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

iotc ctoi

EXECUTIVE SUMMARY: STATUS OF THE INDIAN OCEAN BULLET TUNA (*AUXIS ROCHEI*) RESOURCE

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

Area[1]	Indicators – 2011 assessment		2011 stock status determination 2010[2]
Indian Ocean	Catch[3] 2010:	4,188 t	**UNCERTAIN**
	Average catch[3] 2006–2010:	2,884 t	
	MSY:	unknown	
	F_{2010}/F_{MSY}:	unknown	
	SB_{2010}/SB_{MSY}:	unknown	
	SB_{2010}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]The stock status refers to the most recent years' data used for the assessment.
[3]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 ($F_{year}/F_{MSY}\leq 1$)		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

The WPNT **RECOMMENDED** the following management advice for bullet tuna in the Indian Ocean, for the consideration of the Scientific Committee, noting that there remains considerable uncertainty about stock structure and about the total catches.

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 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 this will have on the resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted.

The WPNT **RECOMMENDED** that the Scientific Committee consider the following:
- 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, although none are species specific:
- Resolution 08/04 *concerning the recording of catch by longline fishing vessels in the IOTC area*.
- Resolution 09/02 *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 10/03 *concerning the recording of catch by fishing vessels in the IOTC area*.
- Resolution 10/08 *concerning a record of active vessels fishing for tunas and swordfish in the IOTC area.*
- Recommendation 11/06 *Concerning the Recording of Catch by Fishing Vessels in the IOTC Area of Competence*.

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.

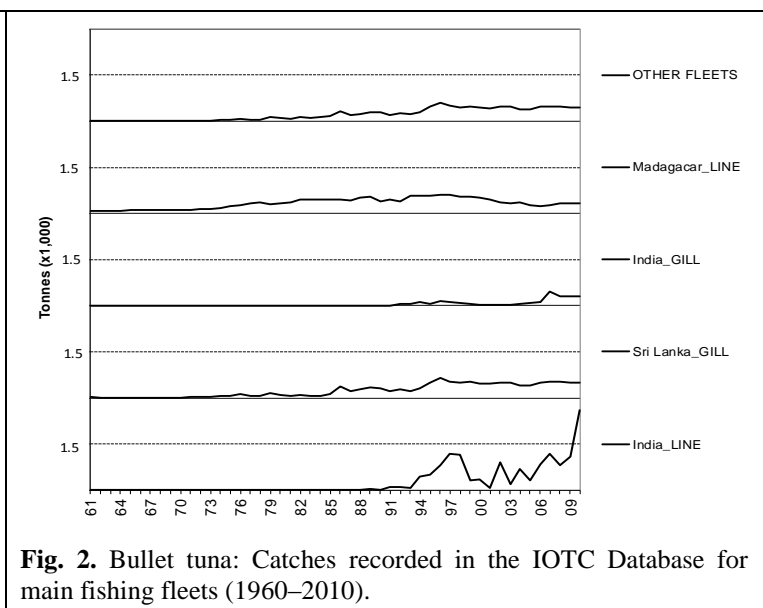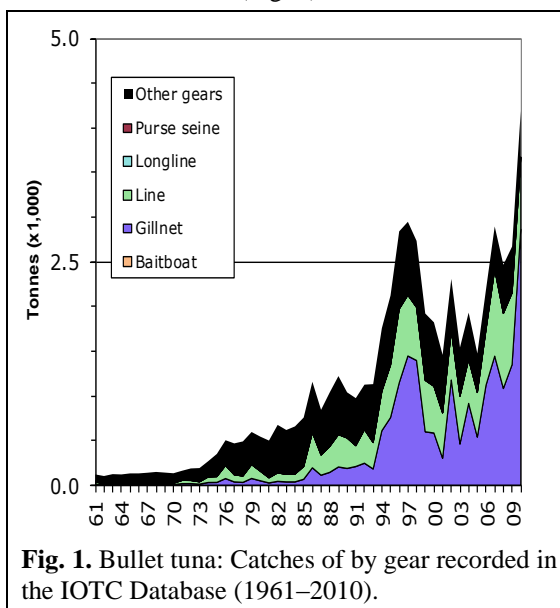**TABLE 2.** Biology of Indian Ocean bullet tuna (*Auxis rochei*).

