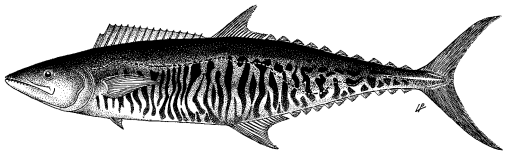
DRAFT EXECUTIVE SUMMARY: NARROW-BARRED SPANISH MACKEREL

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



Status of the Indian Ocean narrow-barred Spanish mackerel (COM: *Scomberomorus commerson*) resource

TABLE 1. Narrow-barred Spanish mackerel: Status of narrow-barred Spanish mackerel (*Scomberomorus commerson*) in the Indian Ocean.

Area[1]	Indicators		2015 stock status determination
Indian Ocean	Catch[2] 2014: Average catch[2] 2010–2014:	153,425 t 149,774 t	
	MSY (1,000 t) [*]: F_{MSY} [*]: B_{MSY} (1,000 t) [*]: F_{2013}/F_{MSY} [*]: B_{2013} B_{MSY} [*]: B_{2013}/B_0 [*]:	127.7 [95.8–183.6] 0.33 [0.21–0.56] 321 [174–693] 1.21 [0.99–1.58] 0.96 [0.69–1.22] 0.53 [0.30–1.04]	

[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. OCOM techniques indicate that the stock is being exploited at a rate exceeding F_{MSY} in recent years, and the stock appears to be below B_{MSY}. Northwest Indian Ocean (Gulf of Oman Sea countries) indicate that localised depletion may be occurring from an analysis done in 2013, and overfishing is occurring in this area, though the degree of connectivity with other stocks remains unknown. Stock structure issues remain to be clarified with this stock. Based on the weight-of-evidence available, including the two different SRA approaches pursued in 2015, the stock appears to be **overfished** and **subject to overfishing** (Table 1, Fig. 1). This is primarily because of new data reported from 2012 (India and Indonesia), that increased the total catch by 17000 tons, and the high catch levels in 2013. The updated index now indicated that 2012 was being subject to overfishing, but not overfished (as opposed to not subject to overfishing nor overfished, as was reported in 2014). The higher levels of catches in 2013 indicate that the stock has experience catches greater than estimated MSY since 2007.

Outlook. There remains considerable uncertainty about stock structure and the total catches. The continued increase of annual catches for narrow-barred Spanish mackerel in recent years has further increased the pressure on the Indian Ocean stock as a whole, and the stock is overfished and subject to overfishing. The apparent fidelity of narrow-barred Spanish mackerel to particular areas/regions is a matter for concern as overfishing in these areas can lead to localised depletion, as was presented at a previous meeting (IOTC-2015-WPNT03-27). Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. There is a high to very high risk of exceeding MSY-based reference points by 2016 if catches are maintained at current (2013) levels (100% risk that $B_{2016}<B_{MSY}$, and 100% risk that $F_{2016}>F_{MSY}$) (Table 2).

The following should be noted:

- Maximum Sustainable Yield estimate for the whole Indian Ocean is 127,700 (range 95,800 t–183,600 t) while current catches (153,342 t) are exceeding this. Therefore catch levels should be stabilised or reduced in future to prevent the stocks becoming overfished..

- Reconstruction of the catch history needs to occur, as do annual catches submitted to the Secretariat.
- Improvement in data collection and reporting is required to assess the stock using more traditional stock assessment techniques.
- Given the rapid increase in narrow-barred Spanish mackerel catch in recent years, some measures need to be taken to slow or reduce catches in the Indian Ocean (Table 2).
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

