DRAFT: EXECUTIVE SUMMARY: INDO-PACIFIC SAILFISH

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

Status of the Indian Ocean Indo-Pacific sailfish (SFA: *Istiophorus platypterus*) resource

TABLE 1. Indo-Pacific sailfish: Status of Indo-Pacific sailfish (*Istiophorus platypterus*) in the Indian Ocean

Area[1]	Indicators		2014 stock status determination
Indian Ocean	Catch 2013: Average catch 2009–2013:	29,750 t 28,087 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): B_{MSY} (1,000 t) (80% CI): F_{2013}/F_{MSY} (80% CI): B_{2013}/B_{MSY} (80% CI): B_{2013}/B_0 (80% CI):	27.84 (24.70–35.00) 0.27 (0.16–0.39) 95.2 (62.89–127.73) 1.19 (0.66–1.72) 1.12 (0.88–1.37) 0.56 (0.44–0.69)	

[1]Boundaries for the Indian Ocean = IOTC area of competence

Colour key	Stock overfished($B_{year}/B_{MSY}< 1$)	Stock not overfished ($B_{year}/B_{MSY}\geq 1$)
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. Data poor methods for stock assessment using Stock reduction analysis (SRA) techniques indicate that the stock is not overfished and close to or exceeding maximum sustainable yield levels (Table 1). However, as this is the first time that the WPB used such a method on Indo-Pacific sailfish, further testing of how sensitive this technique is to model assumptions and available time series of catches needs to be undertaken before the WPB uses it to determine stock status. Thus, the stock status remains **uncertain**. Nonetheless in using the SRA method for comparative purposes with other stocks, the WPB considers that the use of the target reference points may be possible for the approach. The stock appears to show a continued increase in catch rates which is a cause of concern, indicating that fishing mortality levels may be becoming too high (Fig. 1). Aspects of the biology, productivity and fisheries for this species combined with the data poor status on which to base a more formal assessment are a cause for concern. Research emphasis on developing possible CPUE indicators and further exploration of stock assessment approaches for data poor fisheries are warranted. Given the limited data being reported for coastal gillnet fisheries, and the importance of sports fisheries for this species, efforts must be made to rectify these information gaps. Records of stock extirpation in the Gulf should also be examined to examine the degree of localised depletion in Indian Ocean coastal areas.

Outlook. The estimated increase in coastal gillnet catch and effort in recent years is a substantial cause for concern for the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect this will have on the resource.

The following key points should be noted:

- **Maximum Sustainable Yield (MSY)**: estimate for the whole Indian Ocean is unknown.
- **Provisional reference points**: Although the Commission adopted interim reference points for swordfish in Resolution 13/10 *on interim target and limit reference points and a decision framework*, no such interim points have been established for I.P. sailfish.
- **Main fishing gear** (2010–13): Gillnet catches are currently estimated to comprise approximately 77% of the total estimated I.P. sailfish catch in the Indian Ocean.
- **Main fleets** (2010–13): I.R. Iran: 25%; Pakistan: 18%; India: 17%; Sri Lanka: 14%.
- **Improvements required**: Improvement in data collection and reporting, particularly for coastal gillnet and sports fisheries, is required to further assess the stock with a greater degree of certainty.

