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Review of Non-Target and Associated or Dependent Species (NTADS) in the WCPO: Sharks

WCPFC22-2025-28c
29 October 2025

Submitted by the Secretariat

Purpose

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 measure (CMMs) on sharks: CMM 2024-05. Relevant recommendations to the Commission from subsidiary body meetings (SC21 and TCC21) in 2025 are included in this paper and contained in the relevant subsidiary body meeting reports.

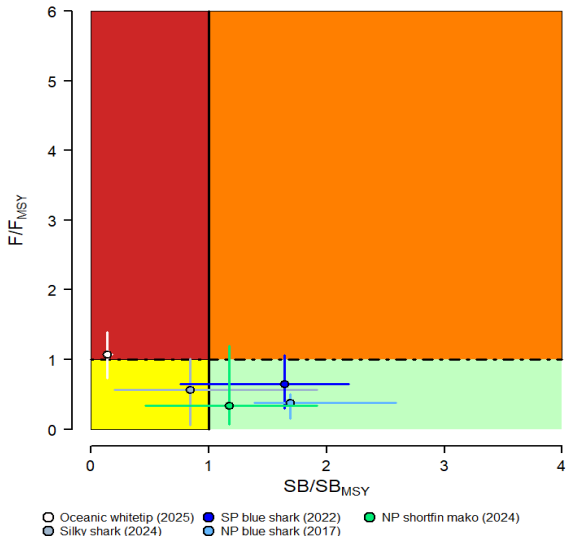
Stock Status and Scientific Research

2. WCPFC manages 14 key shark species: blue shark, silky shark, oceanic whitetip shark, thresher sharks, mako sharks, porbeagle shark, hammerhead sharks (winghead, scalloped, great, and smooth), and whale shark, shown in Table 1 alongside their latest stock status.

3. **Figure 1,** below, further reflects stock status for oceanic whitetip shark, silky shark, south and north Pacific blue shark, and north Pacific shortfin mako, displayed in a Kobe plot where the x-axis shows depletion level and the y-axis shows fishing mortality ratio, based on most recent assessments. Sharks are assessed across a 2-year period, with the first year focussed on data inputs and the second year on the assessment. There is no WCPFC agreed limit or target refence points for depletion ($SB/SB_{F=0}$), so shark stock status is assessed in relation to F_{MSY} and SB_{MSY}. The points indicate the median estimates and bars are the 95%iles.

4. The most recent shark stock assessment that was discussed at SC21 was on the Oceanic whitetip shark (*Carcharhinus longimanus*) and the outcomes of those are detailed in **Annex 1** of this paper.

Stock	Latest Assessment	Overfished[1]	Overfishing[1]	Next Assessment
WCPO Sharks				
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	2025 (SC21)	Yes	No	TBD
Silky shark (*Carcharhinus falciformis*)	2024 (SC20)	Uncertain	No	2029
South Pacific blue shark (*Prionace glauca*)	2021 & 2022 (SC17 & SC18)	No	No	2027
North Pacific blue shark (*Prionace glauca*)	2022 (SC18)	No	No	2027
North Pacific shortfin mako (*Isurus oxyrinchus*)	2024 (SC20)	No (66%)	No (95%)	2029
Pacific bigeye thresher shark (*Alopias superciliosus*)	2017 (SC13)	N/A	N/A	2022
Southern Hemisphere Porbeagle shark (*Lamna nasus*)	2017 (SC13)	N/A	Very low	2022
Whale Shark (*Rhincodon typus*)	'PS Risk' 2018 (SC14)	N/A	N/A	TBD
Southwest Pacific shortfin mako shark (*Isurus oxyrinchus)*	2022 (SC18)	Unknown	Unknown	TBD



Southwest Pacific blue shark
- Assessed 2021-2022
- Management advice : *unlikely overfished, unlikely undergoing overfishing*
- Next assessment 2026-2027

Southwest Pacific mako shark
- Assessed 2021 (first assessment)
- Management advice: *none, assessment not used*
- Next assessment 2026-2027

WCPO silky shark
- Assessed 2023-2024
- Management advice: *unlikely to be undergoing overfishing, stock biomass level uncertain*
- Next assessment 2028-2029

WCPO oceanic whitetip
- Assessed 2025
- Management advice: *overfished and undergoing overfishing*
- Appearance of biomass increase – from 4 to 6% of unfished

Figure 1. Stock status of key sharks based on most recent assessments

[1] The determination of overfished and overfishing is a likelihood not a firm statement – where a percentage is provided that indicates probability.

Management Framework

5. The current conservation and management measure for Sharks is contained in CMM 2024-05[2], with supplementary information in suppl_CMM 2024-05-2[3]and suppl_CMM 2024-05-1[4]

6. The Commission adopted its first CMM (CMM 2010-07) for sharks in 2010 at WCPFC7 covering key shark species: 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.

7. 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 Commission agreed that 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."[5] Japan (Mr. Shingo Ota) was nominated to lead the Commission's work to develop a comprehensive, consolidated CMM on sharks, which was adopted at WCPFC16 in 2019 (CMM 2019-04). Amendments to the CMM were adopted in 2022 (CMM 2022-04) and again in 2024 CMM 2024-05. A side-by-side comparison of the key changes between the two CMMs is contained in Table 1, below.

8. 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.

9. TCC21 paper WCPFC-TCC21-2025-RP02_rev1 contains the Annual Report of the Regional Observer Programme (ROP) and provides additional information on shark (whale shark, oceanic whitetip shark, silky shark, and other shark species) interactions (refer Tables 22 to 30 and Figures 18 to 24) in WCPO fisheries, based on data collected through the ROP.

10. TCC21 continues to consider ways to assess the effectiveness of shark management measures, particularly those requiring the full utilisation of sharks, or alternative measures that CCMs may employ. Such factors will be important considerations alongside shark assessments planned in the Shark Research Plan for 2026.

