652, E-Mail: nagai@japantuna.or.jp

Tsuji, Sachiko
Researcher, Ecologically Related Species Group, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 2-12-4 Fukuura, Kanazawa-ku, Yokohama, Kanagawa 236-8648
Tel: +81 45 788 7931, Fax: +81 45 788 5004, E-Mail: sachiko27tsuji@gmail.com

Uozumi, Yuji
Adviser, Japan Tuna Fisheries Co-operation Association, Japan Fisheries Research and Education Agency, Tokyo Koutou ku Eitai 135-0034

Yoshida, Hiroyuki
Deputy Director, Japan Tuna Fisheries Co-operative Association, 2-31-1 Eitai Koto-Ku, Tokyo
Tel: +81 3 5646 2382, Fax: +81 5646 2652, E-Mail: yoshida@japantuna.or.jp

KOREA REP.
Shim, Soobin *
Deputy Director, International Cooperation Division, Ministry of Oceans and Fisheries, Government Complex Bldg.5, Dasom 2-ro, 30110 Sejong
Tel: +82 10 9356 1682; +82 44 200 5333, Fax: +82 44 200 5349, E-Mail: sbin8shim@korea.kr

Baek, Sangjin
Korea Overseas Fisheries Association, 6th fl. Samho Center Bldg. "A" 83, Nonhyeon-ro, 06775 Seoul Seocho-gu
Tel: +82 258 91614, Fax: +82 258 91630, E-Mail: sjbaek@kosfa.org

Kim, Taeho
Korea Overseas Fisheries Association, 6th Fl. Samho Center Bldg. "A" 83, Nohnyeon-ro, Seocho-gu, 06775 Seoul
Tel: +82 2 589 1615, Fax: +82 2 589 1630, E-Mail: taehokim@kosfa.org

Kim, Young-min
Deputy Director, Ministry of Oceans and Fisheries, 30110
Tel: +82 44 200 5368, Fax: +82 44 200 5379, E-Mail: sagea@korea.kr

Lee, Jooyoun
Advisor, Ministry of Oceans and Fisheries, Government Complex Bldg.5, Dasom 2-ro Sejong, 30110
Tel: +82 44 200 5369, Fax: +82 44 200 5379, E-Mail: sporyoun@korea.kr

Yang, Jae-geol
Policy Analyst, Korea Overseas Fisheries Cooperation Center, 6th FL, S Building, 253, Hannuri-daero, 30127 Sejong
Tel: +82 44 868 7364, Fax: +82 44 868 7840, E-Mail: jg718@kofci.org

MEXICO
Ramírez López, Karina
Instituto Nacional de Pesca y Acuacultura (INAPESCA), Centro Regional de Investigación Acuícola y Pesquera - Veracruz, Av. Ejército Mexicano No.106 - Colonia Exhacienda, Ylang Ylang, C.P. 94298 Boca de Río, Veracruz
Tel: +52 5538719500, Ext. 55756, E-Mail: kramirez_inp@yahoo.com; karina.ramirez@inapesca.gob.mx

Soler Benitez, Bertha Alicia
Comisión Nacional de Acuacultura y pesca (CONAPESCA), Av. Camarón Sábalo 1210 Fracc. Sábalo Country Club., 82100 Mazatlán, Sinaloa
Tel: +52 669 915 6900 Ext. 58462, E-Mail: berthaa.soler@gmail.com

MOROCCO
Adili, Brahim
E-Mail: adili@mpm.gov.ma

Azdad, Chellal
E-Mail: azdad@mpm.gov.ma

Kecha, Youssef
Chef de la Division de Suivi des Opérations de Contrôle et d'Inspection à la DCAPM, Ministère de l'Agriculture,de la Pêche Maritime, du Développement Rural et des Eaux et Forêts / Département de la Pêche Maritime, Quartier Administratif, haut Agdal, 11010 Rabat
Tel: +212 537 688 371, Fax: +212 537 688 382, E-Mail: youssef.kecha@mpm.gov.ma

Sabbane, Kamal
Cadre à la Direction de Contrôle des Activités de la Pêche Maritime, Ministère de l'Agriculture de la Pêche Maritime, du Développement Rural et des Eaux et Forêts, Département de la Pêche Maritime, Quartier Administratif BP 476, 10090 Agdal, Rabat
Tel: +212 537 688 196, Fax: +212 537 688 382, E-Mail: sabbane@mpm.gov.ma