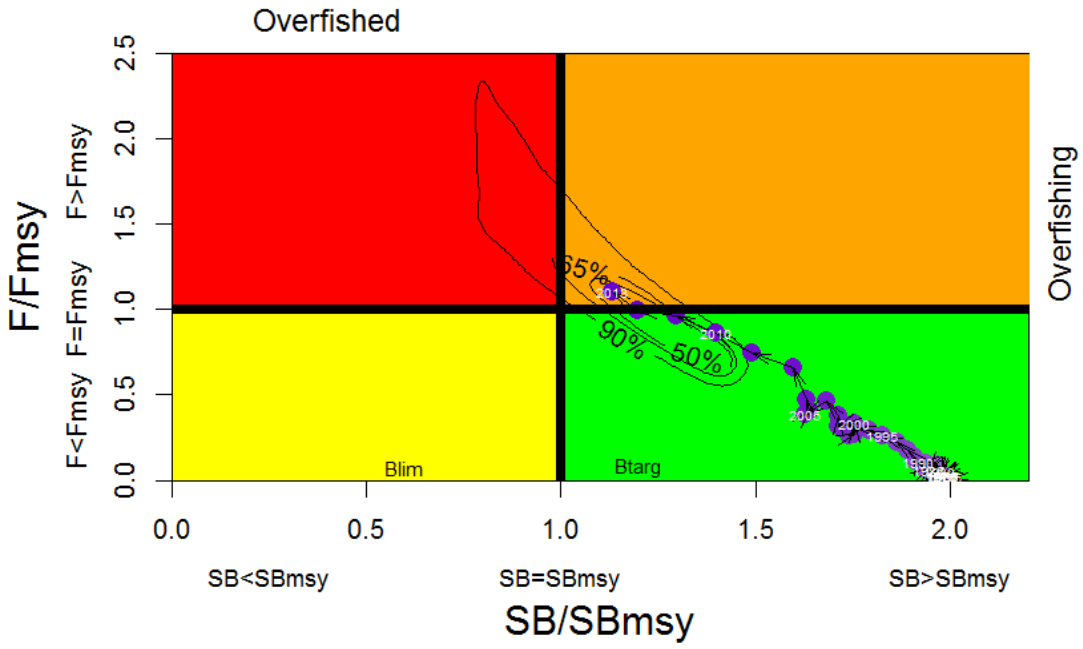


Fig. 1. Indo-Pacific sailfish: Stock reduction analysis (Catch MSY Method) of aggregated Indian Ocean assessment Kobe plot (contours are the 50, 65 and 90 percentiles of the 2013 estimate). Black lines indicate the trajectory of the point estimates (blue circles) for the B ratio and F ratio for each year 1950–2013.

TABLE 2. Indo-Pacific sailfish: Indian Ocean stock reduction analysis Kobe II Strategy Matrix. Probability (percentage) of violating the MSY-based target reference points for nine constant catch projections (average catch level from 2011–2013 (20,087 t) , ± 10%, ± 20%, ± 30% ± 40%) projected for 3 and 10 years. These will be calculated during the next assessment of Indo-Pacific sailfish.

Reference point and projection timeframe	**Alternative catch projections (relative to the average catch level from 2011–2013) and probability (%) of violating MSY-based target reference points (B_{targ} = B_{MSY}; F_{targ} = F_{MSY})**								
	60%	**70%**	**80%**	**90%**	**100%**	**110%**	**120%**	**130%**	**140%**
$B_{2016} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2016} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$B_{2023} < B_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
$F_{2023} > F_{MSY}$	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Note: As detailed in Recommendation 14/07, the colour coding used above, and refers to 25% probability levels (Green: 0–25; Yellow: >25–50; Orange: >50–75; Red: >75–100) associated with the interim target and limit (none for IP sailfish) reference points set by the Commission.

APPENDIX I

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

Indo-Pacific sailfish (*Istiophorus platypterus*) in the Indian Ocean is currently subject to a number of Conservation and management measures adopted by the Commission, although none are species specific:

- Resolution 13/03 on the recording of catch and effort by fishing vessels in the IOTC area of competence
- Resolution 13/07 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 11/04 *on a regional observer scheme*
- Resolution 10/02 *mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*
- Resolution 10/08 *concerning a record of active vessels fishing for tunas and swordfish in the IOTC area*

FISHERIES INDICATORS

Indo-Pacific sailfish: General

Indo-Pacific sailfish (*Istiophorus platypterus*) is a large oceanic apex predator that inhabits tropical and subtropical Indo-Pacific oceans (Fig. 2). Table 3 outlines some key life history parameters relevant for management. There is limited reliable information on the catches of this species and no information on the stock structure or growth and mortality in the Indian Ocean.

