



OCEAN OUTCOMES
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FINAL DRAFT

**Indian Ocean albacore longline Fishery Improvement Project: fleet
data collection and reporting improvement plan**

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Introduction

The Indian Ocean (IO) albacore tuna longline Fishery Improvement Project (FIP) five-year work plan has a strong focus on improving the data collection and reporting of data by FIP vessels. These are to address identified deficiencies in the data collection and subsequent reporting for target, primary, secondary and endangered, threatened and protected species (ETP). The lack of verified data results in an inability to assess the impact of the fishery on primary, secondary and ETP species.

The FIP partners intend to move the FIP vessels into an electronic Fisheries Information System (eFIS), with different strategies to implement the electronic monitoring system (EMS) and eventually with the electronic reporting (ER). In the interim, it is important to improve the existing paper-based data collection and onward reporting to support science-based management decisions. This strategy is therefore broken into two parts: improving the current data collection and reporting; and moving to eFIS.

The FIP vessels land tuna in Mauritius and are flagged to Taiwan. The responsible management authorities for ensuring data collection is therefore the flag state, and provision of data to the Indian Ocean Tuna Commission (IOTC) is the responsibility of the flag and port state depending on the data.

Data deficiencies were identified in, and information on some elements of the management system are derived from, the pre-assessment for IO albacore caught by longline, conducted by ME Certification Ltd (MEC) (MEC, 2018). MEC Ltd were provided summary logbook catch data, but not observer data to use in undertaking the pre-assessment. They noted, “...There is currently a significant paucity of catch and effort data and information on retained and discarded species composition for the Client fleet.” Also “...it is not possible to determine the level of ETP interactions”. Furthermore, there is no validation or verification of the logbook data by any independent source and there is currently no observer coverage of these vessels – this is discussed further in Section 1.2. Therefore, there is a low level of confidence in the robustness and accuracy of data provided in these sheets.” These require resolving prior to entering a full assessment under the Marine Stewardship Council (MSC) fisheries standard.

Guidance in the MSC Standards around what constitutes adequate information states “Generally, having only one form of data collection with a high level of potential bias or other limitation (e.g., logbooks or interviews with fishermen) by itself should not be enough to meet SG80...” (SGA3.6.3). Observer programs allow for verification, however the program needs to be robust, including having sufficient coverage rates to meet the program’s objectives.

Information on the Chinese Taipei management system is derived from the addendum to the pre-assessment evaluating the People’s Republic of China and Taiwan (Chinese Taipei) longline tuna fishery management systems in Western and Central Pacific Ocean yellowfin and albacore longline and IO albacore longline fisheries against Principles 2 and 3 of the MSC Fisheries Standard.

The purpose of this plan is primarily to improve the FIP vessels/fishery data collection and reporting, not to try and improve the whole IOTC information system. While these fishery-wise



improvements may lead to IOTC-wide changes, and specific actions will arise to affect change at the IOTC-level, that is not the aim. Such broadscale improvements would not be feasible to achieve at the IOTC within the next four years of the FIP.

This document is the interim plan to improve data collection and reporting. It focuses on logbooks and observer coverage, however that will be expanded to include port sampling and transshipment (mentioned in the electronic section).

Data-related FIP Work Plan tasks

There were seven year one FIP work plan tasks that are primarily associated with improving the data collection and reporting by the FIP vessels (see Table 1).

Table 1. FIP year one data-related work plan tasks (text in green is directly relevant to this data collection and reporting assessment and plan).

PI#	Performance Indicator	Task #	Task
1.2.3	Stocks - Information and Monitoring	1.5	Evaluate the IO albacore Executive Summary and supporting documentation to identify the gaps in IO albacore data and develop an approach to improving the collection requirements for, and provision of, operational level catch and effort data and data identified as source of uncertainty in assessments at both the vessel and flag-state levels.
		1.6	Conduct training for FIP vessels to ensure accurate data collection and reporting.
2.1.1, 2.2.3 & 2.3.3	Primary species - Outcome, & Secondary species & ETP species - Information	2.1	<p>A. Work with relevant national authorities to evaluate current data collection and reporting strategies against IOTC requirements and requests and identify areas of improvement.</p> <p>B. Consider what is needed to improve the IOTC's species composition and fine scale resolution requirements.</p> <p>C. Develop improved data collection and reporting plan; this can be through increased observer coverage (human or electronic), improved self-reporting (e.g. e-logbooks), or through some other measures as appropriate. An observer sampling design and protocol, to address different data needs and compliance issues, will also need to be developed, noting need to meet the IOTC requirements for 5% representative coverage at a minimum.</p> <p>The aspiration is for 100% scientific electronic observer coverage (with at least 20% analysed), including sampling at landing sites and transshipment operations, when applicable. This information will also be helpful to demonstrate compliance with existing RFMO, national and international measures for ETP species.</p> <p>Conduct an initial assessment on the sourcing of bait, and ensure the origin and amounts of bait is being documented and monitored.</p> <p>Ensure integration with the Bycatch policy/code of conduct being developed in Task 3.2, which will also include data collection.</p>



		2.3	<p>Commence assessment of how to integrate e-observer coverage into a comprehensive data plan, including: how e-observer coverage can be used to increase observer coverage from 5% to 20+%; sampling approach and protocol to address different data needs and compliance issues; encouraging buying and installing units; responsibility for undertaking analysis and analysis costs; how the data will be used, who will own data, under what conditions data can be accessed by third parties; and how the data may be accepted by the IOTC. Ensure integration with the Bycatch policy/code of practice being developed in Task 3.2, which should also include adequate percentage (20+%) of analysed electronic observer coverage.</p> <p>Discussions both within the FIP and with the working group need to include future responsibility for e-observer footage analyses.</p>
		2.5	<p>Regarding sharks, assess whether: i. supplying vessels are complying with the shark finning ban (5% ratio); ii. supplying vessels comply with the prohibition from retaining, transshipping, storing or landing oceanic whitetip and thresher sharks; iii. supplying vessels comply with recommendation for incidentally caught sharks to be released, the incident recorded and reported; iv. China, Taiwan, support flag states in which fishing takes place to develop Nation Plans of Action for the Conservation and Management of Sharks; and are complying generally with the Resolutions pertaining to sharks. If data are insufficient to determine these, integrate into Task 2.1. If any non-compliance is identified, set process to address (Action 3).</p>
		2.7	<p>Require vessels to fill in discard information in logbooks, and commence improvement of the species composition data resolution (life status of discards (dead or alive) and size frequencies) required on the logbooks.</p>
2.2.2 & 2.3.2	Secondary and ETP species - Management	3.2	<p>Commence development of a compulsory and verifiable Bycatch policy/code of practice for participating vessels, that includes full retention of tunas, best practices, gear improvements, mitigation and research, best practices which include each of the ETP species groups (sharks, rays, cetaceans, turtles and birds), 100% observer coverage, data collection and reporting of all interactions and fate.</p> <p>Appropriate monitoring and bycatch policies are critical to characterise, quantify and manage the interactions as well as verify the implementation of any Bycatch policies.</p> <p>Cumulative effects with other MSC certified fisheries should be taken into account. Skipper and crew training considerations to be made in conjunction with the Bycatch policy/code of practice development.</p>

Year two tasks, and carryover from Year one

There are five year two FIP work plan tasks that follow on from year one tasks that are primarily associated with improving the data collection and reporting by the FIP vessels (see Table 2). In addition, due to Covid-19, consultation with relevant authorities and the Taiwan Fisheries Agency did not occur. It will therefore need to occur in year two of the FIP. China was removed a



flag state from the fishery in the first year as the final FIP fleet does not include Chinese-flagged vessels.

Table 2. FIP year two data-related work plan tasks (text in green is directly relevant to this data collection and reporting assessment and plan).

PI#	Performance Indicator	Task #	Task
1.2.3, 2.1.1, 2.2.3 & 2.3.3	Primary species - Outcome, & Secondary species & ETP species - Information	1.5, 1.6, 2.1	Consultation with national authorities required.
1.2.3	Stocks - Information and Monitoring	1.5.2	Commence actions to improve catch and effort data from the FIP fleet, as per the FIP vessel data collection improvement plan.
		1.6.2	Direct FIP fleet engagement (and training for those vessels that missed it in year 1) to improve catch and effort data from the FIP fleet, as per the FIP vessel data collection improvement plan.
2.1.1, 2.2.3 & 2.3.3	Primary species - Outcome, & Secondary species & ETP species - Information	2.1.2	Commence implementation of the paper-based section of the FIP vessel data collection and reporting plan.
		2.2.2a	Commence implementation of electronic Fishery Information System elements of the FIP vessel data collection and reporting plan.
		2.2.2b	Commence implementation of transshipment elements of the FIP vessel data collection and reporting plan.



