DRAFT: EXECUTIVE SUMMARY: BULLET TUNA

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

Status of the Indian Ocean bullet tuna (BLT: *Auxis rochei*) resource

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

Area[1]	Indicators		2013 stock status determination
Indian Ocean	Catch 2012:	8,862 t	
	Average catch 2008–2012:	8,468 t	
	MSY:	unknown	
	F_{2012}/F_{MSY}:	unknown	
	SB_{2012}/SB_{MSY}:	unknown	
	SB_{2012}/SB_0:	unknown	

[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. There remains considerable uncertainty about stock structure and total catches. 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 indicators can be used. Therefore stock status remains **uncertain** (Table 1). However, aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern.

Outlook. The continued increase of annual catches for bullet tuna is likely to have further increased the pressure on the Indian Ocean stock as a whole, however there is not sufficient information to evaluate the effect that this increase may have had on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is unknown.
- annual catches urgently need to be reviewed.
- improvement in data collection and reporting is required to assess the stock.

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 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 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

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 small amounts of information and are therefore highly uncertain[1].

TABLE 3. Bullet tuna: Best scientific estimates of the catches of bullet tuna by type of fishery for the period 1950–2012 (in metric tonnes) (Data as of October 2013)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Purse seine	0	2	28	278	552	646	612	603	562	635	548	935	1,051	1,372	638	606
Gillnet	41	153	296	531	1,222	1,722	1,525	1,699	1,501	1,840	1,623	2,293	2,577	3,346	2,699	2,856
Line	113	193	325	393	780	1,182	1,034	1,004	999	1,152	1,113	1,881	2,178	2,903	1,165	1,245
Other	5	13	44	242	755	1,278	775	1,239	882	1,390	1,745	1,769	2,000	2,746	3,922	4,155
Total	**159**	**362**	**693**	**1,444**	**3,309**	**4,828**	**3,947**	**4,545**	**3,943**	**5,016**	**5,028**	**6,878**	**7,807**	**10,367**	**8,425**	**8,862**

Estimated catches of bullet tuna reached around 2,000 t in the early 1990's, 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 around 4,000 t until the mid-2000's. Since then, catches of bullet tuna have increased to over 8,000 t in recent years, with the highest catch of 10,400 t recorded in 2010 (Table 3; Fig. 1).