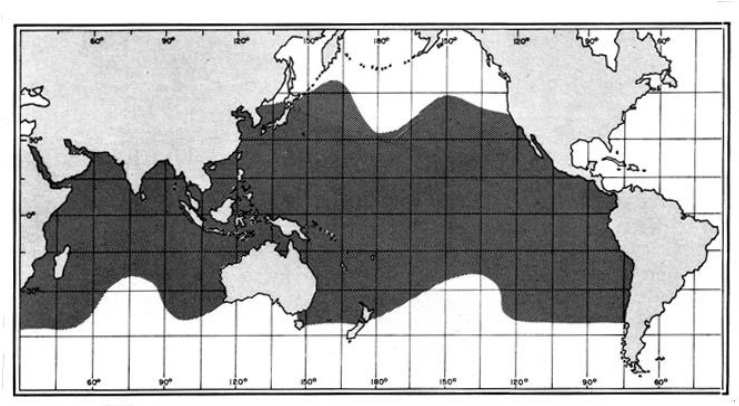


Fig. 1. Indo-Pacific sailfish: The worldwide distribution of Indo-Pacific sailfish (Source: Nakamura, 1984)

TABLE 3. Indo-Pacific sailfish: Biology of Indian Ocean Indo-Pacific sailfish (*Istiophorus platypterus*)

Parameter	Description
Range and stock structure	Found throughout the tropical and subtropical regions of the Pacific and the Indian Oceans. It is mainly found in surface waters above the thermocline, close to coasts and islands in depths from 0 to 200 m. Indo–Pacific sailfish is a highly migratory species and renowned for its speed and (by recreational fishers) for its jumping behaviour — one individual has been reported burst swimming at speeds in excess of 110 km/h. The stock structure of Indo-Pacific sailfish in the Indian Oceans is uncertain: apparently there are local reproductively isolated stocks. At least one stock was reported in the Persian Gulf with no or very little intermixing with open Indian Ocean stocks. However outside of the Gulf no stock differentiation has been determined; thus for the purposes of assessment, one pan-ocean stock is assumed. However, spatial heterogeneity in stock indicators (catch–per–unit–effort trends) for other billfish species indicates that there is potential for localised depletion.
Longevity	Females: 11–13 years; Males: 7–8 years
Maturity (50%)	**Age**: females n.a.; males n.a. **Size**: females n.a.; males n.a.
Spawning season	Spawning in Indian waters occurs between December to June with a peak in February and June. In subtropical waters of the southern hemisphere spawning is associated with warmer months: in Mozambique Channel and around Reunion Island high percentage of ripe females occurs in December.

Size (length and weight)	Maximum: 350 cm FL and weight 100 kg total weight. The Indo-Pacific sailfish is one of the smallest-sized billfish species, but is relatively fast growing. Individuals may grow to over 3 m and up to 100kg, and live to around 7 years. Young fish grow very quickly in length then put on weight later in life. Sexual dimorphism in size, growth rates and size and age at maturity - females reach larger sizes, grow faster and mature later than males. Females: 300 cm LJFL, 50+ kg total weight; Males: 200 cm LJFL, 40+ kg total weight in the Indian Ocean. Recruitment into the fishery: varies by fishing method, apparently at age 0+ and size less than 100 cm LJFL for artisanal fleets. The average weight of fish caught in the Kenyan sports fishery is ~25 kg whole weight.

n.a. = not available. Sources: Nakamura 1985, Hoolihan 2003, 2004, 2006, Speare 2003, Hoolihan & Luo 2007, Sun et al. 2007, Froese & Pauly 2009, Ndegwa & Herrera 2011

Indo-Pacific sailfish: Catch trends

Indo-Pacific sailfish is caught mainly using gillnets (75%) with remaining catches recorded using troll and hand lines (20%), longlines (5%) or other gears (Table 4, Fig. 3). The average annual catch over recent years is estimated at around 29,000 t. In recent years, the countries attributed with the highest catches of Indo-Pacific sailfish are situated in the Arabian Sea (India, IR Iran, Sri Lanka and Pakistan). Smaller catches are reported for line fishers in Comoros and Mauritius and by Indonesia and other longline fleets. This species is also a popular catch for sport fisheries (e.g. Kenya, Mauritius, Seychelles).

Catches of Indo-Pacific sailfish greatly increased since the mid-1990's (from around 5,000 t in the early 1990s to almost 30,000 t in 2011 and similar catch levels in the following years. The increases are largely due to the development of a gillnet/longline fishery in Sri Lanka (Fig. 4) and especially, the extension in the area of operation of IR Iran gillnet vessels to areas beyond the EEZ of IR Iran. In the case of IR Iran gillnets (Fig. 4), catches have increased from less than 1,000 t in the early 1990's to over 7,700 t in 2011 and similar values in subsequent years.