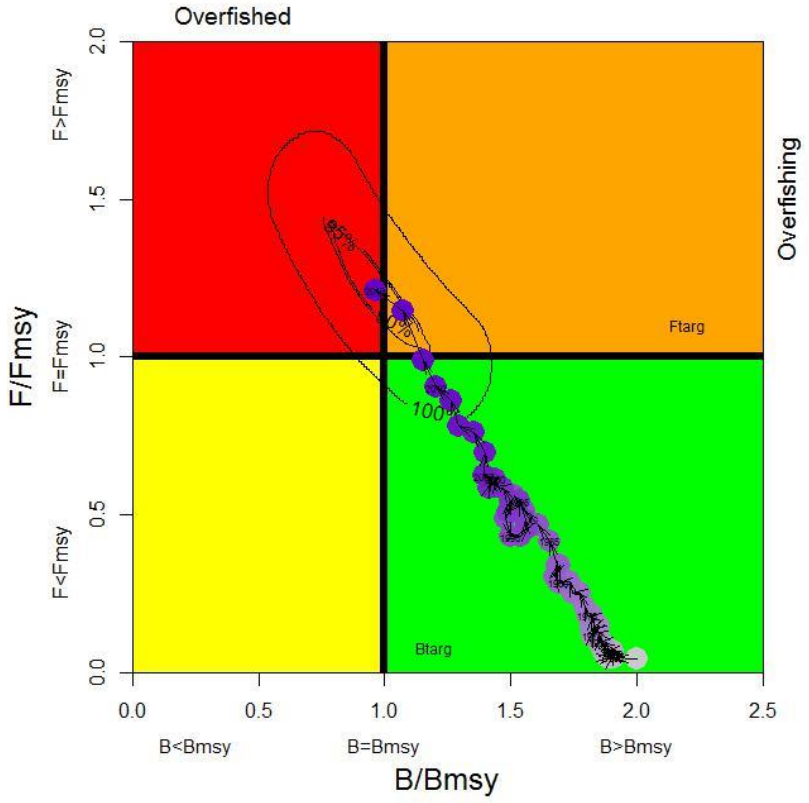


Fig. 1. Narrow-barred Spanish mackerel. Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

Table 2. Narrow-barred Spanish mackerel: 2015 OCOM Indian Ocean assessment Kobe II 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 at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2013) and weighted probability (%) scenarios that violate reference point**					
	70% (107,339 t)	**80%** (122,673 t)	**90%** (138,007 t)	**100%** (153,341 t)	**110%** (168,675 t)	**120%** (184,010 t)
$SB_{2016} < SB_{MSY}$	55	74	99	100	100	100
$F_{2016} > MSY$	100	99	100	100	100	100
$SB_{2023} < SB_{MSY}$	2	67	100	100	100	100
$F_{2023} > MSY$	21	99	100	100	100	100

APPENDIX I

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

Narrow-barred Spanish mackerel (*Scomberomorus commerson*) 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

Narrow-barred Spanish mackerel: General

The narrow-barred Spanish mackerel (*Scomberomorus commerson*) is a pelagic, top level predator found throughout tropical marine waters of the Indo-West Pacific. **Table 3** outlines some key life history parameters relevant for management.

TABLE 3. Narrow-barred Spanish mackerel. Biology of Indian Ocean narrow-barred Spanish mackerel (*Scomberomorus commerson*).

Parameter	Description
Range and stock structure	A pelagic, top level predator found throughout tropical marine waters of the Indo-West Pacific. Juveniles inhabit shallow inshore areas whereas adults are found in coastal waters out to the continental shelf. Adults are usually found in small schools but often aggregate at particular locations on reefs and shoals to feed and spawn. They appear to undertake lengthy migrations, however, larger individuals may be resident which contributes to a metapopulation structure. Feed primarily on small fishes such as anchovies, clupeids, carangids, also squids and shrimps. Genetic studies carried out on *S. commerson* from Djibouti, Oman and U.A.E. showed there were small genetic differences among stocks in these three places.
Longevity	~16 years
Maturity (50%)	**Age**: 1.9 yrs for males and 2.1 yrs for females **Size:** 72.8 cm for males and 86.3 cm for females.
Spawning season	Females are multiple spawners. Year-round spawning has been observed in east African waters, with peaks during late spring to summer (April-July) and autumn (September-November) coinciding with the two seasonal monsoons which generate high abundances of plankton and small pelagic fish. Spawning in the southern Arabian Gulf occurs in the spring and summer months between April and August.
Size (length and weight)	Maximum: Females and males 240 cm FL; weight 70 kgs.

n.a. = not available. Sources: Grandcourt et al. 2005, Froese & Pauly 2009, Darvishi et al. 2011

Narrow-barred Spanish mackerel – Fisheries and catch trends

- Main fisheries: Narrow-barred Spanish mackerel[1] are caught mainly using gillnet, however significant numbers are also caught using troll lines (**Table 4**; **Fig. 2**).
- Main fleets (i.e., highest catches in recent years):
  Fisheries in Indonesia, India, and to a lesser extent I.R. Iran, Myanmar, the UAE and Pakistan (**Fig. 3**). Spanish mackerel is also targeted throughout the Indian Ocean by artisanal and recreational fisheries.
- Retained catch trends:
  Catches of Spanish mackerel increased from around 50,000 t in the late-1970s to over 100,000 t by the late-1990s. The highest catches of Spanish mackerel have been recorded in recent years, at 145,000 t in 2011.

