COMMISSION
Twentieth Regular Session
4-8 December 2023
Rarotonga, Cook Islands (Hybrid)

Review of CMMs on Non-Target and Associated or Dependent Species in the WCPO

WCPFC20-2023-21
2 November 2023

Prepared by the Secretariat

Purpose and Introduction

1. The purpose of this paper is to provide summary information to support the Commission's review of the performance of its current conservation and management measures (CMMs) on non-target and associated or dependent species[1] (NTADS) in the Western and Central Pacific Ocean (WCPO). Relevant recommendations to the Commission from subsidiary body meetings in 2023 are included in this paper and contained in the relevant subsidiary body meeting reports. A section covering information and data requirements to support management decisions is found at the end of this paper.

2. The CMM 2019-05 on *Mobulid Rays Caught in Association with Fisheries in the WCPFC Convention Area* was missing from the WCPFC20 Provisional Agenda, which will be included under Agenda Item 1.1.

3. The current set of CMMs relating to NTADS is as follows:

   i Cetaceans: CMM 2011-03
   ii Seabirds: CMM 2018-03
   iii Sea Turtles: CMM 2018-04
   iv Mobulid Rays: CMM 2019-05
   v Sharks: CMM 2022-04

Status of Conservation and Management Measures

Cetaceans (CMM 2011-03[2], suppl_CMM 2011-03-1[3], suppl_CMM 2011-03-2[4])

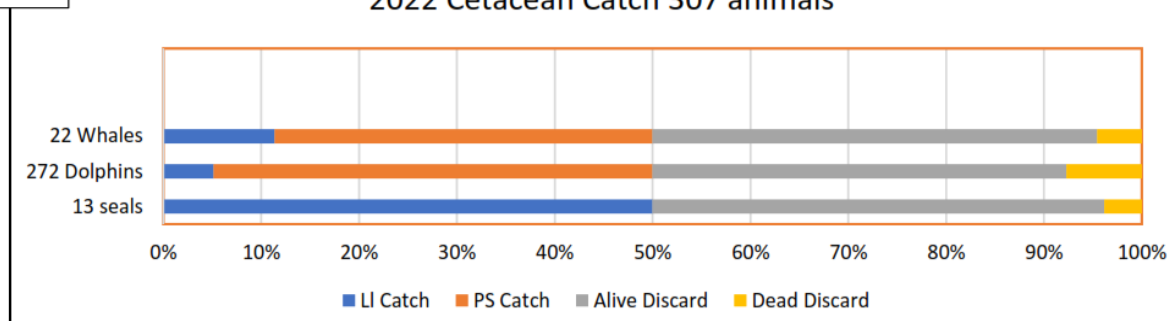
4. After the adoption of CMM 2011-03 by WCPFC8, the Commission began reviewing compliance with the measure in 2014 (covering 2013 activities[5]). The Commission did not consider the CMM again until 2019 when Korea brought a proposal to amend the CMM to WCPFC16. Although the proposed amendments were not agreed to at WCPFC16, the Commission decided to task SC16

[1] Sharks, seabirds, sea turtles, mobulids, and cetaceans.
[2] Conservation and Management Measure for Protection of Cetaceans from Purse Seine Fishing
[3] Best Practices for the Safe Handling and Release of Cetaceans
[4] Best Practices for the Safe Handling and Release of Cetaceans (Graphics)
[5] Although the CMM was adopted in 2011, it did not take effect until 1 January 2013.

with the development of best handling practices for cetaceans, to recommend to the Commission at WCPFC17. The Commission SSP was also tasked to review available data to provide estimates of fishery interaction types and levels with cetaceans in the WCPF Convention Area, and to provide a report to SC16.[6] The COVID-19 pandemic prevented SC16 from addressing this issue and the matter was taken up at SC17, with recommendations on best handling practices (suppl_1) adopted at WCPFC18, and accompanying graphics (suppl_2) adopted at WCPFC19.

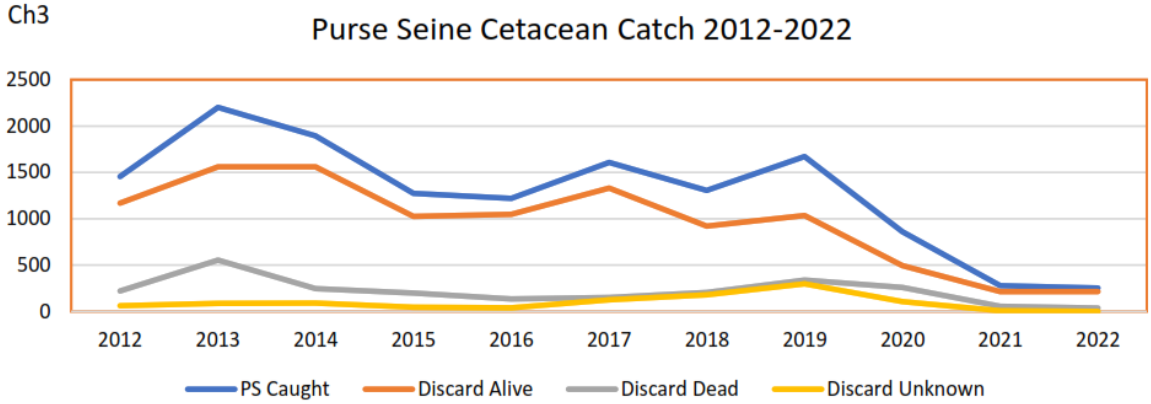
5. The CMM requires reporting in Annual Report Part 1 of purse seine interactions by CCM flagged vessels (para 5), and that the Secretariat report on implementation of the CMM based on ROP data as part of the Annual Report on the Regional Observer Programme. The below graphs are found in TCC19 paper WCPFC-TCC19-2023-RP02, which provides additional details on cetacean interactions in WCPO fisheries.

Ch 2

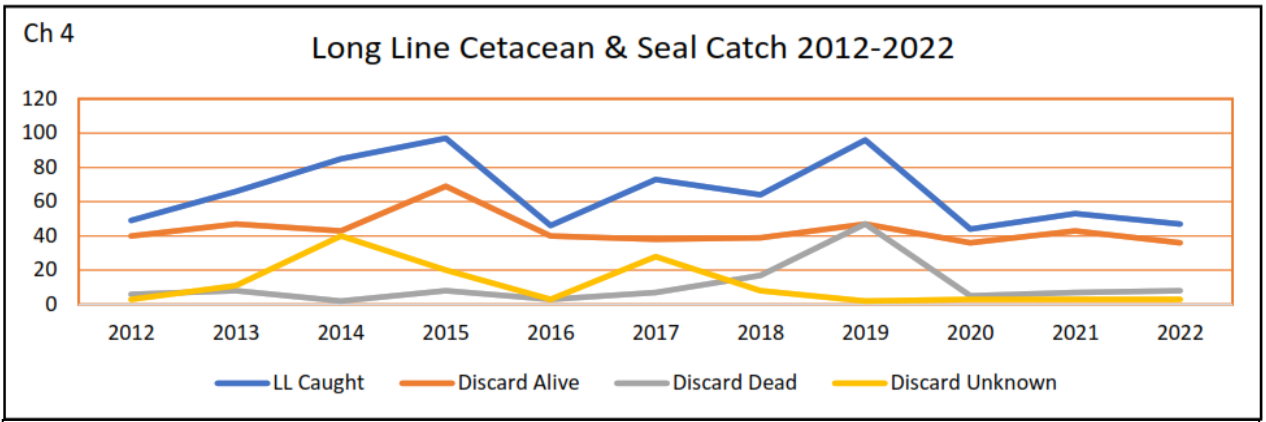


Ch2: Cetacean interaction data from 123 Purse seine trips and 641 longline trips in 2022. Source: WCPFC ROP.

Ch3



[6] See SC16-ST-IP-12, updated in SC17-ST-IP-10. See also WCPFC16 Summary Report paragraphs 519-521.



Ch3 and Ch4: Catch rates on purse-seine and longlines since 2012 when the CMM for Cetaceans CMM 2011-03 was agreed, following a combination of all the data over the years collected by mainly pacific observers using the old General Form 2 (Gen-2) format. Source: WCPFC ROP.

6. Although SC19 was not tasked to review CMM 2011-03, it did consider initial information on cetacean bycatch and interactions in the WCPFC fisheries summarized in SC19 meeting paper WCPFC-SC19-2023/EB-WP-08. While noting the value of improving the understanding of interaction rates, particularly species-specific rates of cetaceans in the WCPO fisheries, in particular those species of conservation concern, SC19 did not make any specific recommendations to the Commission.

