# APPENDIX 14
# EXECUTIVE SUMMARY: STRIPED MARLIN (2025)

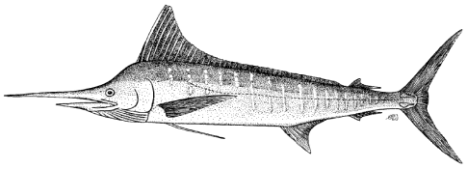

**Table 1**. Status of striped marlin (*Kajikia audax*) in the Indian Ocean

| Area[1] | Indicators | | 2024 stock status determination[3] |
|---|---|---|---|
| Indian Ocean | Catch 2024 (t) | 4,334[2] | 100% |
| | Average catch 2020-2024 (t) | 3,390 | |
| | MSY (1,000 t) (JABBA) | 4.73 (4.22 – 5.24)[3] | |
| | MSY (1,000 t) (SS3) | 4.89 (4.48-5.30) | |
| | $F_{MSY}$ (JABBA) | 0.26 (0.20–0.35) | |
| | $F_{MSY}$ (SS3) | 0.22 (0.21–0.24) | |
| | $F_{2022}/F_{MSY}$ (JABBA) | 3.95 (2.54 - 6.14) | |
| | $F_{2022}/F_{MSY}$ (SS3) | 9.26 (5.38-13.14) | |
| | $B_{2022}/B_{msy}$ (JABBA) | 0.17 (0.11 - 0.27) | |
| | $SB_{2022}/SB_{MSY}$ (SS3)[4] | 0.27 (0.19-0.35) | |
| | $B_{2022}/B_0$(JABBA) | 0.06 (0.04 – 0.10) | |
| | $SB_{2022}/SB_0$ (SS3) | 0.036 (0.03-0.04) | |

[1] Boundaries for the Indian Ocean are defined as IOTC area of competence
[2] Proportion of 2024 catch estimated or partially estimated by IOTC Secretariat: 3.2%
[3] Range estimates in the table are 80% confidence interval
[4] SS3 is the only model that used $SB/SB_{MSY}$, all others used $B/B_{MSY}$
[5]2022 is the final year that data were available for this assessment
* 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 ($B_{2022}/B_{MSY}$< 1) | Stock not overfished ($B_{2022}/B_{MSY}$≥ 1) |
|---|---|---|
| Stock subject to overfishing ($F_{2022}/F_{MSY}$> 1) | **100%** | **0.0%** |
| Stock not subject to overfishing ($F_{2022}/F_{MSY}$≤ 1) | **0.0%** | **0.0%** |
| Not assessed/Uncertain/Unknown | | |

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 striped marlin 2025, thus, the stock status estimates are based on two different assessment models carried out in 2024: JABBA, a Bayesian state-space production model (age-aggregated); and SS3, an integrated model (age-structured) (using data up to 2022). Both models were generally consistent with regards to stock status and confirmed the results from 2012, 2013, 2015, 2017, 2018, and 2021 assessments, indicating that the stock is subject to overfishing ($F>F_{MSY}$) and is overfished, with the biomass being below the level which would produce MSY ($B<B_{MSY}$) for over a decade. Both SS3 and JABBA assessments rely on CPUE indices from the longline

fisheries in which the striped marlin are not the main target species. On the weight-of-evidence available in 2024, the stock status of striped marlin is determined to be ***overfished*** and ***subject to overfishing*** (**Table 1**; **Fig. 3**).

***Outlook***. Biomass estimates of the Indian Ocean striped marlin stock have likely been below BMSY since the late 90's – the stock has been severely depleted ($B/B_0$ = 0.06; JABBA model). The level of depletion has increased since the previous assessment and is currently the worst among IOTC species. There has been a substantial increase of catches of stripe marlin from coastal fleets in recent years. The outlook is very pessimistic, and a substantial decrease in fishing mortality is required to ensure a reasonable chance of stock recovery in the foreseeable future (**Table 2**). It should be noted that point estimates from SS3 indicate that $F_{curr}/F_{MSY}$ are much higher than those estimated by JABBA.