[1] Hereinafter referred to as Spanish mackerel

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

Changes to the catch series**:** No major revisions to the catch series since the WPNT meeting in 2014.

TABLE 4. Narrow-barred Spanish mackerel: Best scientific estimates of the catches of narrow-barred Spanish 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	-	0	285	2,355	4,145	5,611	5,877	7,631	6,588	6,133	8,459	8,929	9,454	9,274	9,440	8,595
Gillnet	9,530	17,704	32,168	54,918	62,712	67,281	59,611	67,804	73,041	75,700	77,041	80,499	80,259	90,635	88,321	93,967
Line	1,731	2,477	4,672	11,334	12,071	17,139	17,392	18,259	19,755	18,747	21,328	20,767	27,539	30,057	26,979	25,353
Other	57	96	468	5,603	9,741	21,351	20,523	23,915	25,530	22,741	28,170	25,672	27,572	31,246	28,800	25,510
Total	**11,318**	**20,277**	**37,593**	**74,210**	**88,669**	**111,382**	**103,404**	**117,609**	**124,914**	**123,322**	**134,998**	**135,868**	**144,823**	**161,213**	**153,540**	**153,425**

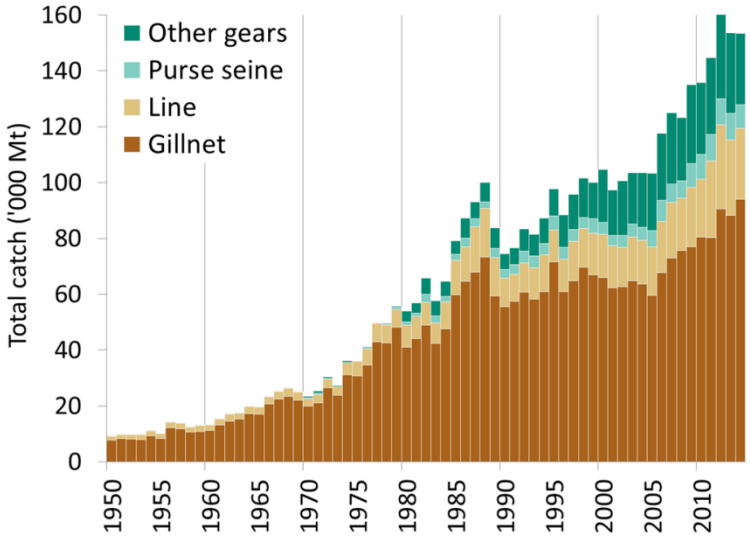


Fig. 2. Narrow-barred Spanish mackerel: Annual catches of narrow-barred Spanish mackerel by gear recorded in the IOTC database (1950–2014) (data as of November 2015).

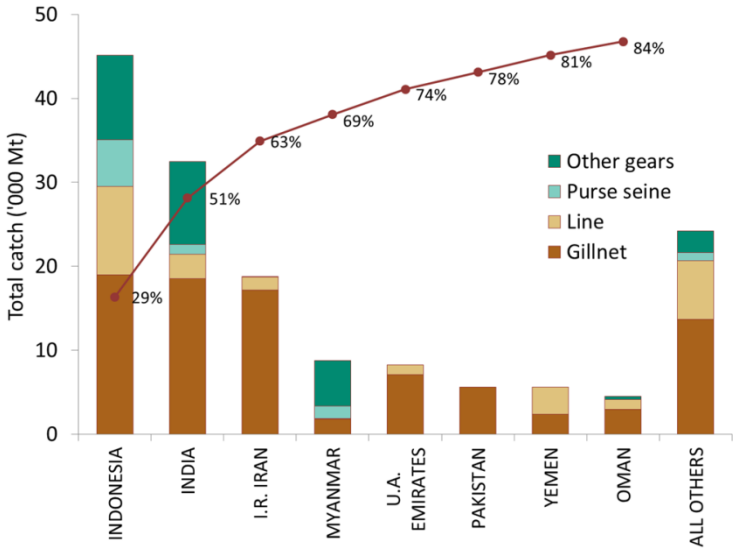


Fig. 3. Narrow-barred Spanish mackerel: Average catches in the Indian Ocean over the period 2011–14, by country. Countries are ordered from left to right, according to the importance of catches of narrow-barred Spanish mackerel reported. The red line indicates the (cumulative) proportion of catches narrow-barred Spanish mackerel for the countries concerned, over the total combined catches of this species reported from all countries and fisheries (Data as of October 2015).