7. SC19 also considered but did not support a proposal from the International Whaling Commission (IWC) to engage in an FAO-ABNJ project focused on assessing and mitigating cetacean bycatch and its impacts on cetacean populations in the WCPO.[7]

8. The cetacean CMM obligations are applicable to flag States. Obligations require CCMs to prohibit their flagged purse seine vessels from setting a purse seine net on a school of tuna associated with a cetacean if the animal is sighted prior to the commencement of the set (CMM 2011-03 01), and if there is unintentional encircling to require prompt release in accordance with safe release practices (CMM 2011-03 02). The CMM was reviewed by TCC under the CMS in 2014 (covering 2013 activities) and again in 2017 (covering 2016 activities). Obligations reviewed were paragraph 05 (Report) and paragraph 01 (Implementation), with summary data relating to the online compliance case file system (CCFS) provided starting in 2020. The Commission adopted audit points in 2022 for paragraphs 01, 02, and 05.

9. CMM 2011-03 01, 02, and 05 are included in the CMS Risk Based Assessment Framework (RBAF). The RBAF assessed the consequences and risks of non-compliance to be at the higher end of the scale with a moderate likelihood of non-compliance. In 2023, TCC19 used the agreed CMS audit points to assess the two implementation obligations related to intentional setting of a purse seine net on a school of tuna associated with a cetacean (paragraph 01), and requirements in the event of unintentional encircling of cetaceans in the purse seine net (paragraph 02). Noting that the information provided is self-reported, no compliance issues were raised by TCC.

[7] See SC19 Outcomes Document paragraphs 232-233.

Seabirds[8]

10. The Commission at its inaugural session in 2004 tasked the Scientific Committee and Technical and Compliance Committee to provide advice to WCPFC2 on "Estimates of the mortality of non-target species with an initial focus on seabirds…"[9] Resolution 2005-01 on the Incidental Catch of Seabirds was then adopted by WCPFC2 the following year. Subsequent CMMs on seabird catch mitigation were adopted in 2006 (CMM 2006-02), 2007, (CMM 2007-04), 2012 (CMM 2012-07), 2015 (CMM 2015-03), 2017 (CMM 2017-06), and 2018 (CMM 2018-03 *current*).

11. At SC19, New Zealand offered to lead a review of CMM 2018-03 "To ensure that effective mitigation methods are required and applied across the Convention Area where there is bycatch risk to vulnerable seabirds from longline fishing" and that its proposed scope would include the following areas of focus:

    i the spatial extent of required mitigation methods
    ii the Southern Hemisphere mitigation options and specifications, and
    iii the Northern Hemisphere mitigation options and specifications.

    New Zealand also offered to establish and lead informal intersessional meetings with interested CCMs to review the latest scientific evidence on seabird bycatch mitigation and gather views on the review of CMM 2018-03, with the goal of submitting a revised CMM to SC20, TCC20, and WCPFC21.

12. SC19 also reviewed information on a multi-year seabird strategy developed by CCSBT[10], outcomes of tori line experiments on vessels flagged to Chinese Taipei fishing in the North Pacific[11], and updated advice from ACAP on bycatch reduction of albatrosses and petrels in WCPFC fisheries[12]. Some of the information reviewed by SC19 was provided in response to CMM paragraph 9 that encourages CCMs to conduct research and report on results.

13. The Secretariat's required annual report on the ROP to TCC19 presented compiled information on seabird interactions identified through observer reports, which included catches and sightings. It should be noted that the observer coverage levels in the longline fishery is currently subject to a minimum 5% ROP observer coverage rate.

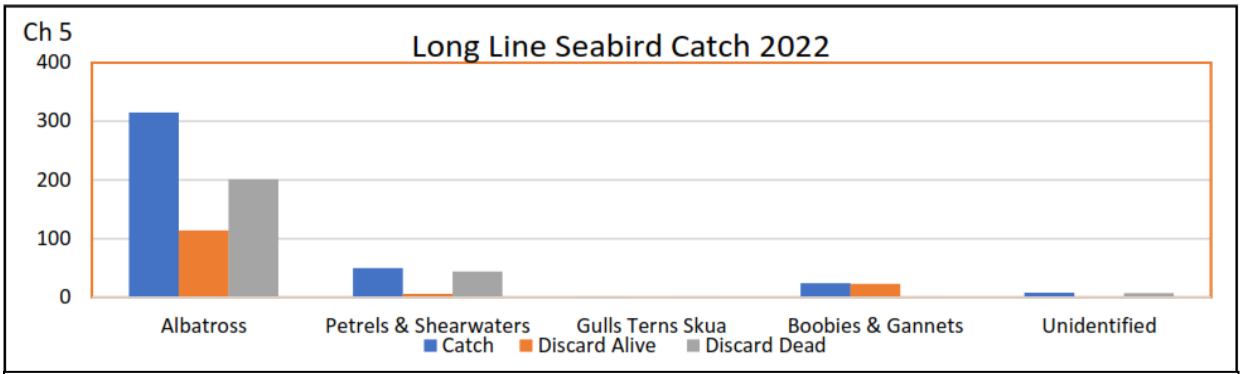
[8] See SC19 Outcomes Document paragraph 230.
[9] See Inaugural Session of the Commission Summary Report Annex II.
[10] SC19-EB-IP-11
[11] SC19-EB-IP-20
[12] SC19-EB-IP-21

Table A7 - Longline Seabird Sightings 2022

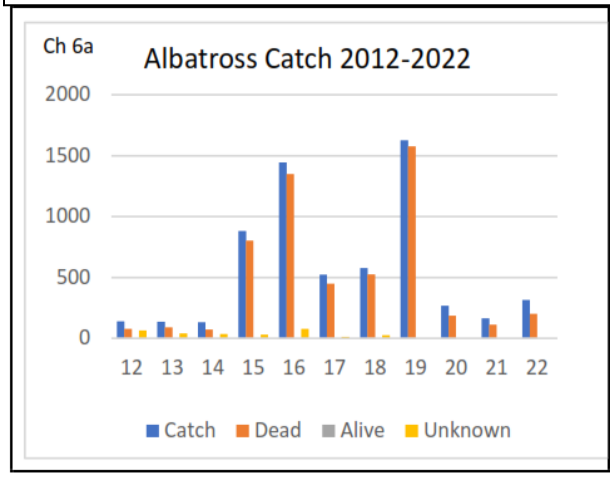
Gear	Species	Number Sighted	<23N >30S	<30S	>23N
LL	Albatross nei	116	45	71	
LL	Antipodean Albatross	4		4	
LL	Black Browed Mollymawk	49	2	47	
LL	Black footed Albatross	2584	15		2569
LL	Boobies & Gannets	332	310		22
LL	Buller's Albatross	8		8	
LL	Cape Petrel	48	1	47	
LL	Flesh Footed Shearwater	40	40		
LL	Grey Petrel	75		75	
LL	Gulls, Terns and Skuas	8	8		
LL	Laysan Albatross	4516			4516
LL	Light Mantled Sooty Albatross	2	1	1	
LL	Petrels and Shearwaters	533	177	217	159
LL	Petrels Nei	413	20	390	3
LL	Salvin's Albatross	9		9	
LL	Shearwaters Nei	93	48	45	
LL	Short Tailed Shearwater	20	20		
LL	Sooty Shearwater	2	2		
LL	Southern Royal Albatross	379	1	378	
LL	Wandering Albatross	549	13	536	
LL	White capped Albatross	39	39		
LL	White chinned Petrel	11	5	6	
LL	Bird (Unidentified)	380	72	205	3
Longline Birds Sightings		**10210**	**819**	**2039**	**7272**