***Management advice.*** Current or increasing catches have a very high risk of further decline in the stock status. The 2024 catches (4,334 t) were lower than the estimated MSY (4,730 t) but are above the limit set by Resolution 18/05 (3,260 t) which may be a concern if this trend continues. However, the limit is not based on estimates of the most recent stock assessment.
The stock has been overfished for more than a decade and is now in a highly depleted state. Based on the Kobe II strategy matrix run in 2024, a 70% reduction in the average 2020-22 catch of 2,891 t (i.e. to a catch of 867 t) would recover the stock to the green quadrant by 2032 with a probability of 78% and a 60% reduction in recent average catch (i.e. catch of 1,157 t) would achieve this with a probability of 58%. Thus, it is recommended that the Commission urgently revise Resolution 18/05 to incorporate limits that reflect the most recent stock assessment and projections, and review, and where necessary, revise the implementation and effectiveness of the measures contained in this Resolution.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: estimates for the Indian Ocean stock are uncertain and estimates range between 4,220 - 5,240 t. However, the current biomass is well below the $B_{MSY}$ reference point and fishing mortality is in excess of $F_{MSY}$ at recent catch levels.
- **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 have been established for striped marlin.
- **Main fisheries (mean annual catch 2020-2024)**: striped marlin are caught using gillnet (71.8%), followed by longline (12.3%) and purse seine (11.4%). The remaining catches taken with other gears contributed to 4.5% of the total catches in recent years (**Fig. 1**).
- **Main fleets (mean annual catch 2020-2024)**: the majority of striped marlin catches are attributed to vessels flagged to I. R. Iran (32.3%) followed by Indonesia (24.9%) and Pakistan (24%). The 24 other fleets catching striped marlin contributed to 18.5% of the total catch in recent years (**Fig. 2**).

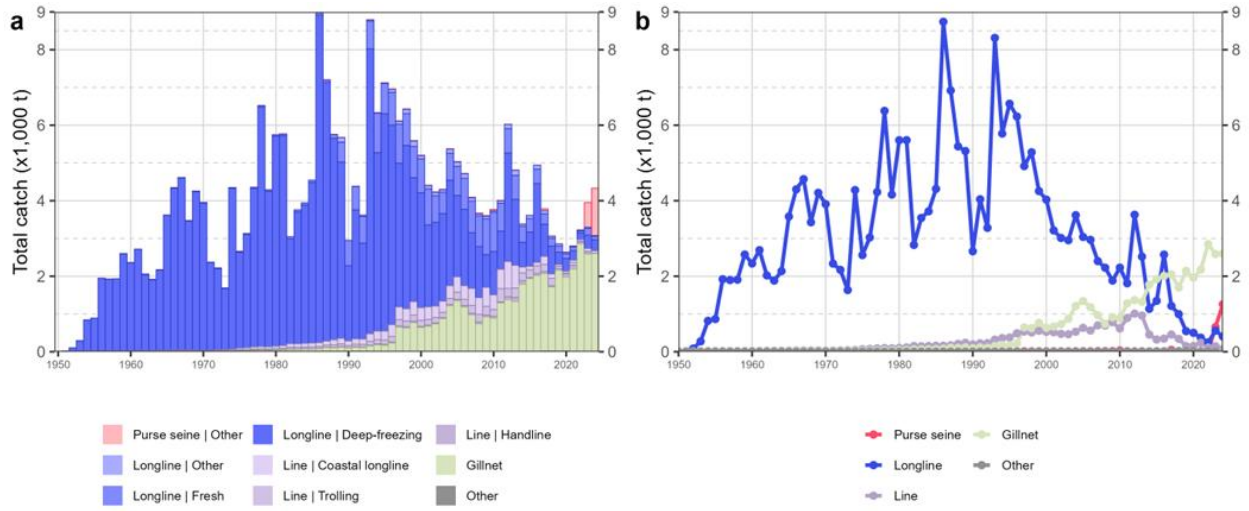


**Fig. 1.** Annual time series of (a) cumulative retained catches (metric tonnes; t) by fishery and (b) individual retained catches (metric tonnes; t) by fishery group for striped marlin during 1950-2024. Purse seine | Other: coastal purse seine, large-scale purse seine, and ring net; Longline | Other: swordfish and sharks-targeted longlines; Other: all remaining fishing gears