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[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 unreporting fisheries for which catches had to be estimated.
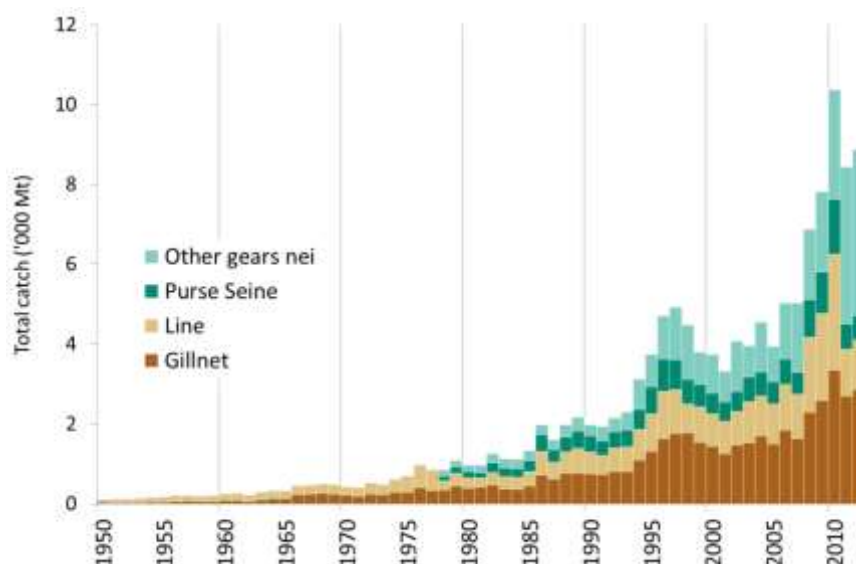
Fig. 1. Bullet tuna: Annual catches of bullet tuna by gear recorded in the IOTC Database (1950–2012) (Data as of October 2013).
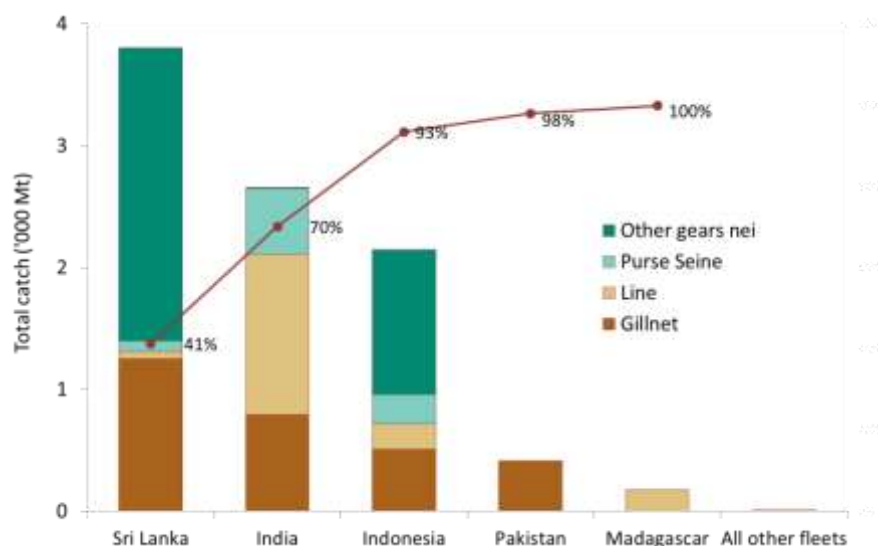
Fig. 2. Bullet tuna: average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of bullet tuna reported. The red line indicates the (cumulative) proportion of catches of bullet tuna for the countries concerned, over the total combined catches of bullet tuna reported from all countries and fisheries (Data as of October 2013).