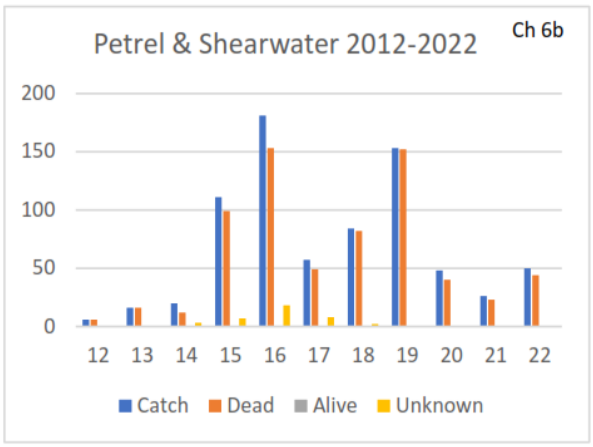
*Figures as of 24 July 2023

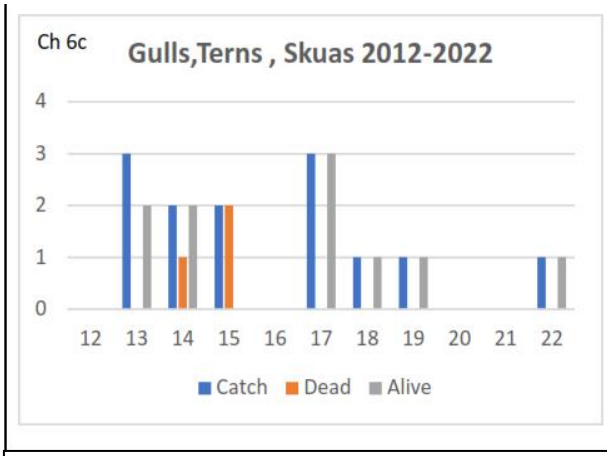
It is noted that the overall sightings of bird numbers are difficult to record for accuracy, as often the same bird may be counted more than once over the period of a trip.
Source: WCPFC ROP.

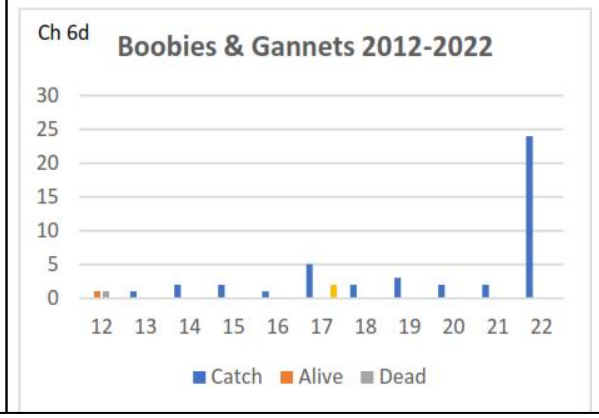


Ch 5 shows available 2022 Observer data collected by observers from China, Hawaii, Fiji, New Caledonia, French Polynesia, Chinese Taipei, New Zealand, and Vanuatu which indicates that birds were recorded as caught and landed on 641 longline trips carried out in 2022. Source: WCPFC ROP.









Ch 6a-6d show recorded observer seabird catches since the first seabird measure, (CMM 2012-07). In the early periods observers did not have ID guides to assist in properly identifying species of birds. Improvements in seabird ID is due to the development of ID manuals and training updates. Albatross and petrels are the predominant species caught on long line vessels. The reported figures for 2020 to 2022 are lower than previous years because of the drop in observer coverage due to COVID-19. Source: WCPFC ROP.

14. The seabird CMM has been reviewed by TCC under the CMS in 2013, 2015, 2016, and 2020. Implementation and Report obligations have been reviewed for compliance using audit points adopted for CMM paragraphs 02 (Implementation), 08 (Report), and 13 (Report). The RBAF assessed the consequences and risks of non-compliance to be at the higher end of the scale with a moderate likelihood of non-compliance. Data collection to support the review and, as required, verification of reported captures of seabirds and implementation of required seabird mitigation measures is incomplete. Observer reporting of interactions with seabirds and the reporting of potential infringements requires further work.

Sea Turtles[13]

15. The Commission adopted WCPFC's first sea turtle CMM at WCPFC5 in 2008 (CMM 2008-03) and revised it at WCPFC15 in 2018 (CMM 2018-04). WCPFC15 also adopted safe handling guidelines (suppl_CMM 2018-04-1) and accompanying graphics (suppl_CMM 2018-04-2).

16. SC19 considered information[14] on reducing the impact of FADs on turtles, which included potential impacts of drifting FADs by the tropical tuna purse seine fishery and provided a series of guidelines to reduce the impact of FADs on sea turtles. SC19 suggested development of best practices and guidelines to minimize the impact of FADs on sea turtles to inform CCMs of potential impacts. Ideally this would include detailed information on Fully Non-entangling FADs and ideas related to a "FAD WATCH" program.[15]

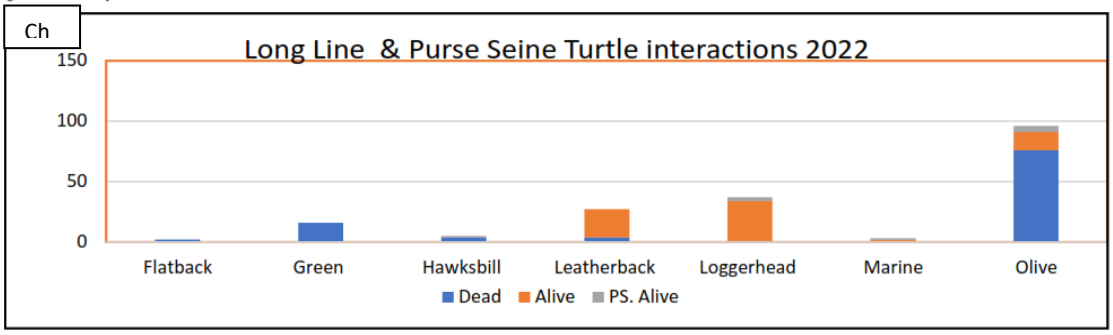
17. Compiled information from the Commission ROP was reported to TCC19 in the Secretariat's required annual reporting. Information in Table A9, Table A10, and Ch7 reflect some summary information on sea turtle interactions in the WCPO purse seine and longline fisheries in 2022. Further details can be found in the TCC19 paper.

Table A9 Longline Turtle Landings and Interactions for 2022

Gear	Species	Number Observed	Retained	Number Discarded Alive	Number Discarded Dead	Unknown Condition	Released Alive before landing
LL	Flatback Turtle	2	0	0	2	0	
LL	Green Turtle	16	0	0	16	0	
LL	Hawksbill Turtle	4	0	0	4	0	
LL	Leatherback Turtle	27	0	21	4	2	16
LL	Loggerhead Turtle	34	0	33	1	0	32
LL	Marine Turtle	2	0	1	1	0	
LL	Olive Ridley	91	0	15	76	0	13
Long-Line Turtles Caught 2022		**176**	**0**	**70**	**104**	**2**	**61**

Figures as of 24 July 2023

Ch



[13] See SC19 Outcomes Document paragraph 231.
[14] See SC13-EB-WP-02 and SC19-EB-WP-12 (*Guidelines to reduce impact of FADs on turtles*).
[15] A collaborative initiative to minimize the impact of FADs in coastal ecosystems

Table A10 Purse-seine Turtle landings and interactions for 2022

Gear	Species	Number Observed	Retained	Number Discarded Alive	Number Discarded Dead	Unknown Condition	Released Alive before landing
PS	Flatback Turtle	0	0	0	0	0	0
PS	Green Turtle	0	0	0	0	0	0
PS	Hawksbill Turtle	1	0	1	0	0	1
PS	Leatherback Turtle	0	0	0	0	0	0
PS	Loggerhead Turtle	3	0	1	0	2	1
PS	Marine Turtle	1	0	1	0	0	1
PS	Olive Ridley Turtle	5	0	5	0	0	4
PS Turtles Caught 2020		**10**	**0**	**8**	**0**	**2**	**7**
Total Turtles LL & PS Caught in 2022		**186**	**0**	**78**	**104**	**4**	**69**

Figures as of 24 July 2023

Table A9, Table A10, and Ch7: Observed turtle catches for 123 Purse Seine trips and 641 Longline trips. Source: WCPFC ROP.

18. The turtle CMM has been reviewed by TCC under the CMS in 2013, 2015, and 2020. Implementation and Report obligations have been reviewed for compliance with audit points adopted for CMM paragraphs 02 and 03 (Report), 05a-d (Report/Implementation), 06 and 07a (Implementation). The RBAF assessed the consequences and risks of non-compliance to be at the higher end of the scale with a moderate likelihood of non-compliance. In 2023, TCC19 used the agreed CMS audit point to assess the two implementation obligations related to sea-turtle mitigation requirements for longline vessels to carry and use line cutters and de-hookers to handle and promptly release sea turtles (CMM 2018-04 06) and for shallow-set longline vessels to implement one of three mitigation methods (CMM 2018-04 07a). For 2021 activities one CCM requested capacity assistance due to the lack of implementation of the paragraph 6 obligation. For 2022 activities, there was a potential issue due to the lack of implementation of the paragraph 6 obligation. Otherwise, and noting that the information provided is self-reported, no compliance issues were raised by TCC. Data collection to support the review and, as required, verification of reported captures of sea turtles and implementation of required sea turtle mitigation measures is incomplete. Observer reporting of interactions with sea turtles and the reporting of potential infringements requires further work.