Shark Research Plan

11. SC21 discussed the *WCPFC Shark Research Plan (SRP) 2021-2030* and updated assessment schedule, and agreed to remove the proposal to treat the southwest Pacific mako shark as a low-information assessment, noting that methodologies should instead be determined by the 2026 billfish and shark bycatch assessment workshop. SC21 also endorsed three projects for 2026 which included the

[2] Conservation and Management Measure for Sharks (effective 1 February 2025)
[3] Best handling practices for the safe release of Sharks (other than Whale Sharks and Mantas/Mobulids)
[4] Guidelines for the safe release of encircled whale sharks
[5] See WCPFC13 Summary Report paragraph 507.

characterization of low-information shark stocks, epigenetic and stock structure analysis of SWP mako sharks, and post-release survival of oceanic whitetip sharks, and confirmed that assessments for SWP and North Pacific blue sharks will begin in 2026.

Table 1. Comparison of WCPFC Shark Conservation and Management Measures (CMM 2022-04 and CMM 2024-05)

Area of Focus	***CMM 2022-04***	***CMM 2024-05***	***Key Changes***
Application	*Applies to sharks in Annex I of 1982 Convention + all other sharks caught in WCPFC fisheries*	*Same*	*No change*
Full Utilization & Finning or alternative measures	*Fins naturally attached (2022–2024). Alternatives allowed: (1) bagging carcass+fins; (2) binding; (3) tagging.*	*Fins naturally attached (2025–2027). Alternatives reduced to (1) binding or (2) tagging (bagging only until 1 July 2025). Requires enhanced monitoring and reporting.*	*Alternatives reduced; bagging phased out; monitoring/reporting obligations strengthened; non-reporting CCMs lose option by 2027.*
Reporting on Finning	*Part 2 Annual Report: describe implementation of fins-attached or alternatives, enforcement, and monitoring challenges*	*Expanded Annex 2 reporting: must detail vessel numbers using alternatives, enforcement at sea/port, fin count discrepancies, substitution, high-grading, and rationale for practice. Secretariat compiles annually for TCC.*	*Much stronger reporting/accountability requirements.*
Bycatch Mitigation (longline)	*Must choose either: (1) no wire trace or (2) no shark lines. Ban on both within 20°N–20°S by Jan 2024.*	*Same wording.*	*No change.*
Safe Release of Sharks	*Release alive where possible; haul alongside if observer/EM present; line cutter use encouraged; develop*	*Same wording.*	*No change.*

Table 1. Comparison of WCPFC Shark Conservation and Management Measures (CMM 2022-04 and CMM 2024-05)			
Area of Focus	***CMM 2022-04***	***CMM 2024-05***	***Key Changes***
	guidelines considering crew safety.		
Species-Specific: Oceanic Whitetip & Silky	*Retention, landing, transshipment prohibited. Frozen bycatch from purse seine must be surrendered (not sold). Observers can sample dead individuals for research.*	*Same provisions.*	*No change.*
Species-Specific: Whale Shark	*No setting on whale shark-associated sets. Retention prohibited. Compatible measures north of 30°N. Report encirclement events + safe release.*	*Same provisions.*	*No change.*
Research	*SC to maintain Shark Research Plan; review gear impacts by 2024.*	*SC to maintain Shark Research Plan; gear impact reviews to be conducted periodically.*	*Shift from one-time (2024) to ongoing periodic reviews.*
Capacity Building	*Support to developing States for NPOA and safe release training.*	*Same wording.*	*No change.*
Review	*Commission review by 2024.*	*Commission review by 2027.*	*Review cycle extended.*
Replacement	*Replaces CMM 2019-04.*	*Replaces CMM 2022-04.*	*Updated lineage.*

Data Collection Efforts and Monitoring for Sharks

12. SC21 recommended continuing multi-model stock assessments for shark species to address persistent data and structural uncertainties, and called for improved observer data collection to better monitor shark abundance trends and post-release survival. These data improvements are expected to inform future reviews of CMM 2024-05, particularly paragraphs 21 and 22. SC21 also tasked the ROP-IWG to identify key data gaps to improve species identification and reporting accuracy, noting lower observer reporting rates of oceanic whitetip sharks compared to logbooks and declining records of shark lengths since CMM 2011-04 implementation. To strengthen the biological basis for assessments, SC21 recommended expanding tagging, genetic, and life-history studies, especially for the oceanic whitetip shark, to address ongoing uncertainties in stock structure and parameters.

13. In 2022, an additional source of data was made available when the Commission, at WCPFC19, adopted minimum data fields for observer transhipment monitoring, with reporting by observers to be implemented from 1 April 2023.[6] Prior to this time, observers monitoring transhipments had not been required to reports their observations. Sharks, including blue sharks regularly appear in reporting of high seas transhipments.[7] These data provide independent reporting of transhipments and more specifically, numbers of trips, species transhipped, catch locations and catch/fish weights to support reliable scientific analysis and compliance verification.

Compliance History

14. Implementation of obligations in CMM 2014-05 are reviewed through the Compliance Monitoring Scheme (CMS). All key binding obligations in shark CMMs have been reviewed by TCC under the CMS at various stages, including after all shark CMMs were consolidated under CMM 2019-04. Implementation of some obligations was last reviewed by TCC21 in the 2025 CMR (covering 2024 activities). Adopted audit points were in place for relevant paragraphs of CMM 2022-04 and compliance for various obligations has been reviewed at TCC during the last three years with the last review in 2024 showing higher levels of compliance. TCC21's evaluation of obligations under the shark CMM will be finalized at WCPFC22.