Tabit Bensliman, Sara
Département de la pêche maritime, 476 Agdal Rabat, 10000
Tel: +212 661 449 370, E-Mail: sara.tabit@mpm.gov.ma

PHILIPPINES
Cadapan, Peter Erick
1114 Qeuzon City Metro Manila
Tel: +63 928 188 3100, E-Mail: pedangs@yahoo.com

Escobar Jr., Severino
BFAR Central Office, Fisheries Building Complex, BPI Compound, Visayas Avenue, BRGY. Vasra, 1101 Quezon City
Tel: +639 178 017 237, Fax: +632 842 66532, E-Mail: jojo_escobar@yahoo.com; slejr@yahoo.com

Mabanglo, Maria Joy
1101 Quezon City Metro Manila
Tel: +63 917 846 8050, E-Mail: mj.mabanglo@gmail.com

San Juan, Beverly
Fisheries Building Complex, BPI Compound, Visayas Avenue, Brgy. Vasra, 1128 Qeuzon City Metro Manila
Tel: +632 426 6532, Fax: +632 426 6532, E-Mail: beyesanjuan@gmail.com

Tanangonan, Isidro
Bureau of Fisheries and Aquatic Resources (BFAR), Capture Fisheries Division, Fisheries Building Complex, BPI Compound, Brgy. Vasra, Visayas Avenue, Quezon City, 1101 Metro Manila
Tel: +63 999 884 7631, E-Mail: itanangonan@bfar.da.gov.ph

Viron, Jennifer
Bureau of Fisheries and Aquatic Resources Central Office, Department of Agriculture, PCA Compound, Eliptical Road, Diliman, 1103 Quezon City Metro Manila
Tel: +639 294 296; +63 929 95 97; +63 929 80 74, E-Mail: jennyviron@bfar.da.gov.ph; jennyviron@gmail.com

SENEGAL
Faye, Adama
Directeur adjoint de la Direction de la Protection et de la Surveillance des pêches, Direction, Protection et Surveillance des Pêches, Cité Fenêtre Mermoz, BP 3656 Dakar
Tel: +221 775 656 958, Fax: +221 338 602 465, E-Mail: adafaye2000@yahoo.fr; adafaye@yahoo.fr

ST. VINCENT AND GRENADINES
Isaacs, Kris
Senior Fisheries Officer, Fisheries Division, Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour, Bay Street, VC0100 Kingstown
Tel: +784 456 2738, Fax: +784 457 2112, E-Mail: kris.isaacs@yahoo.com; fishdiv@gov.vc

Searles, Jeremy
Fisheries Officer / High Seas Unit, Fisheries Division, Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour, VC0100
Tel: +1 784 456 2738, Fax: +1 784 457 2112, E-Mail: jeremy.searles86@gmail.com

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
Brown, James
DEFRA, 2 Marsham Street, London SW1P 4DF
Tel: +44 791 761 9226, E-Mail: James.RJBrown@defra.gov.uk

Deary, Andrew
Head of Blue Belt Compliance, MMO, Marine Management Organisation, Lutra House. Dodd Way. Walton House. Bamber Bridge. Preston Office, PR5 8BX
Tel: +44 782 766 4112, E-Mail: andrew.deary@marinemanagement.org.uk

Nelson, Paul
Chi Gallos, Hayle Marine Renewables Park, North Quay, Hayle, Penzance TR27 4DD
Tel: +44 208 026 9084, E-Mail: Paul.Nelson@marinemanagement.org.uk

UNITED STATES
Blankenbeker, Kimberly
Foreign Affairs Specialist, Office of International Affairs and Seafood Inspection (F/IASI), NOAA, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring Maryland 20910
Tel: +1 301 427 8357, Fax: +1 301 713 1081, E-Mail: kimberly.blankenbeker@noaa.gov

Blankinship, David Randle
Chief, Atlantic Highly Migratory Species Management Division, NOAA - National Marine Fisheries Service, 263 13th Ave South, Saint Petersburg, Florida 33701
Tel: +1 727 824 5313, Fax: +1 727 824 5398, E-Mail: randy.blankinship@noaa.gov