Mobulid Rays

19. WCPFC13 in 2016 designated manta and mobula rays as key shark species for assessment purposes (Paragraph 550, WCPFC13 Summary Report). SC15 in 2019 requested further research into the stock and ecological risk status of mobulid rays, with updated information to be provided to SC16 in 2020. Specifically, the focus of the additional research was a review of available data to allow the Scientific Committee to determine the feasibility of assessing the status of mobulid rays, and the potential types of assessment approaches that may be suitable.

20. At WCPFC16 in 2019, several members expressed their concerns about the status and protection of mobulid rays, and the Commission adopted CMM 2019-05 (*CMM on mobulid rays caught in association with fisheries in the WCPFC Convention Area*), to take effect at the start of 2021. The Commission also tasked the Scientific Services Provider (SSP) with reviewing the data available via the Regional Observer Program (ROP) and *Scientific data to be Provided to the Commission*

(SciData) and identify any additional data requirements to undertake an assessment, either via traditional stock assessments or on the basis of quantitative risk assessments, ecological risk assessments, indicators assessment or other data-poor analytical techniques. The SC was then tasked to advise the Commission on the feasibility and schedule for an assessment for mobulid rays and for the SSP to present an assessment of the status of mobulids to the SC in 2023.

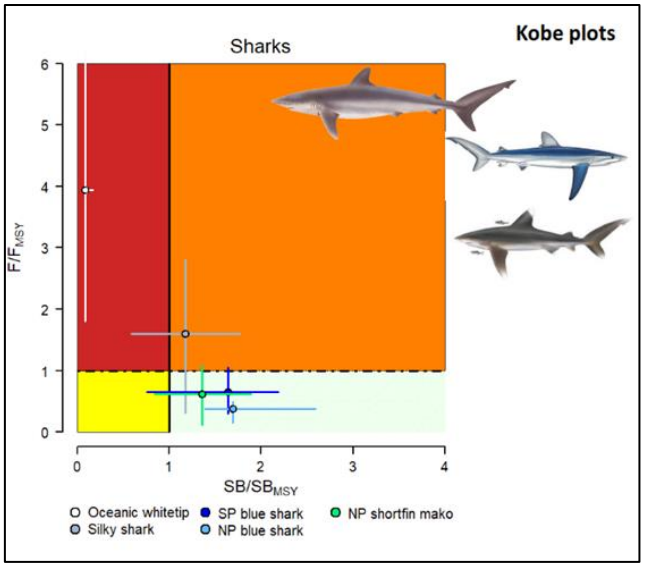
21. Supported by SPC, consulting firm *Dragonfly* introduced SC16-SA-IP-12 (*Data review and potential assessment approaches for Mobulids in the Western and Central Pacific Ocean*) at SC16, which provided a comprehensive list of future research recommendations. This paper was reviewed through the SC16 Online Discussion Forum, and the general conclusion was that collection of biological material to understand mobulid biology is likely to be more informative than conducting any assessments.

22. At SC19 in 2023, an informal Small Group (ISG) on *Shark Research Plan 2021-2025 Mid-term Review* was convened in the margins of SC19. The ISG noted that mobulids are considered as data-poor species and grouped into a project related to purse-seine fisheries. The ISG also noted that research needs for mobulid rays should focus on biological areas (general biology, population structure, post-release survival) and recommended a new project on fisheries characterisation, CPUE standardisation and data-poor methods. Therefore, SC19 recommended a project (P19X9 with $56,000 in 2024; CCMs' priority score 5.2 from a range of 1 – 9) to the Commission on manta, mobulid and whale shark fisheries characterisation, CPUE standardisation and data-poor assessment for its consideration and approval.

23. WCPFC19 adopted audit points for CMM paragraphs 04, 05, 06, 08, and 10. The CMM took effect on 1 January 2021 and was first reviewed in the Commission CMS in 2023 (covering 2021 and 2022 activities). Obligations are applicable to flag States with vessels operating in both purse seine and longline fisheries and carriers, and flag States are expected to prohibit their flagged vessels from retaining on board, transhipping, or landing any part or whole carcass of a mobulid ray, and require prompt release alive and unharmed any mobulid in accordance with safe release practices in the CMM. Data over time may indicate more specific applicability for annual reporting purposes.

24. The RBAF assessed the consequences and risks of non-compliance to be at the higher end of the scale with a moderate likelihood of non-compliance. Potential issues for this CMM in the CMR for 2021 activities reflected the lack of implementation of the obligations. A few CCMs requested capacity assistance to assist in this regard. In the CMR for 2022 activities, implementation had been completed for almost all CCMs with the main issues related more to the introduction of audit points which required specific information on a CCM's monitoring and management of non-compliance. To date, this outcome would tend to support the RBAF assessment.

25. Data collection to support the review and, as required, verification of reported captures is incomplete. Observer reporting of interactions with mobulid and the reporting of potential infringements requires further work.



The Kobe plot showing most recent stock status for the WCPO shark species. SP blue shark, NP blue shark and NP shortfin mako shark are showing in a mostly healthy state. Oceanic whitetip shark and silky shark are showing in a less than healthy state. Source: SPC.

Sharks (CMM 2022-04, suppl_CMM 2022-04-1[16], suppl_CMM 2022-04-2[17])

26. The Commission adopted its first CMM (CMM 2010-07) for sharks in 2010 at WCPFC7 covering key shark species identified by the Scientific Committee: blue shark, silky shark, oceanic whitetip shark, mako sharks, and thresher sharks, porbeagle shark (south of 20°S, until biological data shows this or another geographic limit to be appropriate) and hammerhead sharks (winghead, scalloped, great, and smooth). CMM 2012-04 on whale sharks was adopted by WCPFC9 in 2012, followed by adoption of CMM 2013-08 on silky sharks by WCPFC10 in 2013. CMM 2014-05 on targeted shark fisheries and shark mitigation measures in longline fisheries targeting tunas and billfish was adopted by WCPFC11 in 2014.

27. At WCPFC13 in 2017, the Commission tasked SC and TCC to "work towards the development of a comprehensive approach to shark and ray conservation and management with a view to adopting a new CMM at the Commission's annual meeting in 2018. The new CMM should seek to i) unify the WCPFC's existing shark CMMs; ii) take account of relevant national and international policies and measures; and iii) provide a framework for adopting new components as needs and datasets evolve."[18] Under Shingo Ota's (Japan) leadership, a comprehensive, consolidated CMM on sharks was adopted by the Commission at WCPFC16 in 2019 (CMM 2019-04). Amendments to the CMM were adopted in 2022 at WCPFC19 in the current sharks CMM 2022-04.

28. All the shark CMMs have been reviewed by TCC under the CMS at various stages, including after all shark CMMs were consolidated under CMM 2019-04 and most recently reviewed in the 2023 CMR (covering 2022 and 2021 activities). Adopted audit points are in place for relevant paragraphs of CMM 2022-04, covering Limit, Report, Report Deadline, and Implementation Obligations.

29. The reduction in observer coverage during the global COVID pandemic and the amendments made to the shark CMM in 2022 prompted SC19 to conclude that a review of CMM 2022-04 would be more effective in 2027 after more time has passed to collect information on the impacts of the CMM. In particular, SC19 acknowledged the need for improved data collection, particularly for species with infrequent interactions and the utility of electronic technologies to complement monitoring and estimation of their interactions.

[16] Guidelines for the safe release of encircled whale sharks
[17] Best handling practices for the safe release of Sharks (other than Whale Sharks and Mantas/Mobulids)
[18] See WCPFC13 Summary Report paragraph 507.

30. TCC19 reviewed CMM 2019-04 under the CMS and experienced several challenges in evaluating compliance due to differences relating to interpretation and applicability of certain obligations.[19] Some of these challenges may be addressed through a review of the CMS audit points adopted for relevant paragraphs. The CMM obligation in paragraph 9 was particularly challenging due to a lack of sufficient information available to make an informed assessment of compliance. Noting that the CMM would be reviewed again in 2024, relevant CCMs committed to providing additional information to support an effective compliance review at TCC20.

