Report of the 24TH Session of IOTC Scientific Committee December 6-10, 2021

Toshihide Kitakado
(Tokyo Univ. Marine Science Technology)
Chair of the SC

26TH IOTC Commission Meeting, May 16-20, 2022@Seychelles

1

Scientific Committee Meeting (Virtual)

- The 24th Session of the Indian Ocean Tuna Commission (IOTC) Scientific Committee (SC) was held online from 6-10 December 2021
- A total of 130 delegates and other participants attended the Session
  - 107 delegates from 21 Contracting Parties
  - 23 participants from 15 observer organisations (including the invited experts)
- The meeting was chaired by Dr. Toshihide Kitakado (Japan)
- The reports of Working Parties were smoothly introduced, discussed and endorsed

2

Contents

- Stock status and management advice for the following species for which a new stock assessment was carried out in 2021
  - Yellowfin tuna (WPTT)
  - Striped marlin and black marlin (WPB)
  - Blue shark and Silky shark (WPEB)
  - Indo-Pacific king mackerel, Frigate tuna and Bullet tuna (WPNT)
- MSE progress and relevant issues
- Working Party discussion other than stock assessment
- General recommendations from SC 2021
- Workplan and draft meeting schedule in 2022-2023

3

Stock Status and Management Advice

4

Stock assessment models

	Data-rich	Data-moderate	Data-poor
	Integrated assessment with age- (and gender-) structured models (SS3, SCAA, ASPM,...)	Age-aggregated models (JABBA, BSPM, ASPIC,..)	Data-limited methods (C-MSY, OCOM)
Catch series	✓	✓	✓
STD-CPUE	✓	✓	
Catch-at-size (or Catch-at-age)	✓		
Biological parameters	✓		
Tag-data	(✓)		

yellowfin, bigeye, skipjack, albacore, swordfish

billfish, marlins, shark

neritic species

5

Stock Status and Management Advice (1)

Yellowfin Tuna

6

YELLOWFIN STOCK ASSESSMENT

Meetings

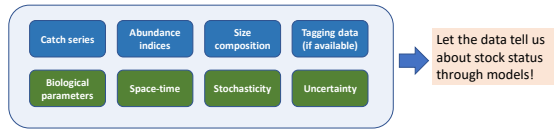
- Chair: Gorka Merino (EU, Spain); Vice-chair: Shiham Adam (IPNLF)
- WPTT23 (DP): May 10-14, 2021
  - ✓ Data preparation
  - ✓ Model specification
- WPTT23 : October 25-30, 2021
  - ✓ Stock assessment and model diagnostics
- SC 24: Dec 6-10, 2021
  - ✓ Projection
  - ✓ Finalization of management advice

7

YELLOWFIN STOCK ASSESSMENT IN 2021

Stock assessment model

- "Stock Synthesis 3" (SS3), an integrated stock assessment model
- Simultaneous use of different sources of data on catch, abundance indices, size and tagging
- Age-structured model with spatial and seasonal components
- High flexibility to account for different fisheries, biological assumptions and stochasticity

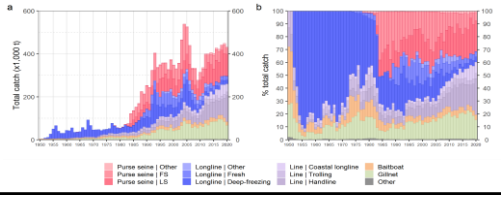


8

DATA (1) CATCH SERIES

- **Catch series (~ 2020)**
- Abundance indices
- Size frequency data
- Tagging data

Total catch decreased by 3.6% in 2020



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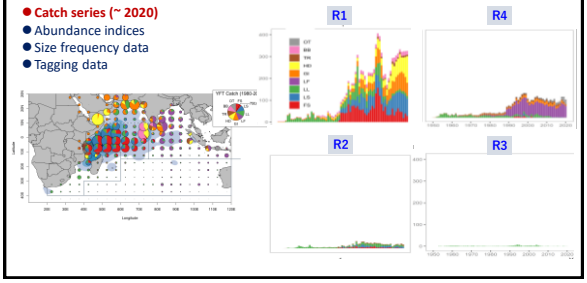
DATA (1) CATCH SERIES

- **Catch series (~ 2020)**
- Abundance indices
- Size frequency data
- Tagging data

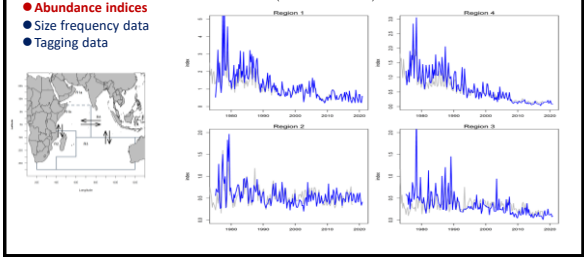


10

DATA (2) ABUNDANCE INDICES

- Catch series
- **Abundance indices**
- Size frequency data
- Tagging data

- CPUE indices (Reference Grid) – Joint LL and

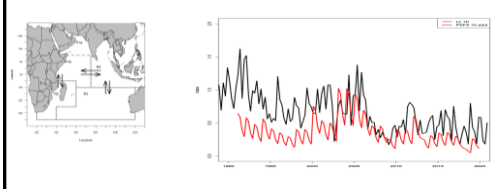


11

DATA (2) ABUNDANCE INDICES

- Catch series
- **Abundance indices**
- Size frequency data
- Tagging data

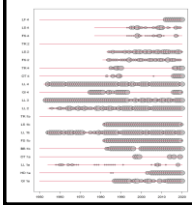
- CPUE indices (Reference Grid) – in Region 1b
- PS FS adult
- Joint LL and

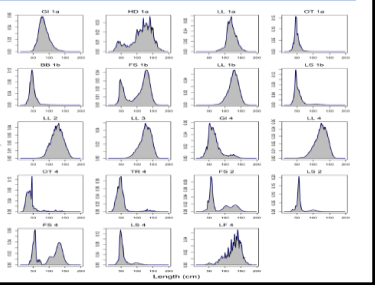


12

Data (3) Size Frequency

- Catch series
- Abundance indices
- **Size frequency data**
- Tagging data

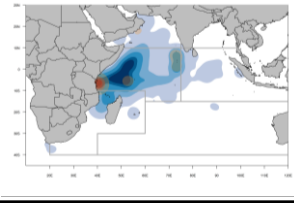




13

Data (4) Tagging Data

- Catch series
- Abundance index:
- Size frequency data
- Tagging data



- 55,000 **releases** 2005–07 (primarily in R1)
- 9,900 **recoveries** 2005–14 (primarily by PS in R1 2006–08)

14

Characterization of Uncertainty

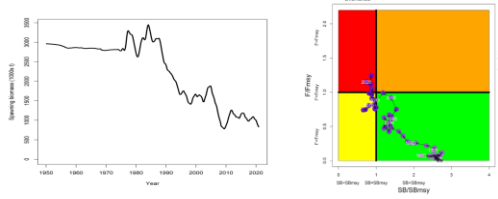
- *Structural uncertainty:* SS3, grid of 96 model configurations:
  - (i) steepness in stock recruitment relationship (3 levels = 2018)
  - (ii) the influence of tagging information (2 levels = 2018)
  - (iii) effect of piracy in longline fleets (2 levels = 2018)
  - ……
  - (iv) growth curves (2 levels ≠ 2018)
  - (v) natural mortality (2 levels ≠ 2018)
  - (vi) spatial structure (2 levels ≠ 2018)

- *Statistical uncertainty:*
  - Average values from multi-variate log-normal distribution

15

Trajectories of SSB and B-&F-ratios

- Biomass estimates have been generally declining over time.
- Spawning biomass in 2020 was estimated to be 87% of the level that supports the maximum sustainable yield (SB_{2020}/ SB_{MSY} = 0.87) [0.83 in 2018].
- Fishing mortality is estimated to be 32% higher than F_{MSY} (F_{2020}/ F_{MSY} = 1.32) [1.20 in 2018].



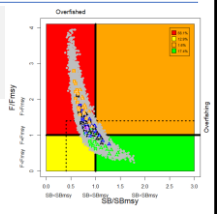
16

Summary of Stock Assessment 2021

- The total catch in 2020 has remained above the estimated MSY since 2012.
- Spawning biomass in 2020 was estimated to be 31% on average of the unfished levels (in 1950)
- The probability of the stock being in the red Kobe quadrant in 2020 is estimated to be 68%.