Improving the current paper-based data collection and reporting

The IOTC manages its scientific data holdings internally and does not have an external science services provider. The IOTC does have a couple of data management staff, compliance staff, fisheries statistician, and a stock assessment scientist who contributes towards the Commission's secretariat work. Most of the Commission's stock assessment and scientific work is undertaken by its members or by consultants through members or grant-funded projects. While not a member of the IOTC¹, Taiwan still contributes data to the IOTC directly. Taiwan's reporting is not published on the IOTC website, although it is available upon request by members. Taiwan aggregate nominal catch data are available online. Taiwan-flagged vessels are not recorded on the IOTC's Record of Authorised Vessels.

If a foreign-flagged vessel (e.g. Taiwan) fishes in the Exclusive Economic Zone (EEZ) of a member coastal state, the catch is allocated to the coastal state or the flag state depending on how the vessel is licenced to fish in that EEZ. If the vessel is fishing in a coastal state under charter or under a license from a bilateral fishing agreements², all catch will be counted as the coastal national annual catch volume during the chartering period, no matter if the catch is from EEZ or high seas.

Logbooks

Summary of the need and current situation

Taiwanese-flagged fishing vessels that engage in fishing for tuna and tuna-like species in the high seas areas of the IOTC are managed through the Fisheries Agency under Council of Agriculture, the official government body in the Republic of China under the Executive Yuan in charged with overseeing affairs related to agriculture, forestry, fishery, animal husbandry and food affairs. The Fishery Agency is under the and is responsible for Taiwan's fisheries management and development. The Fisheries Agency manages all matters relating to fisheries in the country, aims to establish and implement fisheries policies with a macroscopic outlook, with a view of promoting efficient administrative work, solving fisheries-related problems, and maintaining sustainable fisheries development.

As identified by MEC (2018) above there is a clear paucity in data within the logbook dataset, and concerns regarding data validation and verification remain as key issues. The IOTC Scientific Committee repeatedly reports that the quality of logbook data, compared with

¹ As a UN body, the IOTC is the only tuna RFMO that has so far failed to find a solution to incorporate Taiwan. Presently, Taiwan participates in the IOTC as an "invited expert", which does not entitle any rights observed by its members or cooperating members.

² A bilateral license is issued by individual coastal states to Distant Water Fishing Nation (DWFN) vessels that pay an agreed up license fee. The licenses are restricted to the EEZ of the issuing coastal state and comprise most of the license issued to DWFN vessels.



observer data, is poor, especially for secondary or ETP species. Discard data are a key area of missing data. Observers are required to record all species data, including discards (Resolution 11/04) [noting the rate of observer coverage is extremely low], and members are meant to note discards of tuna, tuna-like fish and sharks in their logbook (Resolution 15/01). The FIP's secondary species as per the pre-assessment are: dolphinfish (main), escolar (minor), spotted opah (minor), King mackerel (minor), and bait species.

The FIP vessels all use the Taiwanese electronic logbook and paper logbook system. Information on Taiwan's longline electronic and paper logbook processes are both explained here in tandem as they operate that way in practice.

For Taiwanese-flagged vessels, the "captain shall daily report catch data through the E-logbook system designated by the competent authority, and shall also fill in the logbooks designated by the competent authority." (Fisheries Agency, 2021). The Taiwan Fisheries Agency requires its tuna longline vessels to maintain complete logbooks on board for at least one year, noting that "any discrepancy between any datum recorded in the E-logbook system and the logbook, the datum recorded in the E-logbook system shall prevail." (Fisheries Agency, 2021).

"...Landing takes place exclusively in Mauritius (Port Louis) where all vessels must go through customs clearance before unloading can commence. Customs clearance consists of inspections by both Mauritian and Taiwanese officials. The latter do not inspect all vessels but instead follow a risk-based approach for Taiwanese flagged boats only. After inspection, a landing permit is issued by the Mauritian port authorities." (MEC, 2018). Total trip catches are submitted to the Mauritian and Flag State governments three days prior to landing in order to obtain an unloading permit, as part of the Port State Measures.

For vessels licensed by Contracting Parties (Members) and Cooperating Non-Contracting Parties that use paper logbooks, paper logbook data are sent to the licensing State (the flag State of joint venture /charter State) at the end of each trip as this is a condition of their license. Figure 1 below illustrates the current data flow for paper and electronic logbooks in the IOTC. A paper copy of the logbook will also go to the port authority where the fish are landed. For this FIP, the port authority is Mauritius for the vessels that are not transshipping at sea. For vessels that are transshipping, the product is still transshipped to Mauritius. It is common practice to submit a copy of logbooks to the port authority. Even when a country has implemented its logbook fully electronically, such as Taiwan, captains still have to keep a paper-based logbook just to fulfill this purpose when calling into Mauritius.

Contracting Parties and Cooperating Non-Contracting Parties submit summarised logbook data to the IOTC Secretariat as part of annual scientific data reporting requirements in Resolution 15/02. For "longline fleets operating in the high seas shall provide provisional data for the previous year no later than 30 June. Final data shall be submitted no later than 30 December".

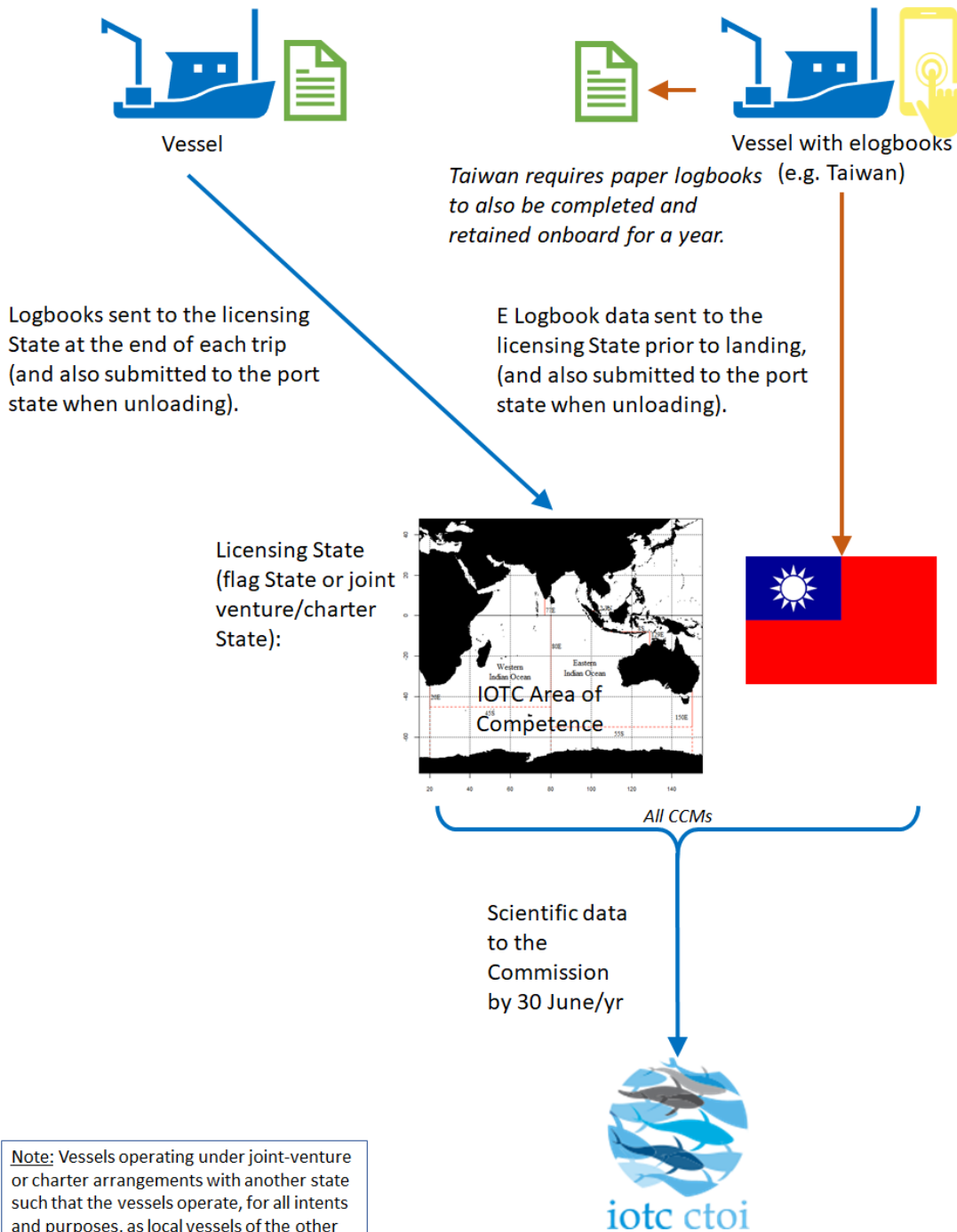


Figure 1. Current paper and electronic logbook data flow in the Indian Ocean Tuna Commission.