Brothen, Tanya
Foreign Service Officer, Office of Marine Conservation (OES/OMC), U.S. Department of State, Rm 2758, 2201 C Street NW, Washington DC 20520-7878
Tel: +1 651 335 0380, E-Mail: brothentr@state.gov

Brown, Craig A.
Chief, Highly Migratory Species Branch, Sustainable Fisheries Division, Southeast Fisheries Science Center, NOAA, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 586 6589, E-Mail: craig.brown@noaa.gov

Clarke, Raymond
PO Box 463, Waialua 96791
Tel: +1 808 722 0486, E-Mail: ray.clarke@bumblebee.com

Donaldson, Tim
NOAA, 1315 East West Hwy, Silver Spring, Maryland 20910
Tel: +1 301 427 8272, E-Mail: tim.donaldson@noaa.gov

Engelke-Ros, Meggan
Deputy Chief, NOAA Office of General Counsel, Enforcement Section, 1315 East-West Highway, SSMC3-15860, Silver Spring, Maryland 20910
Tel: +1 301 427 8284, Fax: +1 301 427 2202, E-Mail: meggan.engelke-ros@noaa.gov

Harris, Madison
Foreign Affairs Specialist, Office of International Affairs and Seafood Inspection (F/IASI), NOAA, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, Maryland 20910
Tel: +1 301 427 8350, E-Mail: madison.harris@noaa.gov

Keller, Bryan
Foreign Affairs Specialist, Office of International Affairs and Seafood Inspection (F/IASI), NOAA, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, Maryland 20910
Tel: +1 202 897 9208, E-Mail: bryan.keller@noaa.gov

Leape, Gerald
Principal Officer, Pew Charitable Trusts, 901 E Street NW, Washington DC 20004
Tel: +1 202 431 3938, Fax: +1 202 540 2000, E-Mail: gleape@pewtrusts.org

McHale, Bradley
Fishery manager, NOAA - National Marine Fisheries Service, 55 Great Republic Dr., Gloucester, MA 01930
Tel: +1 978 281 9139, Fax: +1 978 281 9340, E-Mail: brad.mchale@noaa.gov

Miller, Ian
NOAA, 1315 East-West Highway, Maryland 20910
Tel: +1 302 751 6684, E-Mail: ian.miller@noaa.gov

Moore, Katie
Living Marine Resources Program Manager, United States Coast Guard, Atlantic Area-Response, Office of Maritime Security and Law Enforcement, 431 Crawford St., Portsmouth, Virginia 23704
Tel: +1 757 398 6504, E-Mail: katie.s.moore@uscg.mil

Walline, Megan J.
Attorney- Advisor, NOAA Office of General Counsel, Fisheries & Protected Resources Division, U.S. Department of Commerce, 1315 East-West Highway SSMC-III, Silver Spring Maryland 20910
Tel: +301 713 9695, Fax: +1 301 713 0658, E-Mail: megan.walline@noaa.gov

URUGUAY
Domingo, Andrés *
Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos Pelágicos, Constituyente 1497, 11200 Montevideo
Tel: +5982 400 46 89, Fax: +5982 401 32 16, E-Mail: dimanchester@gmail.com

Forselledo, Rodrigo
Investigador, Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos Pelágicos, Constituyente 1497, CP 11200 Montevideo
Tel: +598 2400 46 89, Fax: +598 2401 3216, E-Mail: rforselledo@gmail.com

VENEZUELA
Lara, Lermis
Director General de Pesca Industrial, Municipio Libertador, Torre Oeste, Parque Central Piso 17, 1015 Caracas
Tel: +58 414 359 0842, E-Mail: dgpi.minpesca@gmail.com; lermislara@gmail.com

OBSERVERS FROM COOPERATING NON-CONTRACTING PARTIES, ENTITIES, FISHING ENTITIES

CHINESE TAIPEI
Chou, Shih-Chin
Section Chief, Deep Sea Fisheries Division, Fisheries Agency, 8F, No. 100, Sec. 2, Heping W. Rd., Zhongzheng Dist., 10070 Taipei
Tel: +886 2 2383 5915, Fax: +886 2 2332 7395, E-Mail: chou1967sc@gmail.com; shihcin@ms1.fa.gov.tw

