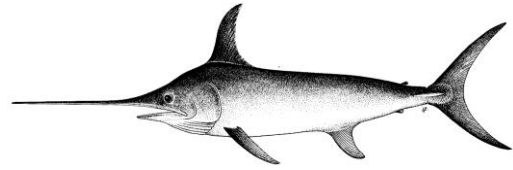### RESOURCE STOCK STATUS SUMMARY – SWORDFISH

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

iotc ctoi

Status of the Indian Ocean swordfish (SWO: *Xiphias gladius*) resource

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

Area[1]	Indicators		2019 stock status determination
Indian Ocean	Catch 2018[2]: Average catch 2014-2018:	31,628 t 31,343 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2015}/F_{MSY} (80% CI): SB_{2015}/SB_{MSY} (80% CI): SB_{2015}/SB_{1950} (80% CI):	31.59 (26.30–45.50) 0.17 (0.12–0.23) 43.69 (25.27–67.92) 0.76 (0.41–1.04) 1.50 (1.05–2.45) 0.31 (0.26–0.43)	

[1] Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2] Proportion of catch estimated or partially estimated by IOTC Secretariat in 2019: 6%

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No new stock assessment was carried out for swordfish in 2019, thus, the stock status is determined on the basis of the 2017 assessment and other indicators presented in 2019. In 2017 a stock synthesis assessment was conducted, with fisheries catch data up to 2015. The assessment uses a spatially disaggregated, sex explicit and age structured model. The SS3 model, used for stock status advice, indicated that MSY-based reference points were not exceeded for the Indian Ocean population ($F_{2015}/F_{MSY}< 1$; $SB_{2015}/SB_{MSY}> 1$). Most other models applied to swordfish also indicated that the stock was above a biomass level that would produce MSY. The spawning stock biomass in 2015 was estimated to be 26%–43% of the unfished levels. The latest year's catches are higher than the MSY level (31,590 t). On the weight-of-evidence available in 2019, the stock is determined to be *not overfished* and *not subject to overfishing*.

Outlook. The decrease in longline catch and effort from 2005 to 2011 lowered the pressure on the Indian Ocean stock, and despite the recent increase in total catches, current fishing mortality is not expected to reduce the population to an overfished state over the next decade. There is a very low risk of exceeding MSY-based reference points by 2026 if catches are maintained at 2015 levels (<1% risk that $SB_{2026}< SB_{MSY}$, and <1% risk that $F_{2026}> F_{MSY}$) (Table 2).

Management advice. The most recent catches (33,352 t in 2017) are higher than MSY (31,590 t) and should be reduced to the MSY level.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the Indian Ocean is 31,590 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 fishing gear (average catches 2014-18)**: Longline catches are currently estimated to comprise approximately 70% of total swordfish catches in the Indian Ocean (Fig. 1).
- **Main fleets (average catches 2014-18):**
  Taiwan,China (longline): 21%; Sri Lanka (longline-gillnet): 20%; EU,Spain (swordfish targeted longline): 10%; Indonesia (fresh longline): 7%.
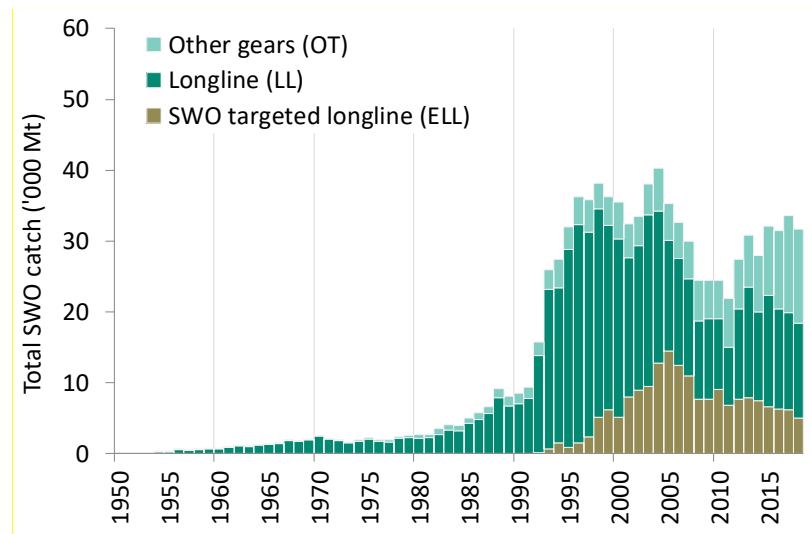

Fig. 1. Swordfish catches by gear and year recorded in the IOTC database (1950–2018);
Note: Other gears (OT) includes: longline-gillnet, handline, gillnet, coastal longline, troll line, sport fishing, and all other gears.

Fig. 2. Swordfish: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 60, 70, 80 and 90 percentiles of the 2015 estimate). Blue circles indicate the trajectory of the point estimates for the SB ratio and F ratio for each year 1950–2015. Interim target (F_{targ} and SB_{targ}) and limit (F_{lim} and SB_{lim}) reference points, as set by the Commission, are shown.

TABLE 2. Swordfish: SS3 aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target (top) and limit (bottom) reference points for nine constant catch projections relative to 2015* catch level (32,129 t), ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	Alternative catch projections (relative to the average catch level from 2015* (32,129 t) and probability (%) of violating MSY-based target reference points (SBtarg = SBMSY; Ftarg = FMSY)								
	60% (19,278 t)	**70%** (22,491 t)	**80%** (22,704 t)	**90%** (28,917 t)	**100%** (32,129 t)	**110%** (35,343 t)	**120%** (38,556 t)	**130%** (41,769 t)	**140%** (44,982 t)
$SB_{2018} < SB_{MSY}$	0	0	0	0	0	0	0	8	13
$F_{2018} > F_{MSY}$	0	0	0	0	13	33	42	58	71
$SB_{2025} < SB_{MSY}$	0	0	0	0	8	33	46	63	75
$F_{2025} > F_{MSY}$	0	0	0	4	38	54	71	83	88

Reference point and projection timeframe	Alternative catch projections (relative to the average catch level from 2015* (32,129 t) and probability (%) of violating MSY-based limit reference points (SBlim = 0.4 SBMSY; FLim = 1.4 FMSY)								
	60% (19,278 t)	**70%** (22,491 t)	**80%** (22,704 t)	**90%** (28,917 t)	**100%** (32,129 t)	**110%** (35,343 t)	**120%** (38,556 t)	**130%** (41,769 t)	**140%** (44,982 t)
$SB_{2018} < SB_{Lim}$	0	0	0	0	0	0	0	0	0
$F_{2018} > F_{Lim}$	0	0	0	0	0	0	0	13	33
$SB_{2025} < SB_{Lim}$	0	0	0	0	0	0	0	0	21

$F_{2025} > F_{Lim}$	0	0	0	0	0	21	42	63	75

* 2015 catches, at the time of the last swordfish assessment conducted in 2017.