Discards

As noted above, the IOTC Scientific Committee repeatedly reports that the quality of logbook data, compared with observer data, is poor, especially for secondary or ETP species. Discard data are a key area of missing data for both the IOTC and the FIP vessels (MEC, 2018). As a result it is highly likely that a Risk Based Framework process including a range of stakeholders, under the MSC Fisheries Standard would be required to enable appropriate scoring.

Observers are required to record all species data, including discards (Resolution 11/04) [noting the rate of observer coverage is extremely low], and members are meant to note discards of tuna, tuna-like fish and sharks in their logbook (Resolution 15/01). The recording by vessels and subsequent national reporting is required “for all species under the IOTC mandate as well as the most commonly caught elasmobranch species according to records of catches and incidents as established in Resolution 15/01”. The Resolutions on the conservation of mobulid rays (19/03), blue sharks (18/02) and sharks in general also require discard reporting in accordance with IOTC data reporting requirements and procedures in Resolution 15/02.

A fishery aiming to get certified should always have strategies “if necessary” for impacts on primary /secondary. Information matters for the primary/secondary species (PIs2.1.2 and 2.2.2) management strategy (scoring issue a) and review of alternative measures (scoring issue e). The FIP needs to consider its impact on discards (unwanted catch), in terms of both observed and unobserved mortality. Collecting data on all discards would make part of the strategy.

In the Western and Central Pacific Fisheries Commission (WCPFC), their science provider requested members to consider a number of suggestions, which were generally supported, but not taken forward by Scientific Committee (William 2018), however these recommendations are also relevant for the IOTC:

- “reviewing their respective longline logbooks to ensure there is differentiation between (i) releases of live fish (in healthy condition), and (ii) releases/discards of dead fish, or fish “unlikely-to- survive”, which will facilitate the estimation of annual discards for the WCPFC key species [This differentiation is also consistent with the reporting requirements of several shark species Conservation and Management Measures (CMMs)];
- ensuring the definition of “live (in healthy condition)” which is consistent with observer data collection is included in the logbook instructions;
- ensuring the annual estimates of discards/releases reconcile with discards/releases in their aggregate and operational data; and
- in addition to estimates of discards in weight by species, provide annual estimates of discards in number (dead fish, or fish “unlikely-to-survive”) for the longline fishery only;”



Improving paper-based logbook data collection

1. Incorporate data collection and reporting of all interactions, and fate if possible, into the bycatch policy/code of conduct being developed for the FIP by the International Seafood Sustainability Foundation.
2. In working toward improved discard recording (2021):
 - annotate the paper and electronic logbooks regarding discards.
 - FCF to print and laminate one for each vessel and provide training when handing laminated reference pages to skippers in Mauritius. For those vessels that do not come into port in Mauritius, FCF will devise an alternative process.
 - FCF to also disseminate the instructions in Mandarin for the captains to use when completing their logbooks.
 - Provide vessels a species reference sheet in Mandarin that syncs with the format of the logbook currently in use.
 - Consider how fate can be included in the logbook, and if the logbook could be expanded to list more species, rather than having the additional species entered in blank rows (2022).
3. Assess how the FIP may work with Overseas Fishing Development Council and/or Taiwan Tuna Association to further educate companies and crews of their data collection and reporting obligations, and the new bycatch policy/code of conduct, and disseminate information.
4. International Sustainable Seafood Foundation (ISSF) and AZTI have prepared a new remote training module that includes a section on correct logbook completion. The module will be used in the Indian Ocean Bumble Bee longline FIP, and we will look to include it in further training in this FIP.

Observers

Summary of the need and current situation

Scientific observers collect extremely valuable, high-quality data, albeit from a miniscule, and largely unrepresentative subset of annual fishing effort. Low levels of non-representative observer coverage results in: inaccurate data on target and bycatch species; illegally, underreported and mis-reported caught fish, fishing beyond the authorised zones; and shark finning. The importance of higher levels of observer coverage is addressed in the [Electronic Monitoring - Summary of the need and current situation](#) section below.

The IOTC requirement for the longline fishery is 5% coverage (established in 2009), while fishing in the IOTC area of competence of 24 meters overall length and over, and under 24 meters if they fish outside their EEZ. Taiwan's longline human observer coverage has historically not met the 5% minimum, recalling that Taiwan's compliance reporting is not made public (unpublished data, 2019).



The Taiwanese-flagged FIP fleets' human observer coverage levels as distinct from the Taiwanese-flagged fleets as a whole are unknown. The FIP fleet's human observer coverage is likely to be lower than 5%.

Observers' are meant to send their reports directly to the vessels' licensing states within 30 days of completion of each trip. The licensing national authority sends each report "within 150 days at the latest ...to the IOTC Executive Secretary, who shall make the report available to the IOTC Scientific Committee upon request. In a case where the vessel is fishing in the EEZ of a coastal State, the report shall equally be submitted to that coastal State." Licensing States also report observer information, such as observer coverage rates and amalgamated observer data, to the IOTC Secretariat as part of the annual data reporting.

Taiwan was one of the 16 members that have submitted observer reports to the IOTC Secretariat for the years 2010-2019 (IOTC Secretariat, 2020a).

Members may choose to use either deployed national or non-national of the flag State of the vessel on which they are deployed (Resolution 11/04).

Resolution 11/04 (On a regional observer scheme) requires states that members "have the primary responsibility to obtain qualified observers, however it doesn't define what "qualified" means. In 2016, the IOTC adopted a Resolution 16/04 requiring the IOTC to "Create a pilot project aiming to enhance the implementation of the Resolution 11/04 ...and to raise the level of compliance to the implementation of Resolutions 15/01 and 15/02, respectively *on the recording of catch and effort data by fishing vessels in the IOTC area of competence and on mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating non-Contracting parties (CPCs)*". Annex I of the Resolution ("Minimal requirements for observers") includes a broad list of qualifications that observers should have. The expectation is that in due course the Scientific Committee will confirm/amend and/or finalise these requirements.

Figure 2 below illustrates the current data flow for paper-observer coverage for the FIP fleets.