Table 2. 2024 Final Compliance Monitoring Report (fCMR) for CMM 2022-04 covering 2023 activities for the shark CMM

CMM 2022-04	Para. 25 (Report)	Para. 25 (Deadline)
Compliant	36	34
Non-compliant	0	2
Not applicable	3	3
Capacity Assistance Need	0	0

[6] WCPFC19 Summary Report, paragraph 466 and Attachment X, page 292

[7] Required Report for TCC "RP03" each year - most recently WCPFC-TCC21-2025-RP03 Annual Report on Transhipment Report

15. In 2025, TCC21 proposed that WCPFC22 consider amending Annex 2 of CMM 2024-05 to support CCMs determining the effectiveness of alternative measures by requiring CCMs to describe any instances of non-compliance observed with respect to paragraphs 7–9 and to describe the quantity of sharks caught where alternative measures are applied and the total quantity of sharks taken.[8] It also recommended that the Secretariat compile separate summaries for CCMs applying "fins naturally attached" policies and those using alternative measures, to better assess effectiveness, for consideration at WCPFC22.[9] TCC21 further encouraged CCMs to collaborate with Canada on these proposed amendments and tasked the TCC Chair, in consultation with the Secretariat, to prepare a paper outlining feasible options for reviewing Annual Report Part 2 information related to these provisions at future meetings.[10] This reflects the ongoing consideration by CCMs on how best to understand and evaluate the effectiveness of measures relating to the requirements for full utilisation of sharks (i.e. fins naturally attached) or the use of alternative management measures, particularly given the differing basis on which CCMs interpret reporting against these obligations.

Recommendations and Next Steps

16. The outcomes and recommendations from SC21 and TCC21 related to sharks are listed below for consideration, support, endorsement and/or approval at WCPFC22:

Sharks: SC21 Outcomes and Recommendations
Stock Assessment *(Reference: para. 103 – 106, SC21 Outcomes Document)* • SC21 additionally recommended continuing multi-model assessments for shark species, where possible, to address persistent concerns with data quality and structural assumptions. • SC21 noted the need for improved observer data collection to inform monitoring of shark abundance trends and shark post-release survival. SC21 also noted this would be expected to inform the review of implementation of CMM 2024-05 paragraphs 21 and 22. • SC21 recommended that the IWG-ROP assess and identify specific data gaps for enhancements needed in order to improve the accuracy and consistency of shark species identification and reporting, noting lower reporting rates of oceanic whitetip sharks by observers relative to logbooks in some regions and diminishing levels of length records since the implementation of CMM 2011-04. • Given persistent uncertainties about stock structure and life-history parameters, SC21 recommended that tagging, genetic, and life-history studies be conducted to improve the biological baseline for future stock assessments of the oceanic whitetip shark.

[8] TCC21-2025-outcomes, paragraph 81
[9] TCC21-2025-outcomes, paragraph 82
[10] TCC21-2025-outcomes, paragraphs 83 and 84

Developing sampling strategy for sharks (Project 126) *(Reference: para. 112 and 125, SC21 Outcomes Document)*

- SC21 agreed to a no-cost extension to continue work on this project based upon the sampling plans developed in Project 117.
- SC21 agreed to adopt the recommendations put forward by ISG-03 (*Attachment X) (Reference: para. 125, SC21 Outcomes Document).*

  Note: Attachment X also appended to this paper, for ease of reference.

Review of CMM for sharks (CMM 2024-05) *(Reference: para. 200, SC21 Outcomes Document)*

- SC21 agreed that the content of the IATTC shark handling release guidelines will be a useful reference to SC23, and recommended that the information be considered by the SC as a reference during the 2027 review of CMM 2024-05.

Shark: TCC21 Outcomes and Recommendations

Review information and provide technical advice and recommendations related to CMM 2024-05 on Sharks *(Reference: para. 81-84, TCC21 Outcomes Document)*

- Pending receipt of a complete CMM 2013-06 assessment, TCC21 recommended that WCPFC22 consider the following addition to Annex 2 of CMM 2024-05 to support CCMs in determining the effectiveness of the alternative measures set out in paragraph 9: "CCMs describe any instances of non-compliance observed with respect to paragraphs 7, 8 and 9; and describe the quantity of sharks caught where the CCM applied the alternative measures and the total quantity of sharks taken."
- Per paragraph 12 of CMM 2024-05, TCC21 recommended that the Commission direct the Secretariat to compile the information provided by CCMs separately for those CCMs implementing the alternative measures and those CCMs who are implementing a “fins naturally attached” policy with respect to paragraphs 10 and 11, including the information outlined in the previous paragraph.
- TCC21 encouraged CCMs to work with Canada in the lead up to WCPFC22 on the proposed amendments to Annex 2 of CMM 2024-05.
- TCC21 tasked the TCC Chair in consultation with the Secretariat to provide a paper to the Commission on how the review of the AR Part 2 information related to CCMs implementation of alternative measures set out in paragraph 9 can be completed at future TCC meetings during plenary sessions. The paper would provide advice on the feasibility of different options, for the Commission’s consideration.

Attachment X

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
TWENTY-FIRST REGULAR SESSION OF THE SCIENTIFIC COMMITTEE
Nuku'alofa, Tonga
13–21 August 2025

Report from ISG-03
Shark Research Plan

The ISG-03 met for one session to review the progress against the 2021-2030 Shark Research Plan (SRP) - 2025 (SC21-2025/SA-IP-19). The ISG-03 reviewed the recommendations in SC21-SA-IP-19, evaluated the assessment schedule for sharks, and assessed the project list for work due to begin in 2026. The ISG-03 suggested removing recommendation 4 (SC21 consider proposing the southwest Pacific (SWP) mako shark assessment as a low information assessment), as since the last assessment, the shark assessments have moved to a 2-year time frame, and the 2026 billfish and shark bycatch assessment workshop may provide a more considered approach to this assessment. The ISG-03 noted that SWP mako shark assessment should not start until the workshop has made recommendation on a suggested way forward. The assessment models/methodologies should therefore be determined by the billfish and shark bycatch assessment workshop. The stock assessment schedule was revised (Table X). The indicator analysis for North Pacific (NP) mako sharks was removed due to limited utility and instead focus on the stock assessment and it was agreed. The ISG-03 also noted that once enough data has been collected by the RoP, each of the biology projects can be re-considered pending successful data collection prior to the projects being re-scheduled. The ISG-03 recommended progressing three projects in 2026:

1. A general characterisation of low information sharks stocks;
2. Epigenetic and stock structure analysis of SWP mako sharks; and
3. Post release survival of oceanic whitetip sharks.

The ISG-03 notes that two assessments (SWP and NP blue sharks) will commence in 2026.

Finally, it was noted that the ISC Shark Working Group (ISC-SWG) was not able to commit to undertake a scoping study for CKMR of mako sharks in the north Pacific Ocean as scheduled, and it was noted that the ISC-SWG had postponed this work pending revision to ISC-SWG schedule.

The ISG-03 requested the authors of SC21-SA-IP-19 to submit a revision of the SRP to reflect these discussions.

Table X. Shark stock assessment table. Note this includes all assessment types from data rich to low information assessment models. The assessment type will be determined by the SC ISG-Sharks for each successive year. Shark assessments are currently scheduled 5-yearly.

A = Assessment; I = Indicator analysis; L/C = Low information assessment or characterisation; X = Scheduled work moved; U = Assessment tabled but not accepted. Red letters indicate proposed change from the SRP or additions. A* - revised assessment grid and management advice

Species	Stock	Last assessment	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Blue shark	Southwest Pacific	2021	A	A*				A				
	North Pacific	2022		A			I	A	A			
Shortfin mako	Southwest Pacific	2022		A					A (pending workshop outcomes)			
	North Pacific	2024			A					A		
Silky shark	WCPO	2024			A					A		
Oceanic whitetip shark	WCPO	2019				A						A
Pelagic thresher	WCPO	-						L/C				
Bigeye thresher	Pacific	2017						L/C				
Common thresher	WCPO	-						L/C				
Greater hammerhead	WCPO	-						L/C				
Smooth hammerhead	WCPO	-						L/C				
Scalloped hammerhead	WCPO							L/C				
Winghead shark	WCPO	-						L/C				
Whale shark	WCPO	-						L/C				
Giant manta	WCPO	-						L/C				
Reef manta	WCPO	-						L/C				
Spinetail devil ray	WCPO	-						L/C				

Annex 1

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
TWENTY-FIRST REGULAR SESSION OF THE SCIENTIFIC COMMITTEE

Nuku'alofa, Tonga
13–21 August 2025

Oceanic whitetip shark (*Carcharhinus longimanus) Stock Assessment*

SC21 noted the extensive efforts undertaken to provide the dual-model stock assessment and appreciated the thoroughness of the assessment approach. While the Stock Synthesis (SS3) integrated age-structured model and Dynamic Surplus Production Model (DSPM) provide different structural assumptions for addressing data conflicts and uncertainties, SC21 noted that the multi-model ensemble approach strengthened conclusions about stock status compared to single-model approaches used previously. **SC21 recommended that stock status and management advice be based upon the Bayesian ensemble across SS3 models, given that it both more appropriately captures the age-structured dynamics and has satisfactory model diagnostics. Additionally, the Bayesian approach provides a comprehensive and principled framework for characterizing uncertainty in stock status and recent fishing mortality.**

Provision of scientific information to the Commission

a. Stock assessment and trends

This assessment represents the third for oceanic whitetip shark (*Carcharhinus longimanus*; OCS) in the Western and Central Pacific Ocean. The assessment employed a dual-model approach to address persistent data conflicts and structural uncertainties. The primary assessment utilized an integrated, age-structured population model in Stock Synthesis (SS3), building on the 2019 assessment framework, using a single region model (**Figure OCS-01, Table OCS-01**). A parallel dynamic surplus production model (DSPM) served as a structural sensitivity analysis, relying on catch and CPUE data while avoiding potentially problematic length-composition data. The assessment incorporated updated data inputs, largely based on observer data, from 1995 through 2023.

The assessment identified multiple sources of uncertainty, and, in particular, emphasized the issue surrounding data quality following non-retention measures (**Table OCS-02**). Conflicts between CPUE indices and length-composition data, and life history parameter uncertainty, both identified in the 2019 stock assessment, remained present. Uncertainties in the level of survival from current discarding practices were considered to inform alternative estimates of recent fishing mortality. Potential non-representativeness of length data was addressed by fitting the DSPM and including model runs with alternative weighting for length compositions in the Bayesian model ensemble.

Historical catch reconstruction suggested markedly lower and less variable early catch estimates compared to the previous assessment. This discrepancy was largely due to the treatment of likely mis-reported hooks-between-float numbers in early assessment years (late 1990s and early 2000s). Longline fisheries were identified as the primary source of catch and historical fishing mortality (**Figure OCS-02**). Significant reductions in catches were predicted over the past decade, following the implementation of

the non-retention measure for OCS (CMM-2011-04).

Standardized CPUE indices showed a steep historic decline, with a slow recent increase since the implementation of CMM-2011-04 (**Figure OCS-03**). These trends in CPUE created a persistent conflict with length-composition data; the latter did not show any trends over time.

The diagnostic model showed a reasonable fit to CPUE and length compositions, despite the low weight assigned to the length compositions (**Figure OCS-04**). Recent CPUE increases could not be fitted without some residual trends, suggesting that recent CPUE increases exceed expectations under the current model configuration. SC21 noted that future shark assessments should explore time-blocks or alternative methods to more explicitly account for changes in the fishery post-CMM-2011-04. The model showed little retrospective pattern in recent depletion or fishing mortality estimates, with retrospective patterns mainly concerning estimates of initial depletion.

A full Bayesian ensemble across key uncertainties was used to characterise uncertainty in stock status and fishing mortality levels. Growth and associated natural mortality priors were key determinants of stock status estimates in the ensemble, while recent discard mortality was a major determinant for recent fishing mortality estimates.

SC21 noted that biomass and recruitment declined substantially during the late 1990s from a starting point that was estimated to be near 20% of equilibrium unfished levels (SB_0) to levels around 4% of equilibrium unfished biomass between 2013-2015 (**Figure OCS-05**). Recent biomass was estimated at approximately 6% of unfished biomass in 2022-2023, following a substantial decline in fishing mortality. The stock therefore remains in a severely depleted state, with indications that declines have been halted and slow rebuilding is taking place.

SC21 noted that the 2025 assessment showed a high level of consistency with the previous stock assessment (Tremblay-Boyer et al. 2019) as well as with projections performed from the 2019 stock assessment (Bigelow et al. 2022), while incorporating improved methodologies and data. The dual-model approach strengthened conclusions about stock status compared to single-model approaches used previously.

