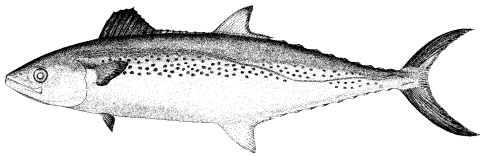
DRAFT EXECUTIVE SUMMARY: INDO-PACIFIC KING MACKEREL

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



Status of the Indian Ocean Indo-Pacific king mackerel (GUT: *Scomberomorus guttatus*) resource

TABLE 1. Indo-Pacific king mackerel: Status of Indo-Pacific king mackerel (*Scomberomorus guttatus*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch[2] 2014:	45,953 t	
	Average catch[2] 2010–2014:	44,621 t	
	MSY (1,000 t) [*]:	43 [35.8–52.9]	
	F_{MSY} [*]:	0.42 [0.34–0.52]	
	B_{MSY} (1,000 t) [*]:	82.8 [60.3–131.1]	
	F_{2013}/F_{MSY} [*]:	1.05 [0.91–1.27]	
	B_{2013}/B_{MSY} [*]:	1.01 [0.80–1.20]	
	B_{2013}/B_0 [*]:	0.52 [0.34–0.74]	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]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.

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. The first Indo-Pacific king mackerel stock assessment was run using SRA techniques (Catch-MSY and OCOM). Early indicators suggest at target yield of 43,000 t, though the last few years catches have exceeded them and peaked to 49,000 t in 2013. Since this is the first year that an assessment is being conducted, the WPNT did not set a stock status indicator for this stock. Stock status in relation to the Commission's B_{MSY} and F_{MSY} target reference points remains **uncertain** (Table 1), indicating that a precautionary approach to the management of Indo-Pacific king mackerel should be applied. Based on the preliminary assessment a stock status summary is shown below (Fig. 1) which indicates that the stock is not overfished but maybe experiencing overfishing.

Outlook. Total annual catches for Indo-Pacific king mackerel have stabilised over the past five years at around 46,300 t. There remains considerable uncertainty about stock structure and about the total catches. Due to a lack of fishery data for several gears, 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 formal assessment are a cause for considerable concern. In the interim until more traditional approaches are developed the data-poor approaches will be used to assess stock status, and although not used in this year to provide stock status advice will be used as an indicator and developed further in subsequent years. The continued increase of annual catches for Indo-Pacific king mackerel is likely to have further increased the pressure on the Indian Ocean stock as a whole resource. The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is probably 43,000 t, and catches in recent years have exceeded this target.
- Data collection and reporting urgently need to be improved.
- Reconstruction of the catch history needs to occur before a reliable assessment can be attempted.
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