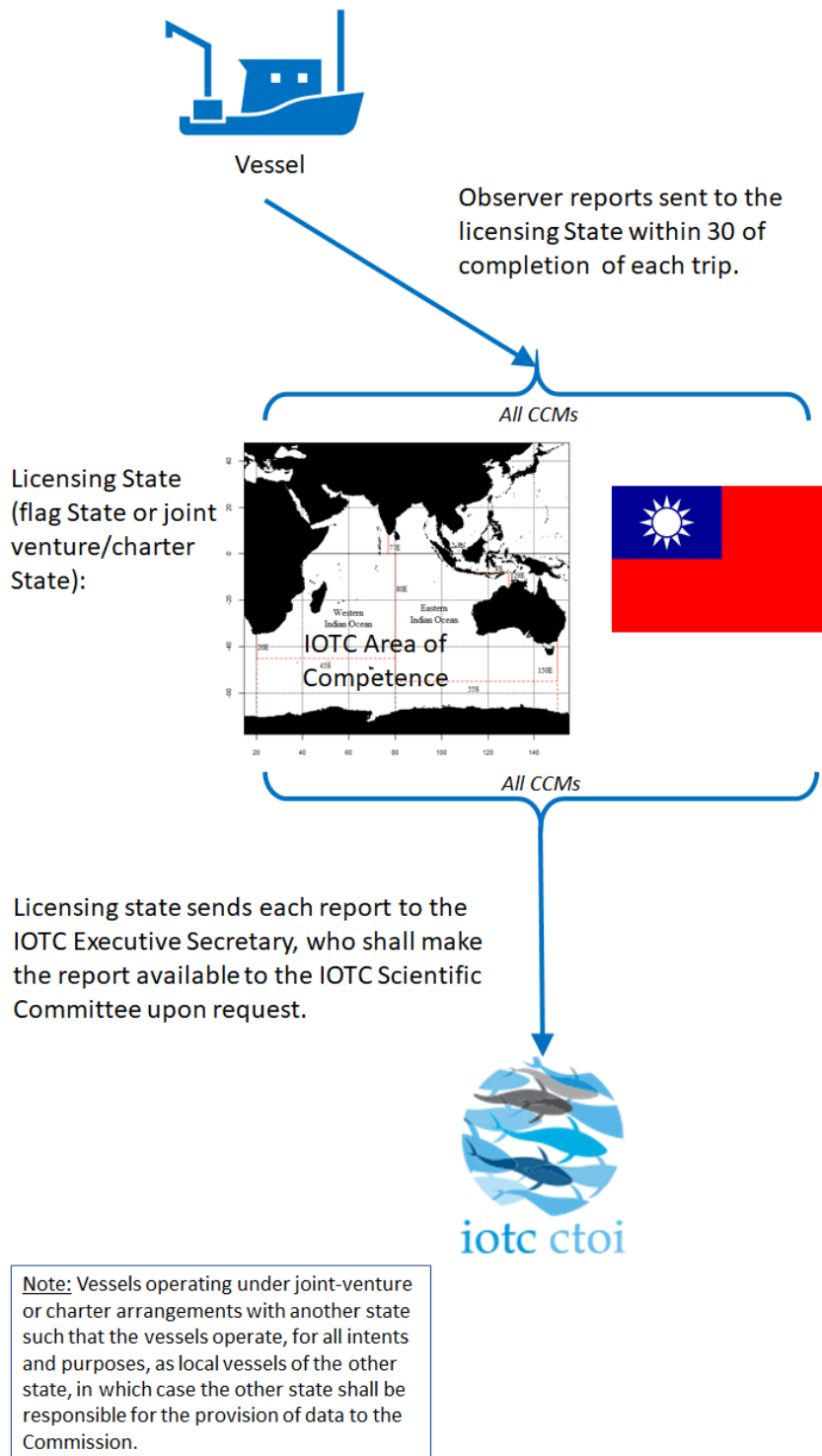


Figure 2. Current observer data flow in the Indian Ocean Tuna Commission.



Improving paper-based observer data collection

1. Work with the Taiwanese Government to improve compliance with the 5% observer requirement amongst the FIP fleet. Encourage representative coverage of the 5% by the FIP fleet. (2021)
2. FCF to work with the Mauritius and Madagascar Governments to encourage any observer reports received by those Governments for FIP vessels fishing in their waters are automatically shared with the relevant Taiwanese authority. (2022)
3. Commence discussions on moving to e-reporting for observer data as discussed under the e-FIS sections below.
4. Pursue verification that vessels have available, and are complying with, a Garbage Management Plan that meets the MARPOL ANNEX 5 requirements.

Bait data collection

Summary of the need and current situation

The pre-assessment (MEC, 2018) explained that the most likely bait type being used by the Taiwanese fleet is *Sardinops sagax*, from South Africa. There may be other species being used, as this finding was based on a small subset of information.

IOTC Resolution 15/01 (*On the recording of catch and effort data by fishing vessels in the IOTC area of competence*) requires the type of bait used for longline sets, without any requirement for detail on species or sources of the bait. The IOTC does not receive data on bait use as the IOTC Agreement doesn't cover stocks used for bait.

Each vessel owner in the FIP should already be maintaining a record of their bait sourcing. This should be evaluated as part of the MSC pre-assessment and any deficits addressed in the FIP workplan. The bait records should contain information on:

- date the bait was supplied to the vessels
- scientific and common name of each species
- weight of each species supplied
- name of the bait supplier
- source fishery(ies) of each species of bait - flag state, fishing grounds or otherwise stock, gear type(s)

From experiences with MSC-certified fisheries in the Western and Central Pacific Ocean, it can be initially challenging for the vessel owner to have their bait suppliers identify the source fisheries and fishing grounds of the bait, and to identify all the bait to the species level. However, in time they managed to collect the needed minimum information in order to enable an assessment under MSC principle 2.

In the interim, FCF believes they should be able to obtain species level and fish origin information.



Improving bait data collection

- FCF to seek bait species and origin information from FIP vessel owners. (2021)
- FCF to work with the FIP owners on updating their bait records to include the information described above. (2022)
- The FIP bycatch Code of Conduct to specify the information that should be collected in the bait records, and indicate how to verify the bait is responsibly sourced. (2021)

Port sampling

Port sampling is critical as an independent source of scientific data on landed (retained) catch for fisheries. Even if EM systems, including cameras, are installed on boats, the subsequent analyses are unable to collect all necessary data that would usually be collected by at-sea observers, for example fish weights. Currently the standard SPC/FFA port sampling form has very few fields (species, length and weight), and this may need to expand in due course if there is a transition from at-sea observers to EM.

The FIP's vessels directly land their product in Mauritius, or have their catch transshipped to Mauritius. At this stage we do not know the port sampling that occurs for the FIP vessels or carrier vessels that are unloading FIP product.

Improving fleet port sampling

- Confirm the sampling protocols that occur in Port Louis, Mauritius where FIP product is being landed. As part of this, if possible, obtain a copy of the IOTC annual scientific report for Taiwan.

Transshipment

Summary of the need and current situation

"The transshipment of catch, which allows fresh fish to get to market sooner, is a vital but largely hidden part of the global commercial fishing industry. Transshipment involves hundreds of refrigerated cargo vessels, or carrier vessels, roaming the oceans, taking in catch from thousands of fishing vessels and transporting it to shore for processing" (The Pew Charitable Trusts, 2019a). The relative lack of transparency surrounding the movement of carrier vessels and their activities has meant that transshipment operations remain poorly monitored at both the regional and global levels. It is anticipated that more transshipments occur each year than are declared.

The IOTC only permits at-sea transshipment is for IOTC authorised industrial longliners over 24 meters in length, transshipping to an IOTC authorised carrier (Resolution 19/06). The FIP vessels fish further south from April to September, meaning they are much farther from Port Louis. FCF arranges carriers to ship the albacore to Mauritius in order for vessels to continue operating in



the fishing grounds. The transshipment carrier vessels that take product from the FIP vessels land in Mauritius.

Taiwan accounts for the largest percentage of large-scale vessel transshipment activity observed in the at-sea Transshipment Programme in the Indian Ocean, with ~65% (IOTC Secretariat, 2020b). Taiwan had 227 Large Scale Tuna Longline Vessels authorised to operate in the IOTC Area in 2019. China and Japan also had a significant number of large-scale longline tuna vessels operating in the program (117 and 184 respectively), but only accounted for ~16% and ~4% respectively of the observed at sea-transshipment activity in the program.

The Taiwanese-flagged longline transshipment flow:

- 15 days prior to highseas transshipment, the carrier needs to submit a plan to the Taiwan Fisheries Agency (TFA) for approval and allow TFA to access the VMS of the carrier.
- Three days prior to highseas highseas transshipment, both FV and MV need to submit transshipment request to TFA for approval.
- 100% observer coverage during highseas transshipment.
- Within 24hrs of completing highseas transshipment, carriers need to submit transshipment declaration to IOTC and TFA.
- Within 7days of completing highseas transshipment, fishing vessel to submit transshipment declaration to TFA.

In 2017, Global Fishing Watch conducted an “Analysis of Possible Transshipment Activity in the Indian Ocean Tuna Commission Convention Area in 2017 through the Use of AIS Data”. The results of the study included: a number of carrier vessels “observed active inside the Convention Area that did not appear listed as authorised by IOTC or any overlapping tuna RFMO”; instances where longline fishing vessels meeting at sea; loitering events with potentially unauthorised observed carriers, and those carriers visiting non-member port States not party to the PSMA, non-CPC port States not party to the Port States Measures Agreement. The authors note that some unauthorised encounters observed by Taiwanese vessels are, in fact, authorised as they “might have been misidentified as unauthorised...” due to “...incomplete historical authorised vessel records for Taiwanese carriers prior to December 2017”. “Without additional mechanisms such as a centralised Vessel Monitoring System, there remains a gap in Monitoring Control and Surveillance capacity for IOTC management authorities to easily detect and respond to suspected IUU activity.”

There are many additional concerns with transshipment ranging from non-compliance with notification and declaration requirements, to lack of standardised observer data collection, and significant underreporting of transshipment events. Transshipment vessels and the fishing vessels are not necessarily flagged to be the same country.