Catches of Indo-Pacific sailfish using drifting longlines (Table 4) and other gears have also increased – to a lesser extent than catches from gillnet – from around 2,500 t to over 8,000 t in recent years. However, it is likely that longline fleets under report catches of this species due to its little commercial value. In recent years, deep-freezing longliners from Japan have reported catches of Indo-Pacific sailfish in the central western Indian Ocean, between Sri Lanka and the Maldives and the Mozambique Channel (Fig. 5).

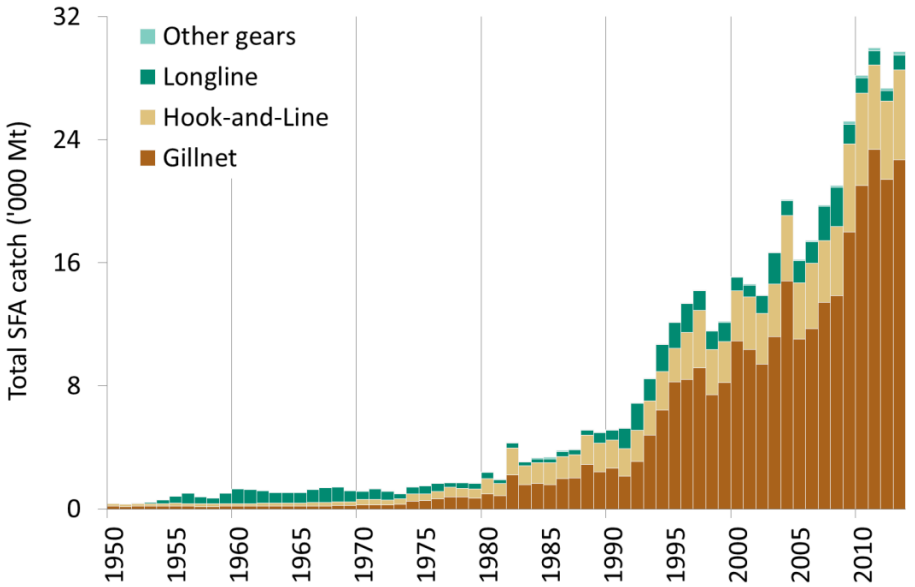


Fig. 2. Indo-Pacific sailfish. Catches of Indo-pacific sailfish by gear and year recorded in the IOTC Database (1950–2013).

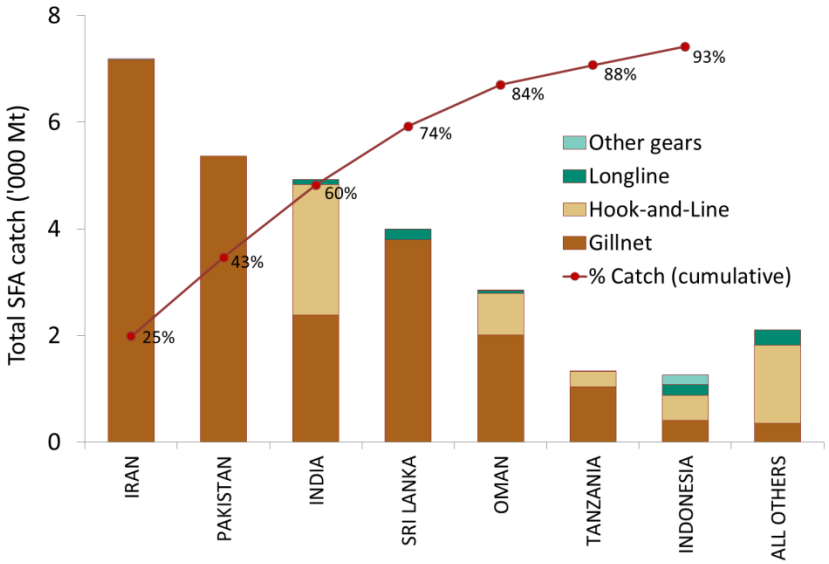


Fig. 3. Indo-Pacific sailfish: Average catches in the Indian Ocean over the period 2010–13, by country. Countries are ordered from left to right, according to the importance of catches of black marlin reported. The red line indicates the (cumulative) proportion of catches of Indo-Pacific sailfish for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

