APPENDIX X
EXECUTIVE SUMMARY: SHORTFIN MAKO SHARK (2024)

Table A 1. Status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean.

Area[1]	Indicators		2024 stock status determination
Indian Ocean	Catches (SMA) 2023 (t)[2]	831	49.7%
	Average catches (SMA) 2019-23 (t)	846	
	Catches (SMA, MAK, MSK) in 2023 [3]	2021	
	Average catches (SMA, MAK, MSK) 2019-2023	2074	
	Not elsewhere included (nei) sharks[2] 2023 (t)[4]	30358	
	Av. Not elsewhere included (nei) sharks[2] 2019-23(t)	30714	
	MSY (1,000 t) (80% CI)	1.93 (0.99 – 3.31)	
	F_{MSY} (80% CI)	0.03 (0.01 – 0.07)	
	B_{MSY} (1,000 t) (80% CI)	60.0 (35.7 – 103.8)	
	$F_{current}/F_{MSY}$ (80% CI)	1.53 (0.65 – 3.71)	
	$B_{current}/B_{MSY}$ (80% CI)	0.96 (0.58 – 1.41)	
	$B_{current}/B_0$ (80% CI)	0.45 (0.27- 0.69)	

[1] Boundaries for the Indian Ocean = IOTC area of competence
[2] Proportion of 2023 catch estimated or partially estimated by IOTC Secretariat: 0%
[3] Catches of MAK include for all Isurus spp, reported as aggregated MAK. Catches of MSK include Mackerel sharks,porbeagles nei. Those 3 codes were the ones used for the total catch in the stock assessment.
[4] Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SKH: Various sharks nei; MSK: Mackerel sharks,porbeagles nei; MAK: Mako sharks; AG38: Blue shark, shortfin mako, oceanic whitetip shark).

Colour key	Stock overfished ($SB_{year}/SB_{MSY} < 1$)	Stock not overfished ($SB_{year}/SB_{MSY} \geq 1$)
Stock subject to overfishing ($F_{year}/F_{MSY} > 1$)	49.7	24.0
Stock not subject to overfishing ($F_{year}/F_{MSY} \leq 1$)	4.1	22.2
Not assessed/Uncertain		

Table A 1. Shortfin mako shark: IUCN threat status of shortfin mako shark (*Isurus oxyrinchus*) in the Indian Ocean.

Common name	**Scientific name**	**IUCN threat status[5]**		
		Global status	**WIO**	**EIO**
Shortfin mako shark	*Isurus oxyrinchus*	Endangered	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean

[5]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

Sources: IUCN Red List 2020, Rigby et al 2019

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Stock status. In 2024 a stock assessment was carried out for the shortfin mako shark in the IOTC area of competence, using data until 2022. The WPEB carried out a data-preparatory meeting earlier in the year followed by the stock assessment meeting. The model applied was a population biomass dynamics model using the platform JABBA. The stock status and projections were based on an ensemble grid of 9 models designed to capture the main uncertainties relating to biology (3 options) and the shape of the production curve used in biomass dynamics models (3 options). A number of additional options and model configurations were explored as sensitivity runs. The MSY for the stock is estimated at 1,930 t (80% CI: 985 – 3,313 t). The median biomass in 2022 was estimated to be at 45% (80% CI: 27-69%) of the unfished levels and below the levels that support MSY (B/BMSY in 2022 = 0.96, 80% CI: 0.58-1.48) (**Table 1**). The median fishing mortality in 2022 was estimated to be higher than the level that supports MSY (F/FMSY in 2022 = 1.53, 80% CI: 0.65-3.71) (**Table 1**). While in recent years there were a number of CPUE indices to compare, the assessment relied on the Japanese CPUE index which showed a large depletion through the late 1990s and there is no alternative abundance index to compare the extent of this decline during that period. Additionally, although the reported catches of shortfin mako are generally considered to be reliable because this species used to be retained by several fleets, there is still significant uncertainty about the accuracy of reports from earlier years. This uncertainty also applies to more recent years (post-2018) due to discarding or non-retention.