The International Sustainable Seafood Foundation and The Pew Charitable Trusts have both been very active in evaluating transshipment practices across the RFMOs. The two organisations prepared a best practices document for the NGO Tuna Forum, which was



finalised in 2020 and signed onto by members of the forum: “The NGO Tuna Forum: Collective Best Practices for Well-Managed At-Sea Transshipment”.

Improving paper-based transshipment elements

1. Work with national authorities to ensure that Transshipment Declarations and notifications are being provided to the relevant authorities.
2. Cross check each year that the number of observer reports submitted to the IOTC Secretariat annually and that the annual reported data match.
3. See if we can check the number of at-sea transshipments being declared, noting that the vessels are not just supplying FCF. Find some useful way to indicate if IUU transshipments might be occurring, for example: a pilot project to identify non-reported transshipments in a collaboration with the Global Fishing Watch; and confirming with the Taiwanese Government their level of monitoring of transshipments via Vessel Monitoring System and enforcement (2022).

Moving to eFIS

Electronic reporting (E-logbooks)

Summary of the need and current situation

As described above, the FIP vessels and their flag states (Taiwan) use e-logbooks. Figure 1 above illustrates the current data flow for paper and electronic logbooks in the IOTC. For Taiwanese-flagged vessels, the “captain shall daily report catch data through the E-logbook system designated by the competent authority, and shall also fill in the logbooks designated by the competent authority.” (Fisheries Agency, 2021) “...Three days prior to landing, the Elog detailing retained catch is submitted to the Taiwanese government.” (MEC, 2018). Total trip catches are submitted to the Mauritian and Flag State governments three days prior to landing in order to obtain an unloading permit, as part of the Port State Measures.

The IOTC requires all vessels to “keep a bound paper or electronic logbook to record data that includes, as a minimum requirement, the information and data in the logbook set forth in Annex I, II and III” of Resolution 15/01. The IOTC does not have an electronic logbook or reporting system. At the latest IOTC Scientific Committee meeting, the committee endorsed the Working Party on Ecosystems and Bycatch workplan, which included: “1.2.3 Development, piloting and implementation of an electronic reporting tool to facilitate data reporting”. There does not appear to be any other mention of electronic logbook development at the regional level. Some member countries report implementing, trialling or developing reporting systems, e.g. Thailand, Australia, Maldives, and Sri Lanka.



In 2016, the IOTC adopted Resolution 16/03 (On the second performance review follow-up), which endorses the recommendations of the second performance review. The review recommended the following changes that include reference to electronic data collection:

- “innovative and/or alternative means of data collection and reporting should be explored and, as appropriate, implemented, including a move towards electronic data collection and reporting for all fleets; and
- to facilitate thorough reviews of compliance, the Commission should invest in the development and implementation of an integrated electronic reporting program. This should include automatic integration of data from CPCs into the IOTC Secretariat’s databases and automatic cross-referencing obligations and reports for the various obligations, in particular related to the provision of scientific data.”

To date these recommendations do not appear to have not been acted upon with regard to logbooks.

The IOTC remains behind other RFMOs, such as the WCPFC. In the WCPFC, “The Pacific Community (SPC) at the request of, and in collaboration with member countries and longline vessel owners has started to implement the Android application “OnBoard”. This application allows longline vessel operators to report their effort and catch data at any time when internet connectivity is available (either on-board the vessel or on shore). The e-logs are securely lodged to the TUFMAN2 database system where they can be verified and validated by the respective member countries’ fisheries authorities. Currently around four WCPFC member countries and 30 longline vessels are using OnBoard. The logsheet can also be exported and printed into the SPC/FFA paper format. The majority of vessels using OnBoard no longer submit paper log sheets.” (Hosken *et al.*, 2018). The WCPFC also has an ER and EM Working Group.

The plan going forward

1. Bumble Bee/FCF to work with the Mauritius Government on being able to receive Taiwanese electronic logbook vessel information. (During 2020/21)
2. All to work on confirming data access by companies in an ER system (presumably vessel owners are authorised to access their logbook data, and this would be the mechanism whereby the FIP can access relevant data?) and develop data access and sharing plans/agreements internally and with other parties (e.g. flag state/vessel owners/coastal states). (Dec 2021)

Electronic monitoring

Summary of the need and current situation

As established, most primary data on fishing activities for the fleet is derived from electronic logbooks. Until recent times, there were few verification systems for what was written or recorded, and none whatsoever for many important aspects of high seas fishing. Scientific observers collect extremely valuable, high-quality data from a miniscule, and largely



unrepresentative subset of annual fishing effort in any given tuna fleet (except Purse Seine fleets), leaving the vast majority of global effort without any independent observation or verification. This 'invisibility' of high seas fishing activities has led to huge challenges in those fisheries' sustainably (see Figure 5).

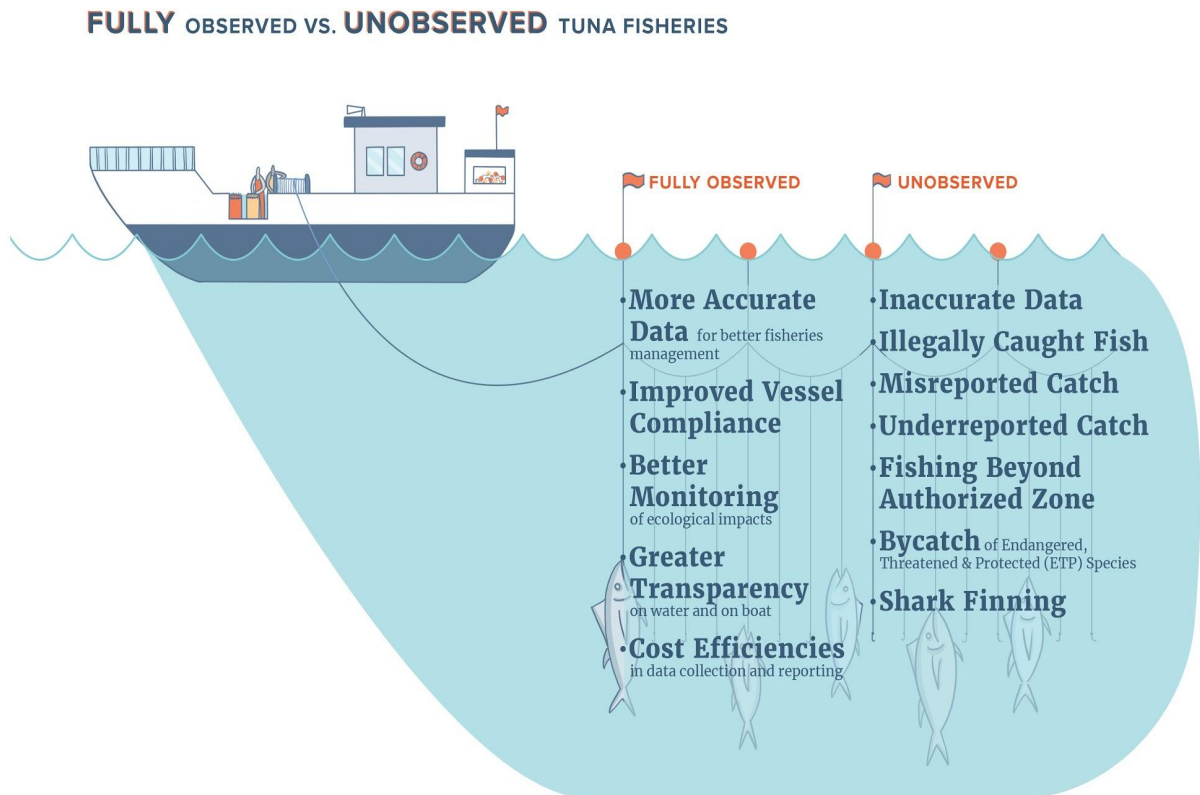


Figure 5. The NGO Tuna Forum's summary of key benefits of observer coverage (2019).

Electronic monitoring is a cost-effective and efficient tool for better tuna governance, as it provides both scientific and compliance-related data, including large quantities of high-quality data for stock assessments. There is widespread agreement between marine conservation NGOs and retail industry bodies largely agree that 100% observer coverage is the target, to be achieved in relatively few years³. The COVID-19 pandemic has provided a regrettable cause to accelerate the uptake of eFIS, namely legitimised lack of observer coverage, including for transshipments. While the need to protect vulnerable crew and observers is clear, there remains the need: to ensure vessels comply with the rules; and that vital scientific data are collected. Removal of key Monitoring, Control and Surveillance elements (in this case, observers)

³ [NGO Tuna Forum statement](#)



weakens the links that maintain the verifiability of fishing-related activities throughout the seafood supply chain. It would open the door to increased Illegal, Unreported and Unregulated fishing and, in doing so, could undermine the recovery and resilience of many important fish stocks globally.