Narrow-barred Spanish mackerel – uncertainty of catches

Retained catches for Spanish mackerel were derived from incomplete information, and are therefore uncertain[2] (**Fig. 4**), notably for the following fisheries:

- Artisanal fisheries of Indonesia and India: Indonesia and India have only recently reported catches of Spanish mackerel by gear, including catches by gear for the years 2005–08 and 2007–08, respectively. In the past, the IOTC Secretariat used the catches reported in recent years to break the aggregates for previous years, by gear and species. However, in a review conducted by the IOTC Secretariat by an independent consultant in 2012 the catches of narrow-barred Spanish mackerel were reassigned by gear. In recent years, the catches of narrow-barred Spanish mackerel estimated for Indonesia and India component represent around 50% of the total catches of this species in recent years.
- Artisanal fisheries of Madagascar: To date, Madagascar has not reported catches of narrow-barred Spanish mackerel to the IOTC. During 2012 the IOTC Secretariat conducted a review aiming to break the catches recorded in the FAO database as narrow-barred Spanish mackerel by species, on the assumption that all catches of tunas and tuna-like species had been combined under this name (the review used data from various sources including a reconstruction of the total marine fisheries catches of Madagascar (1950–2008), undertaken by the Sea Around Us Project). However the new catches timated are thought to be very uncertain.
- Artisanal fisheries of Somalia: Catch levels are unknown.
- Other artisanal fisheries UAE do not report catches of narrow-barred Spanish mackerel by gear. Although most of the catches are believed to be taken by gillnets, some narrow-barred Spanish mackerel may be also caught by using small surrounding nets, lines or other artisanal gears. In addition, Thailand report catches of narrow-barred Spanish mackerel and Indo-Pacific king mackerel aggregated.
- All fisheries: In some cases the catches of seerfish species are mislabelled, the catches of Indo-Pacific king mackerel and, to a lesser extent, other seerfish species, labelled as narrow-barred Spanish mackerel. Similarly, the catches of wahoo in some longline fisheries are thought to be mislabelled as narrow-barred Spanish mackerel. This mislabelling is thought to have little impact in the case of the narrow-barred Spanish mackerel but may be important for other seerfish species.

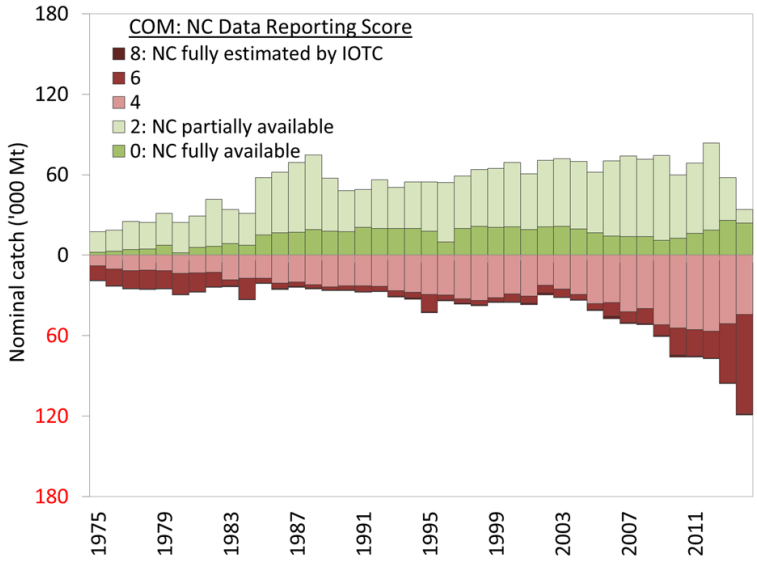


Fig. 4. Narrow-barred Spanish mackerel: Uncertainty of annual catch estimates (1950–2014). Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data 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).

[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.

