

Status of the Indian Ocean kawakawa (KAW: *Euthynnus affinis*) resource

TABLE 1. Kawakawa: Status of kawakawa (*Euthynnus affinis*) in the Indian Ocean.

Area ¹	Indicators		2018 stock status determination
Indian Ocean	Catch 2017 ² :	159,881 t	
	Average catch 2013-2017:	157,326 t	
	MSY (1,000 t) [*]	152 [125–188]	
	F _{MSY} [*]	0.56 [0.42–0.69]	
	B _{MSY} (1,000 t) [*]	202 [151–315]	
	F ₂₀₁₃ /F _{MSY} [*]	0.98 [0.85–1.11]	
B ₂₀₁₃ /B _{MSY} [*]	1.15 [0.97–1.38]		
	B ₂₀₁₃ /B ₀ [*]	0.58 [0.33–0.86]	

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 2017: 58%

Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

*Range of plausible values of biologically realistic OCOM (Optimized Catch-Only Method) model realizations (see IOTC-2015-WPNT05-R)

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)		
Stock not subject to overfishing (F _{year} /F _{MSY} ≤ 1)		
Not assessed/Uncertain		

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Stock status. A stock assessment was not undertaken for kawakawa in 2017 and the status is determined on the basis of the 2015 assessment, which used catch data from 1950 to 2013. Analysis using an Optimised Catch Only Method (OCOM) approach in 2015 indicates that the stock is near optimal levels of F_{MSY}, and stock biomass is near the level that would produce MSY (B_{MSY}). Due to the quality of the data being used, the simple modelling approach employed in 2015, and the large increase in kawakawa catches over the last decade (Fig. 1), measures need to be taken in order to decrease the level of catches which surpassed the estimated MSY levels since 2011. Catches between 2014 and 2017 are lower than those estimated in 2013. Based on the weight-of-evidence available, the kawakawa stock for the Indian Ocean is classified as **not overfished** and **not subject to overfishing** (Table 1, Fig. 2).

Outlook. There is considerable uncertainty about stock structure and the estimate of total catches. Due to the uncertainty associated with catch data (e.g. 58% of catches partially or fully estimated by the IOTC Secretariat in 2017) and the limited number of CPUE series available for fleets representing a small proportion of total catches, only data poor assessment approaches can currently be used. Aspects of the fisheries for this species, combined with the lack of data on which to base a more complex assessment (e.g. integrated models) are a cause for considerable concern. In the interim, until more traditional approaches are developed, data-poor approaches will be used to assess stock status. The continued increase in annual catches for kawakawa is likely to have further increased the pressure on the Indian Ocean stock. Research emphasis on collating catch per unit effort (CPUE) time series for the main fleets, size compositions and life trait history parameters (e.g. estimates of growth, natural mortality, maturity, etc.) should be considered a high priority for the Commission. The assessment projections conducted in 2015 concluded that there would be a high risk of exceeding MSY-based reference points if catches were maintained at 2013 levels (96% risk that B₂₀₁₆ < B_{MSY}, and 100% risk that F₂₀₁₆ > F_{MSY}) (Table 2). However, catches have since declined from 167,348 t (2013) to 159,881 t (2017).

Management Advice. Although the stock status is classified as not overfished and not subject to overfishing, the Kobe strategy II matrix developed in 2015 showed that there is a 96% probability that biomass is below MSY levels and 100% probability that F > F_{MSY} by 2016 and 2023 if catches are maintained at the 2013 levels. There is a 55% probability that biomass is below MSY levels and 91% probability that F > F_{MSY} by 2023 if catches are maintained at around 2016 levels.

The modelled probabilities of the stock achieving levels consistent with the MSY reference points (e.g. $SB > SB_{MSY}$ and $F < F_{MSY}$) in 2023 are 100% for a future constant catch at 80% of 2013 catch levels. If catches are reduced by 20% based on 2013 levels at the time of the assessment (170,181 t)¹, the stock is expected to recover to levels above MSY reference points with a 50% probability by 2023.

The following should be also noted:

- The Maximum Sustainable Yield estimate for the Indian Ocean is estimated to be 152,000 with a range between 125,000 and 188,000 t and so catch levels should be reduced in future to prevent the stock becoming overfished.
- Further work is needed to improve the reliability of the catch series. Reported catches should be verified or estimated, based on expert knowledge of the history of the various fisheries or through statistical extrapolation methods.
- Improvement in data collection and reporting is required if the stock is to be assessed using integrated stock assessment models.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.
- Research emphasis on collating catch per unit effort (CPUE) time series for the main fleets, size compositions and life trait history parameters (e.g. estimates of growth, natural mortality, maturity, etc.) should be considered of high priority for the Commission.
- Given the limited information submitted by CPCs on total catches, catch and effort and size data for neritic tunas, despite their mandatory reporting status, the IOTC Secretariat was required to estimate 63% of the catches (in 2016), which increases the uncertainty of the stock assessments using these data. Therefore the management advice to the Commission includes the need for CPCs to comply with IOTC data requirements per Resolution 15/01 and 15/02.
- **Main fishing gear (average catches 2013–17):** Kawakawa are caught mainly by gillnets ($\approx 52\%$), handlines and trolling ($\approx 17\%$), and coastal purse seiners, and may also be an important bycatch of the industrial purse seiners (Fig. 1).
- **Main fleets (average catches 2013–17):** Catches are highly concentrated: Indonesia, India, and I.R. Iran account for over two thirds of catches in recent years.