Area[1]	Indicator	Value	Status[3]
Indian Ocean	Catch in 2020 (t)[2]	430,956	68%*
	Average catch 2016-2020 (t)	434,235	
	MSY (1,000 t) (80% CI)	349 (286-412)	
	F_{MSY} (80% CI)	0.18 (0.15-0.21)	
	SB_{MSY} (1,000 t) (80% CI)	1,333 (1,018-1,648)	
	F_{2020} / F_{MSY} (80% CI)	1.32 (0.68-1.95)	
	SB_{2020} / SB_{MSY} (80% CI)	0.87 (0.63-1.10)	
	SB_{2020} / SB_0 (80% CI)	0.31 (0.24-0.38)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence
[2]Proportion of 2020 catch fully or partially estimated by IOTC Secretariat: 12.5%
*The stock status refers to the most recent years' data used in the assessment conducted in 2021, i.e., 2020

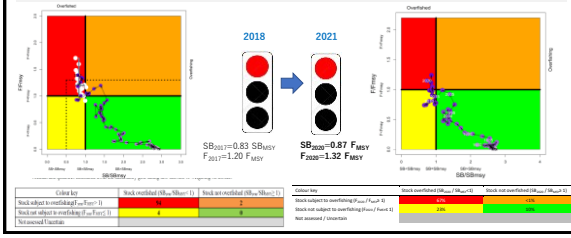


e.g.
Green = Base growth and base M
Orange = Dortel growth and low M

17

Comparison of Results between 2018 and 2021

- The new model grid used in 2021 represents a marked improvement over the previous results available in 2018 and incorporates a far wider range of uncertainty.
- Overall stock status estimates do not differ substantially from the previous assessment.



18

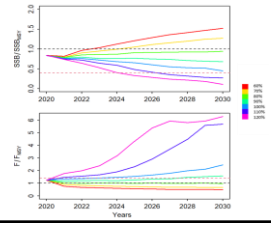
SUMMARY OF STOCK ASSESSMENT

- SB2020/SBMSY = 0.87 (80%CI = 0.63 - 1.10)
- F2020/FMSY = 1.32 (80%CI = 0.68 - 1.95)
- The probability of the stock being in the red Kobe quadrant in 2020 is 68%
- On the weight-of-evidence available since 2018, the yellowfin tuna stock is determined to remain **overfished** and **subject to overfishing**.

19

PROJECTION AND K2SM

The critical errors in the projections and estimations for computing probabilities in the K2SM developed in 2018 have been addressed and the updated projections no longer suffer from the issues previously experienced.



Alternative catch projections (relative to the catch level from 2020) and probability of violating MYP-based target reference points

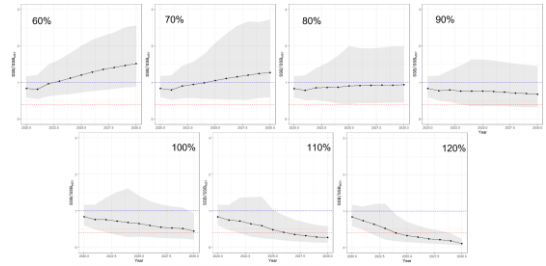
Reference point and projection timeframe	60%	70%	80%	90%	100%	110%	120%
$SB_{2023} < SB_{MSY}$	0.45	0.56	0.68	0.74	0.76	0.82	0.88
$F_{2023} > F_{MSY}$	0.13	0.30	0.53	0.63	0.72	0.82	0.91
$SB_{2030} < SB_{MSY}$	0.1	0.33	0.54	0.76	0.93	0.99	1
$F_{2030} > F_{MSY}$	0.07	0.31	0.49	0.69	0.84	0.97	0.99

Alternative catch projections (relative to the catch level from 2020) and probability of violating MSY-based limit reference points ($SB_{lim} = 0.4\ SB_{MSY}$; $F_{lim} = 1.4\ F_{MSY}$)

Reference point and projection timeframe	60%	70%	80%	90%	100%	110%	120%
$SB_{2023} < SB_{Lim}$	0	0	0	0.05	0.07	0.1	0.16
$F_{2023} > F_{Lim}$	0.03	0.11	0.25	0.43	0.52	0.63	0.78
$SB_{2030} < SB_{Lim}$	0	0	0.01	0.18	0.64	1	1
$F_{2030} > F_{Lim}$	0.02	0.19	0.33	0.60	0.78	0.98	0.98

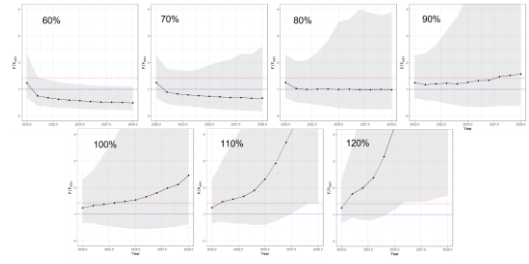
20

B-RATIO (SB/SBMSY)



21

F-RATIO (F/FMSY)



22

PROJECTION (WRT TRP)

- If catches are reduced to **60% of 2020 levels**, there is >50% probability of being above Bmsy levels by 2023 (2020 catch levels indicate the nominal catch available to the WPTT23 in October 2021)
- If catches are reduced to **< 80% of 2020** levels there is **a >50% probability of being above BMSY** in 2030.
- if catches are reduced to **< 80% of 2020** levels there would be **a >50% probability of ending overfishing (F<Fmsy) by 2023 and also by 2030.**

Reference point and projection timeframe	60%	70%	80%	90%	100%	110%	120%
$SB_{2023} < SB_{MSY}$	0.45	0.56	0.68	0.74	0.76	0.82	0.88
$F_{2023} > F_{MSY}$	0.13	0.30	0.53	0.63	0.72	0.82	0.91
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$F_{2030} > F_{MSY}$	0.07	0.31	0.49	0.69	0.84	0.97	0.99

23

PROJECTION (WRT LRP)

- The probability of breaching the biological limit reference point (0.4Bmsy) with 2020 catches is 7% by 2023 and 64% by 2030.
- The probability of breaching the F limit reference point (1.4 Fmsy) with 2020 catch is 52% by 2023 and 78% by 2030.

($SB_{lim} = 0.4\ SB_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)

Reference point and projection timeframe	60%	70%	80%	90%	100%	110%	120%
$SB_{2023} < SB_{Lim}$	0	0	0	0.05	0.07	0.1	0.16
$F_{2023} > F_{Lim}$	0.03	0.11	0.25	0.43	0.52	0.63	0.78
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$F_{2030} > F_{Lim}$	0.02	0.19	0.33	0.60	0.78	0.98	0.98

24

Additional Notes (1) Sensitivity analyses

(Para 85) The SC NOTED that some of the factors and their combinations (e.g., "Dortel" growth, "Low" natural morality, low steepness) in the uncertainty axes resulted in estimates of very low stock productivity and in those cases the model estimated low spawning biomass and highly depleted stock status. …. The SC NOTED that both the "Dortel" growth and "Low" natural mortality option are supported by the recent aging study.

(From Executive Summary) A number of sensitivity runs were conducted to address additional uncertainty. … The results generally indicate a more pessimistic stock status and would lower the estimated median biomass if included in the final grid of models. However, the results from the sensitivity runs were within the range of uncertainty estimated by the model grid. The sensitivity models still require further exploration to ensure uncertainty is being captured appropriately and models are not mis-specified. Other key uncertainties (for example, catch levels) were not explored.

25

Additional Notes (2) Further Investigation

(Para 86) The SC **NOTED** that stock biomass has been declining over the past decade. Total catches have increased through that time, despite decreases in the catches of some fleets, due to increasing catches of some artisanal fleets. Significant uncertainties in the fishing effort levels and trend over time from these artisanal fisheries needs to be further investigated, to better understand the reasons for reported catch increases. The relative impacts of these and other fisheries upon the stock over time also needs further investigation.

(Para 89) The SC **NOTED** that the stock reached the overfished status without going through the overfishing stage. The SC further **NOTED** this occurred around the period 2004-2006 when there were record catches of yellowfin which were thought to be potentially a result of oceanographic factors which increased productivity in the Indian Ocean. The SC **NOTED** that this period was immediately followed by a period of low productivity.

