DRAFT EXECUTIVE SUMMARY: SKIPJACK TUNA

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi
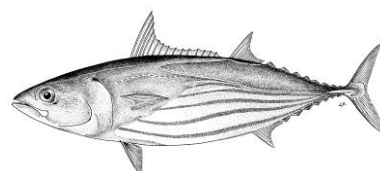
Status of the Indian Ocean skipjack tuna (SKJ: *Katsuwonus pelamis*) resource

TABLE 1. Skipjack tuna: Status of skipjack tuna (*Katsuwonus pelamis*) in the Indian Ocean.

Area[1]	Indicators		2016 stock status determination
Indian Ocean	Catch 2015: Average catch 2011–2015:	393,954 t 394,320 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): C_{2013}/C_{MSY} (80% CI): SB_{2013}/SB_{MSY} (80% CI): SB_{2013}/SB_0 (80% CI):	684 (550–849) 0.65 (0.51–0.79) 875 (708–1,075) 0.62 (0.49–0.75) 1.59 (1.13–2.14) 0.58 (0.53–0.62)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.

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 skipjack tuna in 2016, thus, stock status is determined on the basis of the 2014 assessment and other indicators presented in 2016. The 2014 stock assessment model results did not differ substantively from the previous (2012 and 2011) assessments; however, the final overall estimates of stock status differ somewhat due to the revision of the input parameters and updated standardised CPUE indices. All the runs carried out in 2014 indicate the stock is above a biomass level that would produce MSY in the long term (i.e. $SB_{2013}/SB_{MSY} > 1$) and in all runs that the current proxy for fishing mortality is below the MSY-based reference level (i.e. $C_{current}/C_{MSY} < 1$) (Table 1 and Fig. 1). The median value of MSY from the model runs investigated was 684,000 t with a range between 550,000 and 849,000 t. Current spawning stock biomass was estimated to be 57% (Table 1) of the unfished levels. Catches in 2015 ($\approx$393,954 t) remain lower than the estimated MSY values from the 2014 stock assessments (Table 1). The average catch over the previous five years (2011–15; $\approx$394,320 t) also remains below the estimated MSY. Thus, on the weight-of-evidence available in 2016, the skipjack tuna stock is determined to be **not overfished** and is **not subject to overfishing** (Table 1).

Outlook. The recent declines in total overall catch of skipjack for both BB and PS, the decline in catch per set on FADs (in parallel to the overall increase in number of FADs deployed at sea and number of supply vessels), and the decrease on free school catches of skipjack tuna are thought to be of some concern, particularly as the causes of these indicators are currently not fully understood. These indicators may suggest some increase in fishing mortality or school fragmentation due to the strong associative behaviour of the species. In addition, the marked decline in the relative proportion of skipjack in FAD catches, should be further investigated and explained.

These indicators should be updated and at least considered in parallel, or whenever possible, incorporated to the formal SKJ stock assessment that will be conducted in 2017.

There remains considerable uncertainty in the assessment, and the range of runs analysed illustrate a range of stock status to be between 0.73–4.31 of SB_{2013}/SB_{MSY} based on all runs examined. The Kobe strategy matrix illustrates the levels of risk associated with varying catch levels over time and could be used to inform management actions. Based on the SS3 assessment conducted in 2014, there is a low risk of exceeding MSY‑based reference points by 2016 and 2023 if catches are maintained at 2013 levels of $\approx$425,000 t (< 1 % risk that $B_{2016} < B_{MSY}$ and 1 % risk that $C_{2023} > MSY$ as proxy of $F > F_{MSY}$).

Management advice. If catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments.

The following key points should also be noted:

- Maximum Sustainable Yield (MSY): The median MSY value from the model runs investigated was 684,000 t with a range between ≈550,000 and ≈849,000 t (Table 1); However, MSY reference levels from these models were not well determined. Historically, catches in excess of 600,000 t were estimated to coincide with the time that the stock fell below 40% of the unfished level, which maybe a more robust proxy for MSY in this case. Considering the average catch level from 2010–2014 was ≈402,000 t, the stock appears to be in no immediate threat of breaching target and limit reference points. Current stock size is above $SB_{40\%}$ and predicted to increase on the short term. Catches at the level of ≈425,000 t have a low probability of reducing the stock below $SB_{40\%}$ in the short term (3–5 years) and medium term (10 years). However, taking into account the uncertainty related to current skipjack assessment as well as other indicators such the low catch rates of FADs and increased effort, it is recommended that annual catches of skipjack tuna should not exceed the lower value of MSY of the range (≈550,000 t) in order to ensure that stock biomass levels could sustain catches at the MSY level in the long term.

- The Kobe strategy matrix (Table 2) illustrates the levels of risk associated with varying catch levels over time and could be used to inform management actions.

- **Interim 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:
  - **Fishing mortality**: Current fishing mortality is considered to be below the interim target reference point of F_{MSY}, and therefore below the interim limit reference point of $1.5*F_{MSY}$ (Fig. 1). Based on the current assessment there is a very low probability that the interim limit reference points of $1.5*F_{MSY}$ at the current catch levels will be exceeded in 3 or 10 years.
  - **Biomass**: Current spawning biomass is considered to be above the interim target reference point of SB_{MSY}, and therefore above the interim limit reference point of $0.4*SB_{MSY}$ (Fig. 1). Based on the current assessment, there is a low probability that the spawning stock biomass, at the current catch levels, will be below the interim limit reference point of $0.4*SB_{MSY}$ in 3 or 10 years.