A semi-quantitative ecological risk assessment (ERA) was conducted for the Indian Ocean by the WPEB and SC in 2018 to evaluate the resilience of shark species to the impact of pelagic fisheries (Murua *et al.* 2018). Shortfin mako sharks received the highest vulnerability ranking in the ERA for longline gear (No. 1) because of their low productivity and high susceptibility to longline gear, and were ranked the fourth most vulnerable shark species for purse seine gear. Considering the characterized uncertainty, and on the weight-of-evidence available in 2024, the shortfin mako shark stock is determined to be **overfished** and subject to **overfishing** (**Table 1, Fig 3**).

Outlook. Catches increased mostly from the mid-1980s up to 2016 followed by a decrease until 2022 as it has been under domestic landing restrictions by a number of fleets, and as a result of it having been listed in CITES Appendix II. The CPUE series for several key fleets which have been available since the early 2000s are generally stable or are increasing.

Management advice The Commission should take a cautious approach by implementing management actions that reduce fishing mortality on shortfin mako sharks, and the stock should be closely monitored. 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 future scientific advice. The Kobe II Strategy Matrix (Table 3) provides the probability of exceeding reference levels over 3-, 10-, 20- and 30-year periods, over a range of TAC options established as a percentage of current catches. Catches at the terminal year of the model (2022) were higher than MSY, and the shortfin mako is currently overfished (B/Bmsy < 1) and undergoing overfishing (F/Fmsy > 1). Under those levels of catches, the biomass will continue to decline, and fishing mortality will continue to increase over time. In order to have a lower than 50% probability of exceeding MSY-reference points in 10 years, i.e., to recover the stock to the green quadrant of the Kobe plot with at least 50% probability in 10 years, future catches should not exceed 40% of the average catches between 2020-2022 (i.e., last 3 year of catches used in the model). This corresponds to an annual TAC of 1,217.2 t (representing all fishing mortality including retention, dead discards and post-release mortality), noting that this TAC level should include and account for the SMA, MAK and MSK species codes as reported to IOTC.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the Indian Ocean is approximately 1,930 t
- **Reference points**: The Commission has not adopted reference points or harvest control rules for any shark species.
- **Main fishing gear** (2019-23): Longline targeting swordfish; gillnet, longline (deep-freezing); longline (fresh); gillnet offshore (**Fig 1).**
- **Main fleets** (2019-23): EU,Spain (43.6%) , Pakistan (25.2%) and EU,Portugal (12.4%). The 12 other fleets catching shortfin mako contributed to 18.8% of the total catch in recent years (Reported as discarded/released alive: EU,Spain, Australia, EU,France, Indonesia, Korea, South Africa) **(Fig 2)**.