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)

Bullet tuna – Catch trends

Bullet tuna is caught mainly using gillnet, handline, and trolling gears across the broader Indian Ocean area (Fig. 1). This species is also an important catch for artisanal purse seiners. The catch estimates for bullet tuna were derived from very small amounts of information and are therefore highly uncertain.

Estimated catches of bullet tuna reached around 1,000 t in the early 1990's, increasing markedly in the following years to reach a peak in 1998, at around 2,800 t. The catches decreased sharply in the following years and remained at values of around 2,000 t until the mid-2000's, to increase again sharply up to the 4,188 t recorded in 2010, the highest catches ever recorded for this species (Table 3). The average annual catch estimated for the period 2006 to 2010 is 2,884 t (Table 3). However, the high catches of bullet tuna recorded since 2006, compared to previous years, are thought to be unrealistic. The difference in catches may come from improved identification of specimens of frigate tuna and bullet tuna in recent years, leading to higher catches of bullet tuna reported to the IOTC. Bullet tuna and frigate tuna are very similar and mislabelling is thought to be overspread. In recent years, the countries attributed with the highest catches of bullet tuna are Sri Lanka and India (Fig. 2).

Fig. 1. Bullet tuna: Catches of by gear recorded in the IOTC Database (1961–2010).

Fig. 2. Bullet tuna: Catches recorded in the IOTC Database for main fishing fleets (1960–2010).

TABLE 3. Best scientific estimates of the catches of bullet tuna by type of fishery for the period 1950–2010 (in metric tonnes). Data as of October 2011.

| Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Purse seine	0	3	10	81	151	194	184	205	204	165	165	204	208	209	194	194
Gillnet	5	8	36	94	680	586	303	1179	463	918	540	1,121	1,447	1,084	1,351	2,866
Line	11	16	71	186	497	525	509	560	537	495	501	626	974	841	804	804
Other	61	103	221	443	533	520	464	367	339	355	270	242	268	335	323	323
Total	**78**	**129**	**337**	**803**	**1,861**	**1,825**	**1,460**	**2,311**	**1,543**	**1,933**	**1,476**	**2,193**	**2,897**	**2,469**	**2,673**	**4,188**

Bullet tuna – Uncertainty of catches

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

- Aggregation: Bullet tunas are usually not reported by species, being aggregated with frigate tunas or, less frequently, other small tuna species.
- Mislabelling: Bullet tunas are usually mislabelled as frigate tuna, their catches reported under the latter species.
- Under reporting: 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 tuna in the IOTC database are thought to represent only a small fraction of the total catches of this species in the Indian Ocean. In particular, catches reported by India in recent years are unreliable and need to be verified.

- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of bullet tuna for its purse seine fleet, for 2003–2008, estimated using observer data.
- Changes to the catch series: The catch series of bullet tuna has changed substantially since estimates made in 2010, following reviews of catches for the coastal fisheries in Indonesia and, to a lesser extent India, involving marked changes in catches by species.
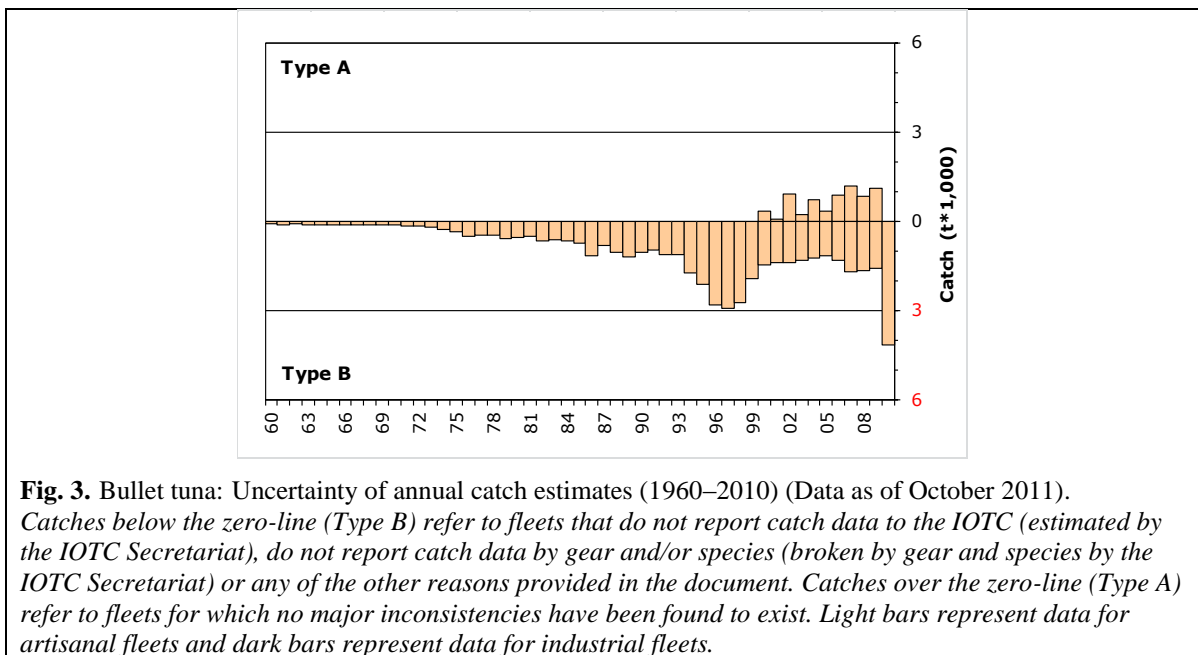