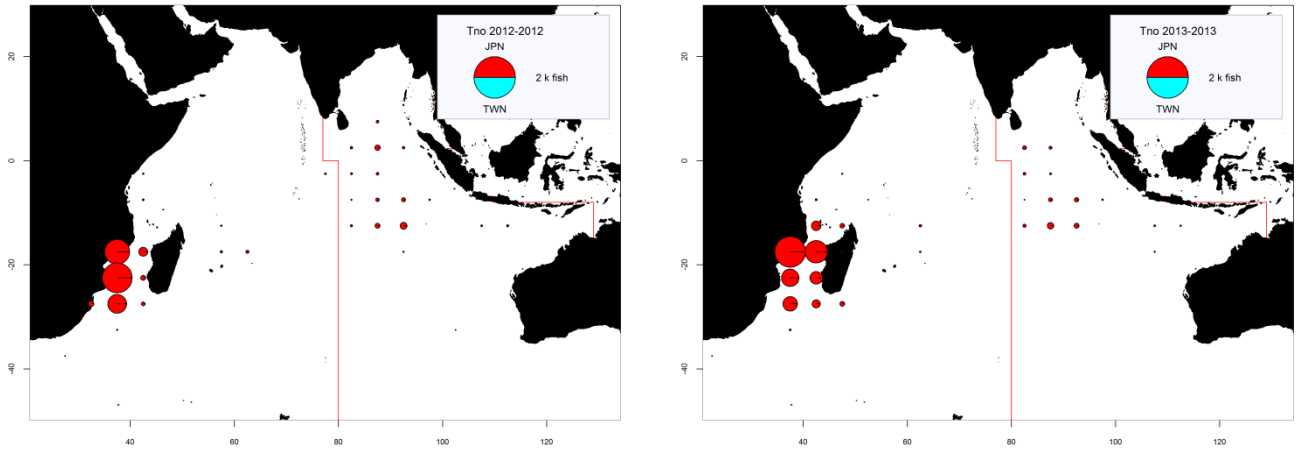


Fig. 4a-f. Indo-Pacific sailfish: Time-area catches (in number of fish) of Indo-Pacific sailfish as reported for the longline fisheries of Japan (JPN) for a) 2012 and b) 2013 by fleet.

TABLE 4. Indo-Pacific sailfish: Best scientific estimates of the catches of Indo-Pacific sailfish by type of fishery for the period 1950–2013 (in metric tons). Data as of September 2014.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
LL	299	818	444	335	1,411	1,466	958	1,438	1,403	2,223	2,526	1,299	991	928	664	975
GN	165	181	507	1,809	6,056	12,470	14,798	11,047	11,712	13,415	13,862	17,994	21,028	23,385	21,413	22,699
HL	171	213	456	1,430	2,498	3,980	4,269	3,645	4,240	4,024	4,513	5,720	5,992	5,472	5,096	5,821
OT	-	-	3	44	42	85	63	84	88	95	134	171	172	181	178	255
Total	**634**	**1,212**	**1,410**	**3,618**	**10,007**	**18,000**	**20,088**	**16,215**	**17,443**	**19,758**	**21,034**	**25,183**	**28,184**	**29,965**	**27,351**	**29,750**

Indo-Pacific sailfish: Uncertainty of time–area catches

Minimum catch estimates have been derived from very small amounts of information and are therefore highly uncertain. Unlike the other billfish, Indo-Pacific sailfish are probably more reliably identified because of the large and distinctive first dorsal fin that runs most of the length of the body.

Retained catches: poorly known for most fisheries (Fig. 5a) due to:

- Catch reports often refer to total catches of all billfish species combined; catches by species are estimated by the IOTC Secretariat for some artisanal (gillnet/longline fishery of Sri Lanka and artisanal fisheries of India and Pakistan) and industrial (longliners of Indonesia and Philippines) fisheries.
- Catches of Indo-Pacific sailfish reported for some fisheries may refer to the combined catches of more than one species of billfish, in particular marlins and shortbill spearfish (many coastal fisheries).
- Catches likely to be incomplete for some artisanal fisheries (e.g. gillnets of Pakistan, pole and lines of Maldives) due to under-reporting.
- Catches are likely to be incomplete for industrial fisheries for which the Indo-Pacific sailfish is not a target species.
- A lack of catch data for most sport fisheries.