Kao, Shih-Ming
Associate Professor, Graduate Institute of Marine Affairs, National Sun Yat-sen University, 70 Lien-Hai Road, 80424 Kaohsiung City
Tel: +886 7 525 2000 Ext. 5305, Fax: +886 7 525 6205, E-Mail: kaosm@mail.nsysu.edu.tw

Lee, Ching-Chao
Technical Specialist, Deep Sea Fisheries Division, Fisheries Agency, 8F., No.100, Sec. 2, Heping W. Rd., Zhongzheng Dist., 10060
Tel: +886 223 835 911, Fax: +886 223 327 395, E-Mail: chaolee1218@gmail.com; chinchao@ms1.fa.gov.tw

Yang, Shan-Wen
Secretary, Overseas Fisheries Development Council, 3F., No. 14, Wenzhou Street, Da'an Dist., 10648
Tel: +886 2 2368 0889 #151, Fax: +886 2 2368 6418, E-Mail: shenwen@ofdc.org.tw

COSTA RICA
Carvajal Rodríguez, José Miguel
Biólogo, Departamento de Investigación, Instituto Costarricense de Pesca y Acuicultura (INCOPESCA), Barrio El Cocal, diagonal a las oficinas del INA, Avenida Central, calles 40 y 42, 333-54 Puntarenas
Tel: +506 263 00600, E-Mail: jcarvajal@incopesca.go.cr

Lara Quesada, Nixon
Biólogo Marino, INCOPESCA, 125 metros este y 75 metros norte de planta de atún Sardimar, 60101 Puntarenas
Tel: +506 831 12658, E-Mail: nixon.lara.21@gmail.com; nlara@incopesca.go.cr

Pacheco Chaves, Bernald
INCOPESCA, Departamento de Investigación, Cantón de Montes de Oro, Puntarenas, 60401
Tel: +506 899 22693, E-Mail: bpacheco@incopesca.go.cr

OBSERVERS FROM INTERGOVERNMENTAL ORGANIZATIONS

INTER-AMERICAN TROPICAL TUNA COMMISSION - IATTC
Roman-Verdesoto, Marlon
Scientist with Bycatch Mitigation and Gear Technology Group, IATTC, 8901 La Jolla Shores Dr., La Jolla 92037, United States
Tel: +1 858 456 5694, E-Mail: mroman@iattc.org

OBSERVERS FROM NON-GOVERNMENTAL ORGANIZATIONS

INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION – ISSF
Murua, Hilario
Senior Scientist, International Seafood Sustainability Foundation (ISSF), 655 15th Street NW, Suite 800, Washington, DC 20005, United States
Tel: +34 667 174 433; +1 703 226 8101, E-Mail: hmurua@iss-foundation.org

Restrepo, Víctor
Chair of the ISSF Scientific Advisory Committee, ISS-Foundation, 1440 G Street NW, Washington DC 20005, United States
Tel: + 1 305 450 2575; +1 703 226 8101, Fax: +1 215 220 2698, E-Mail: vrestrepo@iss-foundation.org; vrestrepo@mail.com

PEW CHARITABLE TRUSTS - PEW
Wozniak, Esther
Pew Charitable Trusts, 901 E Street, NW, Washington DC 20004, United States
Tel: +1 202 657 8603, E-Mail: ewozniak@pewtrusts.org

SHARKPROJECT INTERNATIONAL
Ziegler, Iris
SHARKPROJECT International, Rebhaldenstrasse 2, 8910 8910 Affoltern am Albis, Switzerland
Tel: +49 174 3795 190, E-Mail: i.ziegler@sharkproject.org; int.cooperation@sharkproject.org; driri sziegler@web.de

SCRS CHAIRMAN
Melvin, Gary
SCRS Chairman, St. Andrews Biological Station - Fisheries and Oceans Canada, Department of Fisheries and Oceans, 285 Water Street, St. Andrews, New Brunswick E5B 1B8, Canada
Tel: +1 506 652 95783; +1 506 651 6020, E-Mail: gary.d.melvin@gmail.com; gary.melvin@dfo-mpo.gc.ca

