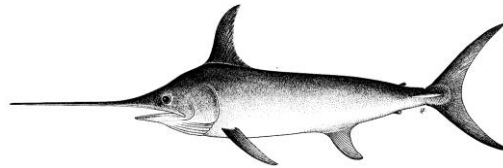# APPENDIX 16
EXECUTIVE SUMMARY: SWORDFISH (2024)

TABLE 1. Status of swordfish (*Xiphias gladius*) in the Indian Ocean.

Area[1]	Indicators		2023 stock status determination
Indian Ocean	Catch 2023[2] (t) Average catch 2019-2023 (t)	26,525 28,142	97%
	MSY (1,000 t) (80% CI) F_{MSY} (80% CI) SB_{MSY} (1,000 t) (80% CI) F_{2021}/F_{MSY} (80% CI) SB_{2021}/SB_{MSY} (80% CI) SB_{2021}/SB_{1950} (80% CI)	30 (26–33) 0.16 (0.12–0.20) 55 (40–70) 0.60 (0.43–0.77) 1.39 (1.01–1.77) 0.35 (0.32–0.37)	

[1] Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence
[2] Proportion of 2023 catch estimated or partially estimated by IOTC Secretariat: 19.8%
[3] 2021 is the final year that data were available for this assessment

| Colour key	Stock overfished (SB_{year}/SB_{MSY}< 1)	Stock not overfished (SB_{year}/SB_{MSY}≥ 1)
Stock subject to overfishing (F_{year}/F_{MSY}> 1)	0.2%	0
Stock not subject to overfishing (F_{year}/F_{MSY}≤ 1)	3%	97%
Not assessed/Uncertain/Unknown		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. In 2024 there is no new stock assessment, the stock status estimates are based on the assessment carried out in 2023 for Swordfish in the IOTC area of competence. Two models were applied to the swordfish stock (ASPIC and Stock Synthesis (SS3)), with the SS3 stock assessment selected to provide scientific advice (as done previously). An update of the JABBA model was also conducted during the WPB meeting. The reported SS3 stock status is based on a grid of 48 model configurations designed to capture the uncertainty relating to steepness of the stock recruitment relationship (0.7, 0.8, and 0.9), recruitment variability (two levels), CPUE series (2 options), growth (2 options) and weighting of length composition data (two options). A number of the options included in the final grid were selected from a range of additional sensitivity runs that were conducted to explore uncertainties. Median spawning biomass in 2021 was estimated to be 35% (80% CI: 32-37%) of the unfished levels (**Table 1**) and 1.39 times (80% CI: 1.01-1.77) the level required to support MSY. Median fishing mortality in 2021 was estimated to be 60% (80% CI 43%-77%) of the FMSY level, and catch in 2021 (23,237 t) was well below the estimated MSY level of 29,856 t (80% CI: 26,319-33,393t). Taking into account the characterized uncertainty, and on the weight-of-evidence available in 2023, the swordfish stock is determined to be *not overfished* and *not subject to overfishing* (**Table 1**, **Fig. 3**).

Outlook. The significant decrease in recent longline catch and effort from 2019 to 2022 (a 33% reduction from 35,256t to 23,597t) substantially lowered the pressure on the Indian Ocean stock as a whole, and current fishing mortality is not expected to reduce the population to an overfished state over the next decade. (**Table 1**). The estimated recent recruitment (2010-2020) was above the long-term average although this appears to be mainly driven by the sharp increase in the Japanese longline CPUE in the northern region. The WPB expressed concern over whether that CPUE index accurately represents the change of abundance in that region which may require further investigation. Further, the South-western region, which is one of the sub-regions used in the model, exhibit a declining biomass trend which indicate higher depletion in this region, compared to other regions.