Discards: unknown for most industrial fisheries, mainly longliners (for which they are presumed to be moderate-high).

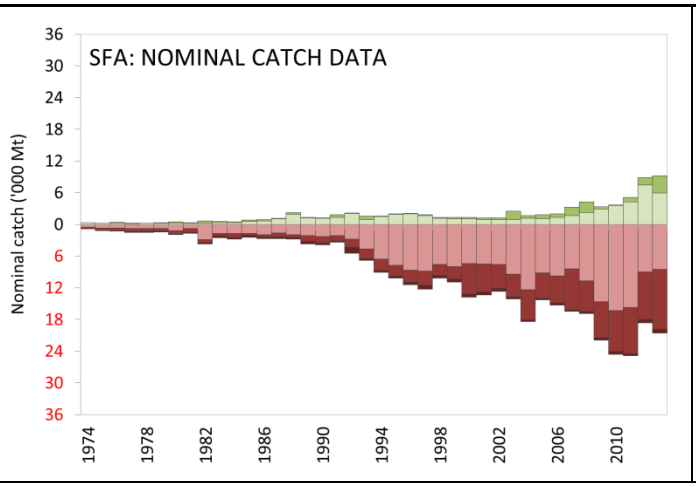
Changes to the catch series: Catches of Indo-Pacific sailfish remain largely unchanged since the WPB meeting in 2013, and have been unaffected by revisions to the catch-by-species for IR Iran gillnet offshore fisheries, and also the revisions to the catch series in Indonesia.

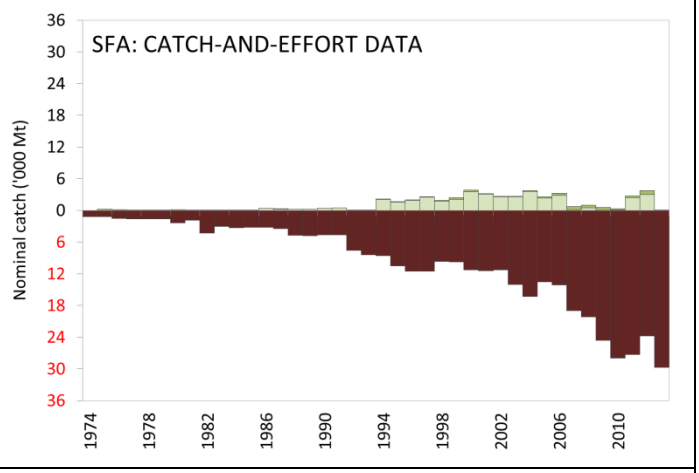
Catch–per–unit–effort (CPUE) series (Fig. 5b): Standardised and nominal CPUE series have not yet been developed. No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of IR Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

Fish size or age trends (e.g. by length, weight, sex and/or maturity) (Fig. 5c): Average fish weight can only be assessed for the longline fishery of Japan since 1970 and the gillnet/longline fishery of Sri Lanka since the late 1980s. The number of specimens measured on Japanese longliners in recent years is, however, very low. Furthermore, the specimens discarded might be not accounted for in industrial fisheries, where they are presumed to be of lower size (possible bias of existing samples).

Catch-at-Size(Age): tables have not been built for this species due to a lack of information reported by CPCs. Fish size is derived from various length and weight information, however the reliability of the size data is reduced when relatively few fish out of the total catch are measured.

