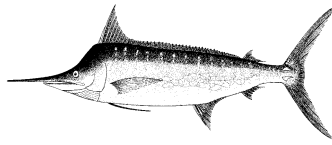


## APPENDIX 13 EXECUTIVE SUMMARY: BLUE MARLIN (2023)



**Table 1.** Status of blue marlin (*Makaira nigricans*) in the Indian Ocean

Area <sup>1</sup>	Indicators		2022 stock status determination
Indian Ocean	Catch 2022 <sup>2</sup> (t)	5,067	72%*
	Average catch 2018-2022 (t)	7,045	
	MSY (1,000 t) (80% CI)	8.74 (7.14 – 10.72)	
	F <sub>MSY</sub> (80% CI)	0.24 (0.14 – 0.39)	
	B <sub>MSY</sub> (1,000 t) (80% CI)	35.8 (22.9 – 60.3)	
	F <sub>2020</sub> /F <sub>MSY</sub> (80% CI)	1.13 (0.75 – 1.69)	
	B <sub>2020</sub> /B <sub>MSY</sub> (80% CI)	0.73 (0.51 – 0.99)	
	B <sub>2020</sub> /B <sub>0</sub> (80% CI)	0.36 (0.26 – 0.50)	

<sup>1</sup> Boundaries for the Indian Ocean are defined as the IOTC area of competence

<sup>2</sup> Proportion of 2021 catch estimated or partially estimated by IOTC Secretariat: 32.5%

\* Estimated probability that the stock is in the respective quadrant of the Kobe plot (shown below), derived from the confidence intervals associated with the current stock status

Colour key	Stock overfished ( $B_{\text{year}}/B_{\text{MSY}} < 1$ )	Stock not overfished ( $B_{\text{year}}/B_{\text{MSY}} \geq 1$ )
Stock subject to overfishing ( $F_{\text{year}}/F_{\text{MSY}} > 1$ )	72%	0%
Stock not subject to overfishing ( $F_{\text{year}}/F_{\text{MSY}} \leq 1$ )	26%	2%
Not assessed/Uncertain		

The percentages are calculated as the proportion of model terminal values that fall within each quadrant with model weights taken into account

### INDIAN OCEAN STOCK – MANAGEMENT ADVICE

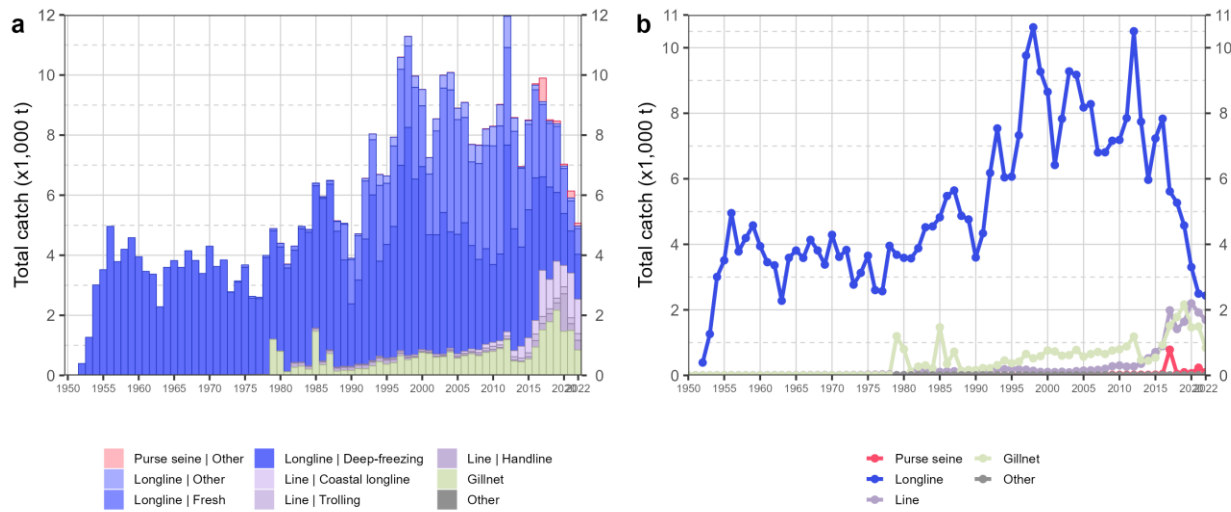
**Stock status.** No new stock assessment was carried out for blue marlin in 2023, thus the stock status is determined on basis of the 2022 assessment which was based on two different models: JABBA, a Bayesian state-space production model (age-aggregated); and SS3, an integrated model (age-structured) (using data up to 2020). Uncertainty in the biological parameters is still evident and as such the JABBA model ( $B_{2020}/B_{\text{MSY}} = 0.73$ ,  $F_{2020}/F_{\text{MSY}} = 1.13$ ) was selected as the base case. Both models were consistent with regards to stock status. On the weight-of-evidence available in 2022, the stock is determined to be **overfished** and **subject to overfishing** (Table 1 and Fig. 3).

