TECHNICAL AND COMPLIANCE COMMITTEE
Fifteenth Regular Session
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Pohnpei, Federated States of Micronesia

Consideration of the outcomes of the review of the Commission's data needs and collection programmes (Project 93) (TCC Workplan 2019-2021)

WCPFC-TCC15-2019-14
28 September 2019

Prepared by FFA, SPC, PNAO and WCPFC Secretariats

1. A progress report on Project 93 was presented to the 15th regular session of the WCPFC Scientific Committee and is appended. It describes the origins, purpose and work accomplished under Project 93 up to the time of SC15.

2. An Informal Working Group met during the course of SC15 and provided some further input to the analysis.

3. Subsequent to SC15, the revised Project 93 tables were distributed to CCMs in WCPFC Circular 2019-48 of 30th August, requesting any further information or comments by 18th September.

4. One comment asked for clarification of the explanation in the SC15 paper that *"It was assumed that for the early stages of implementation of any WCPFC Standard for E-monitoring, the minimum analysis rate might be around 20%, without prejudice to any decision on the actual standard".* This assumption of a 20% analysis rate of the footage from each trip (with footage segments chosen randomly) would be a higher standard than that already in use in an Australian tuna longline fishery, which is also being considered by other FFA member countries, but lower than the analysis rate of some Pacific Island trials. The minimum analysis rate would be entirely up to the ER&EM Working Group to discuss and recommend.

5. Another comment drew attention to the different specifications for electronic monitoring already established or under development by different CCMs, and suggested that these be reviewed by the ER&EM WG before it completed the process of developing a minimum regional standard. This would require CCMs to submit their own national EM standards or specifications to the Chair of the ER&EM WG in good time for consideration before the next meeting.

6. Following this further consultation, the main conclusions and recommendations from Project 93 reported to SC15 in the attached paper are considered by the joint Secretariats to remain a fair

guide to the ER&EM Working Group for establishing priorities and objectives for the development of a Commission Electronic Monitoring Standard.

Recommendation

7. TCC15 is invited to:
    a. recommend that CCMs with established or emerging national or subregional EM standards or specifications communicate these to the Chair of the ER&EM WG as soon as possible;
    b. support the conclusions from Project 93 to inform the Commission of the current status of WCPFC data collection programmes and associated data gaps and needs;
    c. draw the attention of the Commission to the following issues arising from the Project 93 analysis, which suggest that:
        i. Presently there is a 100% requirement for observer coverage aboard purse-seiners operating 20°N to 20°S and high availability of operational catch and effort data, and so consequently there were very few WCPFC purse-seine data gaps identified; and
        ii. Due to the presently lower levels of observer coverage aboard longline vessels, there are several gaps identified where data collection and verification is low. The main specific longline fishery data needs identified were:
            a. Catch: target species
            b. Catch: bycatch key species
            c. Catch: other species
            d. At-sea transhipments
            e. Gear attributes: general
            f. Gear attributes: Mitigation methods
            g. Vessel information: personnel
            h. Vessel information: electronics
            i. Observer safety incidents
    d. recommend that the conclusions from Project 93 be considered by the next meeting of the ER & EM Working Group in the establishment of priorities and objectives for the development of a regional longline EM standard, and
    e. recommend that the conclusions from Project 93 be considered by the IWG to review CMM 2009-06.

SCIENTIFIC COMMITTEE
FIFTEENTH REGULAR SESSION

Pohnpei, Federated States of Micronesia
12 - 20 August 2019

UPDATE ON PROJECT 93
(Review of the Commission's data needs and data sources, including the potential for eMonitoring to address gaps)

WCPFC-SC15-2019/ST-WP-04
(Agenda Item 3.1.4)

Purpose of Project 93

Annex 1 describes the Objectives and Rationale for the project.

The reason for Project 93 is the inability of the WCPFC Electronic Reporting and Electronic Monitoring Working Group (ER&EMWG) to proceed with the development of a Standard for electronic monitoring (E-monitoring) in 2020, as required by the Commission, without agreement on objectives for the exercise – objectives that take into account the Commission data needs that could feasibly be addressed by E-monitoring.