Narrow-barred Spanish mackerel – Effort trends

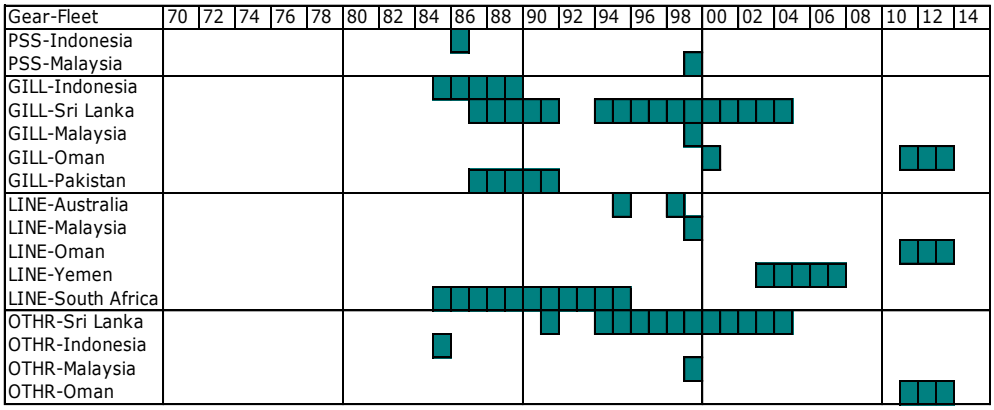
- Availability: Effort trends are unknown for Spanish mackerel in the Indian Ocean, due to a lack of catch-and-effort data.

Narrow-barred Spanish mackerel – Catch–per–unit–effort (CPUE) trends

- Availability: highly incomplete data, available only for selected years and/or fisheries (**Table 5**).
- Main CPUE series available (i.e., over 10 years or more):

  Sri Lanka (gillnets) – however the catches and effort recorded are thought to be unreliable due to the dramatic changes in CPUE recorded in 2003 and 2004 (**Fig. 5**).

TABLE 5. Narrow-barred Spanish mackerel: Availability of catches and effort series, by fishery and year (1970–2014). Note that no catches and effort are available at all for 1950–84[3].



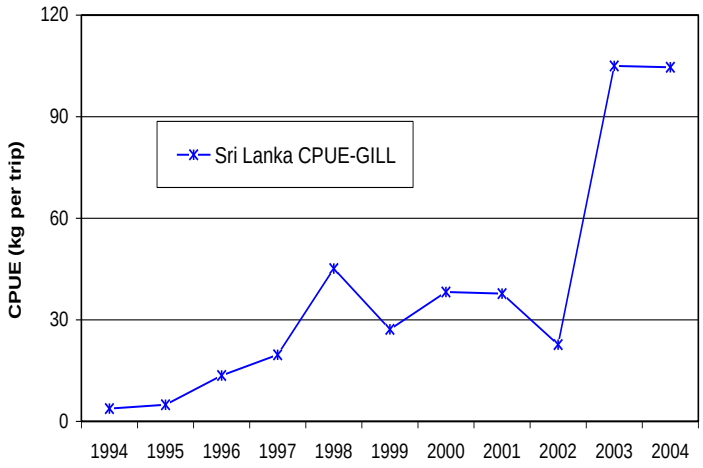


Fig. 5. Narrow-barred Spanish mackerel: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

Narrow-barred Spanish mackerel – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- Sizes: the sizes of narrow-barred Spanish mackerel taken by the Indian Ocean fisheries typically ranges between 30 and 140 cm depending on the type of gear used, season and location – with 32–119 cm fish taken in the Eastern Peninsular Malaysia area, 17–139 cm fish taken in the East Malaysia area and 50-90 cm fish taken in the Gulf of Thailand. Similarly, narrow-barred Spanish mackerel caught in the Oman Sea are believed to be larger than those caught in the Persian Gulf.[4]
- Size frequency data: highly incomplete data, available only for selected years and/or fisheries (**Table 6**).

  Total numbers of samples, across all years, are also well below the minimum sampling standard of 1 fish per tonne of catch recommended by the IOTC Secretariat to reliably assess changes in average weight.