Compliance-related data can range from: the shark measures, such as the prohibition from retaining, transshipping, storing or landing oceanic whitetip sharks, and for incidentally caught sharks to be released, the incident recorded and reported; to the correct use of bird scaring lines (incorporating the use of tension detectors, not just cameras); turtle dehooking; and incorrect discharging.

Electronic Monitoring is not the silver bullet to solve all sustainability issues confronting the tuna industry, but for several challenges it's very close to that. EM should not, for the foreseeable future, put human observers out of work, but should complement them. Human observers are, however, expensive and require significant resources to manage and deploy; further, space on many High Seas vessels, observer safety, high turnover for relatively low-paid, arduous work makes EM a very attractive option in high seas fishing. For example, the Pacific Island countries have agreed that in the foreseeable future, only EM-equipped vessels will be allowed to fish tuna within the waters under their collective jurisdiction.

Tuna stakeholders are starting to expect more from tuna fisheries, including the uptake of electronic observer coverage. In 2018, The NGO Tuna Forum, which comprises environmental Non-Governmental Organizations (NGOs) focused on global tuna conservation, commenced a long-term campaign for longline fisheries to adopt and implement a 100 per cent observer coverage requirement – human and/or electronic – within five years. This was supported by a diverse, global group of 118 commercial and nonprofit organisations in a letter to the four key tuna RFMOs. In 2019, more stakeholders in the tuna supply chain voiced their support. To facilitate the uptake of electronic observer coverage, we encourage retailers to more explicitly request the longline vessels to adopt 100% observer coverage.

Forum Fisheries Committee members have agreed in principle to require all tuna fishing within their managed waters to have electronic monitoring installed by 2024, and are developing minimum standards and an implementation plan. The WCPFC will consider draft EM standards for adoption at its meeting in 2020. The International Commission for the Conservation of Atlantic Tunas will require an increase to 10% observer coverage for longliners from 2022, which will also propel fisheries towards using EM. The Inter-American Tropical Tuna Commission is developing its own set of standards. The draft was prepared for the 11th Scientific Advisory meeting in May 2020 (Román *et al.*, 2020). The document presents a summary of the current sources of EPO fisheries data, the staff's assessment of the potential of EM and how it might be implemented, and proposals for minimum standards for the various components of an EM system.

The primary reason for advocating 100% coverage is because compliance is patchy, and strongly linked to observer presence - levels of compliance are very high when observers are present, and unknown or considerably lower when observers are not present. It's not necessary



to observe every fishing event for scientific purposes, but representativeness (the ability to extrapolate from the observed subset to the entire fleet) and even-handed approaches essentially demand that all vessels have observer systems of some description.

As noted in the paper-based observer section above, Taiwan's human observer coverage sits below 5%. Taiwan has no electronic observer coverage. Coverage levels of 20%-30% of fishing effort are adequate to estimate catch rates for target species with sufficient precision. As observer coverage levels increase from zero to around 20%, the accuracy of bycatch estimates increases exponentially (Lawson 2003, 2004). At 20% coverage, species comprising 35% of the catch will be estimated to within 10% of their actual catch levels 90% of the time (Babcock et al. 2003). More than 20% coverage yields decreasing increments in accuracy (Lawson 2004). Higher rates of coverage to estimate bycatch rates of rarer events. For example, to estimate captures within 10% of true levels 90% of the time for species comprising <0.1% of the catch, >50% coverage is required (Babcock et al. 2003).

We are seeking 100% coverage of fishing activities by cameras, with approximately 20% sampling of that coverage for analysis.

In the WCPFC, Williams (2018) included a preliminary review of discard/release data for the longline fishery. Among other things, the preliminary review noted discard data by species from observer data are considered the most reliable, and that "the estimates of discards in weight are not as accurate, nor as easy to determine, as estimates of discard in number". It's assumed the same situation applies in the Indian Ocean. Given the importance of observer data for estimating discards, and the current low levels of human observer coverage, the e-observer system must incorporate discards reporting, with a view to technologies (e.g. artificial intelligence) enabling tonnage as well as number recording.

EM does have its limitations, and there will likely always be a need for ongoing human involvement for biological sampling. Emery *et al.* (2018) evaluated the WCPFC ROP and identified "Only eight [longline] fields (16%) were classified as not possible to be collected using integrated EM systems (EM-NP), with two additional fields (4%) possible to be collected in the future following technological advancement (EM-P2)...". In 2020, the IOTC Scientific Committee noted "that Electronic Monitoring Systems can be one viable and effective means to collect fishery independent information, including when external circumstances prevent human observers from being deployed onboard, while at the same time acknowledging that data collection through EMS alone cannot fully conform to Res. 11/04 On a Regional Observer Scheme requirements."

At the end of 2019, O2 reviewed Bumble Bee's electronic monitoring trial by SatLink/DOS's (Appendix 1). The review describes what O2 believes to be essential electronic data and information collection for good FIP purposes.

An initial hurdle for implementing EM in the FIP fleets is obtaining approval from the Taiwan Government on installing equipment on vessels and using data. After that we can move to data



reporting sharing in Mauritius IOTC. Consideration will need to be given to how the EM data from our FIP will need to be integrated into the Mauritian system, if that is needed at all.

As identified by MEC (2018) above there is a clear paucity in data within the logbook dataset, and concerns regarding data validation and verification remain as key issues. Systematic verification of logbook data has been shown to lead to improved data collection by vessels if appropriate incentives are incorporated (Emery *et al.*, 2019). However, in a situation where the FIP is a does not own the data, have direct access, or have the capacity to conduct analysis, it is unlikely verification could be run by the FIP, and the implementation of appropriate incentives is challenging. Verification ultimately needs to be incorporated into licensing state management. The implementation of an electronic logbook system that relates to the observer data system would make verification easier.

There are an array of recommendations for improving transshipping practices, however most relevant to the data and reporting elements of the FIP is the implementation of EM. 100% observer monitoring is key. Observer coverage needs to be on both the fishing and carrier vessels.

Bumble Bee's conducted an e-observer trial in the Indian Ocean fleet, however the trial did not get off the ground due to logistical issues trying to move the recordings from Mauritius to Spain. Ocean Outcomes completed an evaluation of the EM data collection previously employed in Bumble Bee' and FCFs EM trial in the Western and Central Pacific FIP (Confidential 1). The evaluation was shared with FIP participants. That strategy forms the basis for future EM data capture.

As mentioned under the electronic reporting section above, the IOTC adopted Resolution 16/03 (On the second performance review follow-up), which endorses the recommendations of the second performance review. The review two recommendations that include reference to electronic data collection, also apply to observer data:

- “innovative and/or alternative means of data collection and reporting should be explored and, as appropriate, implemented, including a move towards electronic data collection and reporting for all fleets; and
- to facilitate thorough reviews of compliance, the Commission should invest in the development and implementation of an integrated electronic reporting program. This should include automatic integration of data from CPCs into the IOTC Secretariat's databases and automatic cross-referencing obligations and reports for the various obligations, in particular related to the provision of scientific data.”

The IOTC's pilot project (Resolution 16/04) aiming to enhance the implementation of the Regional Observer Scheme and to raise the level of compliance to the implementation of Resolutions 15/01 and 15/02, will explore the possibilities offered by electronic observation and observation in port. “The Scientific Committee will [also] evaluate whether electronic observation or observation in port can be used to collect data matching IOTC standards[, and]... propose



minimum standards for the implementation of Electronic observation systems and how they can be used to increase levels of observer coverage for Indian Ocean fisheries.

At its 2020 meeting, the IOTC Scientific Committee recommended to the Commission an “...ad-hoc, intersessional Working Group on the development of EM Programme Standard be constituted and ...workshops ...be held to further progress with the definition of EMS minimum standards.” A decision regarding the formation of the group is expected at the Commission’s regular annual meeting, which is due to be held June 2021.

