

NARROW-BARRED SPANISH MACKEREL

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 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

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 1** outlines some key life history parameters relevant for management.

TABLE 1. 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 <i>S. commerson</i> 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 (COM: *Scomberomorus commerson*)*

Fisheries and main catch trends

- Main fisheries: Narrow-barred Spanish mackerel¹ are caught mainly using gillnet, however significant numbers are also caught using troll lines (**Table 2; Fig. 1**).
- Main fleets (i.e., highest catches in recent years): Fisheries in Indonesia, India, and to a lesser extent I.R. Iran, the UAE, Myanmar and Pakistan (**Fig. 2**). Spanish mackerel is also targeted throughout the Indian Ocean by artisanal and recreational (sports) fisheries.
- Retained catch trends:

¹ Hereinafter referred to as Spanish mackerel.

Catches of Spanish mackerel increased from around 50,000 t in the late-1970's to over 100,000 t by the late-1990's. The highest catches of Spanish mackerel have been recorded in recent years, at 168,000 t in 2016.

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

TABLE 2. Narrow-barred Spanish mackerel: Best scientific estimates of the catches of narrow-barred Spanish 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	-	0	285	2,355	4,145	5,611	6,588	6,133	8,459	8,789	9,113	8,894	9,314	8,075	7,677	8,189
Gillnet	9,521	17,703	32,168	54,918	62,712	67,063	73,041	74,566	75,999	80,497	80,668	87,517	90,024	102,441	96,507	101,550
Line	1,741	2,477	4,672	11,334	12,071	17,357	19,755	19,857	22,400	23,311	28,887	31,878	28,997	29,460	35,430	32,944
Other	57	96	468	5,603	9,741	21,351	25,530	22,741	28,170	24,551	25,802	29,347	26,653	24,231	24,959	25,668
Total	11,318	20,277	37,593	74,210	88,670	111,382	124,914	123,297	135,028	137,148	144,470	157,636	154,988	164,207	164,573	168,350

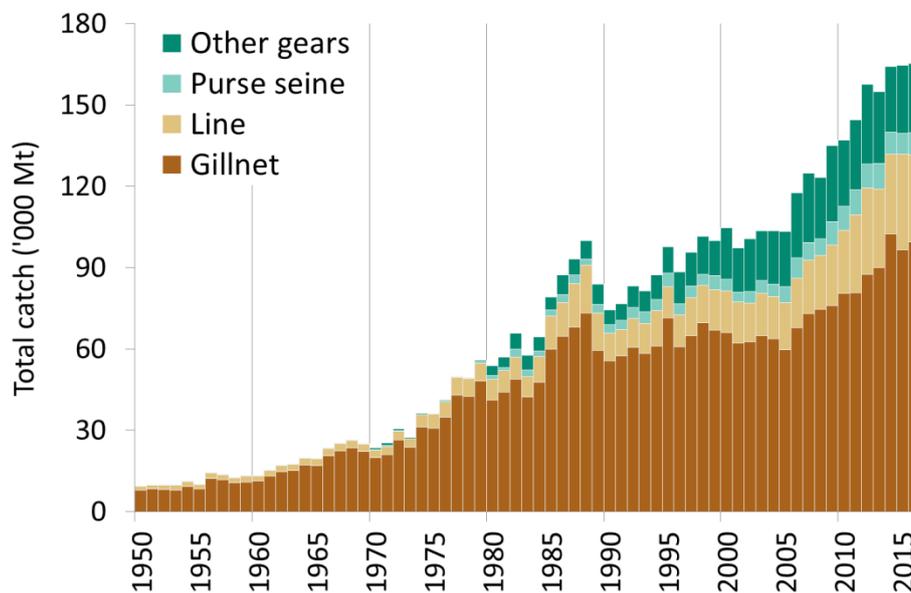


Fig. 1. Narrow-barred Spanish mackerel: Annual catches of narrow-barred Spanish mackerel by gear recorded in the IOTC database (1950–2016)