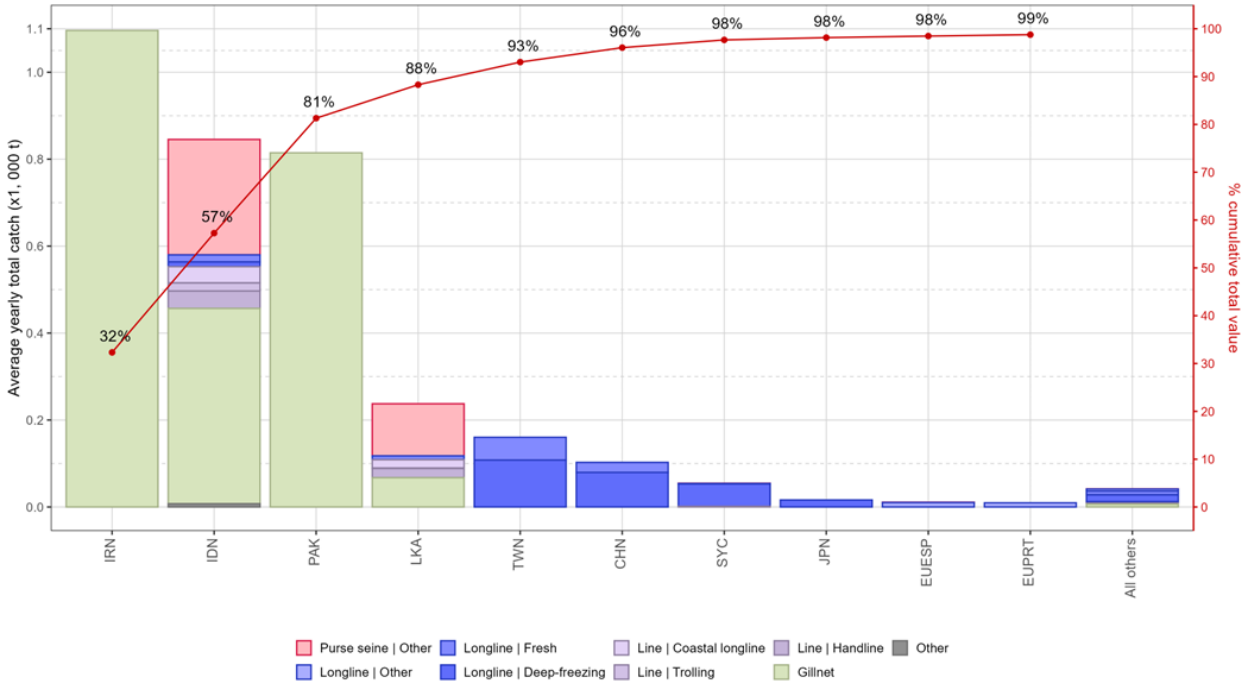


**Fig. 2**. Mean annual retained catches (metric tonnes; t) of striped marlin by fleet and fishery between 2020 and 2024, with indication of cumulative catches by fleet. Purse seine | Other: coastal purse seine, large-scale purse seine, and ring net; Longline | Other: swordfish and sharks-targeted longlines; Other: all remaining fishing gears

(a) (b)