The plan going forward

1. Ocean Outcomes (O2) and ISSF to participate the ad-hoc, intersessional Working Group on the development of EM Programme Standard, once it’s formed.
2. Decide upon and resource a person to access and undertake regular analysis of EM and logbook data (2021)
3. Confirm data needs that will be met through the system to address data deficiencies
4. Establish contract with DOS (2021?)
5. Confirm EM protocols that will be used. Ensure potential additional requirements such as ensuring cameras set up for capturing seabird interactions, use of bycatch mitigation measures and ETP handling techniques, and including hook counting are covered in the EM standards. Consider if it is possible to estimate marine debris discarded during fishing and the Garbage Management Plan is being complied with.
6. As part of developing EM standards there needs to be specific clarity of what the cameras would need to record and what would need to be analysed in relation to transshipment data collection.
7. Determine pathway to obtaining approval by the Taiwanese and Mauritian Governments on: how the EM might integrate with the fisheries management and regulatory framework; installing equipment on vessels; and using data. Obtaining approval is a key priority as many strategies are dependent on it for longer term to successful uptake and implementation.
8. Secure commitment from Bumble Bee for 100% EM plan. (March 2021)
9. Secure funding for roll-out (Sustainable Seafood Fund). (June 2021)
10. Consider establishing a pre-competitive collaboration for expanded EM support (with TNC) (initiated in May 2020)
11. Assist in negotiating EM data capture contract. (June 2021)
12. The base model is 20% random subsampling from EM datasets on a per-trip basis (so each trip is randomly subsampled at 20% of sets, however that could vary. It will depend to some extent on what the video data shows, and if we can access logbook data to cross-reference (this may not be possible for O2, but may be for BB/FCF).
13. Secure approval from the Taiwanese Government on installing equipment and using data, and ensure appropriate management and regulatory framework is being established.



14. Consider feasibility of verification of logbook data, and/or work with the Taiwanese Government to develop a verification program that incorporates incentives to accurate logbook reporting.
15. Oversee implementation of new EM units.
16. By end 2023, all vessels have EM installed and in use.

Additional verifications

In addition to the international and domestic data collection and reporting requirements encompassed in this plan, there are some additional verification, or compliance, that can be incorporated into this document due to the direct fleet engagement/outreach.

Verification of use of mitigation measures and handling practices

In a usual operating environment, FCF would have staff in Mauritius who would liaise with the vessels when they come into port. Unfortunately, in port face to face interactions with skippers and crew was curtailed as a result of restrictions due to the COVID-19 pandemic. FCF has occasionally used these opportunities to talk to crew about their use of mitigation measures and handling practices and inspect gear onboard the vessel. At some point the regular liaison will recommence, and FCF will be able to make more targeted visits to vessels regarding bycatch and secondary species. The sort of things they could talk to crew about their at-sea practices and observe onboard are: availability and likely placement of bird scaring lines; that gear does not include wire traces or shark lines; availability of turtle dehookers; understanding of what could be recorded in logbooks; and that printed waterproof guidance is readily accessible.

The FIP also considers there is an opportunity to improve compliance with mitigation measures and handling practices through vessels joining the ISSF Proactive Vessel Register (PVR), noting that not all FIP vessels are on the PVR. ISSF Participating Companies commit to conform to conservation measures to improve the long-term health of tuna fisheries. They also must adhere to the ISSA Compliance Policy. Compliance reports with audit information prepared by auditor MRAG Americas are published for companies in aggregate as well as for individual companies, and ISSF participating companies may be required to remediate non-conformances with conservation measures found by MRAG during its annual audit.

Some RFMOs have adopted requirements for the use of certain gear modifications, such as the use of circle hooks and monofilament lines, and/or handling techniques, and/or prohibited the use of “shark lines,” in some longline tuna fisheries, while others such as the IOTC have not. ISSF is committed to supporting a transition to the use of such techniques by longline vessels, globally. In 2017, ISSF adopted a bycatch mitigation measure ([3.6 Transactions with Vessels Implementing Best Practices for Sharks and Sea Turtles](#)) for large scale longline vessels (equal to or greater than 20m length overall). The measures requires that “processors, traders, importers, marketers and others involved in the seafood industry shall conduct transactions only



Improving data collection and reporting strategies

with those longline vessels whose owners have a policy requiring the implementation of the following best practices for sharks and marine turtles:

- (a) the use of circle hooks and only monofilament lines (e.g., the use of wire trace is prohibited); and
- (b) implementation by the crew of best practice handling techniques...”

Ultimately, we intend for EM to also be used to independently verify what is occurring at-sea in relation to the use of mitigation measures and handling practices.

The plan going forward

1. O2 and FCF to develop a dockside checklist that FCF staff will use when talking to vessels’ crew and skippers, once restrictions associated with the COVID-19 pandemic permit. The checklist will include checking whether appropriate bycatch mitigation and devices are onboard, in good condition, and the crew know to use them; and that prohibited gear such as shark lines and wire traces are not onboard. The checklist will be guided by the FIP’s Bycatch policy/Code of Conduct.
2. Year two of the FIP workplan includes tasks 3.2.2c and d around training to address any bycatch mitigation measures that are not being effectively and consistently implemented; and secondary and ETP species issues highlighted in the Bycatch policy/Code of Conduct.
3. FCF to ensure all FIP fleet vessels are registered on the ISSF PVR.
4. Point 5 of the Electronic Monitoring “The plan going forward” section includes: “Ensure potential additional requirements such as ensuring cameras set up for capturing seabird interactions, use of bycatch mitigation measures and ETP handling techniques, and including hook counting are covered in the EM standards.”.

MARPOL Annex V - Garbage Management Plans

The International Maritime Organization's International Convention for the Prevention of Pollution from Ships (MARPOL) includes Annex V, Regulations for the Prevention of Pollution by Garbage from Ships. Annex V prohibits all types of all types of garbage into the sea unless explicitly permitted under the Annex. All “shipowners” and operators should minimize taking onboard material that could become garbage. Vessel-specific garbage minimisation procedures should be included in the vessel’s Garbage Management Plan.

The plan going forward

1. FCF to check whether FIP vessels have MARPOL compliant Garbage Management Plans, and if not, ensure vessel owners to develop them and begin implementation. (2021)
2. Point 5 of the Observer “Improving paper-based observer data collection” section includes: “Pursue verification that vessels have available, and are complying with, a Garbage Management Plan that meets the MARPOL ANNEX 5 requirements”.



3. Point 5 of the Electronic Monitoring “The plan going forward” section includes: “Consider if it is possible to estimate marine debris discarded during fishing and the Garbage Management Plan is being complied with.”.



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Appendix 1

Notes regarding EM data for FIPs

(quarter two, 2019)

There are two main issues to consider here. First, what data is it the responsibility of the FIP project partners to collect, so as to ensure and be able to demonstrate to third parties that deck practice and catches are within acceptable standards/limits. The second is data ownership and access.

There is an increasing need to improve the quality and completeness of data collected, cross-reference data from EM with logbook data, and use EM to ensure compliance with various measures. Some of the basic data, such as time and positions of activities (e.g. setting or line-hauling) can be obtained from EM sources quickly and efficiently through automated routines. Other data, such as identifying catch, is considerably more time-consuming, does not currently have Artificial Intelligence (AI) routines (this is changing rapidly...), and so is very costly data to recover from video. There is clearly a need for balance, so as to minimize costs without compromising the purpose of EM. What this project should do is to ensure high quality data from 20% of sets, from every trip, and to cross-reference all catch data from EM with logbook data. This will give clear indications of reliability, and could lead to future reductions in the proportion of sets analyzed, if there is sufficiently high congruence between observed and reported catches. It is highly recommended that participating vessel operators (owners and captains) have this process (subsampling and cross-referencing) explained, so that they are aware that their logbook entries are likely to be verified.

There are multiple potential uses for EM data. Here we describe what O2 believes to be essential for good FIP purposes. There are other datasets that may be required by flag states for reporting to RFMOs, by vessel owners/operators for quality control or other purposes, etc. We will focus on what is required for FIP, and make suggestions for what can be either no longer collected, or the funding for continued collection should be explored with parties that want the data.



OPERATIONAL DATA

Spatial and temporal data of events

Currently, when units are retrieved by Satlink/DOS, they are connected to a server and VMS data stored in association with the video files allows AI to detect all setting operations for an entire voyage, within minutes. Thus, every set start and end time and position can be provided within hours of retrieving the drives.

Key take home message: all trips should be subsampled at $\geq 20\%$ sets observed, and entire sets should be quantified (not subsampling within a set). All catch on observed sets should be quantified to species level whenever possible.