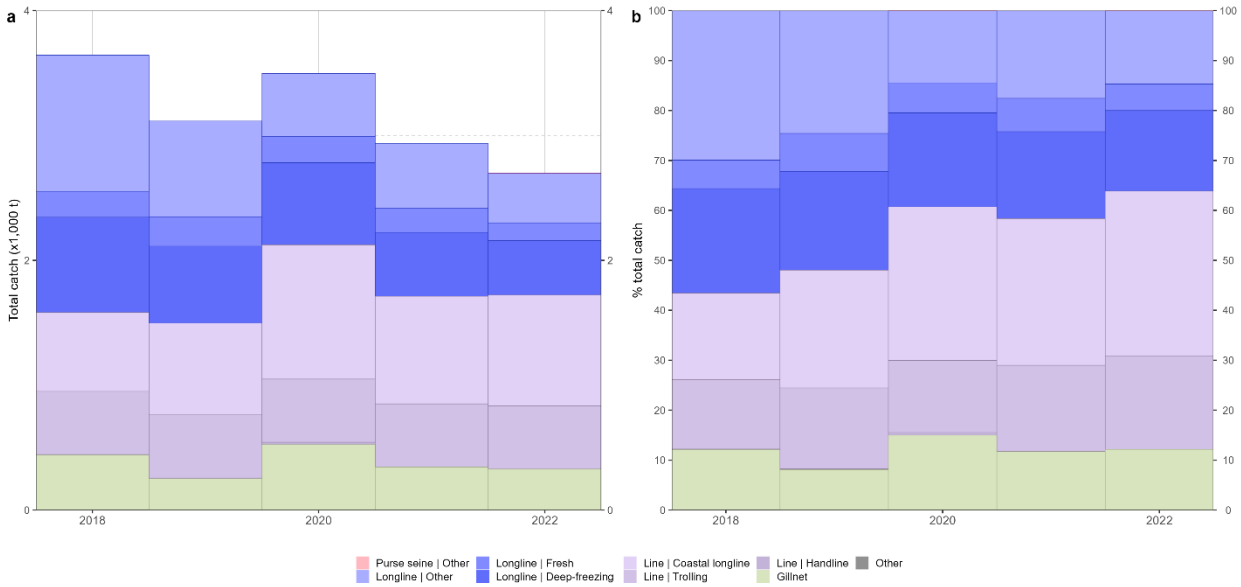

Fig 1: Annual absolute (a) and relative (b) time series of retained catches (metric tonnes; t) of shortfin mako reported at species level or aggregated (SMA, MAK and MSK) by fishery for the period 2018-2022

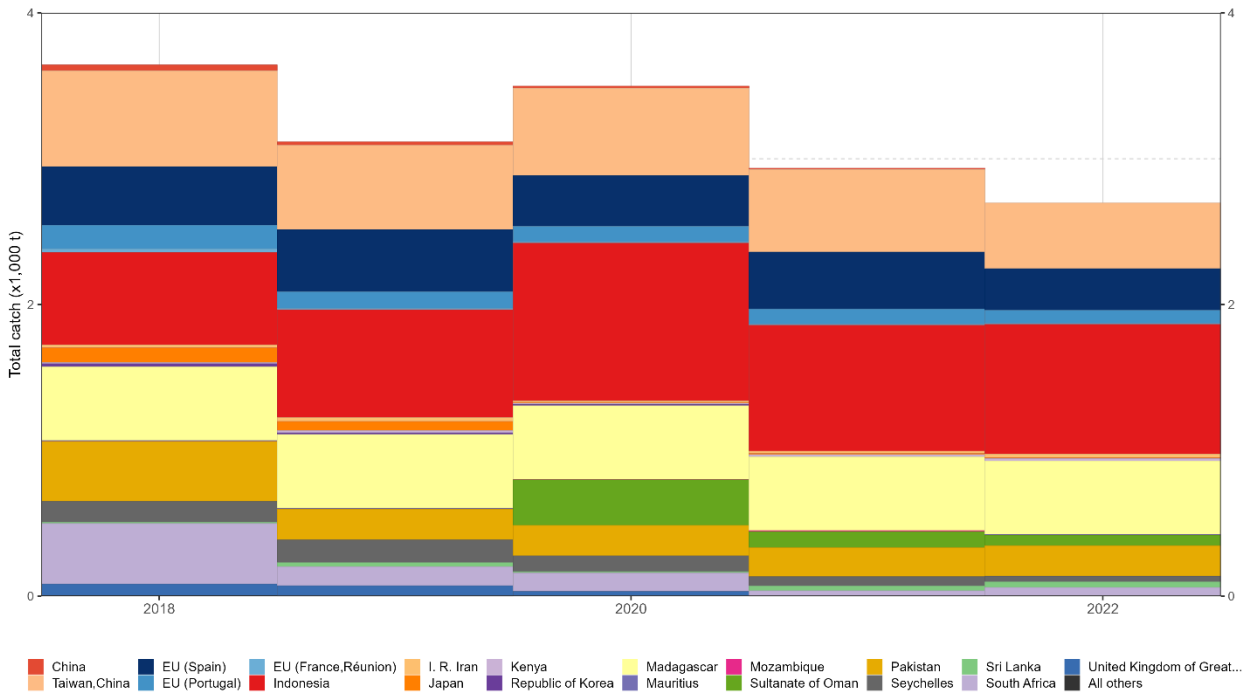

Fig 2: Annual time series of retained catches (metric tonnes; t) of shortfin mako reported at species level or aggregated (SMA, MAK and MSK) by fleet during 1918-2022