The approach taken by the project participants was to first itemise the primary data needs arising from agreed WCPFC measures and data rules, and then to match current and potential data sources with these needs. The resultant tables identify instances where independent data collection and verification is low and where there are currently data gaps. The analysis then considers the potential for E-monitoring to meet these gaps. As well as supporting the development of a WCPFC E-monitoring standard and objectives, this analysis should also be useful in informing other WCPFC discussions.

WCPFC Background

The 3rd ER&EMWG on 6-7th August 2018 recommended that the Commission agree to prioritising E-monitoring in areas where independent data collection and verification is currently low and asked SC14 and TCC14 for advice on priority areas.

At SC14 in August 2018, FFA members agreed with the ER&EMWG3 recommendations and proposed further work to help progress the use of E-monitoring in the Commission. Nauru, on behalf of FFA members submitted working paper SC14-ST-WP-07 to outline the work considered necessary to make progress on a WCPFC E-monitoring standard. This work was not intended to be a detailed review of existing data collection and reporting protocols and processes, but aimed to reconcile the Commission's current needs for scientific data and MCS information against possible future monitoring programs, including E-monitoring, that would be most appropriate to collect and verify the required data. To avoid imposing additional costs on the Commission, it was suggested that the

work be undertaken by SPC, FFA Secretariat, and the PNA Office, with the assistance of the WCPFC Secretariat if possible.

> SC14 recommended *"that FFA, PNA Office, the Scientific Services Provider and WCPFC Secretariat jointly work on a project to review the Commission's data needs and collection programmes"* (later identified as "Project 93" – see TORs in Annex 1).

At TCC it was noted that ER&EMWG3 had highlighted the importance of the independence and impartiality principles enshrined in the Regional Observer Programme and recommended that any WCPFC E-monitoring programme be guided by similar principles (paragraph 68, ER&EMWG3 Report[1]). In relation to observers, FFA members reiterated that while E-monitoring cannot replace observers, it may however provide a valuable supplementary monitoring tool.

The data review work of Project 93 would seek to ensure that each of the Commission's data needs is matched to the most appropriate data collection and data verification tools and programs. It would also assist in defining the objectives and specific data collection needs for any WCPFC E-monitoring program.

> TCC14 recommended to WCPFC15 that the Commission endorse the outcomes of the ER&EMWG3 report (WCPFC-TCC14-2018-18) and that the Commission prioritise the use of electronic monitoring in areas where independent data collection and verification is low and where there are currently data gaps.

At WCPFC15 in December 2018, FFA Members suggested that the ER&EMWG should next convene in 2020 to allow some of the important planned work and analyses, such as Project 93, to be undertaken. These outputs would assist in furthering the Commission's e-reporting and E-monitoring developments.

WCPFC15 discussed the SC14 and TCC14 advice, and in adopting the ER&EMWG3 Summary Report it:

> 'agreed to prioritising E-monitoring in areas where independent data collection and verification is currently low and asked SC15 and TCC15 for advice on priority areas.'; and
>
> 'supported the continuation of intersessional work, led by the ER&EMWG Chair Kerry Smith (Australia) to further develop a draft conservation and management measure on E-monitoring for consideration by the Commission in 2020.' *[paragraphs 409 to 411, WCPFC15 Summary Report]*

FFA and PNA developments

At ERandEMWG3 PNA Members advised that they looked forward to working with other CCMs in this important area, particularly to improve monitoring and scientific data collection on high seas distant water longliners and noted that "PNA Ministers have directed the development of a PNA Electronic Monitoring Program, which was reinforced by the recent call by the President of FSM to have all longline vessels subject to electronic monitoring by the year 2023."