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

Bullet tuna – Uncertainty of catches

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

- Aggregation: Bullet tuna are usually not reported by species being aggregated with frigate tunas or, less frequently, other small tuna species.
- Mislabelling: Bullet tuna are usually mislabelled as frigate tuna, 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 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 changed substantially since the WPNT meeting in 2012, with catches more than doubling over the entire time series, following major reviews of catch time series for Indonesia, India, and Sri Lanka.
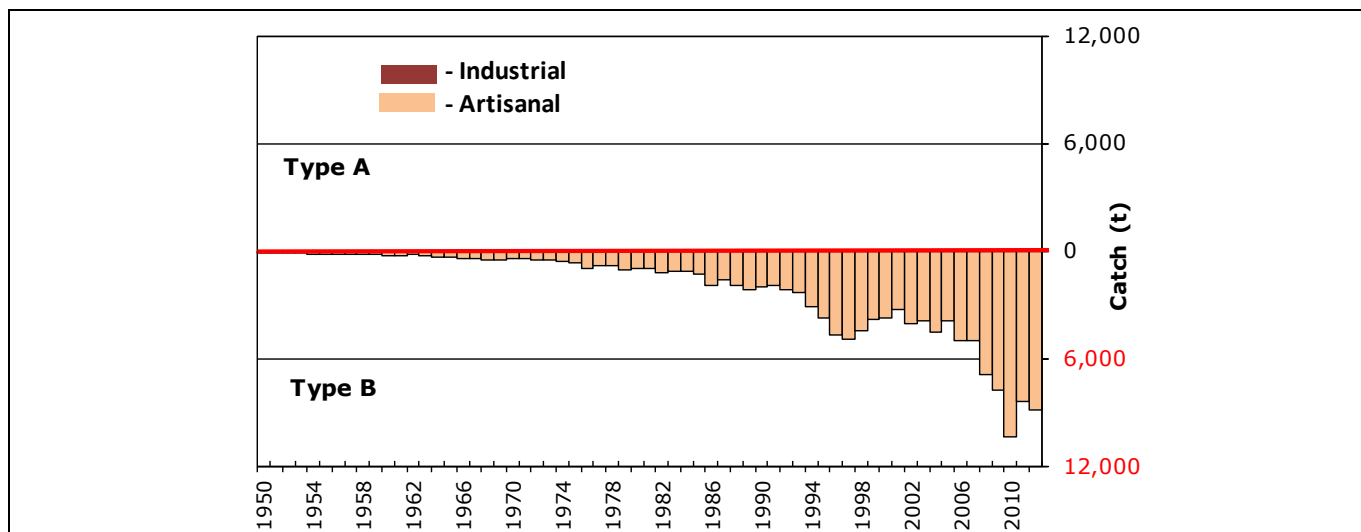
Fig. 3. Bullet tuna: Uncertainty of annual catch estimates for bullet tuna (1950–2012). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2013).
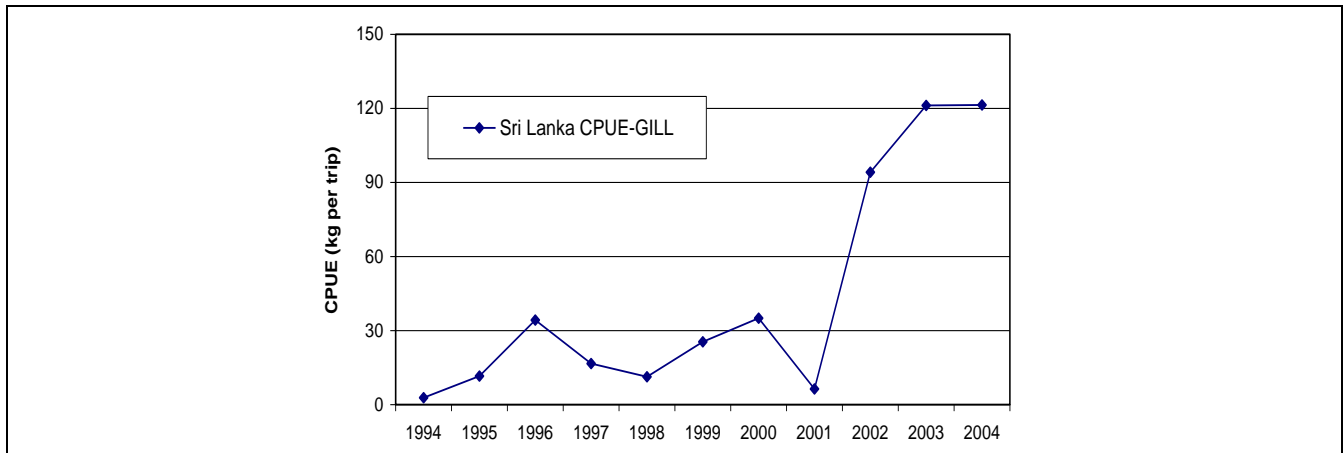
Bullet tuna – Effort trends

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 it 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 (1970–2012) . Note that no catches and effort are available at all for 1950–78.

