DRAFT RESOURCE STOCK STATUS SUMMARIES

BLUE MARLIN (BUM: *Makaira nigricans*)

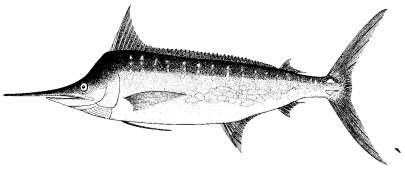

Table 1. Status of blue marlin (*Makaira nigricans*) in the Indian Ocean

Area[1]	Indicators		2020 stock status determination
Indian Ocean	Catch 2019[2] (MT)	8,316	87%*
	Average catch 2015-2019 (MT)	8,958	
	MSY (1,000 MT) (80% CI)	9.98 (8.18 –11.86)	
	F_{MSY} (80% CI)	0.21 (0.13 – 0.35)	
	B_{MSY} (1,000 MT) (80% CI)	47 (29.9 – 75.3)	
	F_{2017}/F_{MSY} (80% CI)	1.47 (0.96 – 2.35)	
	B_{2017}/B_{MSY} (80% CI)	0.82 (0.56 – 1.15)	
	B_{2017}/B_0 (80% CI)	0.41 (0.28 – 0.57)	

[1] Boundaries for the Indian Ocean are defined as the IOTC area of competence
[2] Proportion of 2019 catch estimated or partially estimated by IOTC Secretariat: 26%
* 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_{year}/B_{MSY}< 1)	Stock not overfished (B_{year}/B_{MSY}≥ 1)
Stock subject to overfishing (F_{year}/F_{MSY}> 1)	87%	10%
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)	0%	3%
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. Stock status based on the Bayesian State-Space Surplus Production model JABBA suggests that there is an 87% probability that the Indian Ocean blue marlin stock in 2017 is in the red zone of the Kobe plot, indicating the stock is **overfished** and **subject to overfishing (**B_{2017}/B_{MSY}=0.82 and F_{2017}/F_{MSY}=1.47) as shown in **Table 1** and **Fig. 2**. The most recent catch is lower than the estimate of MSY ($Catch_{2019}$ = 8,316 MT; MSY = 9,984 MT). The previous assessment of blue marlin (Andrade 2016) concluded that in 2015 the stock was subject to overfishing but not overfished. The change in stock status can be attributed to increased catches for the period 2015-2017 as well as improved standardisation of CPUE indices, which includes the area disaggregation of JPN and TWN indices to account for fleet dynamics.

Outlook. The B_{2017}/B_{MSY} trajectory declined from the mid-1980s to 2008 and a steady increase of F/F_{MSY} since the mid-1980s has continued unabated. Periodic data conflict between the CPUE indices included in

the assessment, particularly JPN and TWN, inflate uncertainty in B_{2017}/B_{MSY} and F_{2017}/F_{MSY} point estimates. However, a 'drop one' sensitivity analysis indicated that omitting any of the CPUE time-series would not alter the stock status.

Management advice. The current catches of blue marlin (average of 8,958 MT in the last 5 years, 2015-2019) are lower than MSY (9,984 MT). The assessment conducted in 2017 indicated that the stock was 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 35% compared to the average of the last 3 years, to a maximum value of approximately 7,800 MT.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the Indian Ocean blue marlin stock is 9,980 MT (estimated range 8,180–11,860 MT).
- **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 fishing gear (average catches 2015-19)**: Blue marlin are largely considered to be a non-target species of industrial and artisanal fisheries. Longline catches account for around 68% of total catches in the Indian Ocean, followed by gillnets (15%), with remaining catches recorded under coastal longline, troll and handlines (**Fig. 1**).
- **Main fleets (average catches 2015-19):** Around 70% of the total catches of blue marlin are accounted for by three fleets: Taiwan,China (longline): 43%; Sri Lanka (gillnet, hook and line and longline): 21% and Indonesia (longline and hook-and-line): 7%.