**Outlook.** The  $B/B_{\text{MSY}}$  trajectory declined from the mid-1980s to 2007. A short-term increase in  $B/B_{\text{MSY}}$  occurred from 2007 to 2012, which is thought to be linked to the NW Indian Ocean Piracy period. Thereafter, the  $B/B_{\text{MSY}}$  trajectory again declines to the current estimate of **0.73**.  $F/F_{\text{MSY}}$  increased since the mid-1980s and despite a recent decline,  $F/F_{\text{MSY}}$  remains above 1. The majority of CPUE indices have shown a declining trend since 2015.

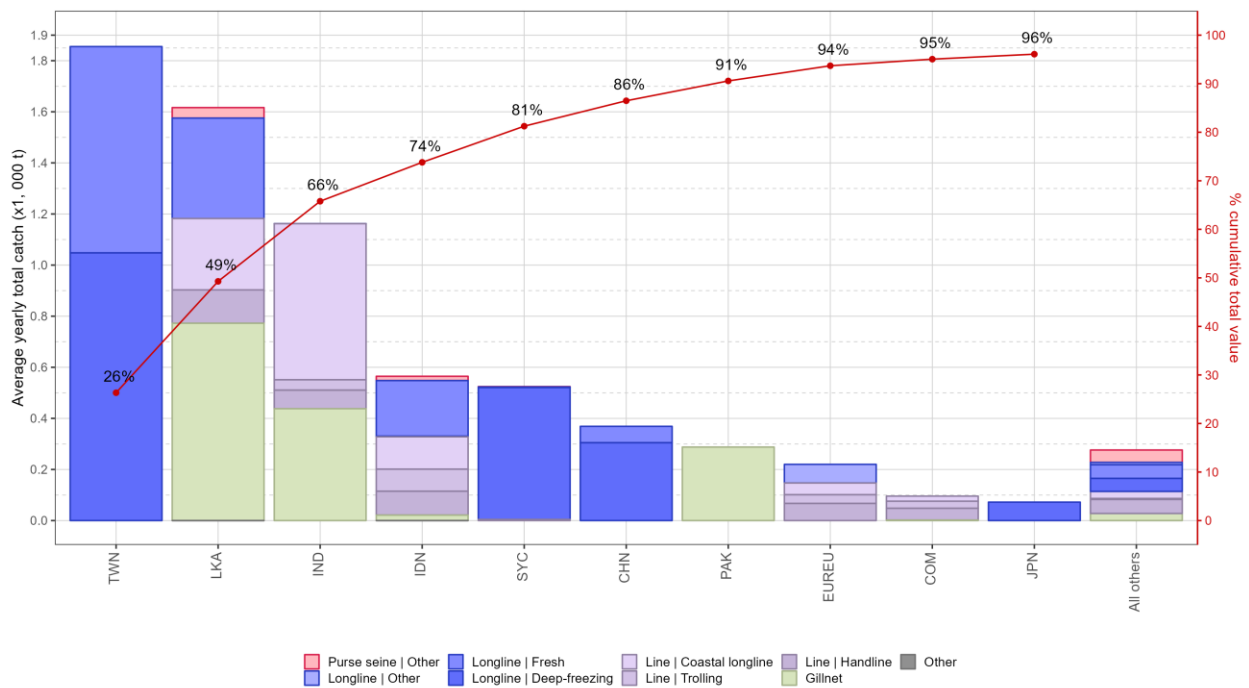
**Management advice.** The current catches of blue marlin (average of 7,964 t in the last 5 years, 2017-2021) are lower than MSY (8,740 t). The stock is currently overfished and subject to overfishing. In order to achieve the Commission objectives of being in the green zone of the Kobe Plot by 2027 ( $F_{2027} < F_{MSY}$  and  $B_{2027} > B_{MSY}$ ) with at least a 60% chance, the catches of blue marlin would have to be reduced by 20% compared to 2020 catch (7,126 t), to a maximum value of approximately 5,700 t.