SCRS VICE-CHAIRMAN
Arrizabalaga, Haritz
Principal Investigator, SCRS Vice-Chairman, AZTI Marine Research Basque Research and Technology Alliance (BRTA), Herrera Kaia Portualde z/g, 20110 Pasaia, Gipuzkoa, Spain
Tel: +34 94 657 40 00; +34 667 174 477, Fax: +34 94 300 48 01, E-Mail: harri@azti.es

*****

ICCAT Secretariat
C/ Corazón de María 8 – 6th floor, 28002 Madrid – Spain
Tel: +34 91 416 56 00; Fax: +34 91 415 26 12; E-mail: info@iccat.int

Manel, Camille Jean Pierre
Neves dos Santos, Miguel
Ortiz, Mauricio
Cheatle, Jenny
Taylor, Nathan
Mayor, Carlos
Parrilla Moruno, Alberto Thais
Campoy, Rebecca
De Andrés, Marisa
Donovan, Karen
García-Orad, María José
Peyre, Christine
Pinet, Dorothée
Peña, Esther

ICCAT INTERPRETERS
Gelb Cohen, Beth
Herrero Grandgirard, Patricia
Hof, Michelle Renée
Liberas, Christine
Linaae, Cristina
Pinzon, Aurélie

Appendix 3

List of ICCAT Recommendations and Resolutions with references to Electronic Monitoring Systems (EMS)

(Prepared by the Secretariat)

Rec/Res.	*Species*	*Paragraph*
Rec. 16-14		12. The SCRS shall: a) develop, as needed and appropriate, an observer working manual for voluntary use by CPCs in their domestic observer programs, that includes model data collection forms and standardized data collection procedures, taking into account observer manuals and related materials that may already exist through other sources, including CPCs, regional and sub-regional bodies, and other organizations; b) develop fisheries specific guidelines for electronic monitoring systems; c) provide the Commission with a summary of the scientific data and information collected and reported pursuant to this recommendation and any relevant associated findings; d) make recommendations, as necessary and appropriate, on how to improve the effectiveness of scientific observer programs in order to meet the data needs of the Commission, including possible revisions to this Recommendation and/or with respect to implementation of these minimum standards and protocols by CPCs.
		13. Where they have been determined by SCRS to be effective in a particular fishery, electronic monitoring systems may be installed on board fishing vessels to complement or, pending SCRS advice and a Commission decision, to replace the human observer on board.
		14. CPCs should consider any applicable guidelines that are endorsed by SCRS on the use of electronic monitoring systems.
		15. CPCs are encouraged to report to the SCRS their experiences in the use of electronic monitoring systems in their ICCAT fisheries to complement human observer programs. CPCs who have not yet implemented such systems are encouraged to explore their use and report their findings to the SCRS.
Rec. 19-02	Tropical tunas	32. CPCs may authorize their purse seine vessels to set on floating objects provided that the fishing vessel has either an observer or a functioning electronic monitoring system on board which is capable of verifying set type, species composition, and providing information on fishing activities to the SCRS.
		55. For longline vessels flying their flag 20 meters length overall (LOA) or greater targeting bigeye, yellowfin and/or skipjack in the Convention area, CPCs shall ensure a minimum of 10% observer coverage of fishing effort by 2022, through the presence of a human observer on board in accordance with Annex 7 and/or an Electronic Monitoring system. For this purpose, the Working Group on Integrated Monitoring Measures (IMM WG), in cooperation with the SCRS, shall make a recommendation to the Commission for endorsement at its 2021 Annual meeting on the following: a) Minimum standards for an electronic monitoring system such as: i) the minimum specifications of the recording equipment (e.g. resolution, recording time capacity), data storage type, data protection
Rec. 19-02	Tropical tunas	ii) the number of cameras to be installed at which points on board b) What shall be recorded c) Data analysis standards, e.g., converting video footage into actionable data by the use of artificial intelligence