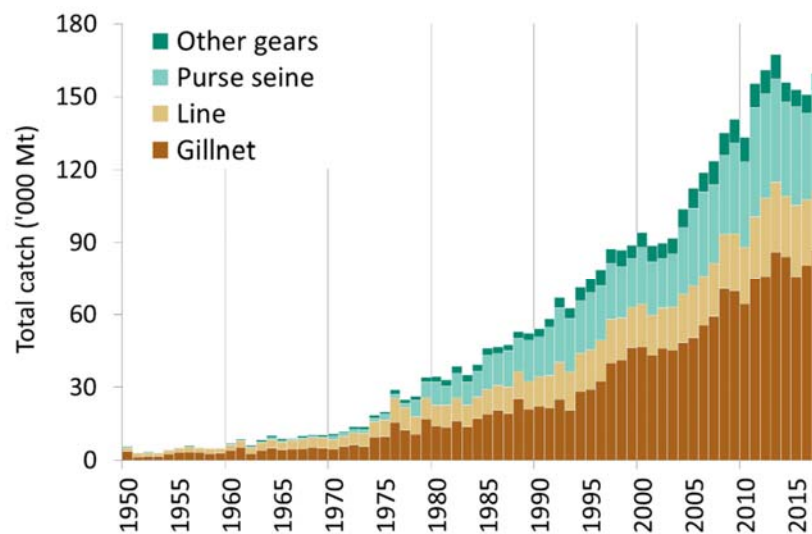


Fig.1. Kawakawa: Annual catches of kawakawa by gear recorded in the IOTC database (1950–2017)².

¹ as estimated in 2015

² **Definition of fishery:** Gillnet: gillnet, including offshore gillnet; Line: coastal longline, hand line, troll line; Purse seine: coastal purse seine, purse seine, ring net; Other gears: baitboat, Danish seine, liftnet, longline, longline fresh, trawling.

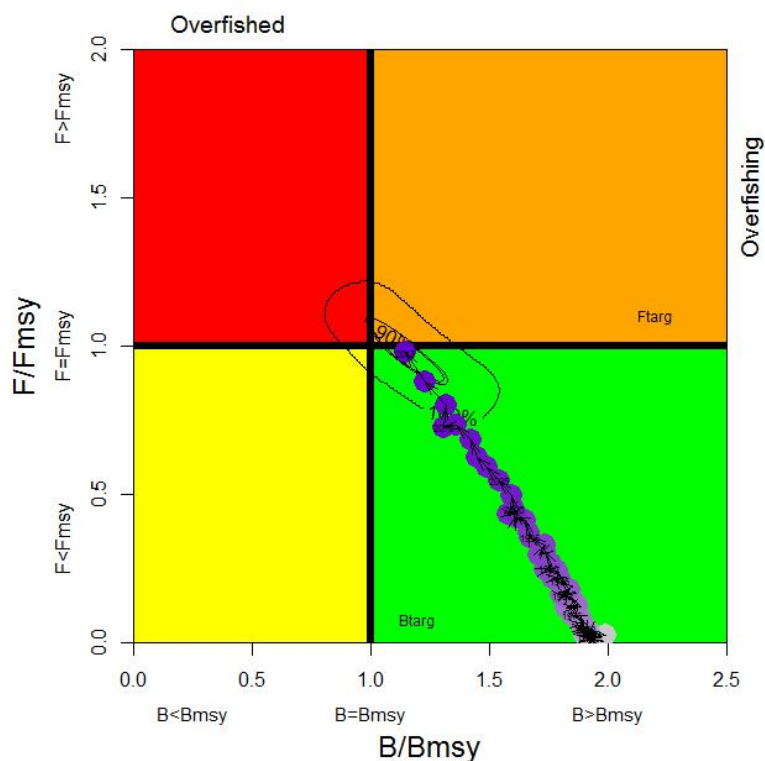


Fig.2. Kawakawa. OCOM aggregated Indian Ocean assessment. Blue circles indicate the trajectory of the point estimates for the B ratio and F ratio for each year between 1950 and 2013 (the black lines represent all plausible model runs shown around 2015 estimate).

Table 2. Kawakawa: OCOM Aggregated Indian Ocean assessment Kobe II Management Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2013 catch level, -10%, -20%, -30%, +10% and +20%) projected for 3 and 10 years. Note: from the 2015 stock assessment using catch estimates (i.e. 1950-2013) at that time.

Reference point and projection timeframe	Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate MSY-based reference points					
	70% (119,126 t)	80% (136,144 t)	90% (153,162 t)	100% (170,181 t)	110% (187,199 t)	120% (204,216 t)
$B_{2016} < B_{MSY}$	0	1	37	96	n.a.	100
$F_{2016} > F_{MSY}$	0	18	87	100	100	100
$B_{2023} < B_{MSY}$	0	0	55	100	100	100
$F_{2023} > F_{MSY}$	0	0	91	100	100	100