In June 2019, the 16th FFC Ministers meeting welcomed FSM's leadership of the FFA group "*on the issue of electronic monitoring through the Technology for Tuna Transparency (T3) Challenge, recognising the potential for electronic monitoring to be a game-changer for improving management*

[1] "The ERandEMWG noted the strength of the ROP as a data collection and verification programme comes from its independence and impartiality, and recommended that any WCPFC E-Monitoring Programme should also have a similar basis"

of longline fisheries, and tasked the FFA Secretariat to work with Members to develop an electronic monitoring policy, in collaboration with PNAO and SPC, to be considered at their meeting in 2020".

Project 93 intersessional work

In accordance with the SC recommendation, staff from SPC, FFA, PNAO and WCPFC met in Noumea on 15-16th April 2019 to progress Project 93. The group discussed Commission data needs and sources, and classified them according to completeness and suitability to be supplemented or improved by E-monitoring. The group produced the Tables in Annex 2, describing longline and purse-seine fishery data needs and sources.

These tables are preliminary, and are being introduced at SC15 for the purpose of seeking feedback from CCMs. Noting that this project originated from SC14's discussion of the outcomes of EM&ERWG3, the views of SC15 participants are welcomed before this work is taken further.

The group took the approach of developing a list of the minimum data types needed for WCPFC to implement the measures agreed by the membership and the requirements of the Convention (the rows in the spreadsheet), and then identifying the available and potential sources of data to fulfil those needs in several categories (the columns in the spreadsheet). For each need, the group also identified the main current source of data, and considered whether EM (including sensor as well as camera data) had the potential to fill gaps, supplement, or help verify existing data sources, or to foster an improvement in compliance with manual reporting requirements.

It should be noted that CCMs may require other types of data in order to implement national and sub-regional fisheries measures, and may thus have additional needs for E-monitoring data at the national level. However, Project 93 considers only the data needs of measures implemented through WCPFC, and E-monitoring data needs of subregional management arrangements such as the PNA VDS, national quota systems and other measures not implemented by WCPFC are not considered.

Vessel owners and flag or EEZ-licencing States may also require information about on-board activities, such as crew behaviour and safety, which could be provided by E-monitoring. However, this need is mainly for non-quantitative information and would be mainly implemented at the national level.

The intersessional work took account of the fact that, while 100% *coverage* may be feasible in the short to medium term with cameras installed on all vessels, 100% camera footage *analysis* may not yet be financially feasible in many fisheries. It was assumed that for the early stages of implementation of any WCPFC Standard for E-monitoring, the minimum analysis rate might be around 20%, without prejudice to any decision on the actual standard, and we judged the potential of footage analysis to complement or replace other data acquisition methods in relation to this analysis rate.

CCMs will be aware that technology is advancing continuously, and costs are decreasing. It will be necessary to review the capacity of data sources from time to time and to consider the potential of E-monitoring to cover more of the identified data gaps and weaknesses.

Preliminary indications from Project 93

Data and monitoring gaps and identification of priority areas where fishery monitoring requires improvement

- Presently there is a 100% requirement for observer coverage aboard purse-seiners operating 20°N to 20°S and high availability of operational catch and effort data, and so consequently there were very few WCPFC purse-seine data gaps identified. The only purse seine data needs that might be addressed by E-Monitoring were:

- Gear attributes: FAD attributes
- Gear attributes: Mitigation methods
- Vessel information: personnel
- Observer safety incidents

- Due to the presently lower levels of observer coverage aboard longline vessels, there are several gaps identified where data collection and verification is low. The main specific longline fishery data needs identified were:
  - Catch: target species
  - Catch: bycatch key species
  - Catch: other species
  - At-sea transhipments
  - Gear attributes: general
  - Gear attributes: Mitigation methods
  - Vessel information: personnel
  - Vessel information: electronics
  - Observer safety incidents

Main conclusions about areas and roles where e-monitoring can be used to better collect scientific data, verify other data needed by the Commission, and foster improved reporting compliance:

- Given the extremely high degree of observer coverage aboard purse-seiners, there are no significant WCPFC purse-seine data gaps that might better be addressed by E-monitoring at this point in time.
- The main current WCPFC data needs that can be addressed by E-monitoring lie within the longline fishery, or at least aboard the many longline fleets that are not already significantly covered by human observers. A major potential application of E-monitoring lies in verification and improving compliance with longline vessel reporting requirements.
- The main specific longline fishery data needs that can be improved by E-monitoring in fisheries with less than 100% observer coverage are:
  - Reporting against WCPFC longline catch limits, and improving the precision of longline catch data for scientific purposes
  - Bycatch and non-target catch monitoring - the biggest gap being for non-key species
  - Monitoring discards of, and interactions with, key species that do not result in retention or landing
  - Augmenting data for science where coverage is currently low (e.g. size data for key species in the longline fishery)
  - Monitoring any exceptional at-sea transhipments permitted under CMM 2009-06
  - Monitoring the application of bycatch mitigation measures

Recommendations

1) SC is invited to:
   a) review the tables in Annex 2;
   b) provide guidance to the Project 93 group on how the tables in Annex 2 might be improved;
   c) provide information about which CCMs or subregional arrangements already have e-monitoring programs, processes, policies, regulations, standards, or trials in place, and

national contacts who might be able to assist the Project 93 group in contributing further information;

This might be most efficiently accomplished by an informal working group during SC15.

2) SC is also invited, through its report, to draw the attention of the Commission to the following issues arising from the Project 93 analysis to date, which suggest that:
   a) the main gaps in the data required for WCPFC work are where observer coverage is lower, and particularly in the longline fisheries in relation to:
      i) target catch verification
      ii) bycatch and non-target catch quantification
      iii) discards and interactions, and
      iv) monitoring at-sea transhipments, and
      v) augmenting data for science

   b) the above listed main gaps in the data required for WCPFC work potentially could all be met through E-Monitoring.

   c) E-Monitoring is likely to be particularly valuable in improving reporting compliance for catches of target species taken under catch limits without 100% observer coverage.

Annex 1: Project 2018 Terms of Reference

During SC14, in response to the consideration of the ERandEMWG3 report outcomes, SC14 adopted a recommendation that FFA, PNA Office, the Scientific Services Provider and WCPFC Secretariat jointly work on a project to review the Commission's data needs and collection programmes (Project 93) (SC14 Outcomes document, paragraph 9). Further details on the proposed data needs and collection review, are provided in the below box.

PROJECT 93	**Review of the Commission's data needs and collection programs**
Objectives	To compare the Commission's data needs against the programs and tools available to the Commission (including the potential for a WCPFC EM program).
Rationale	There are several reasons for this review: • In the context of EM specifically, it is about answering the fundamental question "what data does EM need to collect and what will that data be used for?". The ERandEM working group was not able to answer this question, and as a result did not make too much progress on specific objectives for a WCPFC EM program. • The review will also create efficiency in the Commission's data programs by ensuring that there is no unnecessary duplication between data collection programs and that data is collected through the most appropriate program. • Improving the collection and verification of data will enhance the work of both the SC and the TCC. • It will promote synergy between the different programs by linking them so that there is a common understanding of the collection of primary data through one program and verification through another. • Lastly, it will be useful first step to review and reconsider monitoring programs required by the Commission, to allow additional data collection with high priority, with a proper balance of observers' workload and safety,

Assumptions	• WCPFC is committed to continue development of a WCPFC EM program
	• This review is essentially an extension of the work described in the following two documents:
	  • Emery et al. (2018) *The use of Electronic Monitoring within tuna longline fisheries win the WCPO – implications for international data collection, analysis and reporting. WCPFC-2018-ERandEMWG3-IP04.*
	  • *SPC-OFP (2018). Outcomes from the Second Regional EM Process Standards Workshop (REMPS-2). WCPFC-2018-ERandEMWG3-IP02.*

Scope	The scope and activities included in the review are: • Summarise existing data and information needs of the Commission including scientific data and information to support compliance functions. • Describe how current monitoring programs required by the Commission (e.g. logsheets, observers, VMS, transshipment and other vessel generated reports) are used to collect and/or verify the data and information needed by the Commission. • Specify data and monitoring gaps and identify priority areas where fishery monitoring requires improvement. • Define areas and roles where e-monitoring can be used to collect scientific data and verify data and information needed by the Commission, including whether there could/should be different areas of application. The focus of the mapping exercise will **not** be to undertake a detailed review of the adequacy or otherwise of specific data fields that have been developed for various WCPFC programs.
Links to other work	• This is an essential contribution to the consideration of a WCPFC EM program as it will assist to define the objective and data needs.