The following key points should also be noted:

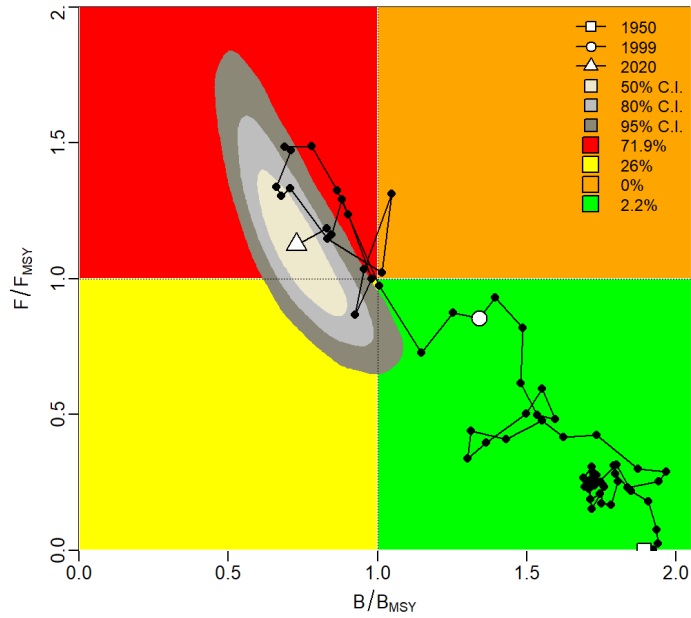
- **Maximum Sustainable Yield (MSY):** estimate for the Indian Ocean blue marlin stock is 8,740 t (estimated range 7,140–10,720 t).
- **Provisional reference points:** although the Commission adopted reference points for swordfish in [Resolution 15/10](#) on target and limit reference points and a decision framework, no such interim reference points, nor harvest control rules have been established for blue marlin.
- **Main fisheries (mean annual catch 2018-2022):** blue marlin are caught using longline (51.3%), followed by line (25.2%) and gillnet (22%). The remaining catches taken with other gears contributed to 1.5% of the total catches in recent years (**Fig. 1**).
- **Main fleets (mean annual catch 2018-2022):** the majority of blue marlin catches are attributed to vessels flagged to Taiwan,China (26.3%) followed by Sri Lanka (22.9%) and India (16.5%). The 22 other fleets catching blue marlin contributed to 34.2% of the total catch in recent years (**Fig. 2**).



**Fig. 1.** Annual time series of (a) cumulative nominal catches (metric tons; t) by fishery and (b) individual nominal catches (metric tons; t) by fishery group for blue marlin during 1950-2022. Longline | Other: swordfish and sharks-targeted longlines; Other: all remaining fishing gears



**Fig. 2.** Mean annual catches (metric tons; t) of blue marlin by fleet and fishery between 2018 and 2022, with indication of cumulative catches by fleet. Longline | Other: swordfish and sharks-targeted longlines; Other: all remaining fishing gears



**Fig. 3.** Kobe stock status plot for the Indian Ocean stock of blue marlin, from the final JABBA base case (the black line traces the trajectory of the stock over time). Contours represent the smoothed probability distribution for 2020 (isopleths are probability relative to the maximum).

**Table 2.** Blue Marlin: Indian Ocean JABBA Kobe II Strategy Matrix. Probability (percentage) of achieving the green quadrant of the KOBE plot nine constant catch projections, with future catch assuming to be 30–110% (in increments of 10%) of the 2020 catch level (7,126 t)

Probability $F \leq F_{MSY}$ and $B \geq B_{MSY}$								
TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030
2137 (30%)	65%	81%	90%	94%	96%	98%	99%	99%
2850 (40%)	59%	76%	85%	91%	94%	96%	97%	98%
3563 (50%)	54%	70%	80%	87%	90%	93%	95%	96%
4275 (60%)	48%	63%	73%	80%	86%	89%	91%	93%
4998 (70%)	42%	55%	65%	72%	78%	82%	85%	88%
5700 (80%)	36%	47%	56%	63%	69%	73%	77%	79%
6413 (90%)	30%	40%	46%	53%	57%	61%	65%	67%
7126 (100%)	25%	32%	37%	41%	45%	48%	51%	53%
7838 (110%)	21%	24%	28%	31%	33%	35%	37%	38%