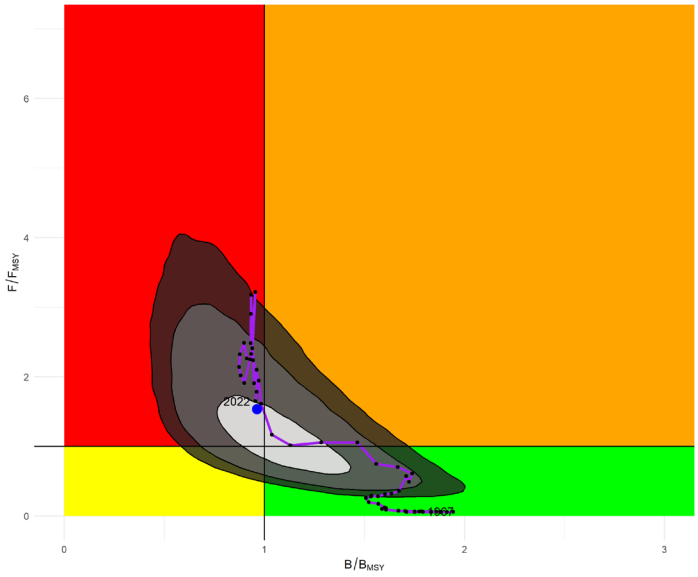

Fig 3: **Shortfin mako**: 2024 stock status, relative to BMSY (x-axis) and FMSY (y-axis) for the final model (terminal year of the model is 2022). The point represents the median of the 9 final models used in the ensemble grid and the shaded areas are the 50%, 80% and 90% contours of the uncertainties in the terminal year. The line represents the time series of the median stock trajectory from the ensemble grid of models.

Table 3. **Shortfin mako**: Final model ensemble aggregated Indian Ocean Kobe II Strategy Matrix. The values represent the probabilities (percentage) of exceeding the MSY-based target reference points,

for constant catch projections between 0%-100% (10% intervals) relative to last years of catches used in the model (i.e., average of last 3 years, 2020-2022), and projected for periods of 3, 10, 20 and 30 years.

Reference point and projection time	**Catch projections (relative to the 2020-2022 catches) and probability (%) of exceeding MSY-based reference points**										
Catch relative to 2020-2022 (%)	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
TAC (t)	**0.0**	**304.3**	**608.6**	**912.9**	**1217.2**	**1521.5**	**1825.7**	**2130.0**	**2434.3**	**2738.6**	**3042.9**
3 year projection											
B2025 < BMSY	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7
F2025 > FMSY	0.0	1.5	9.6	21.7	34.1	45.3	55.1	63.2	70.0	75.7	80.2
10 year projection											
B2032 < BMSY	39.2	41.8	44.5	47.1	49.8	52.5	55.2	57.9	60.6	63.2	65.8
F2032 > FMSY	0.0	2.0	10.0	21.2	32.8	43.8	53.6	62.2	69.5	75.6	80.6
20 year projection											
B2042 < BMSY	26.1	30.0	34.4	39.1	44.0	49.0	54.1	59.1	64.0	68.6	72.9
F2042 > FMSY	0.0	2.4	10.2	20.6	31.9	42.8	52.9	62.0	69.9	76.5	81.8
30 year projection											
B2052 < BMSY	19.3	23.9	29.0	34.9	41.2	47.7	54.3	60.7	66.7	72.3	77.3
F2052 > FMSY	0.0	2.6	10.2	20.4	31.6	42.6	53.1	62.4	70.6	77.5	83.0

LITERATURE CITED

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