26

Additional Notes (3) Peer-Review

- (Para 101) The SC **NOTED** that the **independent peer review** is planned to take place in 2022-2023 and will consist of a series of activities including a review workshop led by an independent panel. The SC **AGREED** that the review panel should consist of leading stock assessment experts in the field who should have minimal or no involvement in the IOTC scientific process in order to provide a new perspective. The SC also **AGREED** that the panel will be elected via a direct selection process coordinated by the IOTC secretariat, the chairs of the SC and WPTT. The SC **AGREED** that the review is important to improve confidence in future yellowfin stock assessments and would also be relevant to the bigeye and skipjack assessments.
- (Para 102) ….The SC also provided further refinement on the TOR (IOTC-2021-SC24-INF05_rev1) including the assessment of the plausibility of low productivity scenarios, and the implementation of stochastic projections. The updated Terms of Reference as **AGREED** by the SC are contained in **Appendix 6c.**

27

Additional Notes (3) Peer-Review

Table 1: Key activities and outputs from peer review (Process should be discussed in the SC):

Activity	Output	Timeframe	Possible dates
Review of the 2021 yellowfin stock assessment document and report of the 2021 WPTT	Summary paper of general comments and suggestions for any pre-workshop modelling or further information/data required by the review panel (To be reviewed by the WPTT in 2022)	In the year following the assessment	August 2022
Pre-workshop planning meeting. (Online)	Plan for the workshop developed	At least 1 month prior to the workshop	January 2023
Review workshop at a location to be decided	Completion of 5 day + travel in-person modelling workshop to be moderated by the chair of the WPTT	**To be discussed**	**February 2023**
Activity	Output	Timeframe	Possible dates
modelling workshop	coordinated by the WPTT chair, SC chair and Secretariat to IOTC WPTT/SC for review and response (to be reviewed by WPTT data prep meeting in 2023)	end of the modelling workshop	
Finalise peer review report	Final report provided to IOTC WPTT for review	**To be discussed**	**October 2023**
Report finalised	Deliver final report including WPTT comments to IOTC SC	**To be discussed**	**December 2023**

- (Para 103) The SC **NOTED** the importance of the peer review process and its role in providing improved scientific advice for management. The SC therefore **RECOMMENDED** that the Commission endorse the process for a YFT stock assessment review as well as the BET MSE review and provide the financial resources to conduct the work planned.

28

WGFAD 02

- The 2nd IOTC ad hoc Working Group on FADs was held online (4-6 October 2021), chaired by Gorka **Merino** (EU, Spain)
- (Para 105) The SC **NOTED** that WGFAD is tasked with providing advice on FAD management, especially with respect to the impact of dFAD on tropical tuna stocks and the assessment of the optimal number of dFADs to deploy. The SC **NOTED** no such advice was provided. This was due to the lack of transparency to provide data that would allow for a qualitative or quantitative assessment to be conducted. The SC **REQUESTED** future WGFAD meetings to take a more pragmatic approach and focus more on technical issues on FAD management.
- (Para 106) The SC **NOTED** Japan's proposal to request a study of the major impacts of fisheries (especially FAD fisheries) on tropical Tuna species using the stock assessment results. Such analysis can be used to provide the basis for determining the optimal number of dFADs. The study should be reviewed at the next WGFAD meeting. It was also proposed that the SC convene a special meeting to discuss the results in order to provide advice in time for the Commission meeting in May.
- (Para 107) The SC **RECOMMENDED** the Commission endorse the process to improve current definitions of FAD types and FAD activities used by the IOTC, to be conducted by the WPTT and WGFAD.
- Gorka **Merino** (EU,Spain) and Abdirahim **Sheik Heile** (Somalia) were elected as co-Chairs of the WGFAD.

29

Food and Agriculture Organization of the United Nations

Stock Status and Management Advice (2)

Billfishes

30

WPB 19

Meeting

- Chair: Denham Parker (South Africa); Vice-chair: Jie Cao (China)
- WPB: 13-16 September 2021
  - ✓ Stock assessment for striped marlin
  - ✓ Stock assessment for black marlin

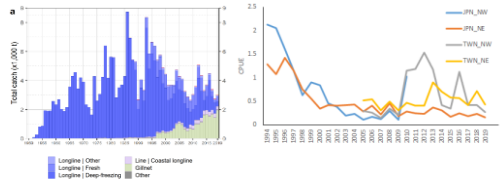
31

Stock Assessment for Striped Marlin

Stock assessment used for the management advice

2 Models applied – SS3 & JABBA

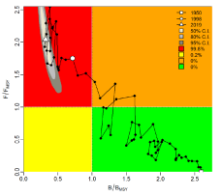
- Four longline CPUE time series
- Length composition for 2 fleets



32

Stock Status for Striped Marlin

Area[1]	Indicators		2021 stock status determination
Indian Ocean	Catch 2020[2] (t)	2,587	100%[a]
	Average catch 2016-2020 (t)	3,292	
	MSY (1,000 t) (JABBA)	4.60 (4.12 - 5.08)[2]	
	MSY (1,000 t) (SS3)	4.82 (4.48 - 5.16)	
	F_{MSY} (JABBA)	0.26 (0.20-0.33)	
	F_{MSY} (SS3)	0.23 (0.23 - 0.23)	
	B_{MSY} (JABBA)	17.89 (14.34 - 23.11)	
	SB_{MSY} (SS3)	6.162 (6.343, 5.837)	
	F_{2020}/F_{MSY} (JABBA)	2.04 (1.35 - 2.93)	
	F_{2019}/F_{MSY} (SS3)	3.93 (2.30 - 5.31)	
	B_{2020}/B_{MSY} (JABBA)	0.32 (0.22 - 0.51)	
	SB_{2020}/SB_{MSY} (SS3)[a]	0.47 (0.35 - 0.63)	
	B_{2020}/B_0(JABBA)	0.12 (0.10 - 0.19)	
	SB_{2020}/SB_0 (SS3)	0.06 (0.05 - 0.08)	



Colour key	Stock overfished (B_{year}/B_{MSY}< 1)	Stock not overfished (B_{year}/B_{MSY}≥ 1)
Stock subject to overfishing (F_{year}/F_{MSY}> 1)	100%	0.0%
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)	0.0%	0.0%
Not assessed/Uncertain		

33

Projection and Management Advice for Striped Marlin

Alternative catch projections (relative to the 2019 catch of 3,001 t) and probability (%) of violating MSY-based target reference points ($B_{targ} = B_{MSY}$; $F_{targ} = F_{MSY}$)

Reference point and projection timeframe	60% (1,801 t)	70% (2,101 t)	80% (2,401 t)	90% (2,701 t)	100% (3,001 t)	110% (3,301 t)	120% (3,601 t)	130% (3,901 t)	140% (4,202 t)
$B_{2032} < B_{MSY}$	100	100	100	100	100	100	100	100	100
$F_{2032} > F_{MSY}$	21	49	75	90	97	99	100	100	100
$B_{2032} < B_{MSY}$	6	18	39	62	82	93	98	100	100

Table 3. Striped marlin: Probability (percentage) of achieving the KOBE green quadrat from 2022-2029 for a range of constant catch projections (JABBA).

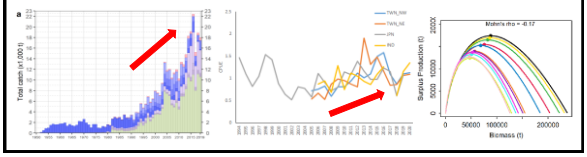
TAC | Year	2022	2023	2024	2025	2026	2027	2028	2029
300	4	31	75	95	99	100	100	100
600	2	22	62	89	98	100	100	100
900	1	15	48	79	94	98	100	100
1201	1	9	33	65	87	96	99	100
1501	1	6	22	49	73	89	96	98
1801	0	3	13	32	55	75	87	94
2101	0	2	7	19	37	55	71	82
2401	0	1	3	10	21	35	49	61
2701	0	0	2	5	10	18	28	38
3001	0	0	1	2	4	8	13	18

- Recovery to the green quadrant of the Kobe plot (60% to 90%) by 2026 as per Resolution 18/05 - annual catches remain between 900 t – 1,500 t
- Catch 2020 = 2,587 t

34

Stock Assessment for Black Marlin

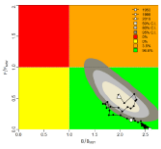
- Four longline CPUE time series, single catch time series
- Conflicts in information between CPUE and catch data lead to large uncertainties
- In 2018 assessment, stock status to change from the red (2016) to the green (2018) zone of the Kobe plot without any evidence of a rebuilding trend.
- JABBA analysis: strong, systematic retrospective pattern, compensating for simultaneous increases in catch and relative abundance by inflating pristine biomass estimate (K).
- Results provide little confidence in the model's



35

Stock Status & Management Advice for Black Marlin

- The 2020 catches (16,977 t) were substantially higher than the MSY limits stipulated in Res (18/05) which is 9,932 t.
- The Commission should provide mechanisms to ensure that catch limits are not exceeded by all concerned fisheries.