Management advice. The 2021 catches (23,237t at the time of the assessment) were significantly lower than the estimated MSY level (29,856 t). Under those levels of catches, the spawning biomass was projected to likely increase, with a high probability of maintaining at or above the SB_{MSY} for the longer term. There is a very low risk of exceeding MSY-based reference points by 2031 if catches are maintained at 2021 levels (<1% risk that SB_{2031}< SB_{MSY}, and <1% risk that F_{2021}> F_{MSY}). The projections indicate that an increase of 40% or more from 2021 catch levels will not likely result in the biomass dropping below the SB_{MSY} level for the longer term (with a 15% probability). Catches in 2022 (23,597t) were still lower than the estimated MSY. Nevertheless, the Commission should consider monitoring the catches to ensure that the probability of exceeding the SB_{MSY} target reference points in the long term remains minimal. Taking into account the differential CPUE and biomass trends between regions, the WPB noted that there is recurring evidence for localised depletion in the South Western region (which appears to be more depleted than other regions) and suggests this should be further monitored.

The following key points should also be noted:
- **Maximum Sustainable Yield (MSY)**: estimate for the Indian Ocean is 29,856 t.
- **Provisional reference points**: noting that the Commission in 2015 agreed to [Resolution 15/10](#) *on target and limit reference points and a decision framework*, the following should be noted:
    a. **Fishing mortality**: current fishing mortality is considered to be below the provisional target reference point of F_{MSY} and below the provisional limit reference point of $1.4*F_{MSY}$ (**Fig. 2**).
    b. **Biomass**: current spawning biomass is considered to be above the target reference point of SB_{MSY}, and therefore above the limit reference point of $0.4*SB_{MSY}$ (**Fig. 2**).
- **Main fisheries (mean annual catch 2019-2023)**: swordfish are caught using longline (52.3%), followed by line (31.5%) and gillnet (15.7%). The remaining catches taken with other gears contributed to 0.4% of the total catches in recent years(**Fig. 1**).
- **Main fleets (mean annual catch 2019-2023)**: the majority of swordfish catches are attributed to vessels flagged to Sri Lanka (26.5%) followed by Taiwan,China (15.4%) and Yemen (7.5%). The 29 other fleets catching swordfish contributed to 50.6% of the total catch in recent years (**Fig. 2**).
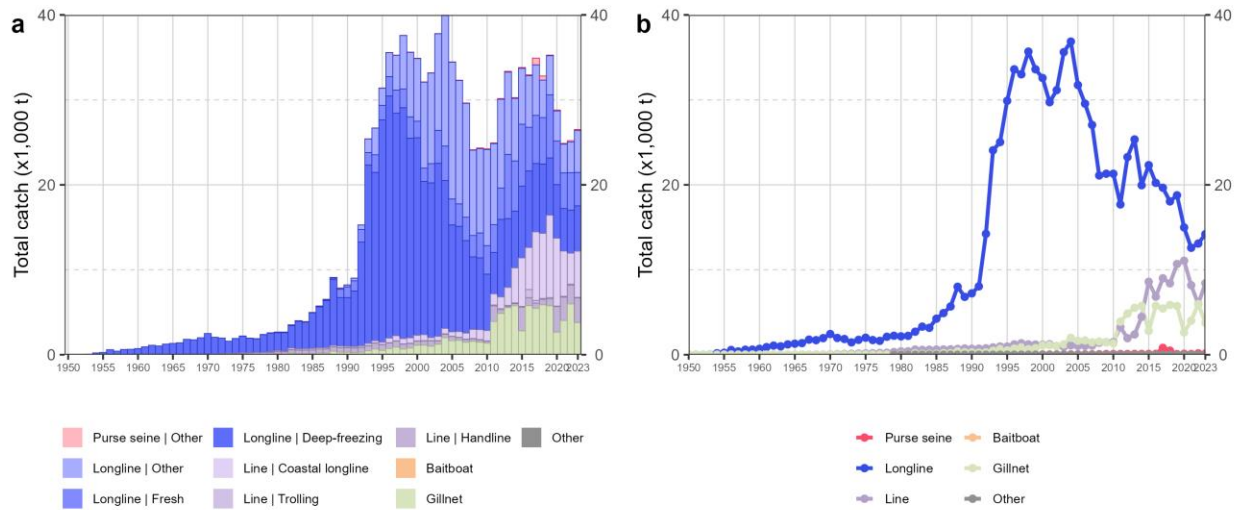
Fig. 1. Annual time series of (a) cumulative nominal catches (metric tons; t) by fishery and (b) individual nominal catches (metric tons; t) by fishery group for swordfish during 1950–2023. <u>Longline|Other</u>: swordfish and sharks-targeting longlines; <u>Other</u>: all remaining fishing gears