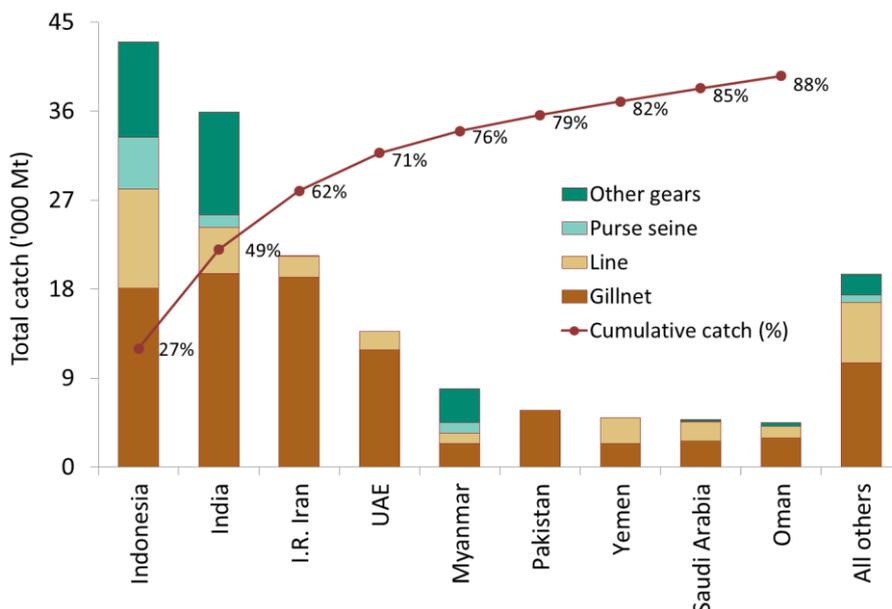


Fig. 2. Narrow-barred Spanish mackerel: Average catches in the Indian Ocean over the period 2012–16, by country. Countries are ordered from left to right, according to the importance of catches of narrow-barred Spanish mackerel reported. The red line indicates the (cumulative) proportion of catches narrow-barred Spanish mackerel for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

Narrow-barred Spanish mackerel: estimation of catches – data related issues

Retained catches for Spanish mackerel were derived from incomplete information, and are therefore uncertain², (**Fig. 3**) 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 the Indian Ocean 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 estimated are still considered to be highly 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.

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 had to be estimated.