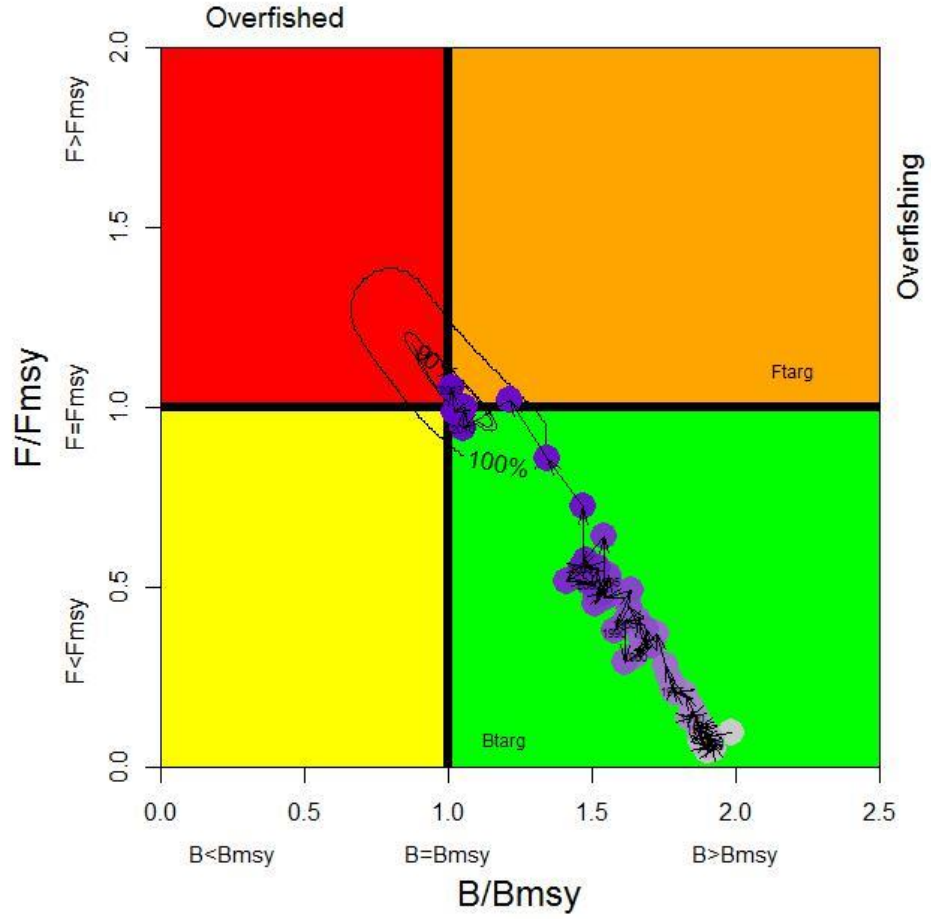


Fig. 1. Indo-Pacific king mackerel: *S. guttatus* OCOM Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

APPENDIX I

SUPPORTING INFORMATION

(Information collated from reports of the Working Party on Neritic Tunas and other sources as cited)

CONSERVATION AND MANAGEMENT MEASURES

Indo-Pacific king mackerel (*Scomberomorus guttatus*) in the Indian Ocean is currently subject to a number of Conservation and Management Measures adopted by the Commission:

- Resolution 15/01 *on the recording of catch and effort by fishing vessels in the IOTC area of competence*
- Resolution 15/02 *mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating non-Contracting Parties (CPCs)*
- Resolution 14/05 *concerning a record of licensed foreign vessels fishing for IOTC species in the IOTC area of competence and access agreement information*
- Resolution 12/11 *on the implementation of a limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties*
- Resolution 10/08 *concerning a record of active vessels fishing for tunas and swordfish in the IOTC area*

FISHERIES INDICATORS

Indo-Pacific king mackerel: General

The Indo-Pacific king mackerel (*Scomberomorus guttatus*) is a migratory species that forms small schools and inhabits coastal waters, sometimes entering estuarine areas. **Table 2** outlines some key life history parameters relevant for management.

TABLE 2. Indo-Pacific king mackerel: Biology of Indian Ocean Indo-Pacific king mackerel (*Scomberomorus guttatus*).

Parameter	Description
Range and stock structure	A migratory species that forms small schools and inhabits coastal waters, sometimes entering estuarine areas. It is found in waters from the Persian Gulf, India and Sri Lanka, Southeast Asia, as far north as the Sea of Japan. The Indo-Pacific king mackerel feeds mainly on small schooling fishes (e.g. sardines and anchovies), squids and crustaceans. No information is available on the stock structure of Indo-Pacific king mackerel stock structure in Indian Ocean.
Longevity	n.a.
Maturity (50%)	**Age**: 1–2 years; females n.a. males n.a. **Size:** females and males ~40–52 cm FL.
Spawning season	Based on the occurrence of ripe females and the size of maturing eggs, spawning probably occurs from March to July in southern India and in May in Thailand waters. Fecundity increases with age in the Indian waters, ranging from around 400,000 eggs at age 2 years to over one million eggs at age 4 years.
Size (length and weight)	Maximum: Females and males 76 cm FL; weight n.a.

