

## INDO-PACIFIC KING MACKEREL

## 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 15/11 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 1** outlines some key life history parameters relevant for management.

**TABLE 1.** 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%)	<b>Age:</b> 1–2 years; females n.a. males n.a. <b>Size:</b> 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

*Fisheries and main catch trends*

- Main fisheries: Indo-Pacific king mackerel<sup>1</sup> are caught mainly by gillnet fisheries in the Indian Ocean, however significant numbers are also caught trolling (**Table 2; Fig.1**).
- Main fleets (i.e., in terms of highest catches in recent years): Around two-thirds of catches are accounted for by fisheries in India, Indonesia; with important catches also reported by I.R. Iran and Myanmar (**Fig.2**).
- Retained catch trends:

<sup>1</sup> Hereinafter referred to as King mackerel.

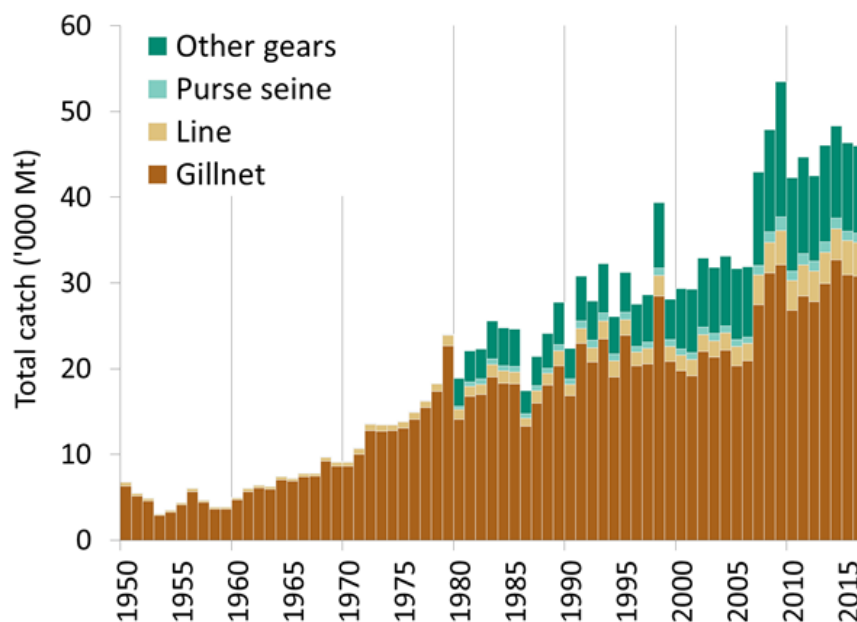
Estimated catches have increased steadily since the mid 1960's, reaching around 24,000 t in the late 1970's and over 30,000 t by the mid-1990's, when catches remained stable until around 2006. Since the late-2000s catches have increased sharply, to over 40,000 t, with the highest catches recorded in 2009 at around 53,000 t.

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

**TABLE 2.** Indo-Pacific king mackerel: Best scientific estimates of the catches of Indo-Pacific king mackerel by type of fishery for the period 1950–2016 (in metric tonnes) (data as of October 2017).