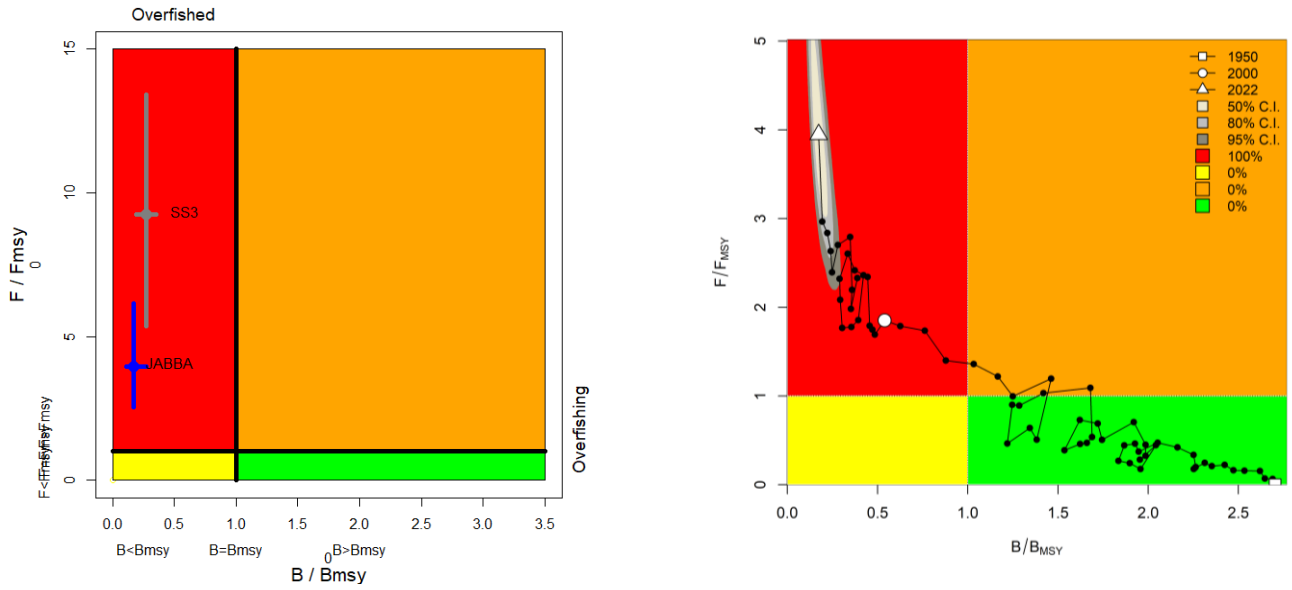


**Fig. 3.** (a) Striped marlin: Stock status from the Indian Ocean assessment JABBA (Bayesian State Space Surplus Production Model) and SS3 models with the confidence intervals (left); (b) Trajectories (1950-2022) of $B/B_{MSY}$ *and* $F/F_{MSY}$ from the JABBA model. NB: SS3 refers to $SB/SB_{MSY}$ while the JABBA model's output refers to $B/B_{MSY}$

**Table 2.** Striped marlin: JABBA Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections relative to the average catch level of 2020–2022 (2,891 t) (100%, 80%, then 70%–10% in decrement of 10%) projected for 3 and 10 years

| **Reference point and projection timeframe** | **Alternative catch projections (relative to the 2020-2022 catch of 3,001 t) and probability (%) of violating MSY-based target reference points (Btarg = $B_{MSY}$; Ftarg = $F_{MSY}$)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **10%** (289 t) | **20%** (578 t) | **30%** (867 t) | **40%** (1,157 t) | **50%** (1,446 t) | **60%** (1,735 t) | **70%** (2,024 t) | **80%** (2,313 t) | **100%** (2,891 t) |
| $B_{2025} < B_{MSY}$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| $F_{2025} > F_{MSY}$ | 3 | 12 | 35 | 66 | 88 | 97 | 99 | 100 | 100 |
| $B_{2032} < B_{MSY}$ | 3 | 9 | 22 | 42 | 64 | 83 | 93 | 98 | 100 |
| $F_{2032} > F_{MSY}$ | 0 | 4 | 8 | 18 | 35 | 57 | 78 | 91 | 99 |

**Table 3.** Striped marlin: Probability (percentage) of achieving the KOBE green quadrant from 2023-2032 for a range of constant catch projections (JABBA).

| Catch (t)\| Year | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|
| 289 (10%) | 0 | 0 | 0 | 0 | 7 | 31 | 63 | 84 | 94 | 97 |
| 578 (20%) | 0 | 0 | 0 | 0 | 3 | 17 | 44 | 68 | 84 | 91 |
| 867 (30%) | 0 | 0 | 0 | 0 | 1 | 8 | 26 | 48 | 66 | 78 |
| 1,157 (40%) | 0 | 0 | 0 | 0 | 0 | 4 | 13 | 28 | 45 | 58 |
| 1,446 (50%) | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 13 | 25 | 36 |
| 1,735 (60%) | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 11 | 17 |
| 2,024 (70%) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 7 |
| 2,313 (80%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| 2,891 (100%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |