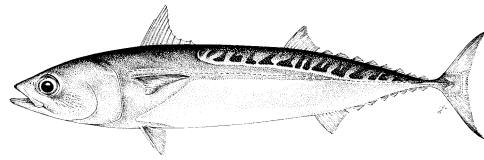


DRAFT EXECUTIVE SUMMARY: BULLET TUNA



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

Status of the Indian Ocean bullet tuna (BLT: *Auxis rochei*) resourceTABLE 1. Bullet tuna: Status of bullet tuna (*Auxis rochei*) in the Indian Ocean.

Area ¹	Indicators		2015 stock status determination
Indian Ocean	Catch ² 2014:	8,117 t	
	Average catch ² 2010–201:	8,952 t	
	MSY (1,000 t) (80% CI):	unknown	
	F _{MSY} (80% CI):	unknown	
	B _{MSY} (1,000 t) (80% CI):	unknown	
	F ₂₀₁₄ /F _{MSY} (80% CI):	unknown	
	B ₂₀₁₄ /B _{MSY} (80% CI):	unknown	
	B ₂₀₁₄ /B ₀ (80% CI):	unknown	

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

²Nominal 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} ≥ 1)
Stock subject to overfishing (F _{year} /F _{MSY} > 1)		
Stock not subject to overfishing (F _{year} /F _{MSY} ≤ 1)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No quantitative stock assessment is currently available for bullet tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock status indicators can be used. Aspects of the fisheries for bullet tuna combined with the lack of data on which to base a more formal assessment, are a cause for considerable concern. 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 bullet tuna should be applied.

Outlook. Total annual catches for bullet tuna over the past three years have ranged between 8,400 t and 9,000 t. There is insufficient information to evaluate the effect that this level of catch, or an increase in catch may have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be considered a high priority for this species. The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- Species identification, 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.

APPENDIX I

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

Bullet tuna (*Auxis rochei*) 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

Bullet tuna: General

Bullet tuna (*Auxis rochei*) is an oceanic species found in the equatorial areas of the major oceans. It is a highly migratory species with a strong schooling behaviour. [Table 2](#) outlines some key life history parameters relevant for management.

TABLE 2. Bullet tuna: Biology of Indian Ocean bullet tuna (*Auxis rochei*).

Parameter	Description
Range and stock structure	Little is known on the biology of bullet tuna in the Indian Ocean. An oceanic species found in the equatorial areas of the major oceans. It is a highly migratory species with a strong schooling behaviour. Adults are principally caught in coastal waters and around islands that have oceanic salinities. No information is available on the stock structure in Indian Ocean. Bullet tuna feed on small fishes, particularly anchovies, crustaceans (commonly crab and stomatopod larvae) and squids. Cannibalism is common. Because of their high abundance, bullet tunas are considered to be an important prey for a range of species, especially the commercial tunas.
Longevity	Females n.a; Males n.a.
Maturity (50%)	Age: 2 years; females n.a. males n.a. Size: females and males ~35 cm FL.
Spawning season	It is a multiple spawner with fecundity ranging between 31,000 and 103,000 eggs per spawning (according to the size of the fish). Larval studies indicate that bullet tuna spawn throughout its range.
Size (length and weight)	Maximum: Females and males 50 cm FL; weight n.a.

n.a. = not available. Sources: Froese & Pauly 2009, Kahraman 2010, Widodo et al. 2012

Bullet tuna – Fisheries and catch trends

Bullet tuna is caught mainly by gillnet, handline, and trolling, across the broader Indian Ocean area ([Table 3; Fig. 1](#)). This species is also an important catch for coastal purse seiners. The catch estimates for bullet tuna were derived from very little, highly aggregated information, and are therefore highly uncertain¹.

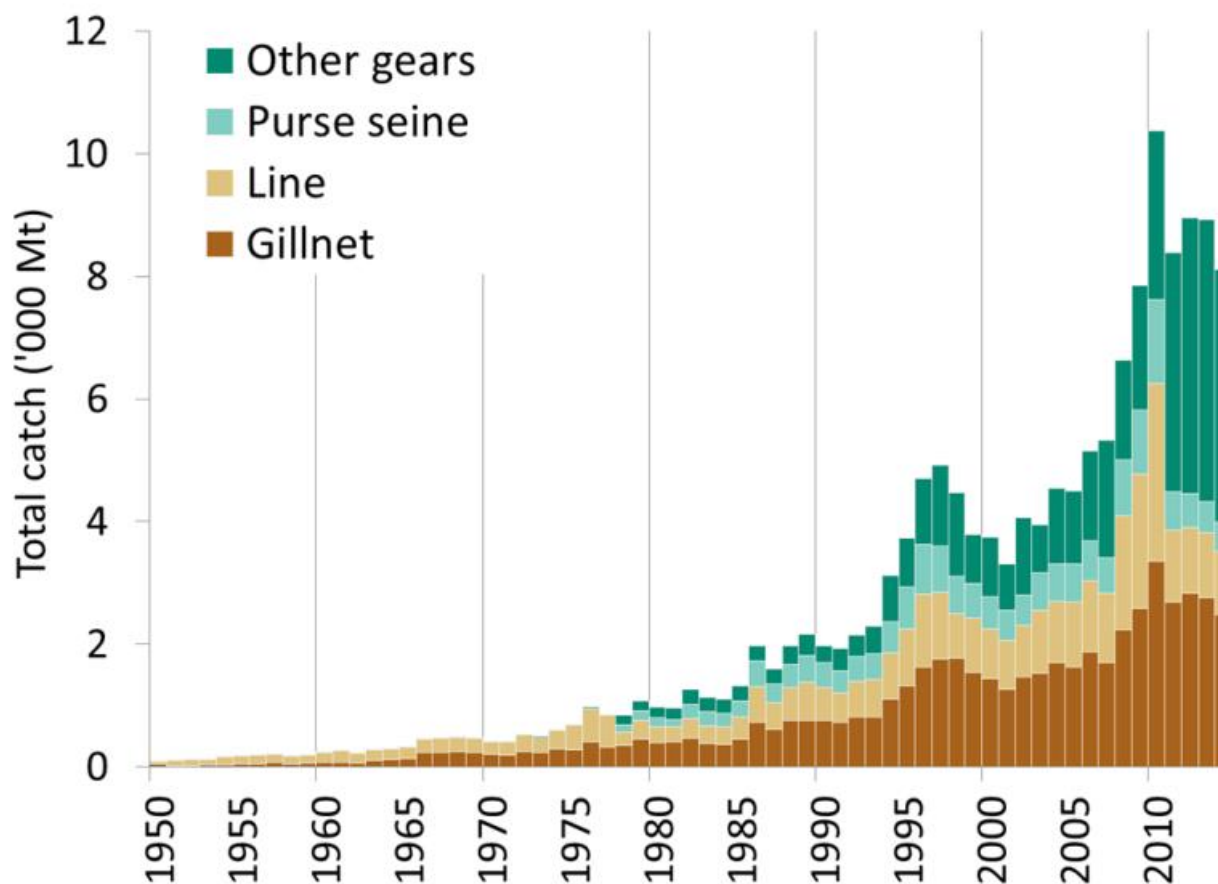
¹ The uncertainty in the catch estimates has been assessed by the IOTC Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of non-reporting fisheries for which catches have been estimated.

TABLE 3. Bullet tuna: Best scientific estimates of the catches of bullet tuna 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	-	-	28	278	552	655	625	650	581	908	1,055	1,372	635	549	513	484
Gillnet	41	153	296	531	1,222	1,741	1,631	1,872	1,692	2,236	2,587	3,347	2,692	2,830	2,760	2,483
Line	113	193	325	393	780	1,190	1,052	1,165	1,141	1,858	2,182	2,903	1,162	1,078	1,051	1,026
Other	5	13	44	242	755	1,322	1,188	1,465	1,908	1,638	2,022	2,748	3,905	4,503	4,597	4,125
Total	159	360	693	1,444	3,309	4,907	4,496	5,152	5,323	6,640	7,847	10,370	8,394	8,960	8,921	8,117

The catches provided in Table 3 are based on the information available at the IOTC Secretariat and the following observations on the catches cannot currently be verified. Estimated catches of bullet tuna reached around 2,000 t in the early 1990s, increasing markedly in the following years to reach a peak in 1997, at around 4,900 t. The catches decreased slightly in the following years and remained at values of between 3,500 t and 5,500 t until the late-2000s, increasing sharply again up to the 10,000 t recorded in 2010, the highest catch ever recorded for this species in the Indian Ocean (Table 3; Fig. 1).

In recent years the catches of bullet tuna estimated for the fisheries of Sri Lanka, India and Indonesia have represented over 90% of the total combined catches of this species from all fisheries in the Indian Ocean (Fig. 2).

**Fig. 1.** Bullet tuna: Annual catches of bullet tuna by gear recorded in the IOTC Database (1950–2014) (data as of November 2015).

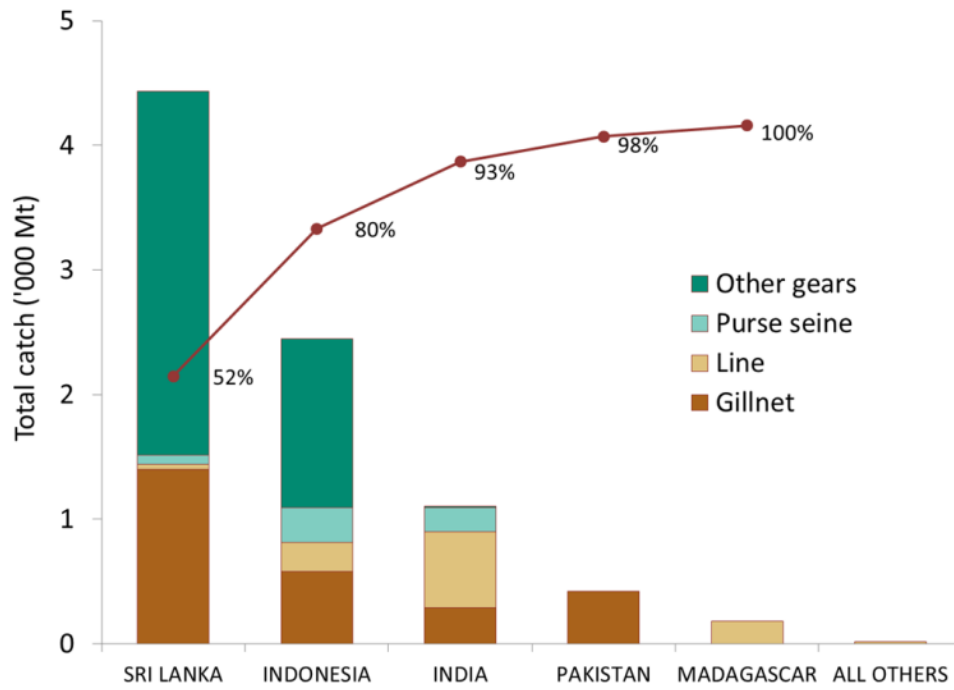


Fig. 2. Bullet tuna: average catches in the Indian Ocean over the period 2011–14, by country. Countries are ordered from left to right, according to the importance of catches of bullet tuna reported. The red line indicates the (cumulative) proportion of catches of bullet tuna for the countries concerned,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

Bullet tuna – Uncertainty of catches

Retained catches are highly uncertain for all fisheries (**Fig. 3**) due to:

- Aggregation: Bullet tunas are usually not reported by species, but are instead aggregated with frigate tunas or, less frequently, other small tuna species.
- Mislabelling: Bullet tunas are usually mislabelled as frigate tuna, with their catches reported under the latter species.
- Underreporting: the catches of bullet tuna by industrial purse seiners are rarely, if ever, reported.
- It is for the above reasons that the catches of bullet tunas in the IOTC database are thought to be highly uncertain and represent only a small fraction of the total catches of this species in the Indian Ocean.
- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of bullet tuna for its purse seine fleet, for 2003–07, estimated using observer data.
- Changes to the catch series: The catch series of bullet tuna has not changed substantially since the WPNT meeting in 2013.

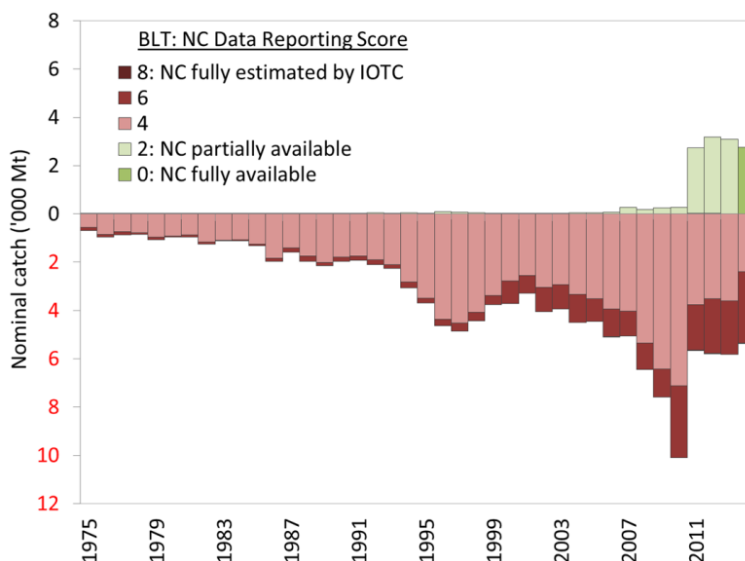


Fig. 3. Bullet tuna: nominal catch; uncertainty of annual catch estimates (1975–2014).

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 2014).

Bullet tuna – Effort trends

Effort trends are unknown for bullet tuna in the Indian Ocean.

Bullet tuna – Catch-per-unit-effort (CPUE) trends

Catch-and-effort series are not available for most fisheries (Table 4) and, when available, they are usually considered to be of poor quality for the fisheries having reasonably long catch-and-effort data series, as is the case with the gillnet fisheries of Sri Lanka (Fig. 4).

TABLE. 4. Bullet tuna: Availability of catches and effort series, by fishery and year (1970–2014)². Note that no catches and effort are available at all for 1950–78 and 2007 to present.

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																								
GILL-India																								
GILL-Indonesia																								
GILL-Sri Lanka																								
LINE-India																								
LINE-Indonesia																								
LINE-Sri Lanka																								
LINE-Yemen																								
OTHR-Indonesia																								
OTHR-Sri Lanka																								

² 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.

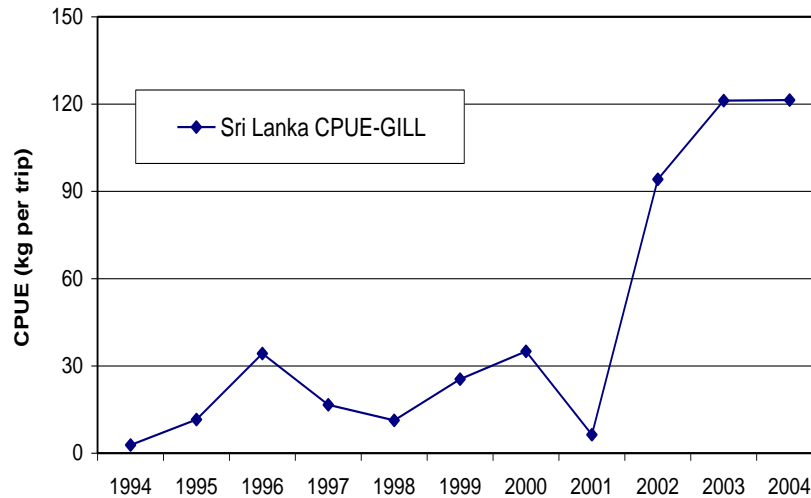


Fig. 4. Bullet tuna: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

Bullet tuna – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- Length frequency data for the bullet tuna is only available for some Sri Lanka fisheries and periods. These fisheries catch bullet tuna ranging between 15 and 35 cm.
- Trends in average weight cannot be assessed for most fisheries. Reasonable long series of length frequency data are only available for Sri Lankan gillnets and lines but the amount of specimens measured has been very low in recent years (Table 5).
- Catch-at-Size(age) data are not available for bullet tuna due to the paucity of size data available from most fleets and the uncertain status of the catches for this species.
- Sex ratio data have not been provided to the Secretariat by CPCs.

TABLE 5. Bullet tuna: Availability of length frequency data, by fishery and year (1980–2014)³. Note that no length frequency data are available at all for 1950–83.

Gear-Fleet	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10	12	14
PSS-Indonesia				■														
PSS-Sri Lanka									■			■	■	■				
PSS-Thailand													■	■				
PS-Korea																	■	■
GILL-Indonesia			■	■														
GILL-Pakistan																		■
GILL-Sri Lanka						■	■	■	■	■	■	■	■	■	■	■	■	■
LINE-Indonesia				■														
LINE-Sri Lanka									■	■	■	■	■	■	■			
LL-Korea																		■
OTHR-Indonesia				■														

Key

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

STOCK ASSESSMENT

No quantitative stock assessment for bullet tuna in the Indian Ocean is known to exist and no such assessment has been undertaken by the IOTC Working Party on Neritic Tunas. However, a preliminary estimation of stock indicators was attempted on the catch and effort datasets from the Sri Lankan gillnet fleet (described above). However, there is considerable uncertainty about the degree to which this and other indicators represent abundance as factors such as changes in targeting practices, discarding practices, fishing grounds and management practices are likely to interact in the depicted trends. Further work must be undertaken to derive additional stock indicators for this species, because in the absence of a quantitative stock assessment, such indicators represent the only means to monitor the status of the stock and assess the impacts of fishing (Table 6).

³ 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.

TABLE 6. Bullet tuna (*Auxis rochei*) key management quantities.

Management Quantity	Aggregate Indian Ocean
2014 catch estimate	8,117 t
Mean catch from 2010–2014	8,952 t
MSY (80% CI) (1,000 t)	unknown
Data period used in assessment	–
F _{MSY} (80% CI)	–
B _{MSY} (80% CI) (1,000 t)	–
F ₂₀₁₂ /F _{MSY} (80% CI)	–
B ₂₀₁₂ /B _{MSY} (80% CI)	–
SB ₂₀₁₂ /SB _{MSY} (80% CI)	–
B ₂₀₁₂ /B ₀ (80% CI)	–
SB ₂₀₁₂ /SB ₀ (80% CI)	–
B ₂₀₁₂ /B _{0, F=0} (80% CI)	–
SB ₂₀₁₂ /SB _{0, F=0} (80% CI)	–

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Widodo AA, Satria F, Barata A (2012) Catch and size distribution of bullet and frigate tuna caught by drifting gillnet in Indian Ocean based at Cilacap fishing port-Indonesia. IOTC-2012-WPNT02-12.