Silky shark (Carcharhinus falciformis) stock assessment in the WCPO (Project 108)[20]

31. SC19 considered potential inputs to the 2024 stock assessment of silky sharks and considered areas of focus, including analysing available catch, catch rate and length composition information in the context of developing time-series of catch, CPUE and length composition[21]. Since the first stock assessment of silky sharks in WCPO in 2012, and subsequent assessments in 2013 and 2018, considerable uncertainties in data inputs have been highlighted.

32. SC19 recommended proceeding with an integrated assessment for silky shark in 2024 and that alternative assessment methods such as data-limited methods or a risk analysis be developed concurrently.

Mid-term Review of 2021-2025 Shark Research Plan (Project 97b)[22]

33. The WCPFC shark research plan (SRP) was discussed at SC19 and proposed for extension to 2030 to encompass two assessment cycles. The SRP will be reviewed annually by the SC to ensure the work is supporting the Commission's conservation and management objectives on shark species. Importantly, SC19 discussed the need for integrated shark assessments projects to include a data-poor component so that advice on stock status can still be provided even if the integrated assessment approach fails. Information on data-limited stock status metrics was considered to be useful to support future SC discussions.

[19] See relevant TCC19 Outcomes.
[20] See SC19 Outcomes Document paragraph 100.
[21] SC19-SA-WP-10 (Analysing potential inputs to the 2024 stock assessment of Western and Central Pacific silky shark Carcharhinus falciformis).
[22] See SC19 Outcomes Document paragraphs 226-229.

Table A3 Observer Reported Whale Shark Interactions and Landings from 2012-2022

Year	Observer Report Whale Shark Interactions & Landings	Trips analyzed for ROP Annual Report	No's of Vessels that caught Whale Sharks	Total No of Sets Made	No's of Sets Whale Sharks reported	Occurrence of 1 Whale Shark by #Set
2012		1202	134	32243	336	96
2013		1409	146	38280	354	105
2014		1559	141	39386	361	104
2015		1552	156	36770	376	94
2016		1531	96	35269	184	182
2017		1408	118	36519	253	118
2018		1746	122	42807	313	133
2019		1770	159	43441	563	7
2020		610	75	14696	141	100
2021		105	13	3730	22	149
2022		123	2	4644	3	1548
2012-2022	**3089**	**13015**	**1162**	**327785**	**2906**	**106**

[b]Figures as of 24 July 2023

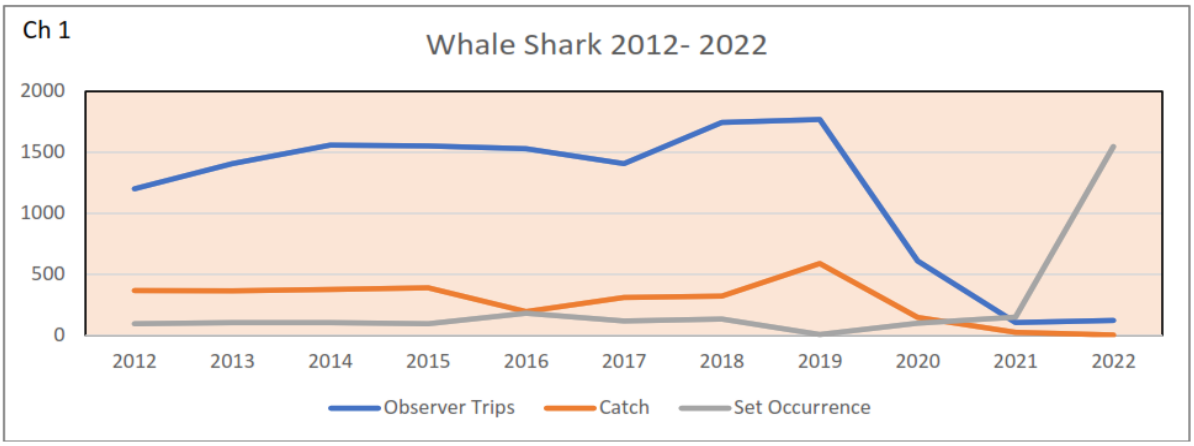


Table A3 and Ch1 shows the updated figures for whale sharks since 2012 and as can be seen the occurrence 2012 to 2022 was about an average of 1 whale shark caught about every 106 sets. The additions of the 2022 figures show 1 caught every 1548 sets. Early figures for 2023 since the 100% observer coverage for purse seiners recommended on 1st January 2023, shows an increase in interactions for whale sharks with 73 observer trips recorded for 14 whale sharks' interactions. Source: WCPFC ROP.

Shark catches for all shark species in 2022 are shown in Table A16 for purse seine vessels and table A17 for longline vessels. Source: WCPFC ROP.

Table A16 Purse seine Shark Catch -2022

SHARK SPECIES	CATCH	RETAINED	DISCARD	FINS RETAINED with Trunk	FINNED-TRUNK DISCARDED
GREAT HAMMERHEAD	1	0	1	0	0
OCEANIC WHITETIP SHARK	74	0	74	0	0
SCALLOPED HAMMERHEAD	1	0	1	0	0
SILKY SHARK	2453	0	2453	0	0
SILVERTIP SHARK	1	0	1	0	0
VARIOUS SHARKS NEI	4	0	4	0	0
WHALE SHARK	3	0	3	0	0
WINGHEAD SHARK	1	0	1	0	0

Table A17 Long Line Shark Catch 2022

SHARK SPECIES	CATCH	RETAINED	DISCARD	FINS RETAINED with Trunk	FINNED TRUNK DISCARDED
BIGEYE THRESHER SHARK	2934	51	2883	0	0
BIGNOSE SHARK	15	0	15	0	0
BLACKTIP REEF SHARK	6	0	6	0	0
BLACKTIP SHARK	15	0	15	0	0
BLUE SHARK	46748	11149	35599	3758	0
BRONZE WHALER SHARK	104	2	102	0	0
BULL SHARK	1	0	1	0	0
COOKIE CUTTER SHARK	5	0	5	0	0
CROCODILE SHARK	1925	0	1925	0	0
DUSKY SHARK	14	14	0	0	0
GALAPAGOS SHARK	11	0	11	0	0
GREAT HAMMERHEAD	7	3	4	0	0
GREY REEF SHARK	9	0	9	0	0
HAMMERHEAD SHARKS NEI	3	0	3	0	0
KITEFIN SHARK	19	0	19	0	0
LONGFIN MAKO	239	65	174	0	0
MAKO SHARKS	7	0	7	0	0
OCEANIC WHITETIP SHARK	1745	0	1745	0	0
PELAGIC THRESHER SHARK	800	0	800	0	0
PORBEAGLE SHARK	107	1	106	0	0
SALMON SHARK	13	0	13	0	0
SANDBAR SHARK	6	0	6	0	0
SCALLOPED HAMMERHEAD	158	1	157	0	0
SCHOOL SHARK	1	1	0	0	0
SHARK SUCKER	18	0	18	0	0
SHARKS (UNIDENTIFIED)	1	0	1	0	0
SHARPNOSE SEVENGILL SHARK	1	0	1	0	0
SHORTFIN MAKO	2485	494	1991	24	0
SILKY SHARK	6133	56	6077	0	0
SILVERTIP SHARK	7	0	7	0	0
SMOOTH HAMMERHEAD	136	19	117	0	0
THRESHER SHARK (VULPINUS)	31	0	31	0	0
THRESHER SHARKS NEI	171	0	171	0	0
TIGER SHARK	24	0	24	0	0
VARIOUS SHARKS NEI	580	1	579	0	0
VELVET DOGFISH	740	0	739	0	0
WHALE SHARK	1	0	1	0	0
WHITETIP REEF SHARK	2	0	2	0	0
Total Shak Catch 2022	**67760**	**11857**	**55903**	**3782**	**0**

Figures as of 24 July 2023

Update on current bycatch mitigation projects in the WCPO

34. In 2021, the FADMO-IWG recommended (WCPFC18-2021-FADMO-IWG5-01):

    - the use of biodegradable materials in the construction of FADs to reduce the number of synthetic debris in the environment but acknowledged that more research is needed on the development and application of suitable biodegradable materials and FAD designs in FAD construction including the use of locally available materials;
    - that CCMs continue to encourage its flagged vessels to use available biodegradable materials on FAD construction; and
    - that the Commission considers developing a definition of "biodegradable FAD", ideally in consultation with other t-RFMOs.