- **Main fishing gear** (Average catch 2012–15): Purse seine ≈30% (FAD associated school ≈28% and free swimming school ≈2%); Gillnet ≈26%; Pole-and-line ≈21%; Other ≈24%.

- **Main fleets** (Average catch 2012–15): Indonesia ≈21%; European Union ≈19% (EU,Spain: ≈15%; EU,France: ≈4%); ≈Maldives 17%; Sri Lanka ≈15%; ≈I.R. Iran 9%; Seychelles ≈8%; India ≈7%.
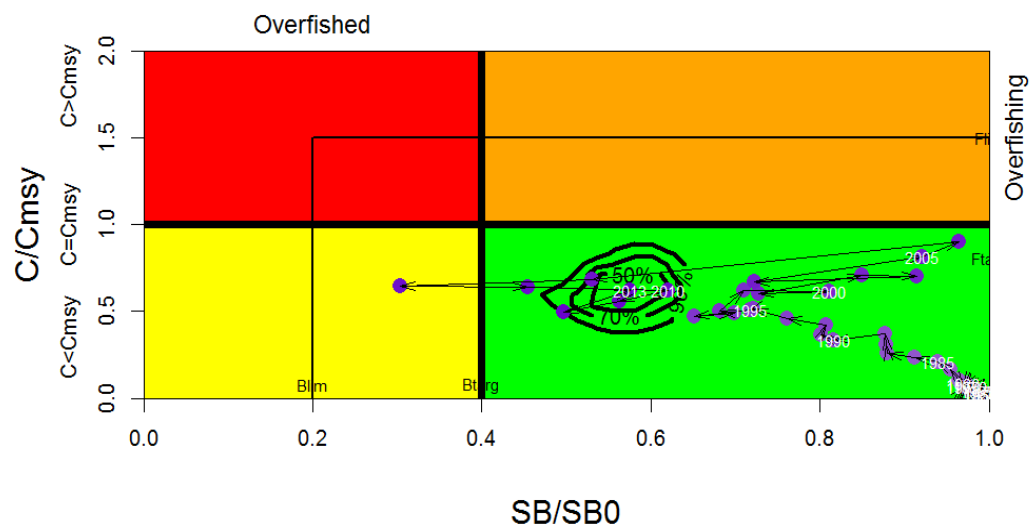
Fig. 1. Skipjack tuna: SS3 Aggregated Indian Ocean assessment Kobe plot (contours are the 50, 70 and 90 percentiles of the 2013 estimate). Blue circles indicate the trajectory of the point estimates for the SB/SB0 ratio and F proxy ratio for each year 1950–2013 estimated as C/C_{MSY}. Interim target (Ftarg and SBtarg) and limit (Flim and SBlim) reference points, are based on 0.4 (0.2) B_0 and $C/C_{MSY}=1$ (1.5) as suggested by WPTT.

TABLE 2. Skipjack tuna: 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 the catch level from 2013 (424,580 t)*, ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years.

Reference point and projection timeframe	Alternative catch projections (relative to the catch level from 2013*) and probability (%) of violating MSY-based target reference points ($SB_{targ} = SB_{MSY}$; $F_{targ} = F_{MSY}$)								
	60% (254,748 t)	**70%** (297,206 t)	**80%** (339,664 t)	**90%** (382,122 t)	**100%** (424,580 t)	**110%** (467,038 t)	**120%** (509,496 t)	**130%** (551,954 t)	**140%** (594,412 t)
$B_{2016} < B_{MSY}$	0	n.a.	1	n.a.	1	n.a.	1	n.a.	9
$F_{2016} > F_{MSY}$	0	n.a.	1	n.a.	1	n.a.	5	n.a.	12
$B_{2023} < B_{MSY}$	0	n.a.	1	n.a.	1	n.a.	6	n.a.	25
$F_{2023} > F_{MSY}$	0	n.a.	1	n.a.	1	n.a.	5	n.a.	20

Reference point and projection timeframe	Alternative catch projections (relative to the catch level from 2013*) and probability (%) of violating MSY-based limit reference points ($SB_{lim} = 0.4\ SB_{MSY}$; $F_{Lim} = 1.4\ F_{MSY}$)								
	60% (254,748 t)	**70%** (297,206 t)	**80%** (339,664 t)	**90%** (382,122 t)	**100%** (424,580 t)	**110%** (467,038 t)	**120%** (509,496 t)	**130%** (551,954 t)	**140%** (594,412 t)
$B_{2016} < B_{Lim}$	0	n.a.	0	n.a.	0	n.a.	0	n.a.	0
$F_{2016} > F_{Lim}$	1	n.a.	1	n.a.	1	n.a.	1	n.a.	1
$B_{2023} < B_{Lim}$	0	n.a.	0	n.a.	0	n.a.	0	n.a.	0
$F_{2023} > F_{Lim}$	0	n.a.	1	n.a.	1	n.a.	1	n.a.	6

* Catches for 2013, at the time of the last skipjack tuna assessment conducted in 2014.