	• Outputs from this work will help the Commission to identify where electronic reporting could be implemented to support timely access to and use of data. May help to identify areas where Commission policies and procedures relating to monitoring programs and data may need refinement • It also has relevance to other WCPFC processes such as considering issues of transhipment management, CDS development and evolution of ER standards.
Timeframe	• Draft distributed intersessionally to all CCMs for their inputs before SC • Presented to SC15 and TCC15 • Final version and recommendations to WCPFC16
Budget	NIL. Work to be undertaken by SPC, FFA Secretariat and PNA Office and presented to SC and TCC by FFA members.
Additional considerations	Assistance from the WCPFC Secretariat would also be welcome and very useful, but will obviously be subject to existing workloads and availability.

PROJECT 93 EXPLANATORY NOTES

• For TORs and background, see WCPFC-SC15-ST-WP-04 (https://www.wcpfc.int/node/42921) - *Update on Project 93 (Review of the Commission's data needs and data sources, including the potential for eMonitoring to address gaps, by FFA, PNAO, SPC and WCPFC Secretariat)*
• Correction or comment is sought from CCMs on the draft analysis contained in the tables "Longline" and "Purse-seine" attached to this spreadsheet

Explanation of the draft tables
• There are two tables with the same format - one for longline and one for purse-seine - on the tabs at the bottom of this Excel spreadsheet.
• Each spreadsheet table contains two sub-tables - Part 1 and Part 2
  • Part 1 contains the analysis of existing data needs and sources.
  • Part 2 contains the analysis of the future potential for EM to supplement existing data sources, and describes the authority for data needs
• Data **needs** are itemised in column B, and columns P & Q describe the authority for, and general purpose of each data need
• Data **sources** are itemised in rows 7 and 8 of Part A in each spreadsheet table
  • sources are classified broadly in row 7 according to responsibility for supply, and in row 8 according to type
• Each cell of Part A identifies where data from each source exists, and whether the source is the main source or for verification (or potential for either)
• Column N in Part B classifies the current gaps between data needs and data sources
• Column O in Part B assesses the potential of E-monitoring to fill this gap. Tier 1 (green highlight) is the most promising. Tier 4 the least.

NOTE THAT THESE CLASSIFICATIONS ARE NECESSARILY GENERALISED. THE ONLY DISTINCTION MADE IS BETWEEN PURSE-SEINE AND LONGLINE FISHERIES. IT IS HOWEVER RECOGNISED THAT DIFFERENCES IN DATA-PROVISION EXIST WITHIN EACH GEAR-TYPE AND BETWEEN FLEETS AND ZONES. **IF FINER DISTINCTION IS REQUIRED, FOOTNOTES CAN BE MADE REFERRING TO SPREADSHEET CELLS**

PROJECT 93: Review of the Commission's data needs and collection programs

Primary data needs vs sources

Table 1: Longline

Key:
M=Main source (required or most reliable or greatest coverage)
V=verification or secondary
P=potential for consideration

Data gap Tiers	Tiers of EM potential
3 - no currently usable data	4 - EM unlikely to cover gap or not adding value
2 - some usable	3 - EM likely to useful in verification
1 - usable data	2 - EM potential for augmenting main source
	1 - EM potential to become primary