35. Noting the report and recommendations of the FADMO-IWG, WCPFC18 established a prohibition on the use of mesh net for any part of a FAD, from January 1, 2024, and agreed to further consider other issues related to FADs (biodegradable FADs, the impact of FADs, and FAD numbers)[23]. WCPFC Project 110: Non-entangling and Biodegradable FAD trial in the WCPO was also conducted.

36. Further, WCPFC18 adopted the revised Tropical Tuna Measure tasking the Scientific Committee to continue to review research results on the use of biodegradable material on FADs and to provide specific recommendations to the Commission in 2022, including a definition of biodegradable FADs, a timeline for the stepwise introduction of biodegradable FADs, potential gaps/needs and any other relevant information (paragraph 19, CMM 2021-01).

37. WCPFC19 considered the outcomes from SC18 and TCC18 with the following recommendations: Paragraphs 23 – 24, WCPFC19 Outcomes Document:

    > *23. The Commission supported the SC18 and TCC18 recommendations for the IATTC definition of biodegradable and categories of biodegradable FADs. The Commission further noted that the FADMO-IWG will further examine the categories of biodegradable FADs, timeline for the stepwise introduction of biodegradable FADs, potential gaps and other relevant information.*
    >
    > *24. The Commission tasked the FADMO-IWG with assistance from the Secretariat and the SSP to review the effectiveness of paragraph 22 of CMM 2021-01 and other FAD-related issues and incorporate into its 2023 work plan.*

38. In 2022, the FADMO-IWG submitted a paper to SC18 (SC18-EP-IP-13) and TCC18 (WCPFC-TCC18-2022-25). This paper includes i) the definition of biodegradable FADs, ii) the timeline for the stepwise introduction of biodegradable FADs, iii) potential gaps/needs, and iv) any other relevant information.

39. Noting the latest recommendations from SC, TCC, and the Commission, the FADMO-IWG considered these issues as its 2023 priority tasks and progress on these including recommendations from SC19 and TCC19 are provided in WCPFC20-2023-FADMO-IWG *(Progress of FADMO-IWG Tasks for 2023 including SC19 and TCC19 Outcomes)*. This paper requests the Commission to i) consider SC19 and TCC19 outcomes related to the updates of FAD Management

[23] See Paragraph 141, WCPFC18 Summary Report

Options IWG priority tasks for 2023 in the development of revised tropical tuna conservation and management measures, and ii) provide guidance on the future work of the FADMO-IWG.

Information and Data Requirements

Refinement of ROP Data Fields

40. Current focus of IWG-ROP is to refine data fields collected by ROP observers to allow for more useful consideration of ROP data in the CCFS and in the Compliance Monitoring Scheme processes. The work planned for 2023-2024 prioritises improvements in ROP minimum standard data fields for NTADs to allow for a distinction between an interaction and a possible infraction in the CCFS. The initial focus of the work is to address the issue that currently the ROP data fields do not permit the observer to categorise the data fields that are inputs to the CCFS to distinguish between interactions where there is no alleged infringement and that are of scientific interest, with those interactions or actions by the crew that could indicate a potential infringement has occurred.[24] There is also work planned to refine ROP minimum standard data fields for sea turtles, seabirds, and mobulids.

Sea Turtles

41. The SSP provided an update of data gaps to SC19 for consideration, which included a review of consistency in data reporting obligations. The review identified a reporting requirement in paragraph 5(c) and 7(e) of CMM 2018-04 (*Sea Turtles*) that is not covered in the operational data requirements of the Scientific Data to be Provided to the Commission (SciData). Paragraphs 5(b) and 7(d) of the CMM each require operators of purse seine and longline vessels, respectively, to record all incidences during fishing operations that involve sea turtles and report such incidences to the appropriate CCM authorities.[25] Paragraphs 5(c) and 7(e) each require the CCM to "*provide the results of the reporting*" under each of the preceding paragraphs.

42. SC19 considered that paragraphs 5(c) and 7(e) are not clear that the reporting requirement is for operational data recorded in paragraphs 5(b) and 7(d), an interpretation issue that arises from the term "*results*" in respect of the reporting of sea turtle incidences, which implies that reporting other than operational data may be intended.

43. TCC19 reviewed this issue through the CMS Audit Points small working group with the initial expectation that the requirement could be clarified through an audit point. The small working group concluded that an amendment to the CMM or the SciData would be required.[26] Clarified reporting requirements are essential to ensuring that CMMs are working as intended.

Longline Bycatch Data

44. SC19 noted that the adopted level of 5% ROP observer coverage rate for longline vessels, which has been in place for over a decade, has not provided robust estimates of bycatch associated with longline fisheries. A previous analysis by the SSP (SC16-ST-IP-11) suggested that observer coverage of at least 10% of longline trips would improve the precision of estimates of bycatch, and that the increase in precision would be highest for species with infrequent interactions.

[24] For further information see TCC19-2023-09 Use of ROP data in the Compliance Monitoring Scheme (CMS)
[25] For example, paragraph 7(d) reads: "*Provide for their longline vessels to record all incidents involving sea turtles during fishing operations and report such incidents to the appropriate authorities of the CCM*." Paragraph 5(b) refers to purse seine vessels.
[26] See Draft TCC19 Summary Report, paragraph 515.

45. TCC19 also considered the current level of observer coverage on longline vessels, which impacts the Commission's ability to independently verify several obligations. Although the Commission and its subsidiary bodies have been discussing the observer coverage levels in the longline fishery for several years, there has been no agreement to increase the minimum 5% ROP coverage rate since the adoption of the original ROP CMM 2007-01. The aim at the time of adoption in 2007 was to achieve this minimum level across most fisheries[27] no later than 30 June 2012.

46. The minimum 5% ROP coverage rate was evaluated through the CMS by TCC annually until 2019 and has not been included in the list of obligations to be assessed because the COVID pandemic had affected placements of observers on fishing vessels. It is worth noting that the most recent compliance assessment completed in 2020 (covering RY 2019) found that all applicable longline fisheries[28] had achieved a minimum of 5% ROP observer coverage rate based on data submission to SSP (see SC16-2020-ST-IP02).

47. SC19 **recommended** that the Commission explore options to expand the observer coverage on longline vessels through both human and electronic approaches in the WCPO so that the SC can provide better estimates of bycatch levels and other metrics from these fleets. Likewise, TCC19 reaffirmed the importance of increasing monitoring and observer coverage in the longline fishery, including through the implementation of electronic monitoring.

Sharks

48. In a report prepared for SC19, it was noted that several species of sharks and rays are experiencing severe population declines, however, due to often limited research grade data collection and access, the contribution of these fisheries to elasmobranch mortality is often incomplete, regionally focused, and poorly understood. SC19 noted a need to support better data collection, particularly for less commonly caught species interactions and the utility of electronic technologies to complement monitoring and estimation of their interactions.[29]

Recommendations

49. The Commission is invited to:

Silky shark[30] stock assessment in the WCPO (Project 108)

a. endorse that in 2024 an integrated assessment for silky shark be attempted and that alternative assessment methods such as data-limited methods or a risk analysis be developed concurrently.

Review of Conservation and Management Measures for sharks

b. endorse SC19's recommendation that, given the reduction in observer coverage over the COVID years and the amendments made to the shark CMM in 2022, it would be more effective to postpone the review of CMM 2022-04 to 2027.

[27] See CMM 2018-05 Annex C para 9 and 10: Except for fishing vessels used exclusively to fish for fresh fish in the area north of 20N, small vessels*, and troll and pole-and-line vessels used for fishing for skipjack tuna or albacore tuna*. (*The implementation date was deferred pending further advice from the IWG-ROP)._

[28] For ROP trips undertaken in 2019, by the longline flagged fleets of Cook Islands, China, European Union, Fiji, Japan, Korea, Solomon Islands, Tuvalu, Chinese Taipei, United States of America and Vanuatu.

[29] See SC19 Outcomes Document.

[30] Carcharhinus falciformis

c. consider a need to support better data collection, particularly for less commonly caught species interactions and the utility of electronic technologies to complement monitoring and estimation of their interactions.

Mid-term Review of 2021-2025 Shark Research Plan (Project 97b))

d. note that the current Shark Research Plan (SRP) is extended to 2030 to encompass two assessment cycles.

e. endorse, to the extent possible, integrated shark assessments projects undertaken within the WCPFC should also include a data-poor component so that advice on stock status can still be provided even if the integrated assessment approach fails.