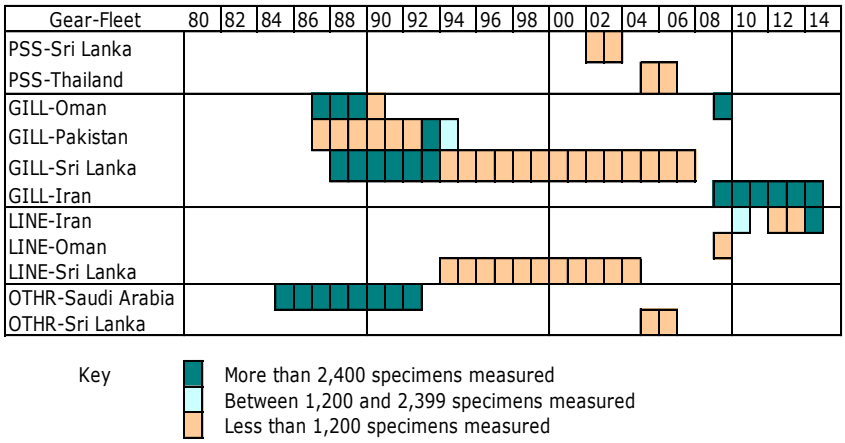
[3] Note that the above list is not exhaustive, showing only the fisheries for which catch-and-effort are available in the IOTC database. In addition, catch-and-effort may not be available for all months for years shown in the table for each fishery.

[4] However IOTC Secretariat has so far been unable to verify this independently with specimens sampled for lengths by CPCs.

Main sources for size samples: Sri Lankan (gillnet) (from late-1980s until early-1990s), and I.R. Iran (gillnet) (from the late-2000s). Length distributions derived from the data available for gillnet fisheries are shown in **Fig. 6**. No data are available in sufficient numbers for all other fisheries.

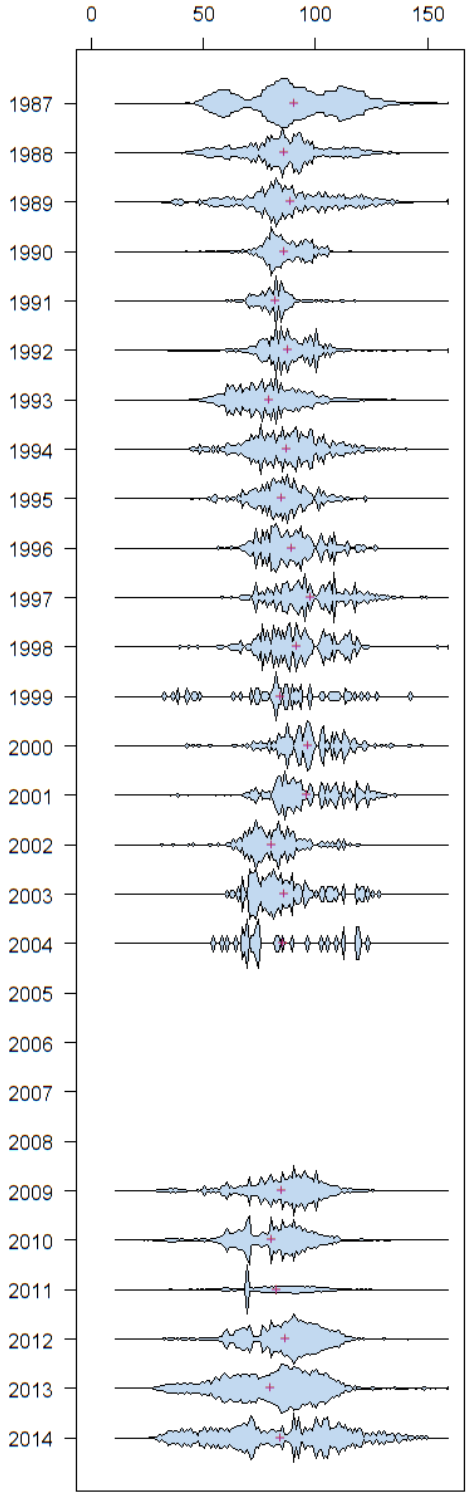
- Catch-at-Size (Age) table: Not available, due to lack of size samples and uncertainty over the reliability of retained catch estimates.
- Sex ratio data: have not been provided to the Secretariat by CPCs.

TABLE 6. Narrow-barred Spanish mackerel: Availability of length frequency data, by fishery and year (1980–2014)[5]. Note that no length frequency data are available at all for 1950–84.



[5] 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.