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 (Fig. 6)
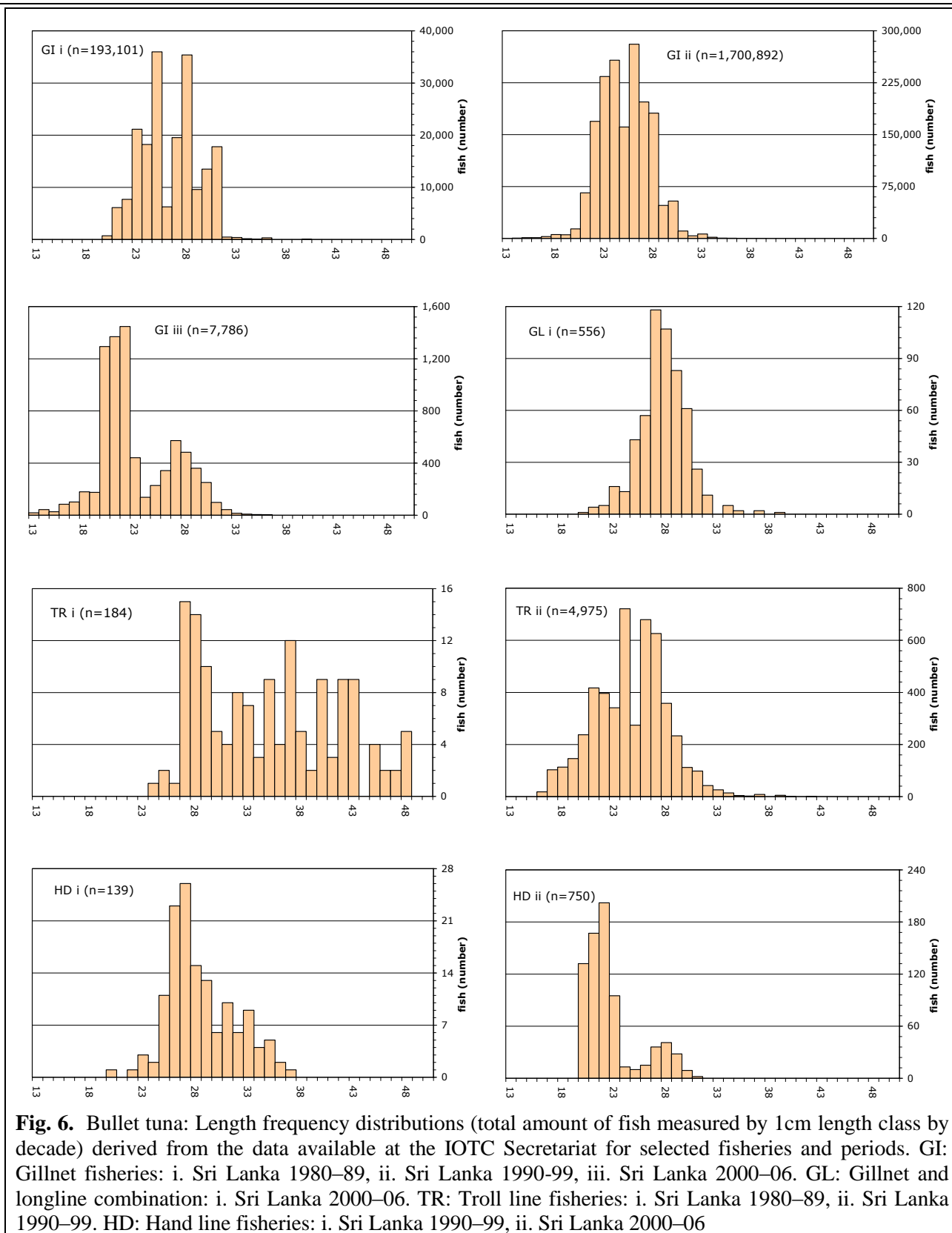- Sex ratio data have not been provided to the Secretariat by CPCs.

TABLE. 5. Bullet tuna: Availability of length frequency data, by fishery and year (1980–2012)[2]. Note that no length frequency data are available for the period 1950–83

Gear-Fleet	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10

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

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[2] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

Fig. 6. Bullet tuna: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990-99, iii. Sri Lanka 2000–06. GL: Gillnet and longline combination: i. Sri Lanka 2000–06. TR: Troll line fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990–99. HD: Hand line fisheries: i. Sri Lanka 1990–99, ii. Sri Lanka 2000–06

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).

TABLE 6. Bullet tuna (*Auxis rochei*) stock status summary

Management Quantity	Aggregate Indian Ocean
2012 catch estimate	8,862 t
Mean catch from 2008–2012	8,468 t
MSY (80% CI)	unknown
Data period used in assessment	–
F_{2012}/F_{MSY} (80% CI)	–
B_{2012}/B_{MSY} (80% CI)	–
SB_{2012}/SB_{MSY}	–
B_{2012}/B_0 (80% CI)	–
SB_{2012}/SB_0	–
$B_{2012}/B_{0, F=0}$	–
$SB_{2012}/SB_{0, F=0}$	–

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Kahraman A, Göktürk D, Bozkurt ER, Akayl T, Karakulak FS (2010) Some reproductive aspects of female bullet tuna, Auxis rochei (Risso), from the Turkish Mediterranean coasts. African J Biotech 9(40): 6813-6818

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.