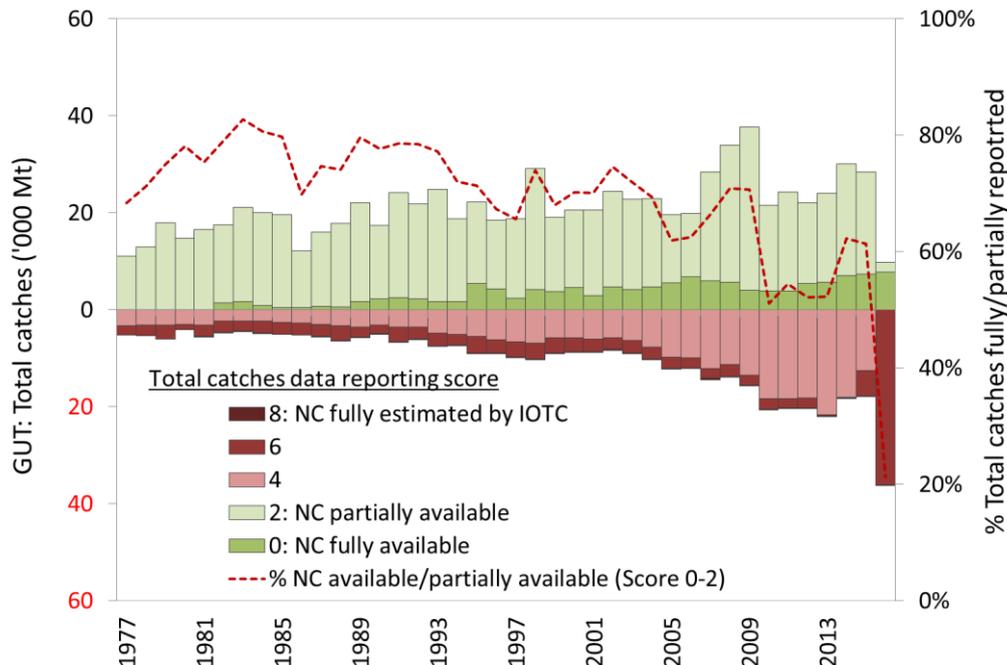


Fig. 3. Narrow-barred Spanish mackerel: Uncertainty of annual catch estimates (1977–2016).

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.

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 3**).
- 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 4**).

TABLE 3. Narrow-barred Spanish mackerel: Availability of catches and effort series, by fishery and year (1970–2016). Note that no catches and effort are available at all for 1950–84³.

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																									
PSS-Malaysia																									
PSS-Sri Lanka																									
PSS-Thailand																									
LL-Madagascar																									
LL-Sri Lanka																									
GILL-Indonesia																									
GILL-Sri Lanka																									
GILL-Malaysia																									
GILL-Oman																									
GILL-Pakistan																									
LINE-Australia																									
LINE-Comoros																									
LINE-Malaysia																									
LINE-Mozambique																									
LINE-Oman																									
LINE-South Africa																									
LINE-Sri Lanka																									
LINE-Yemen																									
OTHR-Sri Lanka																									
OTHR-Indonesia																									
OTHR-Malaysia																									
OTHR-Oman																									

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.

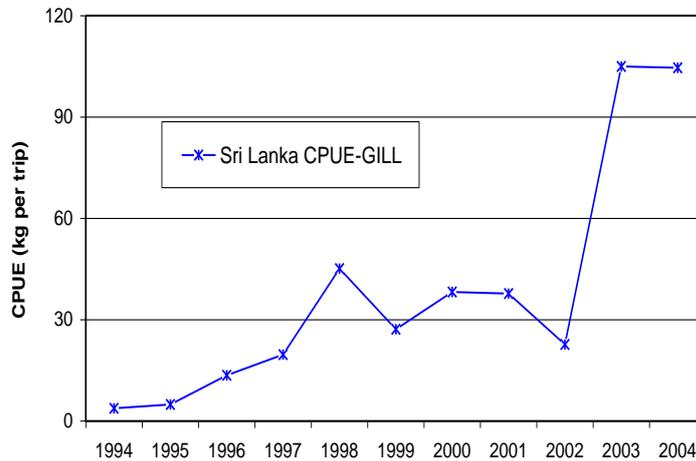


Fig. 4. Narrow-barred Spanish mackerel: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

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.
- **Size frequency data:** highly incomplete data, available only for selected years and/or fisheries (**Table 4**).
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.
Main sources for size samples: Length distributions derived from the data available for gillnet fisheries are shown in (**Fig. 5a**). These are primarily from Sri Lanka (gillnet) (from late-1980s until early-1990s), and I.R. Iran (gillnet) (from the late-2000s) (**Fig. 5b**). 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 4. Narrow-barred Spanish mackerel: Availability of length frequency data, by fishery and year (1980–2016)⁴. Note that no length frequency data are available at all for 1950–84.

Gear-Fleet	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10	12	14	16	
PSS-Sri Lanka																				
PSS-Thailand																				
GILL-Oman																				
GILL-Pakistan																				
GILL-Sri Lanka																				
GILL-Iran																				
LINE-Iran																				
LINE-Oman																				
LINE-Mozambique																				
LINE-Sri Lanka																				
OTHR-Saudi Arabia																				
OTHR-Sri Lanka																				

Key

- More than 2,400 specimens measured
- Between 1,200 and 2,399 specimens measured
- Less than 1,200 specimens measured

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.