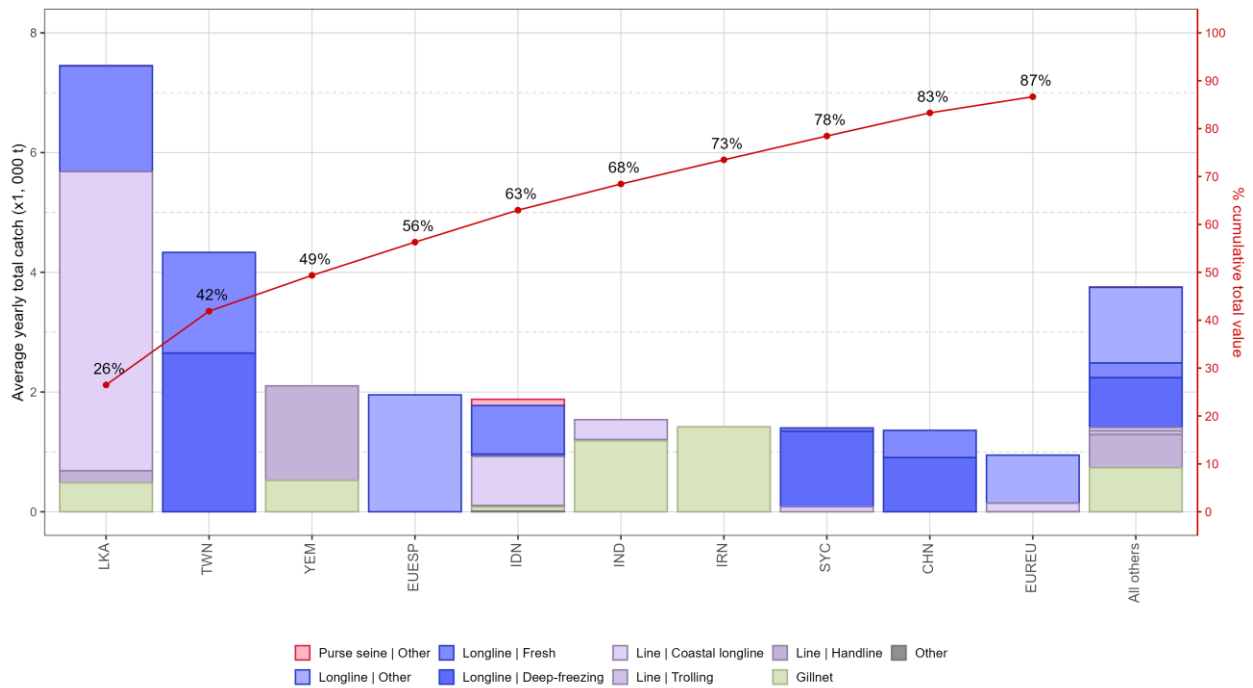
Fig. 2. Mean annual catches (metric tons; t) of swordfish by fleet and fishery between 2019 and 2032, with indication of cumulative catches by fleet. Longline | Other: swordfish and sharks-targeted longlines; Other: all remaining fishing gears
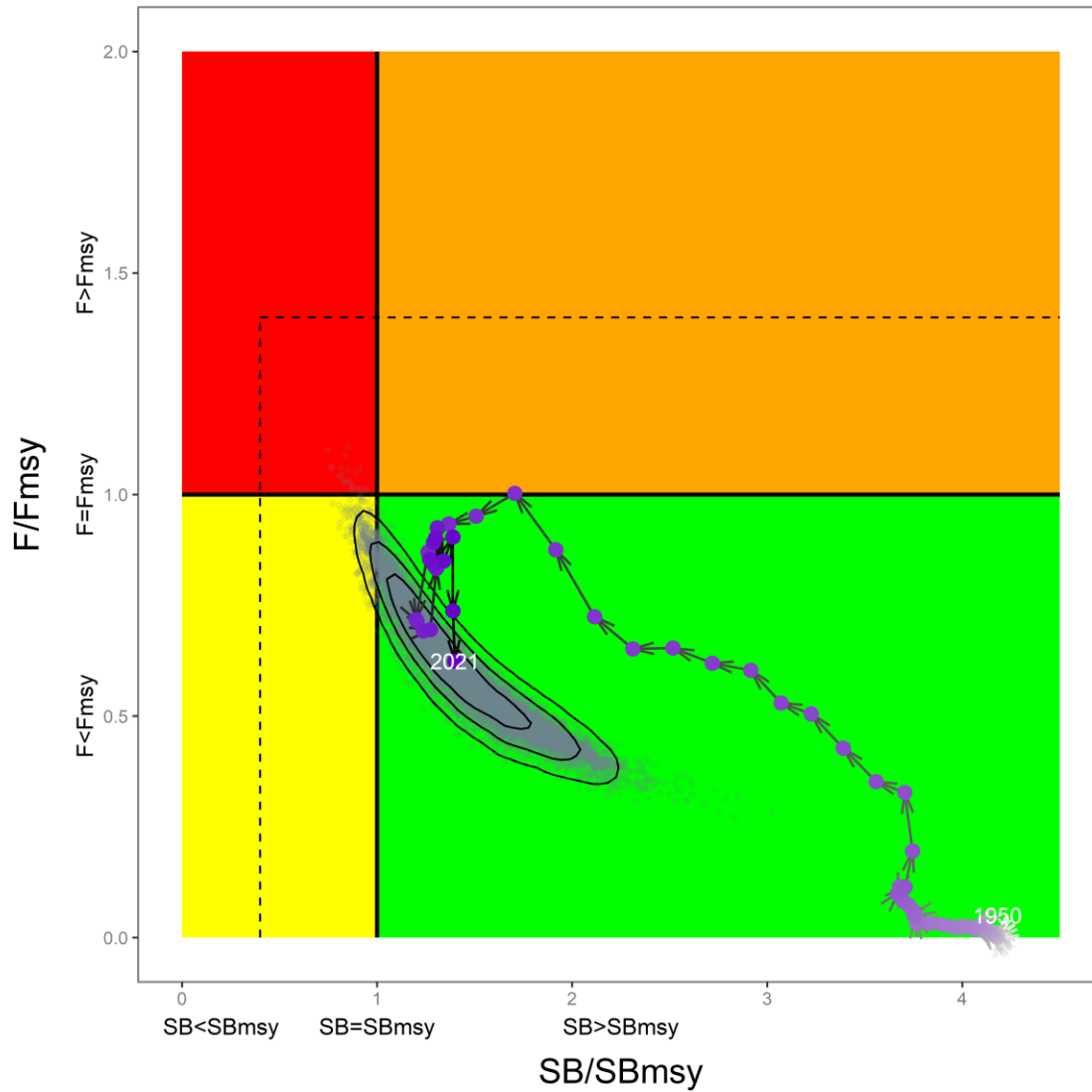
Fig. 3. Swordfish: 2021 stock status, relative to SB_{MSY} (x-axis) and F_{MSY} (y-axis) reference points for the final model grid. Grey dots represent uncertainty from individual models with 50%, 80% and 95% contours lines. The arrowed line represents the time series of stock trajectory from the reference model. The dashed lines represent limit reference points for Indian Ocean swordfish (SB_{lim} = 0.4 SB_{MSY} and F_{lim} = 1.4*FMSY)

Table 2. Swordfish: SS3 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 2021 catch level (23 237 t)*, 0%, ± 20%, ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	Alternative catch projections (relative to the 2019 catch of 3,001 t) and probability (%) of violating MSY-based target reference points (Btarg = B_{MSY}; Ftarg = F_{MSY})				
	60% (13 942 t)	**80%** (18 590 t)	**100%** (23 237 t)	**120%** (27 884 t)	**140%** (32 532 t)
$B_{2024} < B_{MSY}$	0	0	1	1	2
$F_{2024} > F_{MSY}$	0	0	0	5	24
$B_{2031} < B_{MSY}$	0	0	0	3	15
$F_{2031} > F_{MSY}$	0	0	0	8	30