Area[1]	Indicators		2021 stock status determination
Indian Ocean	Catch 2020 (t)[2]	16,977	
	Average catch 2016–2020 (t)	18,289	
	MSY (1,000 t) (95% CI)	17.30 (11.00 – 35.02)	
	F_{MSY} (95% CI)	0.20 (0.12 - 0.34)	
	B_{MSY} (1,000 t) (95% CI)	87.39 (53.82-167.70)	
	F_{2019}/F_{MSY} (95% CI)	0.53 (0.22 – 1.05)	
	B_{2020}/B_{MSY} (95% CI)	1.98 (1.42 – 2.57)	
	B_{2020}/B_0 (95% CI)	0.73 (0.53 – 0.95)	

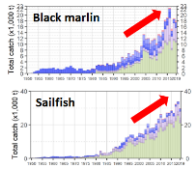
[1] Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence
[2] Proportion of 2020 catch fully or partially estimated by IOTC Secretariat: 35.4%

36

Discussion in light of Resolution 18/05

Resolution 18/05
On Management Measures for the Conservation of the Billfishes: Striped Marlin, Black Marlin, Blue Marlin and Indo-Pacific Sailfish

Year	Black marlin	IP sailfish
2020 Catch	16 997	26 890
5 years average	18 289	29 897
Catch limit set by Resolution 18/05	9 932	25 000
Updated MSY values	17 300 in 2021 assessment	23 900 in 2019 assessment
Compliance to Res. 18/05	Current and recent catches **exceeding the limit**	Current and recent catches **exceeding the limit**



37

Discussion in light of Resolution 18/05

(Par 56)

The SC **NOTED** that catches in recent years for **black marlin** and **Indo-Pacific sailfish** have exceeded all recent MSY estimates and catch limits set by Resolution 18/05 (para 3), and that the current catch trends for the two species show no signs of decline - these catch limits will likely be exceeded again in 2021. Furthermore, results from the 2021 assessment of **striped marlin** provided certainty that the stock is overfished and subject to overfishing (100% probability) and that biomass has been below that which would produce MSY for over a decade. The biomass of striped marlin is considered severely depleted.

As such, the SC **NOTED** the inadequacy of Resolution 18/05 in limiting the catches of billfishes and **RECOMMENDED** the Commission to review the Resolution to update catch limits and provide mechanisms to ensure these limits are adhered to.

38

Stock Status and Management Advice (3)

Blue Shark

39

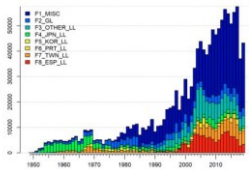
WPEB 17

Meetings

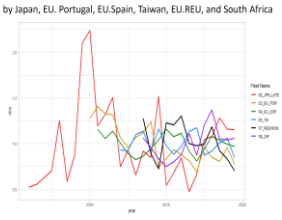
- Chair: Sylvain Bonhommeau (EU, France)
- Vice-chair: Mariana Tolotti (EU, France), Mohammed Koya (India)
- WPEB 17(DP): 12-14 April 2021
  - ✓ Data preparation for blue shark and silky shark
- WPEB 17: 6-10 September 2021
  - ✓ Stock assessment for blue shark and silky shark

40

Blue Shark



Standardised CPUE as reported to the IOTC by Japan, EU. Portugal, EU.Spain, Taiwan, EU.REU, and South Africa

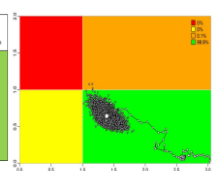


41

Blue Shark

Stock assessment model: SS3

Area	Indicators		2021 stock status determination
Indian Ocean	Reported catch 2020 (t)	21,344	99.9%
	Estimated catch 2019 (t)	43,240	
	Not elsewhere included (nei) sharks[1] 2020 (t)	20,552	
	Average reported catch 2016–20 (t)	25,144	
	Average estimated catch 2015–19 (t)	48,781	
	Avg. not elsewhere included (nei) sharks[1] 2016–20 (t)	30,277	
	MSY (1,000 t) (80% CI)[2]	36.0 (33.5 - 38.6)	
	F_{MSY} (80% CI)[2]	0.31 (0.306 - 0.31)	
	SB_{MSY} (1,000 t) (80% CI)[2,3]	42.0 (38.9 - 45.1)	
	F_{2019}/F_{MSY} (80% CI)[2]	0.64 (0.53 - 0.75)	
	SB_{2019}/SB_{MSY} (80% CI)[2]	1.39 (1.27 - 1.49)	
	SB_{2019}/SB_0 (80% CI)[2]	0.46 (0.42 - 0.49)	



Colour key	Stock overfished ($SB_{2019}/SB_{MSY} < 1$)	Stock not overfished ($SB_{2019}/SB_{MSY} \geq 1$)
Stock subject to overfishing ($F_{2019}/F_{MSY} > 1$)	0%	0.1%
Stock not subject to overfishing ($F_{2019}/F_{MSY} \leq 1$)	0%	99.9%
Not assessed/Uncertain		

42

Projection Results for Blue Shark

Table 3. Blue shark: Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based reference points for nine constant catch projections using the base case model (catch level from 2019* (43,240 t), ± 10%, ± 20%, ± 30% and ± 40%) projected for 3 and 10 years

Reference point and projection time frame	Alternative catch projections (relative to the catch level* from 2019) and probability (%) of exceeding MSY-based reference points								
Catch Relative to 2019	60%	70%	80%	90%	100%	110%	120%	130%	140%
Catch (t)	(25,944)	(30,267)	(34,592)	(38,916)	(43,240)	(47,564)	(51,888)	(56,212)	(60,535)
$SB_{2022} < SB_{MSY}$	0%	0%	0%	0%	0%	0%	0%	0%	0%
$F_{2022} > F_{MSY}$	0%	0%	0%	0%	0%	1%	5%	16%	36%
$SB_{2029} < SB_{MSY}$	0%	0%	0%	0%	0%	2%	9%	25%	48%
$F_{2022} > F_{MSY}$	0%	0%	0%	0%	1%	13%	44%	75%	90%

If the catches are increased by over 20%, the probability of maintaining spawning biomass above MSY reference levels (SB>SBMSY) over the next 10 years will be decreased

43

Management Advice for Blue Shark

- Target and limit reference points have not yet been specified for pelagic sharks in the Indian Ocean. Even though the 2021 assessment indicates that Indian Ocean blue shark are not overfished nor subject to overfishing, increasing current catches is likely to result in decreasing biomass and the stock becoming overfished and subject to overfishing in the near future.
- The stock should be closely monitored. While mechanisms exist for encouraging CPCs to comply with their recording and reporting requirements (Resolution 16/06), these need to be further implemented by the Commission, so as to better inform scientific advice in the future.

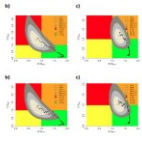
44

Stock Assessment for Silky Shark

- Stock assessment was attempted for this stock. However, due to uncertainty of data and results of CMSY methods, the SC did not provide any new management advice.

Area	Indicators	2018 stock status determination
Indian Ocean	Reported catch 2020 Not elsewhere included (ned) shares' 2020 Average reported catch 2016-20 Av. not elsewhere included (ned) shares' 2016-20	1,1641 20,5521 1,6931 30,2771
	MSY (1,000 t) (80% CI) F_{MSY} (80% CI) SB_{MSY} (1,000 t) (80% CI) $F_{current}/F_{MSY}$ (80% CI) $SB_{current}/SB_{MSY}$ (80% CI) SB_{2029}/SB_{MSY} (80% CI)	unknown

- Despite the absence of stock assessment information, the Commission should consider taking a cautious approach by implementing some management actions for silky sharks. While mechanisms exist for encouraging CPCs to comply with their recording and reporting requirements (Resolution 18/07), these need to be further implemented by the Commission so as to better inform scientific advice.



45

Stock Status and Management Advice (4)

Neritic Tuna Species

46

Main Issues on Neritic Tuna

Meeting (WPNT 11, 5-9 July 2021@virtual)

- Chair: Ririk Sulistyaningsih (Indonesia); Vice-chair: Farhad Kaymaram (Iran).

Data issues

- (Para 35) The SC NOTED that the main outcomes from the WPNT11 highlight the level of **non-reporting** or **partial reporting** of nominal catch, catch-and-effort and size data for many fisheries, and consequently the **lack of reliable data to conduct the assessments** of neritic species.
- (Para 36) The SC RECALLED the need for all concerned CPCs to ensure that the catch, effort and size data for these fisheries are systematically reported to the Secretariat in accordance with Resolution 15/02.