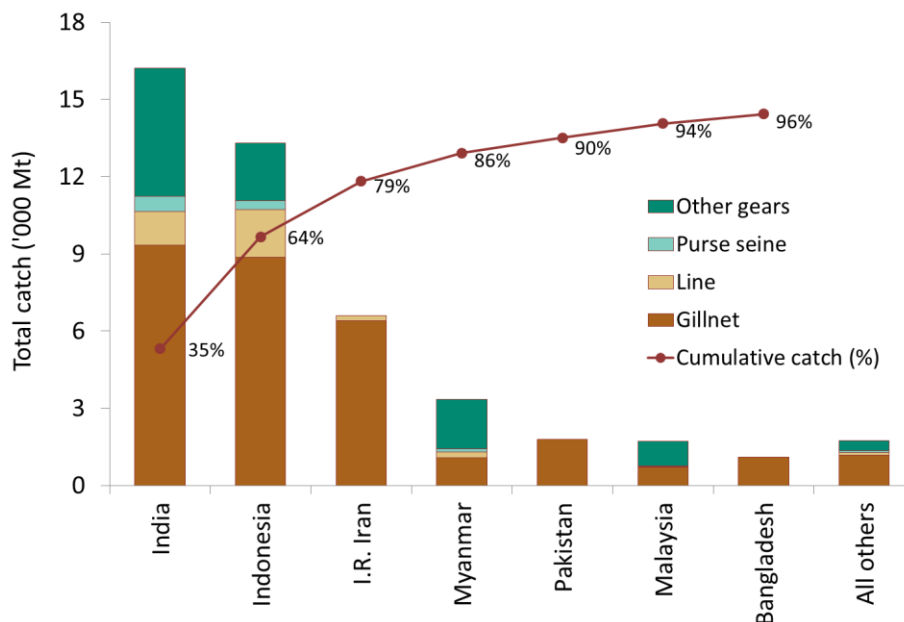
Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Purse seine	-	-	34	584	772	938	1,109	1,239	1,605	1,104	1,268	1,103	1,230	1,235	1,121	1,152
Gillnet	4,367	6,898	13,947	17,096	21,709	23,634	27,450	31,192	32,069	26,800	28,498	27,834	29,898	32,705	30,968	30,818
Line	250	349	769	1,334	1,834	2,504	3,493	3,520	4,041	3,497	3,619	3,575	3,656	3,596	3,969	3,871
Other	13	21	48	3,879	5,100	9,353	10,872	11,929	15,733	10,859	11,268	9,964	11,259	10,747	10,257	10,136
<b>Total</b>	<b>4,630</b>	<b>7,269</b>	<b>14,798</b>	<b>22,893</b>	<b>29,415</b>	<b>36,428</b>	<b>42,923</b>	<b>47,880</b>	<b>53,448</b>	<b>42,260</b>	<b>44,653</b>	<b>42,476</b>	<b>46,042</b>	<b>48,283</b>	<b>46,315</b>	<b>45,978</b>

**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. 1.** Indo-Pacific king mackerel: Annual catches of Indo-Pacific king mackerel by gear recorded in the IOTC database (1950–2016)<sup>2</sup>.

<sup>2</sup> **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.** Indo-Pacific king mackerel: Average catches in the Indian Ocean over the period 2012–16, 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.

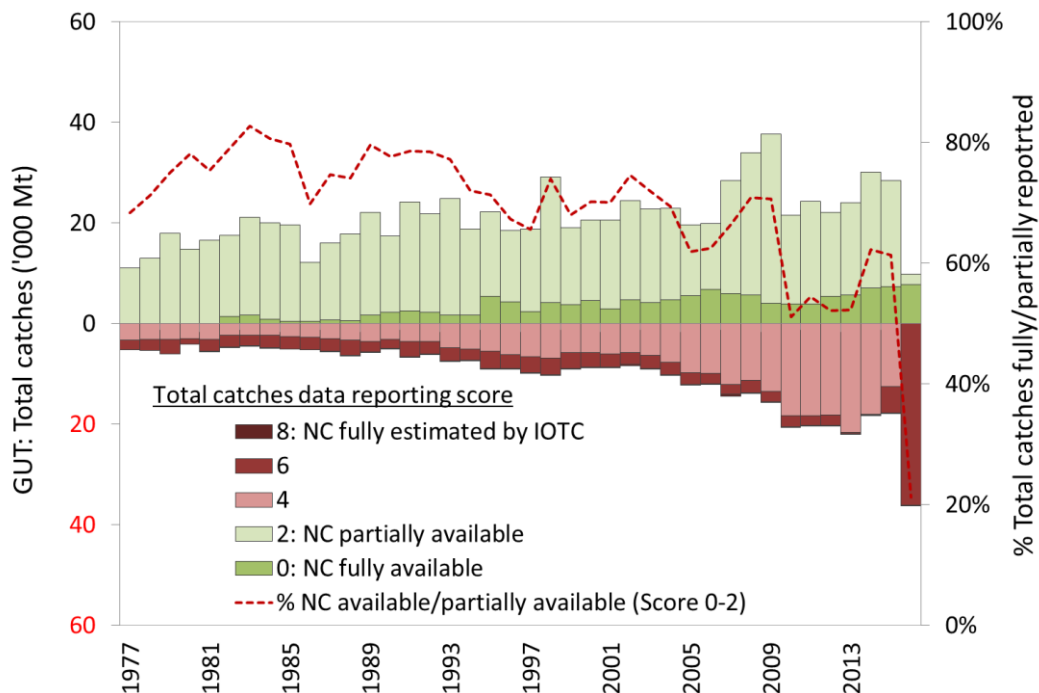
#### *Indo-Pacific King mackerel: estimation of catches – data related issues*