Table OCS-01. Assessment structure, including key fisheries and catch proportions.

Species	**Oceanic whitetip shark (Carcharhinus longimanus)**
Stock area	Western and Central Pacific Ocean; Single area
Assessment model	Dual approach: Stock Synthesis (SS3) and Dynamic Surplus Production Model (DSPM)
Data period	1995 through 2023
Primary fisheries	Longline bycatch (major source of mortality), purse seine (minor)
Key data	Catch predictions, discard condition (mortality) estimates, standardized CPUE, and length compositions

Table OCS-02. Summary of main sources of uncertainty in the assessment, with a degree of confidence assigned to each aspect of the assessment and potential source of uncertainty.

Source	Type	Rationale	Uncertainty	Impact	Confidence
Data	CPUE	Standardized longline CPUE index	Steep decline and recent recovery conflicts with length data; recent CPUE may be biased by cutting free of sharks	Potential bias in recent abundance trends	Medium
	Catch	Reconstructed historical catches using refined HBF methods	Early period uncertainty, zero-HBF treatment. HBF may not reflect the depth of the hook in some cases. Uncertainty in the proportion of discard survival and the historic overall catch	Population-scale estimates may be impacted	Medium
	Length composition	Observer length measurements	Data quality degraded by non-retention policy	Conflicts with CPUE trends	Low
Model	Stock Synthesis	Integrated age-structured model	Length data are probably not representative of abundance trends	Primary model for inference	High
	DSPM	Surplus production model	Alternative structural assumption	Provides robustness check	Medium
Spatial assumptions	Single stock	WCPO treated as a single unit	Stock structure unknown	May affect assessment validity	Low
Key parameter	Natural mortality (M)	Literature-derived priors	Conflicting information in the data	Affects productivity	Medium
	Growth	Fixed, from Literature	Not estimable from data	Structural uncertainty	Medium
Structural	CMM-2011-04 effects	Non-retention conservation	Data quality	Potential under-estimated recent	Low

		measure		CPUE	
Estimation	Bayesian inference	MCMC estimation	Parameter uncertainty	Principled estimation of uncertainty	High

Figure OCS-01. Western and Central Pacific Fisheries Commission convention area (light grey), including the stock assessment area for oceanic whitetip shark (dark grey), bounded by the 30◦ N and 30◦S parallels.

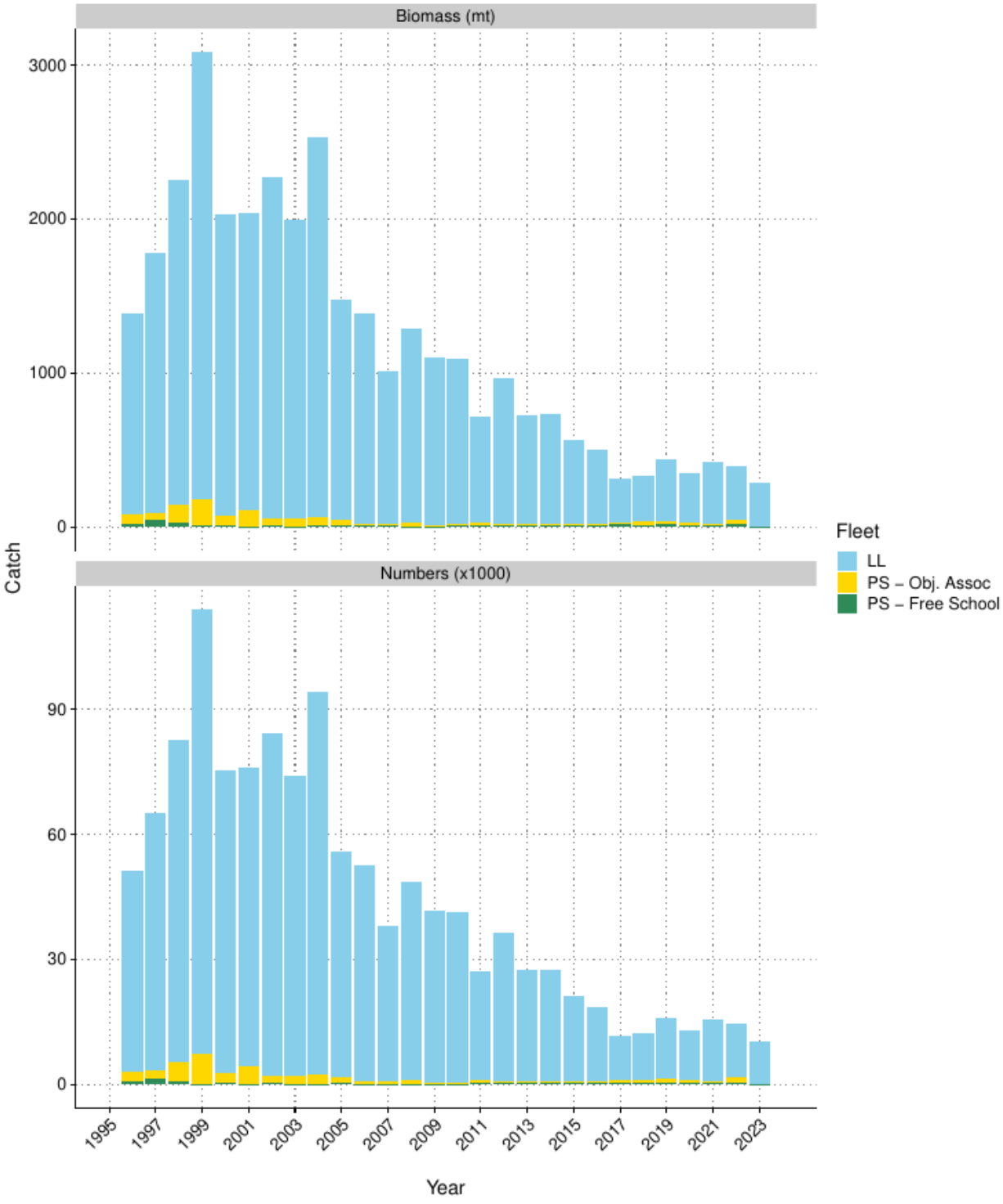


Figure OCS-02. Estimated mortality by fleet in biomass and numbers.