Stock assessment in 2021

- Three stock: Indo-Pacific king mackerel, frigate tuna and bullet tuna

47

Stock assessment models

	Data-rich	Data-moderate	Data-poor
	Integrated assessment with age- (and gender-) structured models (SS3, SCAA, ASPM,…)	Age-aggregated models (JABBA, BSPM, ASPIC,..)	Data-limited methods (C-MSY, OCOM)
Catch series	✓	✓	✓
STD-CPUE	✓	✓	
Catch-at-size (or Catch-at-age)	✓		
Biological parameters	✓		
Tag-data	(✓)		

yellowfin, bigeye, skipjack, albacore, swordfish

billfish, marlins, shark

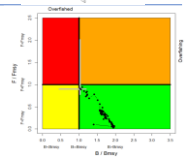
neritic species

48

INDO-PACIFIC KING MACKEREL

Area[1]	Indicators		2021 stock status determination
Indian Ocean	Catch 2020[2] (t)	42,471	35%
	Average catch 2016-2020 (t)	44,870	
	MSY (1,000 t)	46.9 (37.7–58.4)	
	F_{MSY}	0.74 (0.56–0.99)	
	B_{MSY} (1,000 t)	63.2 (42–94)	
	$F_{current}/F_{MSY}$	0.90 (0.78–2.01)	
	$B_{current}/B_{MSY}$	1.03 (0.46–1.19)	
	$B_{current}/B_0$	0.51 (0.23–0.60)	

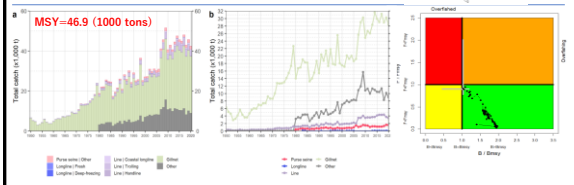
Colour key	Stock overfished ($B_{current}/B_{MSY}$< 1)	Stock not overfished ($B_{current}/B_{MSY}$> 1)
Stock subject to overfishing ($F_{current}/F_{MSY}$> 1)	16%	19%
Stock not subject to overfishing ($F_{current}/F_{MSY}$< 1)	30%	35%
Not assessed/Uncertain		



- Two data-limited methods (CMSY, LB-SPR) showed comparable results, but CMSY gives a defensible approach
- A 35% probability of the stock being in the green, and the based on the weight-of-evidence available in 2021, the stock status has been revised from "Unknown" to "**not overfished and not subject to overfishing**".

49

INDO-PACIFIC KING MACKEREL

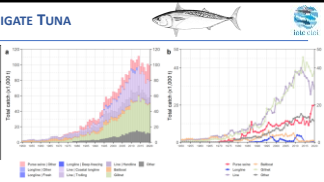


- **Management advice:** Reported catches has increased considerably since the late 2000s with recent catches fluctuating around estimated MSY, although the catch in 2020 was below the estimated MSY. This suggests that the stock is very close to being fished at MSY levels and that higher catches may not be sustained despite the substantial uncertainty associated with the assessment, a precautionary approach to management is recommended.

50

FRIGATE TUNA

Indicators	2021 stock status determination
Catch 2020[2] (t) 98,875	
Average catch 2016–2020 (t) 98,017	
MSY (1,000 t) (80% CI) unknown	
F_{MSY} (80% CI) unknown	
B_{MSY} (1,000 t) (80% CI) unknown	
$F_{current}/F_{MSY}$ (80% CI) unknown	
$B_{current}/B_{MSY}$ (80% CI) unknown	
$B_{current}/B_0$ (80% CI) unknown	



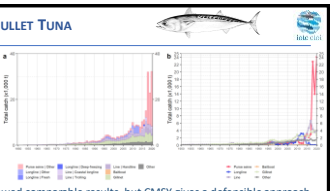
- Two data-limited methods (CMSY, LB-SPR) showed comparable results, but CMSY gives a defensible approach
- (Para 39) … However, the catch data for frigate tuna are very uncertain given the high percentage of the catches that had to be estimated by the Secretariat. The SC **EXPRESSED concern** that the lack of data on which to base an assessment has resulted on the stock status for this species remaining unknown.

Management advice: In the absence of a stock assessment of frigate tuna a limit to the catches should be considered by the Commission, by ensuring that future catches do not exceed the average catches estimated between 2009 and 2011 (**101,260 t**). The reference period (2009-2011) was chosen based on the most recent assessments of neritic species in the Indian Ocean for which an assessment is available under the assumption that also for frigate tuna MSY was reached between 2009 and 2011. This catch advice should be maintained until an assessment of frigate tuna is available.

51

BULLET TUNA

Indicators	2021 stock status determination
Catch 2020[2] (t) 32,251	
Average catch 2016–2020 (t) 22,690	
MSY (1,000 t) (80% CI) unknown	
F_{MSY} (80% CI) unknown	
B_{MSY} (1,000 t) (80% CI) unknown	
$F_{current}/F_{MSY}$ (80% CI) unknown	
$B_{current}/B_{MSY}$ (80% CI) unknown	
$B_{current}/B_0$ (80% CI) unknown	



- Two data-limited methods (CMSY, LB-SPR) showed comparable results, but CMSY gives a defensible approach
- (Para 40) The SC NOTED that as with Frigate tuna, the stock status for Bullet tuna could not be determined due to the lack of suitable data. The SC **ENCOURAGED** CPCs to improve the data collection and submission for these important species, in order to be able to provide science-based management advice.

Management advice: In the absence of a stock assessment of bullet tuna a limit to the catches should be considered by the Commission, by ensuring that future catches do not exceed the average catches estimated between 2009 and 2011 (**8,547t**). This catch advice should be maintained until an assessment of bullet tuna is available.

52

STOCK STATUS SUMMARY

Stock	WP	2015	2016	2017	2018	2019	2020	2021	2022
Albacore	Temperate		SA			SA			SA
Bigeye tuna			SA			SA			SA
Skipjack tuna	Tropical			SA			SA		
Yellowfin tuna		SA	SA		SA	SA		SA	
Swordfish							SA		
Black marlin			SA		SA			SA	
Blue marlin	Billfishs		SA			SA			SA
Striped marlin		SA			SA			SA	
Indo-Pacific Sailfish		SA				SA			SA
Bullet tuna								SA	
Frigate tuna								SA	
Kawakawa	Neritics	SA		SA			SA		
Longtail tuna		SA	SA	SA			SA		
Indo-Pacific king mackerel		SA	SA					SA	
Narrow-barred Spanish mackerel		SA	SA	SA			SA		
Blue shark				SA				SA	
Oceanic whitetip shark									
Scalloped hammerhead shark									SA
Shortfin mako shark	Bycatch						SA		
Silky shark	(shark)							SA	
Bigeye thresher shark									SA
Pelagic thresher shark									SA
Seabirds	Bycatch								
Marine mammals	(others)								
Seaturtles									

53

Food and Agriculture Organization of the United Nations

MSE PROGRESS

54

MSE in General

Meetings

- Chair: Hilario Murua (ISSF)
- WPM(MSE): 1-5 Mach 2021
  - ✓ Technical discussion on MSE
- WPM12: 18-20 October 2021
  - ✓ MSE, joint CPUE, etc.

- The WPM and WPM MSE taskforce took into consideration the recommendations and discussions in TCMP04

55

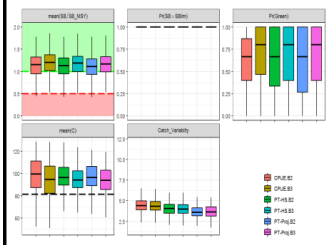
MSE Progress for Bigeye Tuna

- SC, WPM, WPTT and MSE taskforce as well as TCMP have discussed bigeye MSE over several years. Thanks to those dedicated discussion, OMs and the MP evaluation process are now at a reasonably mature stage, with a suite of potentially viable candidate MPs that all achieve current tuning objectives

- **(Para 122)** The SC **NOTED** that the bigeye tuna OM, which has been developed over the years, has proven to be relatively stable. The SC also **NOTED** that many candidate MPs have been thoroughly evaluated by MSE so far. Following the WPM' recommendation, the SC has determined that the bigeye OM and MSE has appropriately considered the key causes of uncertainty for this stock and that the conditions for applying the "Butterworth guillotine" (stop OM reconditioning) are met. The SC therefore **AGREED** to endorse the bigeye tuna OM.

56

MSE Progress for Bigeye Tuna



- Summary of performance indicators for 6 MP/tuning criteria combinations
  - 3 MPs (CPUE, Model-based hockey stick, and Model-based Catch and CPUE projection)
  - 2 tuning criteria (60% and 70% probability of being in the Kobe green quadrant over the reference years)
- The contrast in MP performance is determined by the tuning targets and as such, by excluding the CPUE MP, the main signals are not lost.

57

MSE Progress & Peer-reviw for Bigeye Tuna

- **(Para 123)** The SC NOTED two MPs, specifically the Model-based hockey stick (PT-HS) and the Model-based Catch and CPUE projection (PT-PROJ), both tuned against two tuning criteria (60% and 70% probability of being in the Kobe green quadrant over the reference years) are recommended by the WPM, based on their performance indicators. The SC **AGREED** to present the MPs together with their performance indicators to the TCMP/Commission. The SC NOTED it will be **up to the TCMP/Commission to decide on the final MP**.
- **(Para 125)** External review of the bigeye MSE is planned to take place 2022-2024. The SC discussed the timeframes, workplans and deliverables, and provided further refinement on the TOR. The SC **AGREED** that the process of the external review should not impede the adoption of an interim bigeye MP by the Commission prior to completion of the review. The SC also **AGREED** that the number of reviewers required will be determined at a later stage depending on the availability of funding.
- Further TCMP results will be reported later in the ITEM.10

58

Main Points for Other 4 Species

Albacore:

- Further investigation of selection criteria of OM grids has been conducted
- In addition to commonly used MPs in the IOTC, a CCSBT type MP was tested

Skipjack:

- To review and potentially revise the HCR as required by Res 16/02, with the aim of developing a full skipjack MP (current HCR is not a fully specified MP)
- Now depletion-based RPs have been used for SKJ. Using the both (MSY-related and depletion-related) might make the communication difficult, but the information on MSY-based RPs could be included in the full table of performance in addition to depletion-based RPs .

59

Main Points for Other 4 Species

Yellowfin:

- The stock assessment has been significantly improved, although several key issues remain
- Redevelopment and reconditioning of OMs are needed
- Different conditioning approaches were discussed in 2021 SC and WPM(MSE) in 2022
- Further technical discussion will continue for evaluation of the approach in WPM, WPTT and SC this year

Swordfish:

- Work is in progress, by following the approached used in Albacore MSE
- SC will receive progress made in 2022 following feedback given in WPM and WPB

Albacore, Yellowfin, Skipjack and swordfish:

- Outcomes will be reported in TCMP and Commission in 2023

60

Exceptional Circumstances

Stage 1

When a Management Procedure (MP) is adopted, SC will annually review the following items for evidence of exceptional circumstances:

1. Information on the stock, fishing operations, population dynamics parameters, or biology that is outside the range (90% probability interval from MSE projections – or % to be decided by the SC) considered during MSE of the adopted MP.
2. Input data to the MP that are missing, have changed, or outside the range (90% – or % to be decided by the SC) simulated in the MSE.
3. Implementation of the MP that is inconsistent with the MP advice (e.g. total catch is greater than the TAC recommended by the MP).

Stage 2

If there is evidence for exceptional circumstances the SC will review the potential impact and severity on implementation and performance of the MP.

61

Exceptional Circumstances

Stage 3

Depending on the impact of the exceptional circumstance, the SC will provide advice on the action required, such as a collection of ancillary data to be reviewed, review of the MP and, if necessary, provide updated management advice (e.g. TAC advice). As a guide, the SC could consider the following:

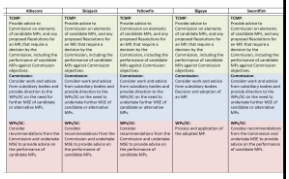
If there is a very high potential impact the SC will consider TAC changes. TAC change can be determined by an x% change to the TAC, where the x% is based on an urgently updated assessment and projections and is consistent with meeting the objectives of the MP.

- **(Para 114)** The SC NOTED the guidelines included as Appendix 6a to this report to deal with exceptional circumstances in the MSE process. The SC further NOTED that these guidelines are **a living document** and revisions may still be required in the future. The SC **RECOMMENDED** that the Commission consider and endorse the guidelines.

62

Schedule of Work for MSE Development

- Schedule of work previously agreed was a little optimistic, and considering current progress, the SC revised its schedule of work for MSE development
- **(Para 115)** The SC NOTED the revised schedule of MSE work included as Appendix 6b to this report to provide the timeframe for the development of management procedures for key IOTC species. The SC NOTED that the revised MSE schedule is still **ambitious** but that the technical work could, in principle, be completed within the proposed timeframes with minor adjustments. The SC **RECOMMENDED** that the Commission consider and endorse the revised timetable.



63

WP on Data Collection and Statistics

64

On WPDCS 17

Meeting

- Chair: Ndegwa (Kenya), Vice-Chair: Barde (EU, France)
- WPDCS17: 29 Nov – 3 Dec 2021
- A number of items
  - data collection
  - quality of data
  - observer scheme etc.
- Several recommendations (I will introduce them when I report the consolidated list of recommendations soon)

65

WGFAD 02

- The 1st Session of IOTC ad-hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) was held online (15 - 17 November 2021), chaired by Dr. **Murua** (ISSF)
- (Para 142) The SC **NOTED** the outcomes and recommendations from the WPDCS specifically regarding the WGEMS, **ACKNOWLEDGED** that the nature and scope of the Working Group include also elements of compliance, and DISCUSSED whether to maintain the Working Group under direct responsibility of the WPDCS.
- (Para 143) The SC **NOTED** the outcomes of the 1st ad-hoc IOTC WGEMS and **RECOMMENDED** the Commission endorse its continuation in the future and for the Commission to discuss if the WGEMS should remain under the WPDCS or report directly to the SC or CoC. The SC ENDORSED the Terms of Reference and Plan of Work for the WGEMS.
- Hilario **Murua** (ISSF) was elected as Chairperson, and Don **Bromhead** (Australia) was elected as Vice-Chairperson for the next biennium.

66

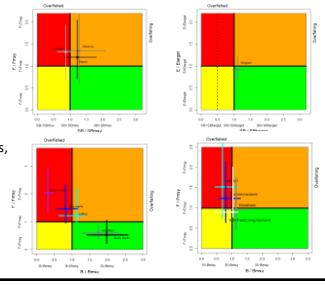
RECOMMENDATIONS TO THE COMMISSION

67

RECOMMENDATIONS TO THE COMMISSION (1)

SC24.01 – SC24.03

The SC **RECOMMENDED** that the Commission note the management advice developed for each species under the IOTC mandate (tropical, temperate, billfish, neritic tuna and mackerel), as provided in the Executive Summary for each species, and combined Kobe plots.



68

RECOMMENDATIONS TO THE COMMISSION (2)

Sharks

SC24.04 (para. 158) The SC **RECOMMENDED** that the Commission note the management advice developed for a subset of shark species commonly caught in IOTC fisheries for tuna and tuna-like species:

- Blue shark (*Prionace glauca*) – Appendix 23
- Oceanic whitetip shark (*Carcharhinus longimanus*) – Appendix 24
- Scalloped hammerhead shark (*Sphyrna lewini*) – Appendix 25
- Shortfin mako shark (*Isurus oxyrinchus*) – Appendix 26
- Silky shark (*Carcharhinus falciformis*) – Appendix 27
- Bigeye thresher shark (*Alopias superciliosus*) – Appendix 28
- Pelagic thresher shark (*Alopias pelagicus*) – Appendix 29

Marine turtles

SC24.05 (para. 159) The SC **RECOMMENDED** that the Commission note the management advice developed for marine turtles, as provided in the Executive Summary encompassing all six species found in the Indian Ocean:

- Marine turtles – Appendix 30

69

RECOMMENDATIONS TO THE COMMISSION (3)

Seabirds

SC24.06 (para. 160) The SC **RECOMMENDED** that the Commission note the management advice developed for seabirds, as provided in the Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:

- Seabirds – Appendix 31

Marine Mammals

SC24.07 (para. 161) The SC **RECOMMENDED** that the Commission note the management advice developed for cetaceans, as provided in the newly developed Executive Summary encompassing all species commonly interacting with IOTC fisheries for tuna and tuna-like species:

- Cetaceans – Appendix 32

70

RECOMMENDATIONS TO THE COMMISSION (4)

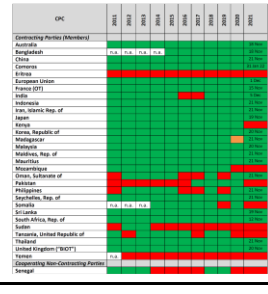
NATIONAL REPORTS FROM CPCS

SC24.08 (para. 26) **NOTING** that the Commission, at its 25th Session (in 2021), noted that there was an improvement in submission of National reports in 2020 over the previous year, it also reiterated its concerns about the lack and poor quality of data, and again, strongly encouraged CPCs to take immediate steps to review, and where necessary, improve their performance with respect to the provision of data through improved compliance with Resolutions 15/01 and 15/02. The SC **RECOMMENDED** that the Commission note that there was a decrease in the Submission of National reports in 2021, as only 21 reports were provided by CPCs (25 in 2020, 23 in 2019, 26 in 2018, 23 in 2017 and 23 in 2016 (Table 2).