n.a. = not available. Sources: Froese & Pauly 2009

Indo-Pacific king mackerel – Fisheries and main catch trends

- Main fisheries: Indo-Pacific king mackerel[1] are caught mainly by gillnet fisheries in the Indian Ocean, however significant numbers are also caught trolling (**Table 3**; **Fig. 1**).
- Main fleets (i.e., in terms of highest catches in recent years):

  Fisheries in India, Indonesia, and, to a lesser extent, Myanmar, I.R. Iran and Pakistan (**Fig. 2**).
- Retained catch trends:

[1] Hereinafter referred to as King mackerel.

Estimated catches have increased steadily since the mid 1960s, reaching around 24,000 t in the late 1970s and over 30,000 t by the mid-1990s, when catches remained stable until around 2006. Since the late-2000s catches have increased sharply, to over 40,000 t, with the highest catches recorded in 2009 at around 53,000 t.

- Discard levels**:** are thought to be very low, although estimates of discards are unknown for most fisheries.

Changes to the catch series**:** there have been no major revisions to the catch series for King mackerel since the WPNT in 2014.

TABLE 3. Indo-Pacific king mackerel: Best scientific estimates of the catches of Indo-Pacific king mackerel by type of fishery for the period 1950–2014 (in metric tonnes) (data as of November 2015).

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Purse seine	-	-	34	584	772	938	768	720	1,109	1,239	1,605	1,122	1,311	1,150	1,248	1,179
Gillnet	4,367	6,897	13,948	17,097	21,709	23,628	20,347	20,915	27,450	31,193	32,007	26,252	28,261	27,630	29,284	30,567
Line	250	349	768	1,333	1,834	2,504	2,240	2,046	3,493	3,520	4,041	3,215	3,362	3,345	3,429	3,244
Other	13	21	48	3,879	5,101	9,353	8,334	8,208	10,872	11,929	15,733	11,578	12,349	11,127	12,489	10,963
Total	**4,630**	**7,268**	**14,798**	**22,893**	**29,416**	**36,422**	**31,689**	**31,889**	**42,923**	**47,881**	**53,386**	**42,166**	**45,282**	**43,252**	**46,450**	**45,953**

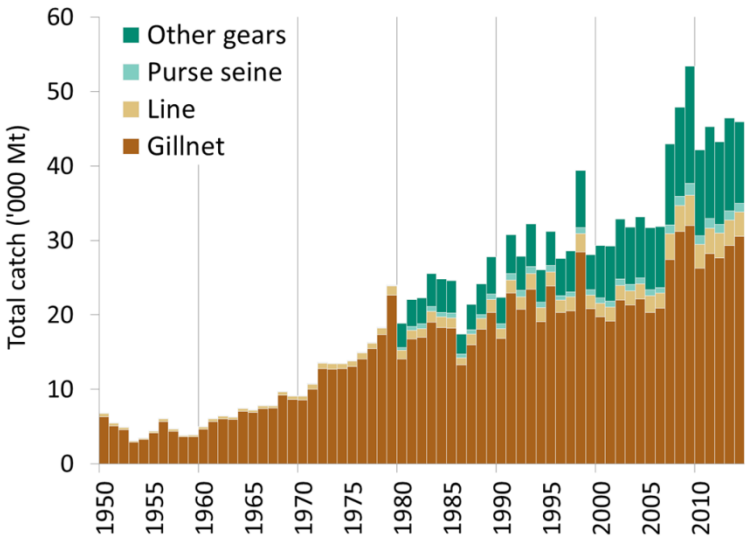


Fig. 1. Indo-Pacific king mackerel: Annual catches of Indo-Pacific king mackerel by gear recorded in the IOTC database (1950–2014) (data as of November 2015).