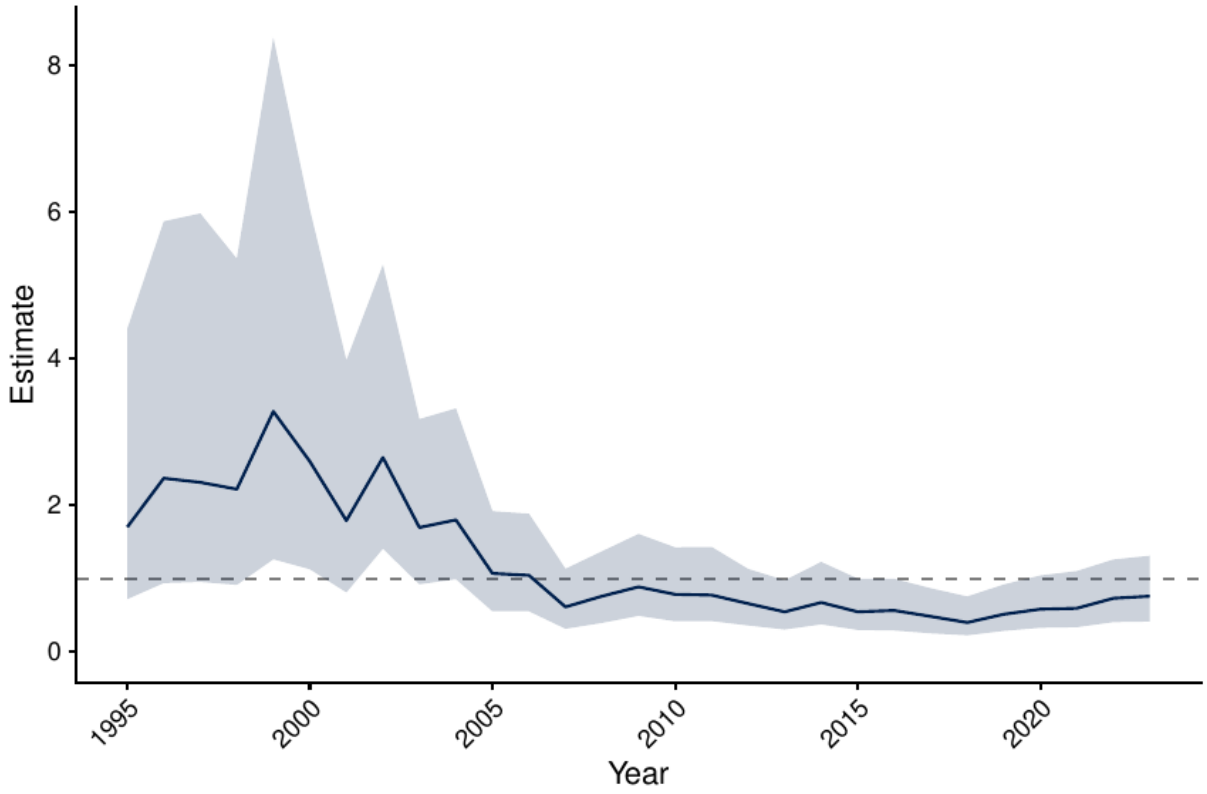


Figure OCS-03. Longline CPUE index using long-running observer indices. Shown is the posterior median and 95% credible interval for the year effect, standardised for regional trends and environmental variables.