**Retained catches** for King mackerel were derived from incomplete information, and are therefore uncertain<sup>3</sup> (**Fig.3**), notably for the following fisheries:

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

It is for the above reasons that the catches of 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.

<sup>3</sup> 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 had to be estimated.



**Fig. 3.** Indo-Pacific king mackerel: uncertainty of annual catch estimates (1977–2016).

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 (e.g., partially adjusted by gear and species by the IOTC Secretariat; catches with a score of 8 refer to fleets that do not report catch data to the IOTC and are fully estimated by the IOTC Secretariat. The red dotted line indicates the proportion of total catches fully or partially reported to the IOTC Secretariat.

**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 3**). This makes it impossible to derive any meaningful CPUE from the existing data.

**TABLE 3.** Indo-Pacific king mackerel: Availability of catches and effort series, by fishery and year (1970–2016)<sup>4</sup>. 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	16	
PSS-Indonesia									■																
LINE-Comoros																									
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 4**).
- 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.

<sup>4</sup> 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 4.** Indo-Pacific king mackerel: Availability of length frequency data, by fishery and year (1980–2016)<sup>5</sup>. Note that no length frequency data are available at all for 1950–82).

Gear-Fleet	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10	12	14	
PSS-Thailand																			
GILL-Sri Lanka																			

Key

<span style="display:inline-block; width:10px; height:10px; background-color:blue; border:1px solid black;"></span>	More than 2,400 specimens measured
<span style="display:inline-block; width:10px; height:10px; background-color:lightblue; border:1px solid black;"></span>	Between 1,200 and 2,399 specimens measured
<span style="display:inline-block; width:10px; height:10px; background-color:orange; border:1px solid black;"></span>	Less than 1,200 specimens measured

**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 in 2016. The results of the OCOM model are presented in **Table 5**. 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, no management advice is presented regarding stock status, only in terms of the yield target, which was similar for both models considered (45,022, Catch-MSY and 45,632 OCOM).

**TABLE 5.** Indo-Pacific king mackerel (*Scomberomorus guttatus*) Key management quantities from the OCOM assessment in 2016 using a base case with maximum depletion of 70%.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2016) t	45,978
Mean catch 2012-2016 t	45,819
MSY (plausible range) t	46,000 [38,900–54,400]
Data period used in assessment	1950 - 2014
F <sub>MSY</sub> (plausible range)	0.52 [0.40–0.69]
B <sub>MSY</sub> (plausible range) t	66,000 [45,900–107,900]
F <sub>2014</sub> /F <sub>MSY</sub> (plausible range)	0.98 (0.85 – 1.14)
B <sub>2014</sub> /B <sub>MSY</sub> (plausible range)	1.10 (0.84 – 1.29)
SB <sub>2014</sub> /SB <sub>MSY</sub> (80% CI)	n.a.
B <sub>2014</sub> /B <sub>0</sub> (plausible range)	0.55 (0.42 – 0.64)
SB <sub>2014</sub> /SB <sub>0</sub> (80% CI)	n.a.
B <sub>2014</sub> /B <sub>0, F=0</sub> (80% CI)	n.a.
SB <sub>2014</sub> /SB <sub>0, F=0</sub> (80% CI)	n.a.

n.a. not available; Geometric means and plausible ranges

**LITERATURE CITED**

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

<sup>5</sup> 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.