PART A	WCPFC DATA SOURCES										PART B			
	WCPFC/ FLAG STATE	INDUSTRY/ OPERATOR REPORTING (to licencing state or flag or direct to			MONITORING (noting that observer coverage on longliners is low for most vessels)				AUTOMATIC					
PRIMARY WCPFC DATA NEEDS	Record of Fishing Vessels	Vessel Operator logsheet and incident etc reports	Vessel Operator unloading, transhipment, etc reports	Voluntary Cannery	Onboard Trip Observer	EM footage analysis	Inspections (HSBI, Port, PFI Surveillance etc)	Post-trip including port & TS observing	EM sensor data	VMS	Gaps in current WCPFC data. Key to tiers is above	Potential of EM to fill gap or replace manual reporting. Key is above	Reference to WCPFC requirement ("**SciData**"=DATA-01: scientific data to be provided to the Commission) ("**ROP**"=ROP-03 Minimum Data Fields)	Purpose and importance of data required by WCPFC (for science & for MCS & Compliance Monitoring - not including non-WCPFC management arrangements)
Catch													WCPFC Art.5(i)	
- target spp		M required	V	V	V	PV	V	V	PV[1]		1-2	1	SciData:3 Annex 1:1.5	SCI, CMS (for any catch limits)
- bycatch key spp		M	V		V	PV	V	V	PV		1-2	1	SciData:3 Annex 1:1.5	SCI, CMS (for any catch limits)
- bycatch other spp					M	PV	V	V	PV		2[2]	1	ROP	SCI
- sex					M						1 (sample)	4	ROP	SCI
- size					M	PV					1 (sample)	2	SciData:5	SCI
- fate (retain/discard etc)		V			M	PV					1	3	CMM TT, Scidata:1	SCI
- SSI interaction (encirclement etc)		M			V	PV					1	3	CMMs shark, bird, turtle	SCI, CMS (for any interaction limits)
- Biological samples					M						1	4	ROP	SCI
- Life status (release live/dead etc)					M	PV					1	3	ROP	SCI, CMS (for any interaction limits)
Effort													WCPFC Art.5(i)	
- setting time		M			V	PV			PV		1	3	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits)
- hooks per set		M			V	PV					1	4	SciData:3 Annex 1:1.5	SCI
Position at Date/time													WCPFC Art.5(i)	
- compliance polling									V (ALC)	M	1	4	SciData:3 Annex 1:1.5	MCS, CMS
- start/end of set		M			V		some V		V		1	4	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits by zone)
- other activites		M			V		some V				1	4	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits by zone)
Vessel interactions														
At-sea transhipments		V	M		observers but no data obligation	PV	V	observers but no data obligation	PV	V	2	1-3	Scidata, CMM 2009-06, DATA-6	SCI, MCS, CMS
Trip Information														
- DEPART Date/Time & position/Port		M			V				P	V	1	4	Scidata	SCI, MCS
- RETURN Date/Time & position/Port		M	V		V			V	P	V	1	4	Scidata	SCI, MCS
Gear Attributes														
- general attributes/hooks/floats					M						2	4	ROP	SCI, CMS
- use of sharkline or wire trace		M			V						2	4		CMS
- mitigation methods		M			V	P					1-2	3	Bycatch CMMs	SCI, CMS
Vessel information														
- Vessel attributes	M				V		V				1	4	RFV	SCI
- Electronics					M		V (for VMS)				2	4	ROP	MCS, CMS
- Personnel	M				V		V				2	4	RFV	MCS
Observer safety incidents		M	M		V	P	V	V			2	1	CMM 2017-03	MCS, CMS

FOOTNOTES

[1]Weight sensors

[2]Taking into account difficulty of fully recording bycatch amid other tasks

PROJECT 93: Review of the Commission's data needs and collection programs

Primary data needs vs sources

Table 2: Purse-seine

Key:
M=Main source (required or most reliable or greatest coverage)
V=verification or secondary
P=potential for consideration

Data gap Tiers	Tiers of EM potential
3 - no currently usable data	4 - EM unlikely to cover gap or not adding value
2 - some usable	3 - EM likely to useful in verification
1 - usable data	2 - EM potential for augmenting main source
	1 - EM potential to become primary