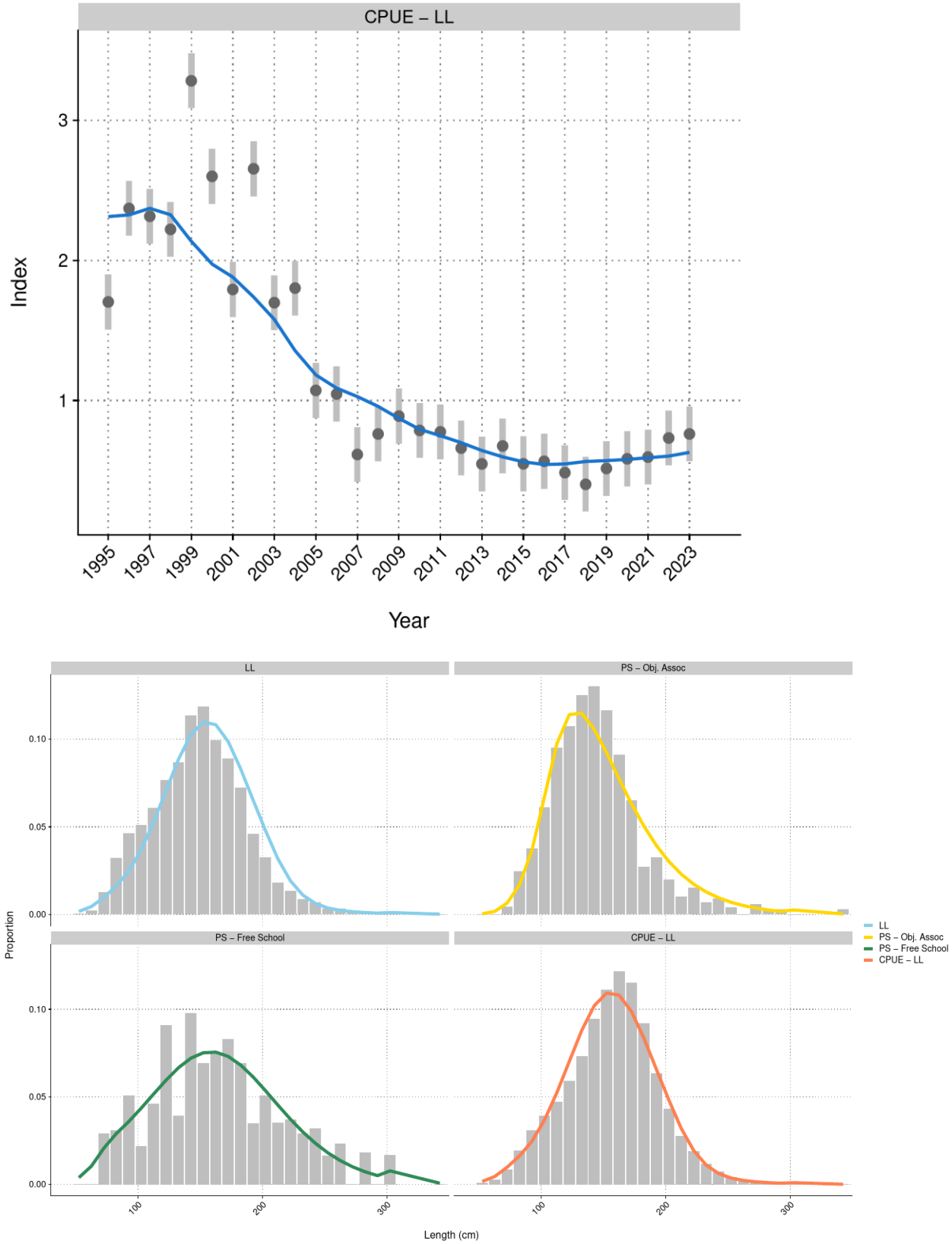


Figure OCS-04. Fits to CPUE and length composition data for the diagnostic model for OCS in 2025.

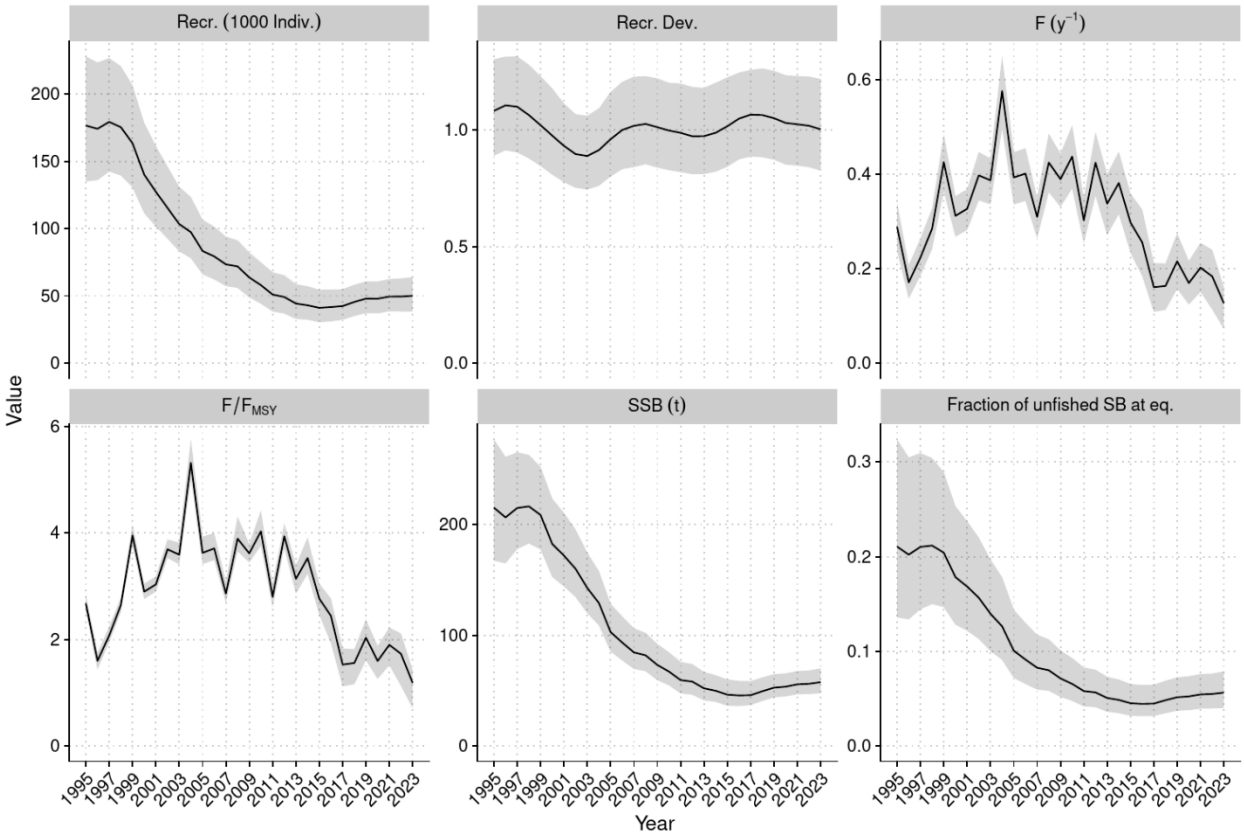


Figure OCS-05. Estimated annual average recruitment (top left), recruitment deviations (top middle), fishing mortality (F; top right), fishing mortality relative to FMSY (bottom left), spawning biomass (bottom middle), and spawning biomass depletion (bottom right) across the model ensemble.

b. Stock status

SC21 noted that there are no agreed reference points for sharks in the WCPFC. The 2025 model suggested that stock status has been improving since 2015. Recent fishing mortality was estimated to be below suggested biological reference points for sharks with high probability (F_{recent}/F_{crash} = 0.54 [95% credible interval 0.37-0.74]; Figure OCS-06, Table OCS-03).

SC21 noted that the 2025 assessment for oceanic whitetip shark concluded that the stock was overfished at 6% of estimated unfished equilibrium biomass, and as likely as not to be subject to overfishing (F_{recent}/F_{MSY} = 1.07 [0.73 – 1.39]; P[F>F_{MSY}] = 0.57).

SC21 noted that the multi-model ensemble indicated recent fishing mortality rates are below suggested limit reference points (F_{lim} and F_{crash},, WCPFC-SC15-2019/MI-IP-04), and current estimated fishing pressure is unlikely to preclude stock rebuilding.