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





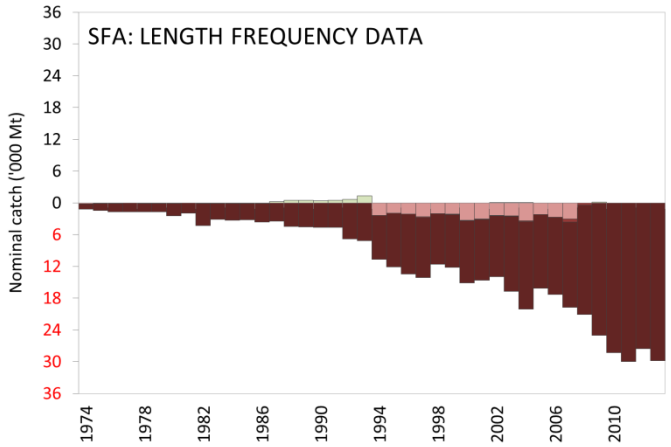


Fig. 5a–c. Indo-Pacific sailfish: data reporting coverage (1974–2013). a) nominal catch data; b) catch-and-effort data; c) length frequency data. *Each IOTC dataset (nominal catch, catch-and-effort, and length frequency) are assessed against IOTC reporting standards, where: a score of 0 indicates the amount of nominal catch associated with each dataset that is fully reported according to IOTC standards; a score of between 2 – 6 refers to the amount of nominal catch associated with each dataset that is partially reported by gear and/or species (i.e., adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; a score of 8 refers to the amount of nominal catch associated with catch-and-effort data that is not available. (Data as of September 2014)*

Key to IOTC Scoring system

Nominal Catch	By species	By gear
Fully available	0	0
Partially available (part of the catch not reported by species/gear)*	2	2
Fully estimated (by the IOTC Secretariat)	4	4

*Catch assigned by species/gear by the IOTC Secretariat; or 15% or more of the catches remain under aggregates of species

Catch-and-Effort	Time-period	Area
Available according to standards	0	0
Not available according to standards	2	2
Low coverage (less than 30% of total catch covered through logbooks)	2	
Not available at all	8	

Size frequency data	Time-period	Area
Available according to standards	0	0
Not available according to standards	2	2
Low coverage (less than 1 fish measured by metric ton of catch)	2	
Not available at all	8	

Key to colour coding

- Total score is 0 (or average score is 0-1)
- Total score is 2 (or average score is 1-3)
- Total score is 4 (or average score is 3-5)
- Total score is 6 (or average score is 5-7)
- Total score is 8 (or average score is 7-8)

Indo-Pacific sailfish: Effort trends

Total effort from longline vessels flagged to Japan, Taiwan,China and EU,Spain by five degree square grid in 2012 and 2013 are provided in Fig. 6, and total effort from purse seine vessels flagged to the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags), and others, by five degree square grid and main fleets, for the years 2012 and 2013 are provided in Fig. 7.

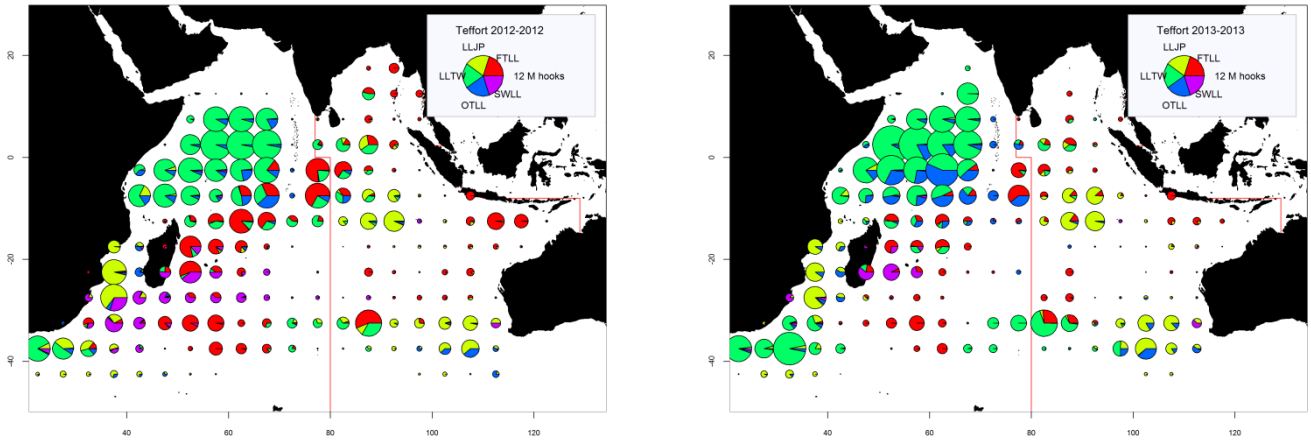


Fig. 6. Number of hooks set (millions) from longline vessels by five degree square grid and main fleets, for the years 2012 (left) and 2013 (right) (Data as of September 2014).
LLJP (light green): deep-freezing longliners from Japan
LLTW (dark green): deep-freezing longliners from Taiwan,China
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)
OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, Rep. of Korea and various other fleets)