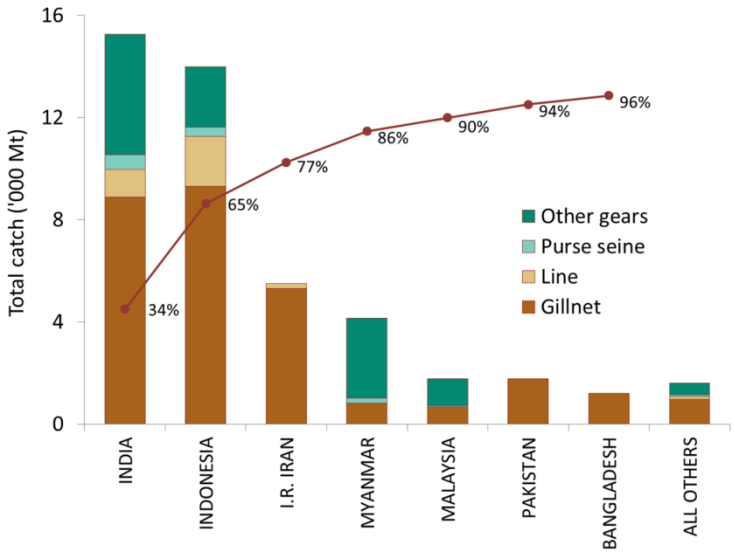


Fig. 2. Indo-Pacific king mackerel: Average catches in the Indian Ocean over the period 2011–14, by country. Countries are ordered from left to right, according to the importance of catches of Indo-Pacific king mackerel reported. The red line indicates the (cumulative) proportion of catches of Indo-Pacific king mackerel for the countries concerned, over the total combined catches of this species reported from all countries and fisheries (data as of November 2015).

Indo-Pacific king mackerel – Uncertainty of catches

Retained catches for King mackerel were derived from incomplete information, and are therefore uncertain[2] (**Fig. 3**), notably for the following fisheries:

- Species aggregation: Indo-Pacific king mackerels are often not reported by species but are aggregated with narrow-barred Spanish mackerel or, less frequently, other small tuna species.
- Mislabelling: Indo-Pacific king mackerels are often mislabelled as narrow-barred Spanish mackerel, their catches reported under the latter species.
- Underreporting: the catches of Indo-Pacific king mackerel may be not reported for some fisheries catching them as a bycatch.

It is for the above reasons that the catches of Indo-Pacific king mackerel in the IOTC database are thought to represent only a small fraction of the total catches of this species in the Indian Ocean and are therefore highly uncertain.

[2] The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of non-reporting fisheries for which catches have been estimated.

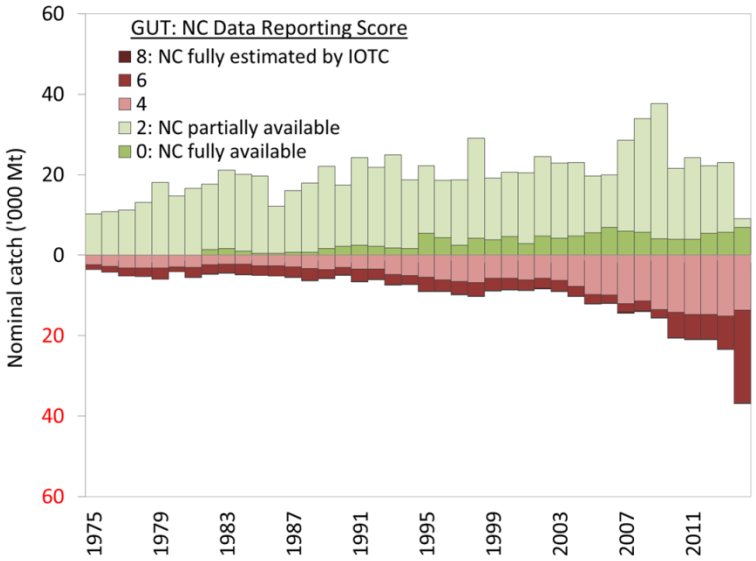


Fig. 3. Indo-Pacific king mackerel: uncertainty of annual catch estimates (1950–2014). Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat) (data as of November 2015).