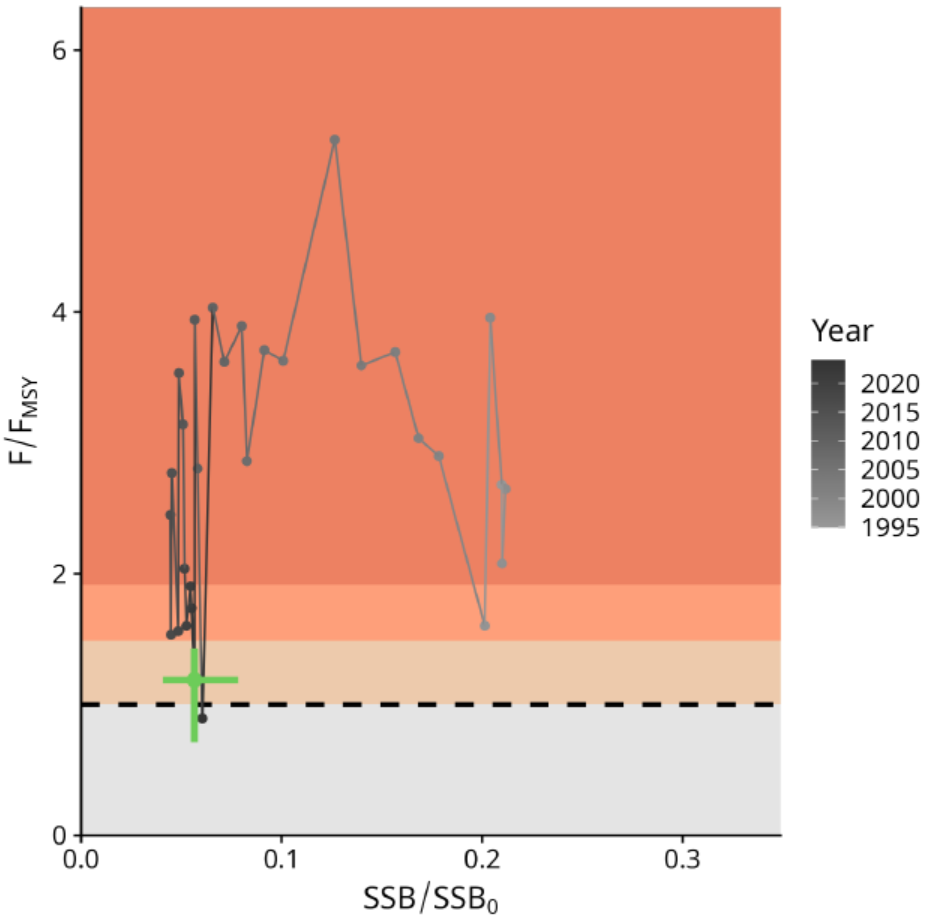


Figure OCS-06. Majuro plot summarising the results for each of the models, including uncertainty arising from estimation, structural, and intrinsic uncertainties (variability and process error). Note that the SSB axis has been truncated to better depict the results.

c. Management advice

SC21 noted that the 2025 oceanic whitetip assessment concluded that while oceanic whitetip shark remains severely depleted at approximately 6% of unfished biomass (**Table OCS-03**), recent signs of recovery indicate conservation measures are likely providing some positive effects.

SC21 noted that the largest reductions in mortality appear to have come from changes in longline fishing practices, suggesting gear-based mitigation measures have been effective. However, given the subtle nature of estimated recovery and persistent uncertainties, continued monitoring is essential.

SC21 noted that the assessment provides high confidence that recent fishing mortality is below levels that would preclude rebuilding, with F/F_{crash} ratios well below 1. It is as likely as not that recent fishing mortality has exceeded F_{MSY}.

SC21 additionally recommended continuing multi-model assessments for shark species, where possible, to address persistent concerns with data quality and structural assumptions.

SC21 noted the need for improved observer data collection to inform monitoring of shark abundance trends and shark post-release survival. SC21 also noted this would be expected to inform the review of implementation of CMM 2024-05 paragraphs 21 and 22.

SC21 recommended that the IWG-ROP assess and identify specific data gaps for enhancements needed in order to improve the accuracy and consistency of shark species identification and reporting, noting lower reporting rates of oceanic whitetip sharks by observers relative to logbooks in some regions and diminishing levels of length records since the implementation of CMM 2011-04.

Given persistent uncertainties about stock structure and life-history parameters, SC21 recommended that tagging, genetic, and life-history studies be conducted to improve the biological baseline for future stock assessments of the oceanic whitetip shark.

Table OCS-03. Stock status summary table

Summary			
Year: 2023	**Fishing mortality**	**Likely (>60%) to be below tentative limits**	
	Recommendation	Stock is increasing slowly, and F is declining at the current catch; maintain conservation measures to minimise fishing mortality. There is a high level of confidence that recent fishing mortality is below levels that would preclude stock rebuilding.	
Reference points		**Estimate [5%--95%]**	**Comment**
Fishing Mortality	F_{MSY}	0.11 [0.09 – 0.13]	(not agreed)
	F_{Lim}	0.16 [0.14 – 0.18]	(not agreed)
	F_{Crash}	0.21 [0.18 – 0.24]	(not agreed)
Recent (2023) estimates			**Recent trend / projection**
Biomass	SB_{recent}	12 630 [7 670 – 19 350]	SB_{recent} increasing
Depletion	SB_{recent}/SB_0	0.06 [0.04 – 0.08]	
Fishing mortality	F_{recent}	0.12 [0.07 – 0.16]	F_{recent} declining
Status			**Likelihood**
Fishing mortality	F_{recent}/F_{MSY}	1.07 [0.73 – 1.39]	As likely as not (40%-60%) to be above F_{MSY}
	F_{recent}/F_{lim}	0.71 [0.49 – 0.93]	Likely (>60%) to be below F_{lim}
	F_{recent}/F_{crash}	0.54 [0.37 – 0.74]	Very likely (>90%) to be below F_{crash}