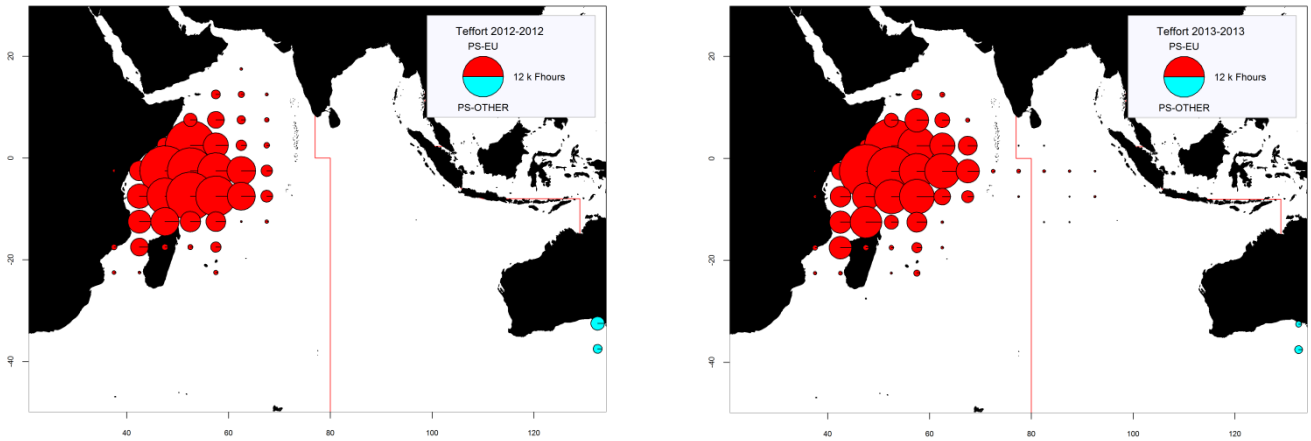


Fig. 7. Number of hours of fishing (Fhours) from purse seine vessels by 5 degree square grid and main fleets, for the years 2012 (left) and 2013 (right) (Data as of September 2014)
PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)
PS-OTHER (green): Industrial purse seiners from other fleets (includes Japan, Mauritius and purse seiners of Soviet origin) (excludes effort data for purse seiners of Iran and Thailand)

Indo-Pacific sailfish: Catch–per–unit–effort (CPUE) trends

Currently there is insufficient data to develop a CPUE series for Indo-Pacific sailfish caught in the IOTC area of competence. No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of I.R. Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

STOCK ASSESSMENT

The results of the stock assessment of Indo-Pacific sailfish in 2014 (Table 5) are based on very limited information and in particular are compromised by the uncertainty in the estimates of catches for this species, over the time series. As this was the first time that IP sailfish was the subject of an assessment, stock status should remain as 'uncertain' until further work is carried out by the WPB in 2015. Scientists from the U.A.E. may be able to provide the latest information from the I.P. sailfish fishery in the Gulf, as the most recent information submitted to the WPB some time ago suggested that the fishery may be collapsing or have collapsed. Any new information received should be submitted to the next WPB meeting as part of a general review of I.P. sailfish fisheries in the Indian Ocean.

TABLE 5. Indo-Pacific sailfish (*Istiophorus platypterus*): Key management quantities from the SRA approach used.

Management Quantity	Indian Ocean
2013 catch estimate	34,481 t
Mean catch from 2009–2013	32,414 t
MSY (1000 t) (80% CI)	27.84 (24.70–35.00)
Data period used in assessment	1950–2013
F_{MSY} (80% CI)	0.27 (0.16–0.39)
B_{MSY} (1000 t) (80% CI)	95.2 (62.89–127.73)
F_{2013}/F_{MSY} (80% CI)	1.19 (0.66–1.72)
B_{2013}/B_{MSY} (80% CI)	1.12 (0.88–1.37)
SB_{2013}/SB_{MSY} (80% CI)	n.a.
B_{2013}/B_{1950} (80% CI)	0.56 (0.44–0.69)
SB_{2013}/SB_{1950} (80% CI)	n.a.
$B_{2013}/B_{1950,\ F=0}$ (80% CI)	n.a.
$SB_{2012}/SB_{1950,\ F=0}$ (80% CI)	n.a.

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