	WCPFC DATA SOURCES												
PART A	WCPFC/ FLAG STATE	INDUSTRY/ OPERATOR REPORTING (to licencing state or flag or direct to WCPFC)			MONITORING (noting that observer coverage on purse-seiners is 100%)				AUTOMATIC		PART B		
PRIMARY WCPFC DATA NEEDS	Record of Fishing Vessels	Vessel Operator logsheet and incident etc reports	Vessel Operator unloading, transhipment, etc reports	Voluntary Cannery	Onboard Trip Observer	EM footage analysis	Inspections (HSBI, Port, PFI Surveillance etc)	Post-trip including port & TS observing	EM sensor data	VMS	Gaps in current WCPFC data. Key to tiers is above	Potential of EM to fill gap or replace manual reporting. Key is above	Reference to WCPFC requirement ("**SciData**"=DATA-01: scientific data to be provided to the Commission) ("**ROP**"=ROP-03 Minimum Data Fields)	Purpose and importance of data required by WCPFC (for science & for MCS & Compliance Monitoring - not including non-WCPFC management arrangements)
Catch													WCPFC Art.5(i)	
- target spp		M required	V	V	V	PV	V	V	PV[1]		1	3	SciData:3 Annex 1:1.5	SCI, CMS (for any catch limits)
- bycatch key spp		M	V		V	PV	V	V	PV		1-2	2	SciData:3 Annex 1:1.5	SCI, CMS (for any catch limits)
- bycatch other spp					M	PV	V	V	PV		2[2]	1	ROP	SCI
- sex					M						1 (sample)	4	ROP	SCI
- size					M	PV					1 (sample)	2[3]	SciData:5	SCI
- fate (retain/discard etc)		V			M	PV					1	3	CMM TT, Scidata:1	SCI
- SSI interaction (encirclmt etc)		M			V	PV					1	3	CMMs shark, bird, turtle	SCI, CMS (for any interaction limits)
- Biological samples					M						1	4	ROP	SCI
- Life status (release live/dead etc)					M	PV					1	3	ROP	SCI, CMS (for any interaction limits)
Effort													WCPFC Art.5(i)	
- # active vessels	M												SciData:2	CMS (for any capacity limits)
- searching time		M			V	PV			PV	V	1	4[4]	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits)
- setting time		M			V	PV			PV		1	4	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits)
- set type (ASS/UNA)		M			V	PV					1	4	SciData:3 Annex 1:1.5	SCI, MCS (FAD closures)
Position at Date/time													WCPFC Art.5(i)	
- compliance polling									V (ALC)	M	1	4	SciData:3 Annex 1:1.5	MCS, CMS
- start/end of set		M			V		some V		V		1	4	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits by zone)
- other activites		M			V		some V				1	4	SciData:3 Annex 1:1.5	SCI, MCS, CMS (for effort limits by zone)
Trip Information														
- DEPART Date/Time & position/Port		M			V				P	V	1	4	ROP	SCI, MCS
- RETURN Date/Time & position/Port		M	V		V			V	P	V	1	4	ROP	SCI, MCS
Gear Attributes														
- FAD attributes					M		V	V			2	4	ROP	SCI, CMS (FAD restrictions)
- net attributes					M						1	4	ROP	SCI, CMS
- mitigation method		M			V	P					1-2	3	Bycatch CMMs	SCI, CMS
Vessel information														
- Vessel attributes	M				V		V				1	4	RFV	SCI
- Electronics					M		V (for VMS)				1	4	ROP	MCS, CMS
- Personnel	M				V		V				2	4	RFV	MCS
Observer safety incidents		M	M		V	P	V	V			2	1-3	CMM 2017-03	MCS, CMS

NOTES

[1]Weight sensors

[2]Taking into account difficulty of fully recording bycatch amid other tasks

[3]On vessels with chute, and can avoid hindrances caused by observer sampling

[4]100% of footage unlikely to be monitored