SC24.09 (para. 27) The SC **RECOMMENDED** that the Compliance Committee and Commission note the lack of compliance by 9 Contracting Parties (Members) and 1 Cooperating Non-Contracting Party (CNCPs) that did not submit a National Report to the Scientific Committee in 2021, noting that the Commission agreed that the submission of the annual reports to the Scientific Committee is mandatory.

71

RECOMMENDATIONS TO THE COMMISSION (4)



72

RECOMMENDATIONS TO THE COMMISSION (5)

REPORT OF THE 19TH SESSION OF THE WORKING PARTY ON BILLFISH (WPB19)

SC24.10 (para. 42) **RECALLING** that one of the Indian Ocean billfish species (shortbill spearfish, *Tetrapturus angustirostris*) is currently not listed among the species managed by IOTC, and considering the ocean-wide distribution of this species, its highly-migratory nature, and that it is a common bycatch in IOTC managed fisheries, the SC reiterated its previous **RECOMMENDATION** that shortbill spearfish be included as an IOTC species

73

RECOMMENDATIONS TO THE COMMISSION (6)

Revision of catch levels of Marlins under Resolution 18/05

SC24.11 (para. 56) The SC **NOTED** that catches in recent years for black marlin and Indo-Pacific sailfish have exceeded all recent MSY estimates and catch limits set by Resolution 18/05 (para 3), and that the current catch trends for the two species show no signs of decline - these catch limits will likely be exceeded again in 2021. Furthermore, results from the 2021 assessment of striped marlin provided certainty that the stock is overfished and subject to overfishing (100% probability) and that biomass has been below that which would produce MSY for over a decade. The biomass of striped marlin is considered severely depleted. As such, the SC **NOTED** the inadequacy of Resolution 18/05 in limiting the catches of billfishes and **RECOMMENDED** the Commission to review the Resolution to update catch limits and provide mechanisms to ensure these limits are adhered to

74

RECOMMENDATIONS TO THE COMMISSION (7)

REPORT OF THE 17TH SESSION OF THE WORKING PARTY ON ECOSYSTEMS AND BYCATCH (WPEB17)

Status of development and implementation of national plans of action for seabirds and sharks, and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations

SC24.12 (para. 60) The SC **RECOMMENDED** that the Commission note the current status of development and implementation of National Plans of Action (NPOAs) for sharks and seabirds, and the implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations, by each CPC as provided in Appendix 5, recalling that the IPOA-Seabirds and IPOA-Sharks were adopted by the FAO in 1999 and 2000, respectively, and recommended the development of NPOAs.

75

RECOMMENDATIONS TO THE COMMISSION (8)

Other matters

SC24.13 (para. 74) The SC **ACKNOWLEDGED** the proposed Letter of Intent between the IWC and IOTC and **NOTED** that this letter is based on the language used in the Letter of Intent between IOTC and ACAP which has been accepted by the Commission. The SC **RECOMMENDED** that the letter is presented at the Commission for further consideration.

SC24.14 (para. 77) The SC **NOTED** the use of subsurface gillnetting in the Indian Ocean may be an effective mitigation measure to reduce bycatch of cetaceans, sharks and sea turtles and that Resolution 19/01 already requests the utilization of subsurface gillnets by 2023 to mitigate ecological impacts of this gear. The SC **RECOMMENDED** that it be kept informed by the Commission on the current status of implementation of the relevant clause of Resolution 19/01.

76

RECOMMENDATIONS TO THE COMMISSION (9)

REPORT OF THE 23RD SESSION OF THE WORKING PARTY ON TROPICAL TUNAS (WPTT23)

Yellowfin tuna Stock Assessment

SC24.15 (para. 103) The SC **NOTED** the importance of the peer review process and its role in providing improved scientific advice for management. The SC therefore **RECOMMENDED** that the Commission endorse the process for a YFT stock assessment review as well as the BET MSE review and provide the financial resources to conduct the work planned.

Update on the WGFAD02

SC24.16 (para. 107) The SC **RECOMMENDED** the Committee endorse the process to improve current definitions of FAD and FAD activities used by the IOTC, to be conducted by the WPTT and WGFAD

REPORT OF THE 12TH SESSION OF THE WORKING PARTY ON METHODS (WPM12)

77

RECOMMENDATIONS TO THE COMMISSION (10)

Management Strategy Evaluation Progress

SC24.17 (para. 114) The SC **NOTED** the guidelines included as Appendix 6a to this report to deal with exceptional circumstances in the MSE process. The SC further **NOTED** that these guidelines are a living document and revisions may still be required in the future. The SC **RECOMMENDED** that the Commission consider and endorse the guidelines.

SC24.18 (para. 115) The SC **NOTED** the revised schedule of MSE work included as Appendix 6b to this report to provide the timeframe for the development of management procedures for key IOTC species. The SC **NOTED** that the revised MSE schedule is still ambitious but that the technical work could, in principle, be completed within the proposed timeframes with minor adjustments. The SC **RECOMMENDED** that the Commission consider and endorse the revised timetable.

78

Recommendations to the Commission (11)

Report of the 17th Session of the Working Party on Data Collection and Statistics (WPDCS17)

SC24.19 (para. 136) **NOTING** that the WPDCS identified aspects of several data-related resolutions that are either unclear or inconsistent (15/01, 15/02 and 19/02) the SC **RECOMMENDED** that the Commission consider how to best address these issues at the next revision of each resolution.

SC24.20 (para. 139) **ACKNOWLEDGING** that the workload of the Secretariat data team has increased markedly in recent years to manage an increasing number of datasets, provide more data outputs, and improve data access, the SC **RECOMMENDED** that the Commission consider strengthening the capacity of the Secretariat's Data Group with the addition of an extra staff member.

SC24.21 (para. 140) The SC **ACKNOWLEDGED** the long-term relationship between the OFCF and the IOTC to improve the collection, management and reporting of fisheries statistics and **RECOMMENDED** the Commission consider the continuation of this collaboration through an appropriate arrangement.

Update on WGEMS01

SC24.22 (para. 143) The SC **NOTED** the outcomes of the 1st ad-hoc IOTC WGEMS and **RECOMMENDED** the Commission endorse its continuation in the future and for the Commission to discuss if the WGEMS should remain under the WPDCS or report directly to the SC or CoC. The SC **ENDORSED** the Terms of Reference and Plan of Work for the WGEMS.

79

Recommendations to the Commission (12)

Summary discussion of matters common to Working Parties (capacity building activities – stock assessment course; connecting science and management, etc.)

Invited Expert(s) at the WP meetings

SC24.23 (para. 145) Given the importance of external independent review for working party meetings, the SC **RECOMMENDED** the Commission continues to allocate sufficient budget for invited scientific experts to be regularly invited to scientific working party meetings.

Meeting participation fund

SC24.24 (para. 147) The SC reiterated its **RECOMMENDATION** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with visa application procedures for candidates.

IOTC species identification guides: Tuna and tuna-like species

SC24.25 (para. 148) The SC reiterated its **RECOMMENDATION** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can continue to be printed as many CPC scientific observers, both on board and at port, need to have hard copies.

80

Recommendations to the Commission (13)

Chairpersons and Vice-Chairpersons of the SC and its subsidiary bodies

SC24.26 (para. 150) The SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in Appendix 7.

Program of work and schedule of Working Party and Scientific Committee meetings

Consultants

SC24.27 (para. 181) Noting the highly beneficial and relevant work done by IOTC stock assessment consultants in previous years, the SC **RECOMMENDED** that the engagement of consultants be continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs.