Fig. 3. Bullet tuna: Uncertainty of annual catch estimates (1960–2010) (Data as of October 2011).
Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species 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.

Bullet tuna – Effort trends

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

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

Standardised CPUE series have not yet been developed. Nominal CPUE series are however available from some fisheries but they are considered highly incomplete and 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).
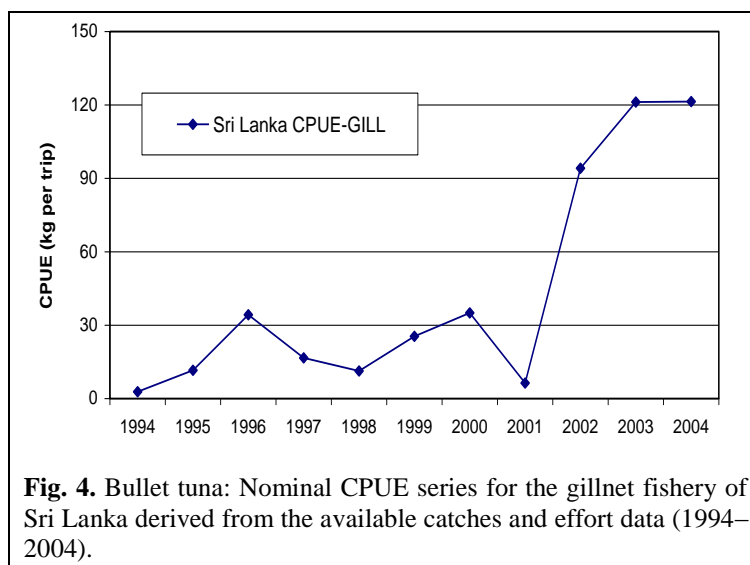
Fig. 4. Bullet tuna: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004).

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

- The size of bullet tuna taken by the Indian Ocean fisheries typically ranges between 13–48 cm depending on the type of gear used, season and location.
- 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.
- Catch-at-Size(Age) tables 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.

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 4. Bullet tuna (*Auxis rochei*) stock status summary.

Management Quantity	Aggregate Indian Ocean
2010 catch estimate (1000 t)	4.2
Mean catch from 2006–2010 (1000 t)	2.9
MSY (1000 t) (80% CI)	unknown
Data period used in assessment	–
F_{2010}/F_{MSY} (80% CI)	–
B_{2010}/B_{MSY} (80% CI)	–
SB_{2010}/SB_{MSY}	–
B_{2010}/B_0 (80% CI)	–
SB_{2010}/SB_0	–
$B_{2010}/B_{0, F=0}$	–
$SB_{2010}/SB_{0, F=0}$	–

LITERATURE CITED

Froese R & Pauly DE, 2009.FishBase, version 02/2009, FishBase Consortium, <www.fishbase.org>.