Narrow-barred Spanish mackerel (Gillnet samples): size (in cm)



Narrow-barred Spanish mackerel (Gillnet): no. of samples (‘000)

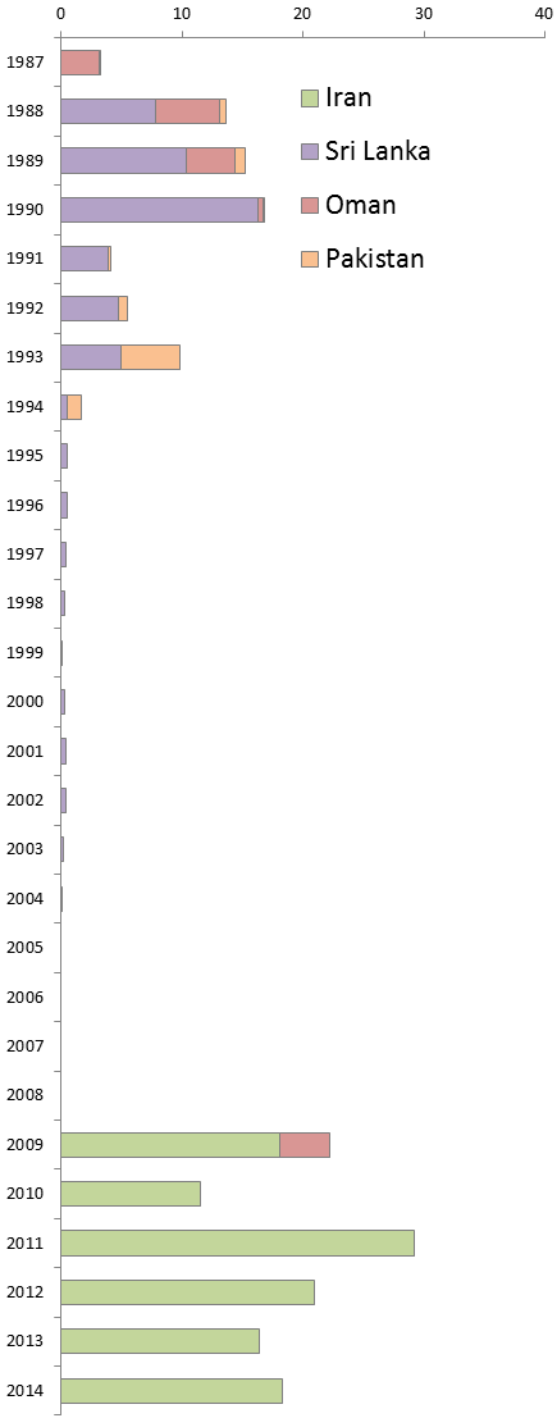


Fig. 6. Narrow-barred Spanish mackerel: Left - Narrow-barred Spanish mackerel: Length frequency distributions for gillnet fisheries (total amount of fish measured by 1cm length class) derived from data available at the IOTC Secretariat. Right - number of narrow-barred Spanish mackerel specimens sampled for lengths, by fleet (gillnet only).

STOCK ASSESSMENT

Two assessment approaches were applied to narrow-barred Spanish mackerel in 2015, a Catch-MSY analysis and an Optimised Catch Only Method (OCOM). The resulting stock trajectories for both approaches were very similar and gave similar outcomes, and for reporting and stock status advice the OCOM is used, due to the fewer assumptions about final depletion level (**Table 7**).

Noting that the Commission adopted Resolution 12/01 On the implementation of the precautionary approach, which effectively means that in a situation of increased uncertainty (e.g. data poor situations), a more precautionary approach should be undertaken when developing advice and possible management actions, this approach, combined with the weight-of-evidence available (stock status indicators from data poor assessment approaches, species biology, fishery indicators), were used to determine stock status for narrow-barred Spanish mackerel.

The stock status management advice for narrow-barred Spanish mackerel is based on the OCOM method, combined with the known species and fishery attributes for status interpretation purposes. The approach presented is useful to assess stock status in the near term, while more traditional stock assessment approaches in the region are deferred until more data is collected and submitted in accordance with the IOTC data recording and reporting requirements for neritic tunas.

TABLE 7. Narrow-barred Spanish mackerel: Key management quantities from the OCOM used in 2015.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2014)	152,623 t
Mean catch from 2010–2014	148,910 t
MSY (1,000 t) [*]	129 [96–184]
Data period used in assessment	1950–2013
F_{MSY} [*]	0.33 [0.21–0.56]
B_{MSY} (1,000 t) [*]	320 664 [174–693]
F_{2013}/F_{MSY} [*]	1.21 [0.99–1.58]
B_{2013}/B_{MSY} [*]	0.96 [0.69–1.22]
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_0 [*]	0.53 [0.30–1.04]
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.

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