		d) Data to be analyzed, e.g., species, length, estimated weight, fishing operation details e) Reporting format to the Secretariat In 2020 CPCs are encouraged to conduct trials on electronic monitoring and report the results back to the IMM and the SCRS in 2021 for their review. CPCs shall report the information collected by the observers or the electronic monitoring system from the previous year by 30 April to the ICCAT Secretariat and to SCRS taking into account CPC confidentiality requirements.
		57. CPCs shall endeavour to further increase observer coverage rates for longline vessels, including through trials and implementation of electronic monitoring to supplement human observers. CPCs that trial electronic monitoring shall share technical specifications and standards with the Commission towards the development of agreed ICCAT standards.
		58. For purse seine vessels flying their flag and targeting bigeye, yellowfin and/or skipjack in the Convention area, CPCs shall ensure 100% observer coverage of fishing effort, through the presence of an observer on board in accordance with Annex 7 or through an approved electronic monitoring system. CPCs shall report the information collected by the observers from the previous year by 30 April to the ICCAT Secretariat and to SCRS.
Rec. 19-05	Billfishes (BIL)	5. The Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures (PWG), in cooperation with the SCRS, shall work to develop recommendations on the following issues for consideration at the 2021 annual meeting of the Commission: a) Minimum standard for an electronic monitoring system such as: (i) the minimum specification of the recording equipment (e.g. resolution. recording time capacity, data storage type, data protection) (ii) the number of cameras to be installed at which points on board b) What shall be recorded c) Data analysis standards, e.g., converting video footage into actionable data by the use of artificial intelligence d) Data to be analyzed, e.g., species, length, estimated weight, fishing operation details e) Reporting format to the Secretariat In 2020 CPCs are encouraged to conduct trials on electronic monitoring and report the results back to the PWG and the SCRS in 2021 for their review.
Rec. 19-06	Shortfin mako (SMA)	2. Notwithstanding the provisions in paragraph 1 above, CPCs may authorize their vessels to catch and retain on board, transship or land North Atlantic shortfin mako, provided that: (1) For vessels whose length is greater than 12 m, a) the vessel has either an observer or a functioning electronic monitoring system on board which can identify whether the fish is dead or alive; b) shortfin mako is dead when brought along side for taking on board the vessel; c) the observer collects data on the number of individuals hooked, body length, sex, condition, maturity (whether the

		individual is pregnant and its litter size) and weight of products for each shortfin mako caught as well as fishing effort; and d) when shortfin mako is not retained, the number of dead discards and live releases shall be recorded by the observer or estimated from the records of the electronic monitoring system. (2) For vessels whose length is equal or smaller than 12 m, a) shortfin mako is dead when brought along side for taking on board the vessel.
Rec. 21-01	Tropical tunas	*Recommendation by ICCAT replacing Recommendation 19-02 replacing Recommendation 16-01 on a multi-annual conservation and management programme for tropical tunas*
Rec. 21-09	Shortfin mako (SMA)	*Recommendation by ICCAT on the conservation of North Atlantic stock of shortfin mako caught in association with ICCAT fisheries*
Res. 21-17	Bluefin tuna (BFT)	*Resolution by ICCAT establishing a pilot project for the implementation of Remote Electronic Monitoring (REM) on bluefin tuna processing vessels*
Res. 21-22		*Resolution by ICCAT for the establishment of an ICCAT Working Group on the use of Electronic Monitoring Systems (EMS)*

Appendix 4

Electronic Monitoring in the U.S. Atlantic Pelagic Longline Fishery: An Information Paper

(Submitted by the United States)

The United States is providing this paper to offer details on the use of electronic monitoring (EM) equipment in the U.S. Atlantic pelagic longline (PLL) fishery. This paper was previously submitted as IMM-25 to the 2021 meeting of the Integrated Monitoring Measures (IMM) Working Group. We hope this information can support discussions now taking place in the Working Group on Electronic Monitoring Systems (WG-EMS) about the scope, purpose, and specifications of any EM rules ICCAT may consider developing in light of the relevant provisions in recommendations, including Recs. 19-05, 21-01 and 21-09. This paper is intended only to describe an example of one successful EM program, along with various considerations and lessons learned from its implementation.

The United States has required EM on our PLL vessels, regardless of size, operating in ICCAT fisheries since 2015. EM was implemented as a compliance tool on PLL vessels to monitor implementation of individual bluefin tuna quotas. The EM system allows the United States to confirm that bluefin tuna interactions are being reported accurately and as required, and to verify the accuracy of reported catch and of species identification. EM provides an independent data stream to verify bluefin tuna catch reports submitted by PLL fishermen through traditional logbooks, VMS set reports, and/or observer reports. The U.S. EM requirement has been very effective as a compliance tool, and the incidental catch of bluefin tuna in the U.S pelagic longline fishery has been effectively reduced.