Things that DOS currently gathers for BB/FCF, but which is not be required for FIPs:

1. *Total hooks set.* This is done by having the dry observer (rather laboriously) count the number of hooks between floats (not all, but a large sample), and count the number of floats (all). For **every** set. However, this is not of any interest or relevance to the FIP, which can safely rely on the logbook effort reporting without any concerns. Paying DOS to provide this is unnecessary and **removing this requirement should reduce costs significantly**. Setting duration can be delivered automatically, and this will give a very robust ‘rule of thumb’ for verifying the total effort in the logbook.
Note: this information (total hooks and total floats and hooks between floats) is currently required from observer programs by RFMOs, however this is a national competence, not a FIP requirement. Wet observers typically take these data from the logbooks, so asking the EM operations to expend significant resources to capture these is irrational. It could be a point of discussion for national governments to have collected (but who would be responsible for the costs, as this is an expensive dataset to obtain?). This is an area where rudimentary “Electronic Reporting” can add value – skippers log can electronically record how many hooks and floats were set, as they would ordinarily do in their paper logbook; this information can then accompany the EM data (should such a system be implemented – tbd) and be served to RFMOs as required.
2. *Detecting fish on deck.* Data on managed species (tunas, billfish, etc.) should be gathered from a random subset of 20% of sets, and **cross-referenced with logbook data**. If there are consistent discrepancies, this will require further investigation into appropriate solutions.
3. *Bait species/proportions.* For FIP purposes it should suffice to know where the companies (including FCF) are procuring their bait from, and what fish species are used.

BYCATCH of ETP SPECIES

Discards



1. For all sets observed ($\geq 20\%$), **all catch** should be recorded, by species or groups if species is not identifiable from video. This includes bycatch/discards.
2. Where lines are cut away before being hauled, they should be recorded as such (i.e. there should be a 'cutaway' column to be completed. If camera placements allow the observer to view the area of water around the hauling bay, then the species/group (e.g. 'shark') should be recorded as discarded, ideally with a tag denoting that it was cut away not hauled aboard.

RFMO discard reporting requirements are mixed and often recommended rather than required. Discards are ubiquitously poorly reported. Part of the FIP aims to educate fishers about discard reporting in logbooks, and encouraging recording and reporting of all discards. This will involve improving the logbook fields and verification through cross-referencing with EM.

According to DOS, roughly 20% of bycatch is cut away before being hauled. Recording of ETP species is a requirement in all RFMOs, and cut-away behavior introduces meaningful uncertainty, likelihood of under-reporting of true captures, and therefore risk to the FIP. This loophole can be eliminated through placement of a camera with a wide-angle view over the water immediately around the hauling bay area. This is not something that should be factored in immediately, unless existing camera arrangements allow cutaways to be viewed and quantified, but certainly something to consider as EM roll-outs progress.

Seabirds

Compliance with seabird bycatch mitigation measures can and should be verified through EM, whenever vessels operate south of 25°S . There are nuances between the relevant CMMs for WCPFC and IOTC areas. For the purposes of the FIP, and to simplify instructions to participating vessels, we recommend that all vessels be required to use 2 out of 3 measures whenever operating south of 25°S , in either ocean:

1. Night setting
2. Line weighting
3. Bird scaring lines

From January 2020 WCPFC (2018-03) will allow vessels to ignore the above 2 out of 3 measures in favor of hookpods – this can be evaluated through EM on a case-by-case basis (i.e. through vessel-specific instructions to DOS).

Ross Wanless has engaged with DOS to request that they develop an AI routine to determine night setting, which should be possible for DOS to provide within 3 days of receipt of hard drives. If requested in future, DOS will automatically run the routine when any vessel conducts any operations in the south, and deliver a report on which sets were conducted at night. Note that night setting as a seabird bycatch mitigation measure is binary; there is no possibility within the CMMs for 'partial night setting'. Either all hooks are set between nautical dusk and nautical dawn, or night setting was not used.



DOS should further be instructed to automatically flag up any sets that occur south of 25°S, and immediately check the following from the stern (setting deck) camera:

1. Was a bird scaring line (BSL) deployed?⁴ This should include checking within 10 minutes of the start and within 10 minutes from the end of setting, and at least once in between. An AI routine could be developed to select 30-second clips randomly for checking – i.e. this should NOT be an onerous and time-consuming effort, as all that is required is to verify presence/absence.
 - a. If no, then mark the set as not using this measure.
 - b. If yes, was the BSL deployed when setting commenced and for the duration of setting operations?
 - i. If yes, then mark set as having used this measure.
 - ii. If no, then mark 'BSL partial use'. Partial use should trigger internal interventions to engage with the captain, with the purpose of ensuring that in future, BSLs are deployed correctly.
2. Is there any evidence of weights attached to branchlines? This can be achieved through visual inspection by a dry observer of a reasonable subset of hooks (~100?) selected at random from the entire setting process. If no, mark set as 'No line weighting'. If yes, mark set as 'Line weighting used', if partial, then flag this for further visual inspection and/or direct communication with the skipper in future.
3. Use of hookpods can be assessed in future, currently no vessels are using this measure

Sharks

Identifying the species, or major group, of sharks is difficult and time-consuming. However, there are certain species for which “no retention” is required. These are mostly easily identifiable species/groups (e.g. thresher sharks, hammerheads, etc.). DOS should be requested to quantify, from 20% of all operations of each voyage, how many of the following were a) captured and b) retained:

1. oceanic white-tips
2. threshers
3. hammerheads
4. Others (all other sharks, unless easily identified, should simply be recorded as “shark NEI”)

Finning is banned, although removing fins is not. Cameras can detect any discarding of trunks from the hauling deck, but cannot detect covert discarding. Cameras may be used to verify that fins are landed attached to the trunks – i.e. during landing/transshipment. This should be explored further. During the 20% detailed analysis, DOS should be asked to look specifically for and report upon

- a) any trunk discarding

⁴ This may not be possible to determine currently, and will depend on the layout of the setting deck, and the placement and angle of the stern camera. It would be good to review each vessel's camera setup and adjust as needed to ensure this information can be collected.



- b) how many branchlines are cut away (i.e. catch not landed and so not detectable)
- c) how many sharks are landed and taken out of camera view

Turtles

DOS should observe turtle handling procedures (likely to be very few). Guidelines for how DOS should quantify handling procedures on deck are required, and perhaps this is where a turtle bycatch expert could be commissioned to provide advice? Or O2 can explore further how to bring data capture routines to DOS that meet Best Practice standards, or which provide good information that can be used to train crew in future. All FIP vessels use only circle hooks, and there is a strong preference for fish bait, both of which are recommended turtle bycatch mitigation options. There's thus no need to have EM evaluate these mitigation options, occasional inspections and bait info from elsewhere will suffice.



LOGISTICAL CHALLENGES

A technician is required to be physically present at each landing site where hard drives are to be removed/replaced. DOS/Satlink currently do not have a presence in Mauritius, and this is going to have to be addressed if EM is to be effective in the Indian Ocean.

A second challenge is ‘batching’ of drives. It is ideal for DOS to receive a regular stream of returning drives. It is very problematic for drives to accumulate from multiple vessels and to then be couriered to DOS together. There may be minor additional costs for sending drives more regularly in smaller consignments, but this will help prevent massive delays in getting data captured and returned.

Satlink and FCF should explore setting up a relationship with transshipment observer service providers, and to provide them with the training and means to replace drives during transshipment operations.

Ultimately, the ideal (and very likely future in the next 12-24 months) is for each vessel to have a dedicated laptop computer that uses AI algorithms to analyze all video streams ‘on the fly’, and to generate reports with negligible data transmission costs. This will allow reports from EM to be transmitted near-realtime (at daily/5-day/weekly intervals) and will eliminate most of the costs currently associated with EM data capture. However, AI is unlikely to provide the full picture – certain things, such as finning or use of BSL, probably cannot be evaluated by AI at this stage. Nonetheless AI should vastly increase the volume and quality of data (i.e. no need to subsample 20% of sets), reduce the lag times from events to data provision, and eliminate much cost.

COLLABORATIVE SYNERGIES

Privately funded observer programs, such as those that FCF and BB are implementing, represent a significant opportunity to national reporting obligations. FCF and BB should explore relationships with flag states, to include the FIP EM data as observer data into the national observer programs. Typically, observer schemes are funded through license fees, so FCF could seek to secure rebates on behalf of participating vessels that have EM installed. This raises challenges – such as ownership of data, who pays for data capturing costs, etc. But it’s worth exploring these options. Also worth exploring if flag states are willing to pay for certain data to be captured, which BB/FCF/the FIP could then use, in return for sharing with the State the data that BB/FCF are paying for. Finally, sharing the data for scientific analyses should be strongly encouraged. O2 will establish a group to, *inter alia*, consider how and where to share EM data.