Indo-Pacific king mackerel – Effort trends

- Availability: Effort trends are unknown for King Mackerel in the Indian Ocean, due to a lack of catch-and-effort data.

Indo-Pacific king mackerel – Catch–per–unit–effort (CPUE) trends

- Availability: no data available for most fisheries, and where available, data refer to very short periods (**Table 4**). This makes it impossible to derive any meaningful CPUE from the existing data.

TABLE 4. Indo-Pacific king mackerel: Availability of catches and effort series, by fishery and year (1970–2014)[3]. Note that no catches and effort are available at all for 1950–85

Gear-Fleet	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10	12	14
PSS-Indonesia									■														
LINE-South Africa																		■					
LINE-Yemen																			■				

Indo-Pacific king mackerel – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- Size frequency data: trends in average weight cannot be assessed for most fisheries due to lack of data.

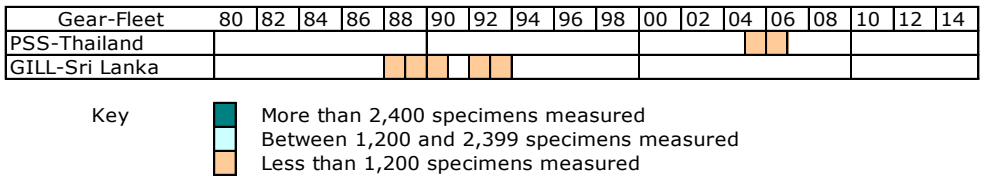
  Main sources for size samples: Thailand (coastal purse seiner) and Sri Lankan (gillnet) – however the number of samples is very small and the data refer to very short periods (**Table 5**).

- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.

- Sex ratio data: have not been provided to the Secretariat by CPCs.

[3] Note that the above list is not exhaustive, showing only the fisheries for which catch-and-effort are available in the IOTC database. In addition, catch-and-effort may not be available for all months for years shown in the table for each fishery.

TABLE 5. Indo-Pacific king mackerel: Availability of length frequency data, by fishery and year (1980–2014)[4]. Note that no length frequency data are available at all for 1950–82).



STOCK ASSESSMENT

Two data-poor stock assessment models, a Catch-MSY and Optimised Catch Only Method (OCOM), were used to assess the status of Indo-Pacific king mackerel in the Indian Ocean for the first time in 2015. The results of the OCOM model are presented in **Table 6**. The catch data for Indo-Pacific king mackerel are very poor and highly correlated with the catch data for Narrow-barred Spanish mackerel due to the disaggregation by species used in the catch estimation procedures. As the data and stock assessment approaches were considered to be highly uncertain and have only been carried out for one year, no management advice is presented regarding stock status, only in terms of the yield target.

TABLE 6. Indo-Pacific king mackerel (*Scomberomorus guttatus*) key management quantities.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2014)	45,872 t
Mean catch from 2010–2014	44,527 t
MSY (1,000 t) [*]	43 [36–53]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.42 [0.34–0.52]
B_{MSY} (1,000 t) [*]	83 [60–131]
F_{2013}/F_{MSY} [*]	1.05 [0.91–1.27]
B_{2013}/B_{MSY} [*]	1.01 [0.80–1.20]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.52 [0.34–0.74]
SB_{2013}/SB_0 (80% CI)	n.a.
$B_{2013}/B_{0, F=0}$ (80% CI)	n.a.
$SB_{2013}/SB_{0, F=0}$ (80% CI)	n.a.

LITERATURE CITED

Froese R, Pauly DE (2009) FishBase, version 02/2009, FishBase Consortium, www.fishbase.org

[4] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. In addition, size data may not be available for all months for years shown in the table for each fishery.