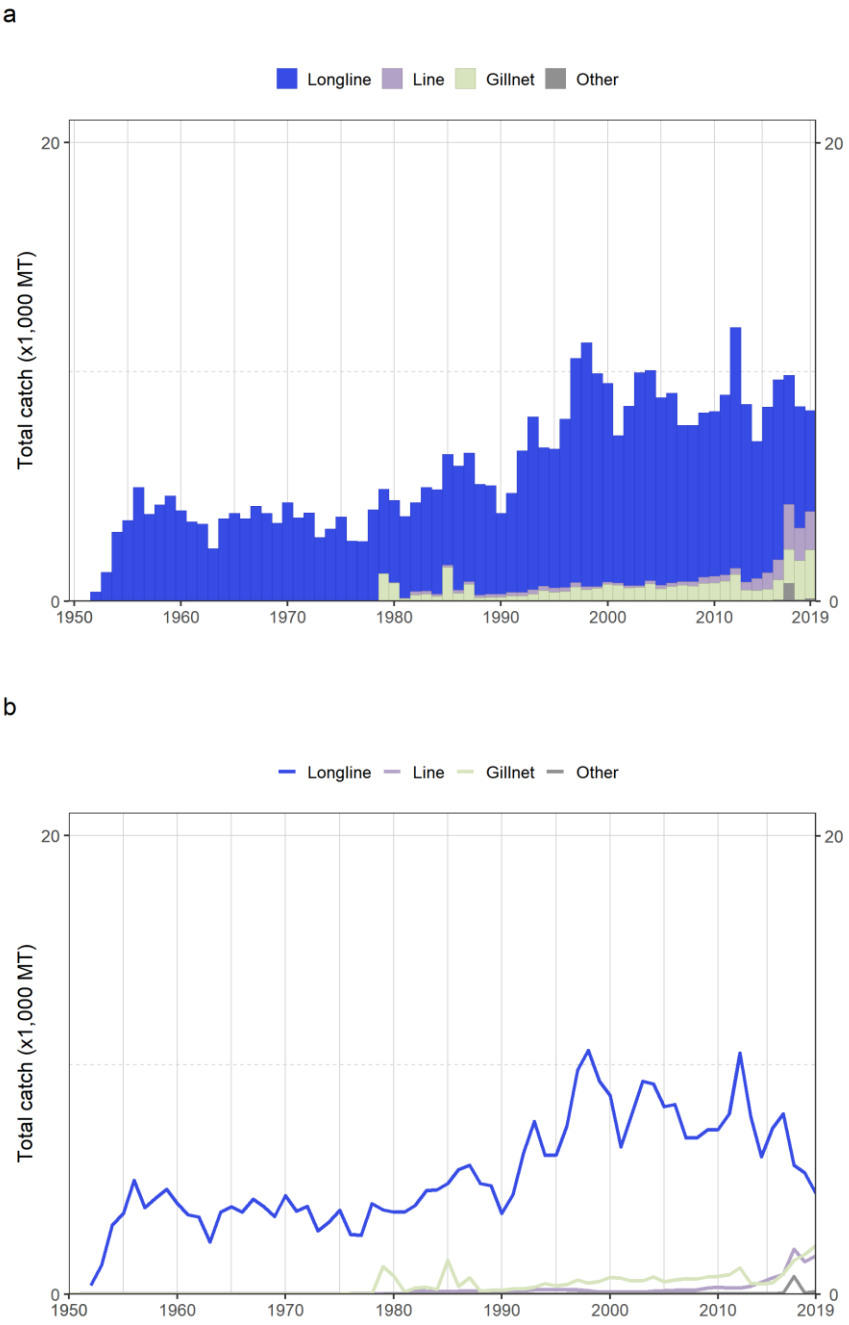

Fig. 1. Annual time series of (a) cumulative and (b) individual nominal catches (MT) by gear group for blue marlin during 1950–2019. Longline: deep-freezing and fresh longlines, swordfish and sharks-targeted longlines; Line: coastal longline, handline, troll line; Gillnet: coastal and offshore gillnets, driftnet; Other: all remaining gears

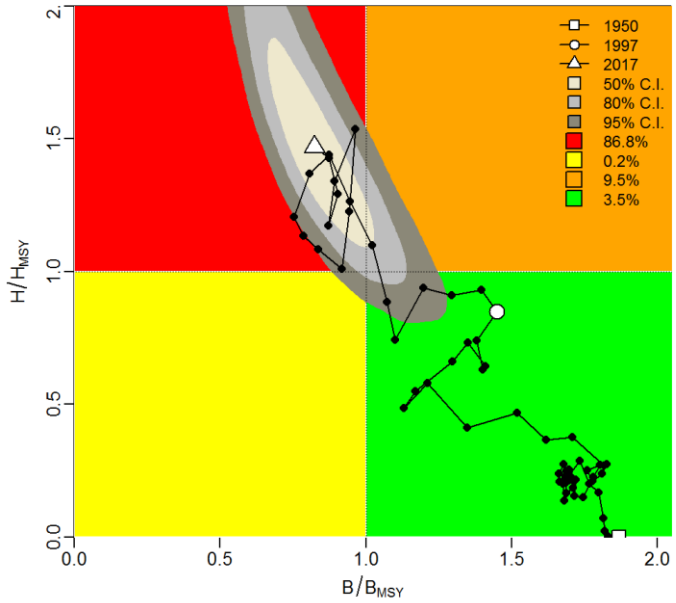

Fig. 2. Kobe stock status plot for the Indian Ocean stock of blue marlin, from the final JABBA base case (the black line traces the trajectory of the stock over time. Contours represent the smoothed probability distribution for 2018 (isopleths are probability relative to the maximum)

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 2017 catch level (12,029 MT)

TAC | Year	2019	2020	2021	2022	2023	2024	2025	2026	2027
30% (3609)	20	39	58	71	81	87	91	93	95
40% (4812)	20	36	51	63	72	79	83	87	90
50% (6014)	21	33	44	54	62	68	73	77	81
60% (7217)	20	29	38	45	51	56	60	64	67
70% (8420)	20	26	32	37	41	45	47	50	52
80% (9623)	20	23	26	28	30	31	33	34	35
90% (10826)	17	18	19	19	20	20	20	20	20
100% (12029)	11	11	11	10	10	10	10	9	9
110% (13232)	7	6	6	6	5	5	4	4	4