In response to the adoption of the *Recommendation by ICCAT on the Conservation of the North Atlantic Stock of Shortfin Mako Caught in Association with ICCAT Fisheries* (Rec. 17-08), the United States incorporated EM requirements into U.S. regulations to address overfishing and support measures to rebuild North Atlantic shortfin mako sharks. In the PLL fishery, that action implemented measures allowing retention of North Atlantic shortfin mako sharks if dead at haulback, provided the fishing activity was observed by either an at-sea observer or an approved EM system.

Technical description:

The EM system must be installed by a U.S.-approved contractor, it must consist of video cameras, other related sensors, and recording equipment, and it must have the following components and capabilities:

- Video cameras must be mounted and placed so as to provide clear, unobstructed views of the area where the PLL gear is retrieved and of the catch during hook removal prior to being placed in the hold or discarded. There must be lighting sufficient to clearly illuminate individual fish.

- Vessels are required to be equipped with a minimum of two cameras, with sufficient resolution (no less than 720 pixels) to determine the number and species of fish harvested. To obtain the views described above, one camera must be mounted to record close-up images of fish being retained on the deck at the haulback station, and one camera must be mounted to record activity at the waterline along the side of the vessel at the haulback station.

- The EM system must be capable of initiating video recording at the time gear retrieval starts. It must record all periods of time when the gear is being retrieved and during hook removal until the catch is placed in the hold or discarded.

- The EM system will continue to record for 30 minutes after the last drum rotation sensor signal, or hydraulic pressure sensor signal, which indicates the activity of machinery used for hauling gear. The system must include a GPS receiver which records location coordinates, velocity, and heading data, and is directly and continuously logged by the control box.

- The GPS receiver must be installed and remain in a location where it continuously receives a strong signal.

- Hydraulic sensors are required to continuously monitor the hydraulic pressure, and a drum rotation sensor must continuously monitor drum rotations; these hydraulic pressures are recorded and stored by the control box.

- The system must include a control box that receives and stores the raw data provided by the sensors and cameras. The control box must contain removable hard drives and storage systems adequate for a trip lasting 30 days.

- A wheelhouse monitor must provide a user interface for the vessel operator to monitor the control box and provide information on the current date and time (synchronized via GPS), GPS coordinates, current hydraulic pressure reading, presence of a data disk, percentage used of the data disk, and video recording status.

- The EM system must have software that enables the vessel operator to initiate an EM self-diagnostic test for functionality of the system components, and that records the outcome of the tests.

Data collection and submission:

When a vessel enters the U.S Atlantic PLL fishery, the owner/operator is required to have an EM system installed on their vessel. Vessels are provided with four hard drives for use in the EM system. The owner/operator is responsible for plugging in the hard drive before the start of each fishing trip, verifying that it is functioning properly, and ensuring the system remains powered on and positioned correctly for the duration of each trip. These EM systems record only during gear haulback; recording is triggered by sensors that are mounted on the mainline drum and on the hydraulics. The system continues to record for up to 30 minutes after the last time the sensors are triggered. Within 48 hours of completion of a fishing trip, the vessel owner/operator must return the hard drive(s) to the EM service provider with pre-paid return postage. When a hard drive is received for processing, a new hard drive is shipped back to the vessel owner/operator within 48 hours.

Data from the hard drives is managed by an EM service provider company contracted by the U.S. government. The vessel owner/operator is responsible for notifying the EM service provider if they have not received a replacement hard drive or if their EM system is not functioning properly. Video footage from all PLL vessels is also reviewed by the EM service provider. Currently, 10% of fleet-wide sets are targeted for review per year. Potential noncompliance identified during the review of video footage and program administration is referred to NOAA's Office of Law Enforcement for appropriate action.

Costs:

EM program costs in the Atlantic PLL fishery are currently borne by the U.S. Government. In 2020, the U.S. PLL fleet had 110 vessels outfitted with EM, 67 of which were active. Overall costs per CPC of implementing an EM program will vary taking into account the domestic structure of their program, including who bears which costs (i.e., the vessel, the government, or some combination) and how the program is implemented (e.g., via contractors and/or government personnel), the size of the fleet to be covered, and the purpose and scope of the EM program.