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

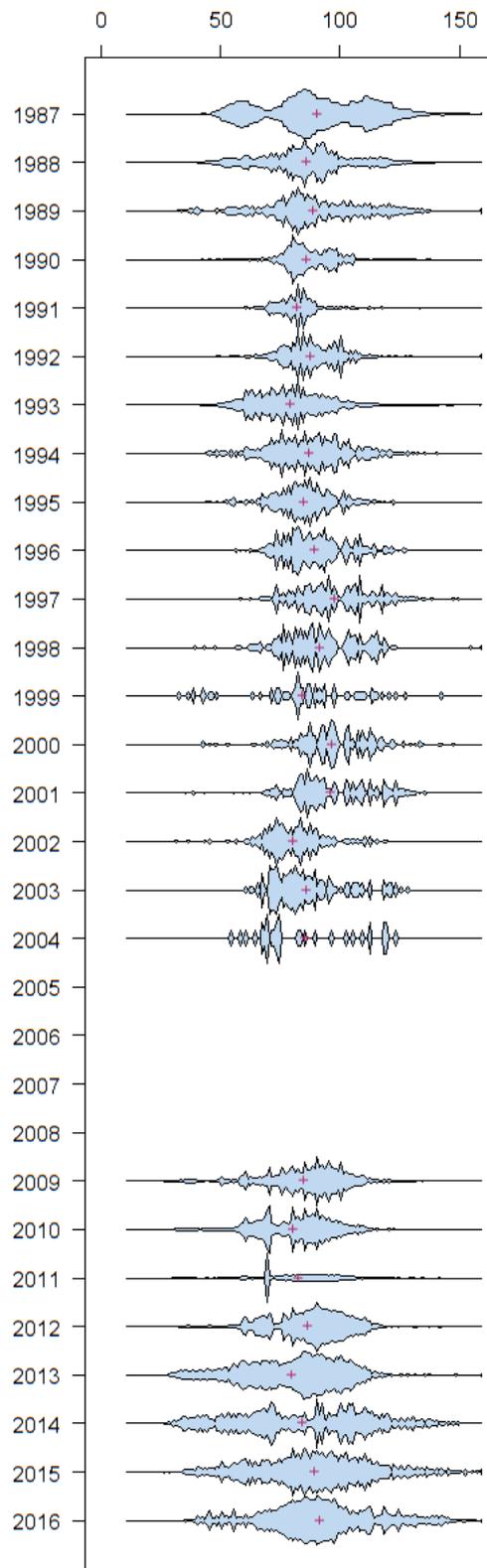


Fig. 5. Narrow-barred Spanish mackerel: Length frequency distributions for gillnet fisheries (total amount of fish measured by 1cm length class) derived from data available at the IOTC Secretariat.

STOCK ASSESSMENT

Two assessment approaches were applied to narrow-barred Spanish mackerel in 2016, 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 5**).

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 5. Narrow-barred Spanish mackerel: Key management quantities from the OCOM used in 2017.

Management Quantity	Aggregate Indian Ocean
Most recent catch estimate (2015)	154 723 t
Mean catch 2011–2015	148 610 t
MSY (plausible range)	131,000 [96,000–180,000]
Data period used in	1950 - 2015
F_{MSY} (plausible range)	0.35 [0.18–0.7]
B_{MSY} (plausible range)	371,000[187,000–882,000]702 344)
F_{2014}/F_{MSY} (plausible)	1.28 [1.03–1.69]
B_{2014}/B_{MSY} (plausible)	0.89 [0.63–1.15]
SB_{2014}/SB_{MSY} (80% CI)	n.a
B_{2014}/B_0 (plausible)	0.44 [0.31–0.57]
SB_{2014}/SB_0 (80% CI)	n.a
$B_{2014}/B_{0, F=0}$ (80% CI)	n.a
$SB_{2014}/SB_{0, F=0}$ (80% CI)	n.a

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