81

List of Chairs and Vice-chairs

Group	Chair/Vice-Chair	Chair	CPC/Affiliation	1st Term commencement date	Term expiration date (End date is until replacement is elected)	Comments
SC	Chair	Dr Toshihide Kitakado	Japan	10–Dec–19	End of SC in 2023	2nd term
	Vice-Chair	Dr Denham Parker	South Africa	10–Dec–19	End of SC in 2023	2nd term
WPB	Chair	Dr Denham Parker	South Africa	12–Sept–19	End of WPB in 2023	2nd term
	Vice-Chair	Dr Jie Cao	China	12–Sep–19	End of WPB in 2023	2nd term
WPTmT	Chair	Dr Jiangfeng Zhu	China	26–July–19	End of WPTmT in 2022	2nd term
	Vice-Chair	Dr Toshihide Kitakado	Japan	26–July–19	End of WPTmT in 2022	2nd term
WPTT	Chair	Dr Gorka Merino	EU,Spain	03–Nov–18	End of WPTT in 2023	2nd term
	Vice-Chair	Dr Shiham Adam	Maldives, Rep. of	13–Nov–18	End of WPTT in 2023	2nd term
WPEB	Chair	Dr Mariana Tolotti	EU,France	10–Sept–21	End of WPEB in 2023	1st term
	1st Vice-Chair	Dr Mohamed Koya	India	10–Sept–21	End of WPEB in 2023	1st term
	2nd Vice-Chair	Dr Charlene da Silva	South Africa	10–Sept–21	End of WPEB in 2023	1st term
WPNT	Chair	Ms Rirk Sulistyaningsih	Indonesia	5–July–19	End of WPNT in 2023	2nd term
	Vice-Chair	Dr Farhad Kaymaram	I.R. Iran	5–July–19	End of WPNT in 2023	2nd term
WPDCS	Chair	Dr Julien Barde	EU,France	3–Dec–21	End of WPDCS in 2023	1st term
	Vice-Chair	Mr Nuwan Gunawardane	Sri Lanka	3–Dec–21	End of WPDCS in 2023	1st term
WPM	Chair	Dr Hilario Murua	ISSF	19–Oct–19	End of WPM in 2023	2nd term
	Vice-Chair	Vacant	Vacant	NA	NA	NA
WGFAD	Co-Chair	Dr Gorka Merino	EU,Spain	06-Oct-21	End of WGFAD in 2023	1st term
	Co-Chair	Mr Abdirahim Sheik Helle	Somalia	06-Oct-21	End of WGFAD in 2023	1st term
WGEMS	Chair	Dr Hilario Murua	ISSF	17-Nov-21	End of WGEMS in 2023	1st term
	Vice-Chair	Dr Don Bromhead	Australia	17-Nov-21	End of WGEMS in 2023	1st term

Thank ex-chairs Stephen Ndegwa (Kenya, WPDCS) and Sylvain Bonhommeau (EU,France, WPEB)

82

Assessment schedule in 2022-2026

Working Party on Tropical Tunas

Species	2022	2023	2024	2025	2026
Bigeye tuna	**Data preparatory meeting** **Full assessment**	Indicators	Indicators	**Data preparatory meeting** **Full assessment**	Indicators
Skipjack tuna	Indicators	**Data preparatory meeting** **Full assessment**	Indicators	Indicators	**Data preparatory meeting** **Full assessment**
Yellowfin tuna	Indicators	Indicators	**Data preparatory meeting** **Full assessment**	Indicators	Indicators

Working Party on Temperate Tunas

Species	2022	2023	2024	2025	2026
Albacore	Data preparatory Meeting Stock assessment meeting	–	–	Data preparatory Meeting Stock assessment meeting	

83

Assessment schedule in 2022-2026

Working Party on Neritic Tunas

Species	2022**	2023*	2024*	2025**	2026*
Bullet tuna	Data preparation	Data preparation	**Assessment**	Data preparation	Data preparation
Frigate tuna	Data preparation	Data preparation	**Assessment**	Data preparation	Data preparation
Indo-Pacific king mackerel	Data preparation	Data preparation	**Assessment**	Data preparation	Data preparation
Kawakawa	Data preparation	**Assessment**	Data preparation	Data preparation	**Assessment**
Longtail tuna	Data preparation	**Assessment**	Data preparation	Data preparation	**Assessment**
Narrow-barred Spanish mackerel	Data preparation	**Assessment**	Data preparation	Data preparation	**Assessment**

Working Party on Billfish

Species	2022	2023	2024	2025	2026
Black marlin			**Full assessment**		
Blue marlin	**Full assessment**			**Full assessment**	
Striped marlin			**Full assessment**		
Swordfish	**Indicators****	**Full assessment**		**Indicators****	**Full assessment**
Indo-Pacific sailfish	**Full assessment***			**Full assessment***	

84

ASSESSMENT SCHEDULE IN 2022-2026

Working Party on Ecosystems and Bycatch

Species	2022	2023	2024	2025	2026
Blue shark	-	–	–	Data preparatory meeting Full assessment	-
Oceanic whitetip shark	Indicator analysis	–	Data preparation	Indicator analysis	-
Scalloped hammerhead shark	Assessment*	–	–	–	-
Shortfin mako shark	–		Data preparatory meeting Full assessment	–	-
Silky shark	-	Assessment*	-	–	Assessment*
Bigeye thresher shark	Assessment*	-	–	–	Assessment*
Pelagic thresher shark	Assessment*	-	–	–	Assessment*
Porbeagle shark	–	Assessment*	–	–	-
Mobulid Rays	-	-	Interactions/ Indicators	–	-
Marine turtles	–	Indicators	–	–	-
Seabirds	Review of mitigation measures in Res. 12/04	–	–	–	Review of mitigation measures in Res. 12/04
Marine Mammals	–	–	–	Review of mitigation measures	-
Ecosystems Report Cards (ERSWG experiment)	ongoing	ongoing	ongoing	ongoing	-

85

SCHEDULE OF MEETINGS IN 2022 AND 2023

Meeting	2022 No.	2022 Date	2022 *Location	2023 No.	2023 Date	2023 *Location
Management Strategy Evaluation Task Force of the **Working Party On Methods** Meeting	13th	7 – 10 March (4d)	TBC	14th	TBC	TBC
Working Party on **Temperate Tunas** (WPTmT) Data preparatory meeting	08th	13 – 15 April (3d)	TBC	-	-	-
Working Party on **Tropical Tunas** (WPTT) Data Preparatory meeting	24th	30 May – 3 June (5d)	TBC	25th	TBC	TBC
Working Group on Electronic Monitoring Standards (WGEMS)	2nd	13 – 15 June (3d)	TBC			
Working Party on **Neritic Tunas** (WPNT)	12th	4-8 July (5d)	TBC	13th	July	TBC
Working Party on **Temperate Tunas** (WPTmT) Assessment meeting	08th	25 – 29 July (5d)	TBC	-	-	-
Working Party on **Ecosystems and Bycatch** (WPEB)	18th	5-9 September (5d)	TBC	19th	September (with WPB)	TBC
Working Party on **Billfish** (WPB)	20th	12-15 September (4d)	TBC	21st	September (with WPEB)	TBC
Ad hoc Working Group on FADs (WGFAD)	3rd	3-5 October (3d)	TBC	4th	TBC	TBC
Working Party on **Methods** (WPM)	13th	19-21 October (3d) (with WPTT)	TBC	14th	October (with WPTT)	TBC
Working Party on **Tropical Tunas** (WPTT) Assessment meeting	24th	24-29 October (6d) (with WPM)	TBC	25th	October (with WPM)	TBC
Working Party on **Data Collection and Statistics** (WPDCS)	18th	29 November - 3 December (5d)	TBC	19th	November	TBC
Scientific Committee	xxth	5-9 December (5d)	TBC	xxth	December	TBC

- Data preparatory meetings are useful and important
- Due to the Covid-19 crisis and the cancellation of physical meetings for the foreseeable future, offers to host meetings in 2022 were not requested but would be considered if made.

86

RECOMMENDATIONS TO THE COMMISSION (14)

REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 24TH SESSION OF THE SCIENTIFIC COMMITTEE

SC24.28 (para. 190) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC24, provided at Appendix 38.

87

ACKNOWLEDGEMENTS

- All the participants of WPs and SC for dedicated and productive discussion
- Chairs of…..
- IOTC secretariat team

88

Food and Agriculture Organization of the United Nations

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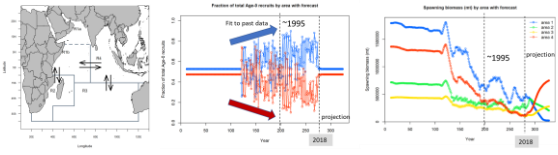
THANK YOU SO MUCH FOR KIND ATTENTION

89

Problems in the projection

The proportion of recruits was assumed to be distributed between Regions 1 and 4.



Extract from the WPTT report slide prepared by the Chair, Dr. Merino

90

Problems in the projection

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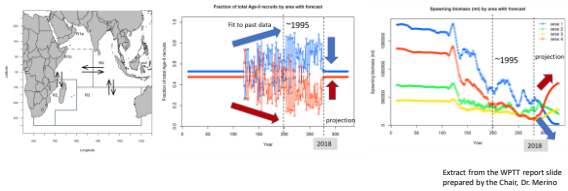

Extract from the WPTT report slide prepared by the Chair, Dr. Merino

91