EM Cost Estimates	*Start Up Costs (Year 1)*	*Annual Maintenance Costs*
Equipment Installation and Repair	$1,500,000 -1,700,000	$500,000 - $700,000
Data Storage and Review	$900,000 - $1,400,000	$750,000 - $1,100,000
Total Costs	$2,400,000 - $3,100,000	$1,250,000 - $1,800,000

Appendix 5

Concept paper for a Pilot Project to test the use of stereoscopic cameras during first transfers and the automation of video footage analysis

(Submitted by the European Union)

Most of the bluefin tuna (BFT) quota set by ICCAT is intended for caging in fattening farms (live BFT). Due to its special characteristics, the regulation of the live BFT fishery is very complex, and its control is equally **complex, demanding and very expensive**.

The monitoring and control of the live BFT fishery is largely based on **video recordings** of the various transfer and caging operations of live bluefin tuna that take place underwater.

Because it is only possible to obtain live tuna weight through the use of a stereoscopic camera (SC), which is only used at the time of caging, the calculation of the quantities caught and the **closure of the fishery** is based on rough **estimates** made at the time of catching, which are only corrected after the results of the caging operations are available (usually a few months after the catch took place).

Important provisions, such as **minimum size**, are difficult to implement since it is only possible to determine the size of the tuna at the time of its caging (use of the SC), and an eventual detention of fish below the minimum size once the fish has been caged, makes the segregation of undersized fish and its release difficult in practice.

Every movement of tuna underwater has to be recorded using stereoscopic and/or conventional cameras, including first transfers, further transfers, caging, control transfers, carry-over assessments and intra-farm and inter-farm transfers. All of this means that hundreds of video footages have to be reviewed manually in each fishing campaign, with the consequent huge **workload** that this entails (on average, the analysis of a SC video can take between 6 and 8 hours and a conventional camera video between 3 and 4 hours). Despite the heavy workload, manual counting offers **inherent errors** due to human intervention and does not allow in some cases for high precision in the counting.

In recent years there have been important technological developments in new technologies that can assist in the control of fisheries. These technologies are promising but need to be tested. A pilot project for the use of new available technologies could have a double objective:

- to test whether the newly available **stereoscopic cameras** can be used during the **first transfers** from purse seine vessels or traps to towing cages;

- to test the use of available software and artificial intelligence for the **automatic analysis of the video footages**, to automatically determine the number of individuals and its weight.

The potential advantages of these new technologies are:

1. Use of stereoscopic cameras during first transfer

    a) The **quota** consumption could be determined from the outset. Now the closure of the fishery is based only on estimates of the quantities caught, which is not balanced until the SC results are available several months later, with compensations at JFO level and potential releases;

    b) It would end with potential problems regarding no reporting of **mortalities** during transport and **difficulties in monitoring** and trace fish when further transfers prior to caging take place;

    c) It would help the more effective implementation of the **minimum size** provisions for live BFT, which are now considered to be difficult to implement;

d) It would do away with the **burden** now needed between farm and catching state for the determination of final quotas, investigations for discrepancies between quantities caught and caged, etc.; and could simplify control by eliminating some of the control requirements now necessary.

e) It would end the need for **releases**. Right now significant quantities of fish are released to compensate the estimated quantities. It is not clear whether the released fish returns to the stock with the consequent impact on the management of the fishery.

2. Use of artificial intelligence for automatic counting and measurement

a) The use of automatic counting and measurement (determination of weight) would significantly reduce the **burden** for the authorities and save **money and resources**;

b) It would allow the authorities to **analyse all the videos** of the different transfers and further transfers. At the moment due to the heavy workload involved, not all videos are reviewed by the authorities;

c) It could also increase **accuracy** (companies claim 98% accuracy). Now only a 20% of the fish in each video footage are manually measured. It would also eliminate possible **human bias** (now the specimens that are measured are selected by the officer analysing the video and the measurement is carried out manually).

The EU believes that the introduction of this can make a difference by **modernizing and streamlining** the control system for live BFT. The technology could help to solve important challenges faced by the control of this fishery, improve the accuracy of estimates of fish caught and greatly reduce the workload and cost for the authorities involved in its control. Lastly, if these technologies prove to be reliable and up to the expectations, they would allow to substantially complement the efforts put in closing existing loopholes through the revision of the Recommendation 19-04 in 2021.