Seabirds

f. note that New Zealand will lead informal intersessional meetings with interested CCMs to review the latest scientific evidence on seabird bycatch mitigation and gather views on the review of CMM 2018-03 with an aim to draft a revision of CMM 2018-03 for submission to SC20, TCC20, and WCPFC21.

Sea turtles

g. consider development of a best practices and guidelines to minimize the impact of FADs on sea turtles to inform CCMs of potential impacts, including detailed information on Fully Non-entangling FADs and ideas related to a "FAD WATCH" program.

Inconsistencies between SciData and CMM operational data reporting requirements

h. consider whether it is necessary to clarify the reporting requirements in paragraphs 5 and 7 of CMM 2018-04, while noting the difficulty of logbook-based data collection for sea turtles.

Bycatch estimates of longline fisheries

i. consider an increase in longline observer coverage of at least 10% of trips, which allows for reasonably good estimates of bycatch, and that the increase in precision would be highest for species that are frequently caught, and weakest for rarely caught species, especially sea turtles and cetaceans.

The Commission for the Conservation and Management of
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
Scientific Committee
Nineteenth Regular Session
Koror, Palau
16-24 August 2023

Report from ISG-05 (Shark Research Plan 2021-2025 Mid-term Review)

There was a request from SC19-EB-WP-06 ("Shark research plan 2021-2025 mid-term review") for ISG-Sharks to:

1. Consider an extension of the SRP to 2030
2. Review the current assessment schedule
3. Review priority rankings and timelines for new and existing projects
4. Submit TORs for SC consideration for any projects requiring funding in 2024
5. Review recommendations for consideration by SC19

1. Extension of the SRP to 2030

The midterm review of the SRP suggested an extension of the SRP to encompass two shark assessment cycles. This was supported by ISG-05, together with annual reviews of SRP progress via a short paper to the SC, and an annual ISG Sharks (held at SC) to inform ongoing and future projects planning.

2. Review of the current assessment schedule

The SRP included Table 5.1 listing the current schedule for key shark stock assessments in the WCPFC. ISG-05 supported the removal of the southwest Pacific porbeagle shark assessment from the list of WCPFC stock assessments, given most catches for this species occur within the CCSBT convention area. The removal of the Pacific wide silky shark assessment was also supported, noting that the expansion of the stock assessment spatial scope to the EPO provided limited new data. The WCPO silky shark assessment is meant to proceed as planned. Other assessments planned were not opposed.

The authors of the SRP suggested that for key species with poor data availability, fishery characterisations, CPUE standardisations and data-poor methods be considered. This includes threshers sharks, hammerhead sharks, manta rays, mobulids and whale sharks, and explore data poor methods to provide information on trends. This approach was supported by ISG-05, acknowledging that integrated stock assessments were not possible for these species. It was suggested that the species be grouped into two projects based on the main fishing gears concerned (for purse-seine fisheries, whale sharks, manta rays and mobulids; for longline fisheries, thresher and hammerhead sharks). The existing project proposal for a whale shark stock assessment was removed to reflect the switch to a fishery characterisation and data-poor approach for this species.

It was suggested to amend Table 5.1 to note which assessments were to be led by ISC, and confirmed there was no change to the schedule for these assessments.

Additional key changes to Table 5.1 included the removal of a catch reconstruction project utilising global fin trade data given methodological concerns noted in previous WCPFC shark assessments. The NP blue shark assessment was also noted as completed and removed from the list of projects.

There was a suggestion that two projects on data-poor assessment methods and data-poor metrics (5(c)(i) and 5(c)(ii)) could be accommodated within the existing assessment framework for WCPFC key sharks. For the first one, it was suggested that a data poor/risk assessment approach be added to TORs for future WCFPC integrated stock assessment projects, where possible. Advantages of this approach include the provision of stock status should the integrated stock assessment approach fail, and useful insights to SC arising from the comparison of data-poor vs. data-rich assessment outcomes. ISG-05 supported this on a case-by-case basis but noted budget increases would likely result from the expanded scope of the TORs.

For project 5(c)(ii) "Include data poor assessment metrics as standard outputs for data rich assessments", it was suggested that data-poor assessment metrics could be discussed as standard assessment outputs for WCPFC key shark assessments. Further clarifications were sought from CCMs as to the nature of these metrics and whether this request would also apply to North Pacific stocks. It was suggested that to the extent possible the data-poor metrics provided in SC17 report Table MI-01 could be used as a baseline (noting they are standard output of common assessment packages like Stock Synthesis) and that their inclusion in North Pacific assessments could be encouraged, but not treated as mandatory.

3. Review of projects

ISG-05 reviewed the existing projects in Table 5 and new projects listed in Table 7 of SC19-EB-WP-06.

Projects listed in Tables 5 and 7 were reviewed in terms of their current relevance and proposed timeline. New proposals included the development of a biological sampling plan. One CCM also indicated a need to extend training for sample collection to port samplers. The additional logistical challenges of sample collection given the recently updated Appendix II listings for requiem shark were also noted.

Mitigation projects 5.2(a)(i) "Investigate effective mitigation of WCPFC key sharks" and 5.2(a)(ii) "Investigate mitigation method trade-offs between mitigation methods for sharks, seabirds and turtles" were reviewed. ISG-05 supported the removal of project 5.2(a)(i) as its scope could be covered by project 5.2(a)(ii) which would also consider mitigation methods in general. It was clarified that these projects were for longline fisheries.

The table was amended to remove project 5.2(b)(i) "Estimate silky shark and oceanic whitetip shark post release survival from WCPO longline fisheries" as it had been completed. Noting the ban of setting on whale sharks enacted by CMM 2022-04 and its predecessors, project 5.2(b)(ii) "Estimate whale shark post release survival from WCPO purse seine fisheries" was removed. However, there was a request to include a hot spot analysis for whale sharks to inform future tagging opportunities in the relevant fishery characterisation work.

Timelines for all projects listed in Table 5.3 ("Biological data improvements") were shifted by two years to reflect delays in observer training incurred by the COVID-19 pandemic. ISG-05 considered whether the project on thresher sharks' life-history was still relevant given the recommended shift to a data-poor assessment for this species, but agreed to retain the project as listed as data-poor methods remain sensitive to biological assumptions.

ISG-05 noted that observer data collection training support was ongoing and should remain prioritised as a project work area. CCMs also emphasized the potential of EM data to be integrated into observer data.

For new project Table 7 (11), Japan mentioned challenges in the measurement of the length of the trailing branchline from cut-free sharks due to concerns about crew and observer safety. Undue burden incurred to crew and observers for the collection of this measurement during hauling given the short time window (fishers cut and release the sharks immediately after capture) were also highlighted. Japan suggested that this item should not be included in the minimum requirements of the Regional Observer Programme

(ROP). ISG-05 acknowledged the concern to crew and observer safety and noted that this should be discussed in the ISG dealing with minimum data standards.

Japan noted similar concerns about crew safety for new project Table 7 (15) and questioned the feasibility of observer training in this area. Japan suggested that this item should not be included in the observer training as a minimum requirement of the ROP but that it could be considered on a voluntary basis.

Research needs for manta, mobulids and hammerhead sharks were reviewed with a focus on biological areas (general biology, population structure, post-release survival) given the recommendation of a new project on fisheries characterisation, CPUE standardisation and data-poor methods. The US noted ongoing domestic work on mantas and mobulids release survival for purse seine and longline fisheries. ISG-05 supported the improvement of life-history and general biology as key research areas, underpinned by the sampling planning work. New Zealand also expressed support for satellite tagging on shortfin mako in the southwest Pacific and suggested genetic approaches as more suited to understanding natal homing.

A sampling optimisation project was further discussed, noting it would be important to support sample collections for research areas utilising genetic information. It was noted that while sample optimisation for close-kin mark recapture (CKMR) for sharks was also required, that this project should be considered separately due the nature of the simulation work required.

There was also support for a project exploring approaches for dealing with the deterioration of fishery dependent data due to non-retention measures.

Finally, ISG-05 supported a delayed review of the shark CMM (CMM-2022-04) until 2027 to allow time for its implications to have effects and also to account for the impacts of COVID on data.

Updated project tables were collated by the Chair to reflect ISG-05 discussions. An online survey was distributed to Heads of Delegations seeking feedback on priorities and timelines when these had not already been discussed at ISG-05 (16 projects). One response was allowed by delegation, and updated rankings and timelines were allotted to projects based on survey responses (19 respondents). The priority rankings and timelines were reviewed and approved by ISG-05.

ISG-05 requested that the authors of the SRP (SC19-EB-WP-03) submit a revision reflecting the updated project definitions, priorities and timelines as discussed at the ISG-05. An updated version of Table 5 including the changes outlined above is also included in Appendix I.

4. Submit TORs for SC consideration for any projects requiring funding in 2024

Four new TORs were submitted to SC for funding consideration following discussions at ISG-05:

- Manta, mobulid and whale shark fisheries characterisation, CPUE standardisation and data-poor assessment
- Oceanic whitetip assessment in the WCPO
- Developing a statistically robust and spatial/temporal optimized sampling strategy for biological data collection
- Estimate the post-mortality retention time of elasmobranchs entangled in FADs

These TORs were developed by the ISG chair with support from the authors of the mid-term review of the SRP (Steve Brouwer and Paul Hamer) with further support from SPC. In addition, a modified TOR for Project 108 “Silky shark stock assessment in the WCPO” was submitted to reflect an expanded scope including data-poor methods, as recommended by ISG-05.

5. Review recommendations for consideration by SC19

ISG-05 agreed on the following recommendations for SC19 to consider:

1. Extend the current shark research plan to 2030 to encompass two assessment cycles.
2. SC19 should note Table 5 and consider any proposed changes.
3. Noting that integrated stock assessments for elasmobranchs are challenging and can sometimes fail to succeed, SC19 recommends that, to the extent possible, integrated shark assessments projects undertaken within the WCPFC also include a data-poor component so that advice on stock status can still be provided even if the integrated assessment approach fails.
4. SC19 would also like to encourage that future integrated elasmobranch stock assessments presented to SC also report data-limited stock status metrics such as those outlined in SC17 report Table MI-01, if they can be estimated.

Updated Table 5 for inclusion in revised SC19-EB-WP-06

Stock assessment				
Title	Priority	Start year	End year	Comments
(a) Determine the stock status for WCPFC Key Sharks				
i) Southwest Pacific blue shark assessment	High	2026	2028	
ii) North Pacific blue shark assessment	High	2026	2027	
iii) Southwest Pacific shortfin mako shark assessment	High	2027	2028	
iv) North Pacific shortfin mako shark assessment	High	2023	2024	Data preparatory meeting in November 2023 assessment scheduled for presentation to SC20
v) WCPO silky shark assessment	High	2022	2024	Underway 1-year (papers for SC19 SA-WP-10; SA-IP-09)
vi) WCPO oceanic whitetip shark assessment	High	2024	2025	
vii) Fishery characterisation of manta and mobulid rays and whalesharks	High	2024	2025	SC19 survey 91% high 2024 agreed start date
viii) Fishery characterisation of hammerhead and thresher sharks	Medium	2025	2026	SC19 survey 86% Medium and agree on start date
(b) Develop reliable catch histories, assessment methods and data input improvements				
i) Redefining the fleets currently assumed in the BSH NP stock assessment	Medium	2021	2022	Work completed (ISC/21/SHARKWG-2/I-01) the results indicate that no change to the fleet composition used in the assessment was required.
ii) Developing a statistically robust and spatial/temporal optimized sampling strategy for biological data collection - consider ISCs approach.	High	2024	2025	SC19 survey 100% agreement
iii) Future options for assessments with less data due to ongoing reduction in retention of sharks (i.e. degradation of data for CPUE and estimation of catch)	Medium	2026	2027	SC19 survey 64% medium starte date 2024-2027 chose the mid
iv) Spatio-temporal abundance patterns and drivers of abundance indices for SP shortfin mako	Medium	2025	2026	SC19 survey 55% medium starte date 2025
v) Satellite tagging of mako sharks (juveniles and adults) in NZ, AU and the high seas east of NZ (genetic analysis also mentioned regarding natal homing)	Medium	2025	2027	SC19 survey 75% medium start 2025 (need 2 years for this work)
vi) Feasibility of tag-recapture methods to obtain estimates of M (for SP shortfin mako)	Medium	2025	2026	SC19 survey 60% medium start date 2025
(c) Test and improve Medium and Data Poor assessment methods to inform management decisions				
i) Include data poor assessment metrics as standard outputs for data rich assessments where possible	High	Ongoing	Ongoing	Done in SP-BSH, SP-mako? SC Shark ISG may want to review these and provide a specific list for future assessments.
(d) Assess the success of management				
i) Review the impact of CMM-2022-04	High	2027	2028	SC19 survey 100% agreement on priority and start date

Mitigation				
Title	Priority	Start year	End year	Comments
(a) Provide advice on mitigation Sharks with non-retention policies and unwanted elasmobranchs				
i) Investigate effective mitigation for WCPFC Key Sharks	Medium	2023	2025	To do - still planed project scheduled for proposal at SC19
ii) Investigate mitigation method trade-offs between mitigation methods for sharks, seabirds and sea turtles	Medium	2023	2025	To do - still planed project scheduled for proposal at SC19
(b) Provide advice on safe release methods and assess release survival of WCPFC Key Sharks				
i) Estimate silky and oceanic whitetip shark post release survival from WCPO longline fisheries	High	2025	2026	SC19 survey 59% high priority. Some work undertaken in EPO (IATTC - Shaffer) preliminary results indicate a post-release mortality rate of 5.7% for silky sharks Hutchinson and Bigelow - OCS (67-92% survival) FAL (100% survival)
ii) Estimate whale shark post release survival from WCPO purse seine fisheries	TBD	TBD	TBD	Hot spot analysis suggested as part of assessment project a) vi) postpone until those results are on the table
iii) Estimate the retention time of elasmobranchs entangled in FADs	Low	2025	2027	SC19 survey 50% low

Biology				
Title	Priority	Start year	End year	Comments
(a) Increase the understanding of important biological parameters of WCPFC Key Sharks				
i) Silky shark and oceanic whitetip shark reproductive biology and longevity	High	2027	2030	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
ii) Biology and life history of hammerhead sharks	High	2025	2027	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
iii) Resolving blue shark reproductive biology and reproductive schedule	Medium	2025	2027	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
iv) Biology of the longfin mako shark	Medium	2025	2027	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
v) Life history of thresher sharks	Medium	2025	2027	If not assessment this can get a lower priority
vi) Validated life history, biology, and stock structure of the shortfin mako in the south Pacific	Medium	2025	2027	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
vii) Age validation and stock structure of the silky shark and oceanic whitetip shark	Low	2025	2027	To do - still planed but probably delayed due to COVID delays for observer training in biological data collection. Schedule work once enough samples have been collected.
viii) Stock structure and life history of southern hemisphere porbeagle shark	Low			Move to CCSBT
ix) Biology of manta and mobulid rays	High	2027	2030	SC19 survey 45% high (35% medium and 20% low) start date most 2027
x) Stock structure of manta and mobulid rays	High	2027	2028	SC19 survey 50% high
xi) Stock structure of hammer head sharks	Low	2026	2030	SC19 survey 55% low
xii) Genetic CKMR (and stock structure and natal homing) scoping study all species	Medium	2026	2027	82% medium with a start date of 2026
xiii) Review of non lethal approaches to collect life-history data (e.g. reproductive status from blood samples) to inform observer training	Medium	2025	2026	45% medium (35% high 20% low)

Observer data				
Title	Priority	Start year	End year	Comments
(a) Improve spatio-temporal observer data for informing scientific needs				
i) Training observers in the WCPO to be proficient in species identification	High	Ongoing	Ongoing	Material developed by SPC: Park T., Marshall L., Desurmont A., Colas B. and Smith N. 2019. Shark and ray identification manual for observers and crew of the western and central Pacific tuna fisheries. Noumea, New Caledonia: Pacific Community. 79 p. Observer training ongoing
ii) Training observers for extraction and storage of vertebrae and shark reproductive material	High	2021	Ongoing	SPC currently looking at getting the protocols developed for shark biological sampling through a consultant. This should also ensure that observer training covers good sampling practices for tissue samples to reduce cross-contamination.
iii) Training observers for on-deck reproductive staging of elasmobranchs	High	2021	Ongoing	SPC currently looking at getting the protocols developed for shark biological sampling through a consultant
iv) Measuring elasmobranchs on purse seine and longline vessels for length-length and length-weight conversion factor development	High	Ongoing	Ongoing	ROP training conversion factor measurements have just been introduced - COVID delay.