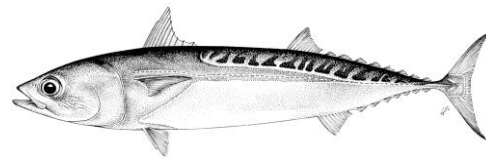


DRAFT: EXECUTIVE SUMMARY: BULLET TUNA (*AUXIS ROCHEI*)

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

**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	2012 stock status determination
Indian Ocean	Catch ² 2011: 4,949 t Average catch ² 2007–2011: 2,961 t MSY: unknown F ₂₀₁₁ /F _{MSY} : unknown SB ₂₀₁₁ /SB _{MSY} : unknown SB ₂₀₁₁ /SB ₀ : 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. There remains considerable uncertainty about stock structure and about the 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 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 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

Bigeye tuna (*Thunnus obesus*) in the Indian Ocean is currently subject to a number of Conservation and Management Measures adopted by the Commission:

- 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
- Resolution 12/03 on the recording of catch and effort by fishing vessels in the IOTC area of competence

- Resolution 12/07 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

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 artisanal purse seiners. The catch estimates for bullet tuna were derived from very small amounts of information and are therefore highly uncertain¹.

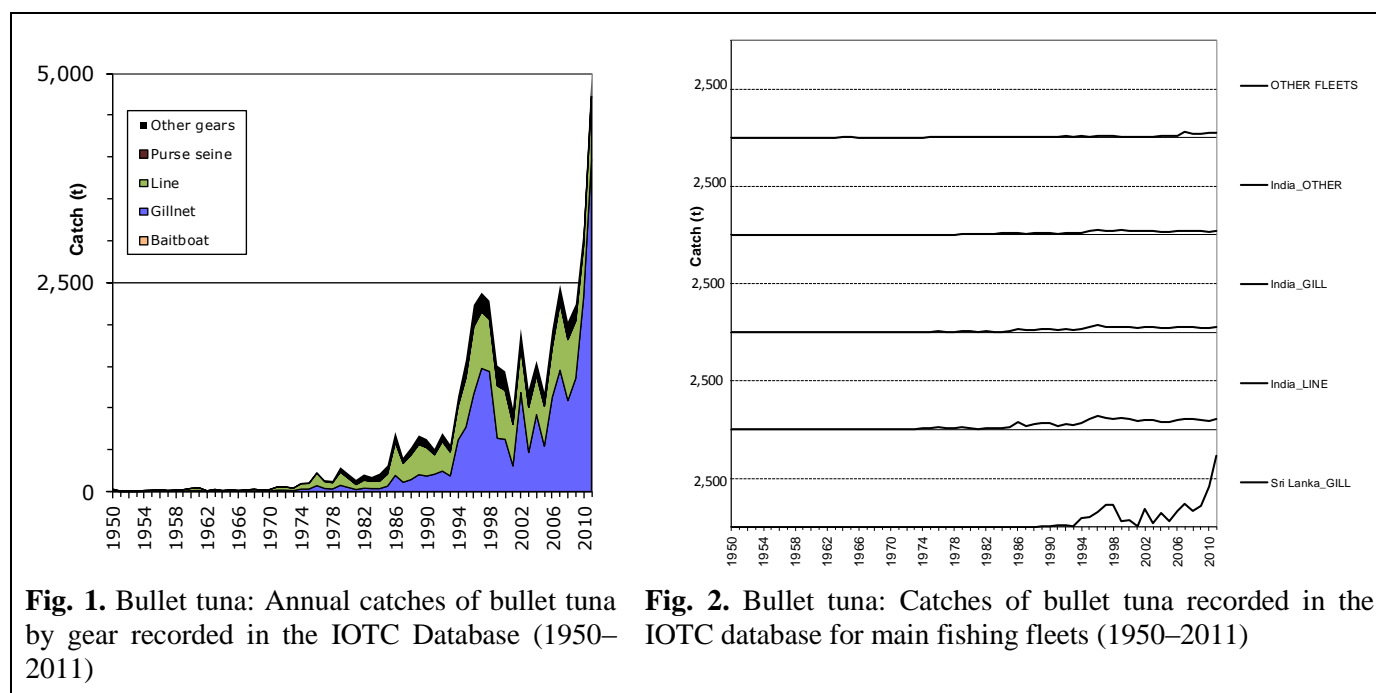
TABLE 3. Bullet tuna: Best scientific estimates of the catches of bullet tuna by type of fishery for the period 1950–2011 (in metric tonnes) (Data as of October 2012)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Purse seine	-	3	10	81	164	200	210	209	169	169	208	213	214	199	171	226
Gillnet	5	9	35	92	694	908	1,186	469	922	545	1,127	1,453	1,089	1,356	2,322	3,970
Line	12	16	72	187	495	595	553	541	473	478	596	808	729	686	617	754
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	17	28	117	360	1,353	1,704	1,948	1,219	1,565	1,192	1,932	2,474	2,032	2,241	3,110	4,949

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 around 2,000 t until the mid-2000's. The highest reported catches of bullet tuna were taken in 2011 with 4,950 t estimated as being landed. The high catches of bullet tuna recorded since 2006, compared to previous years, are thought to be

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.

highly uncertain. 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 Secretariat.



In recent years, the countries attributed with the highest catches of bullet tuna are Sri Lanka and India (Fig. 2). Length frequency data for bullet tuna is only available for some Sri Lanka fisheries and periods.

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. In particular, catches reported by India in recent years are unreliable and need to be verified.

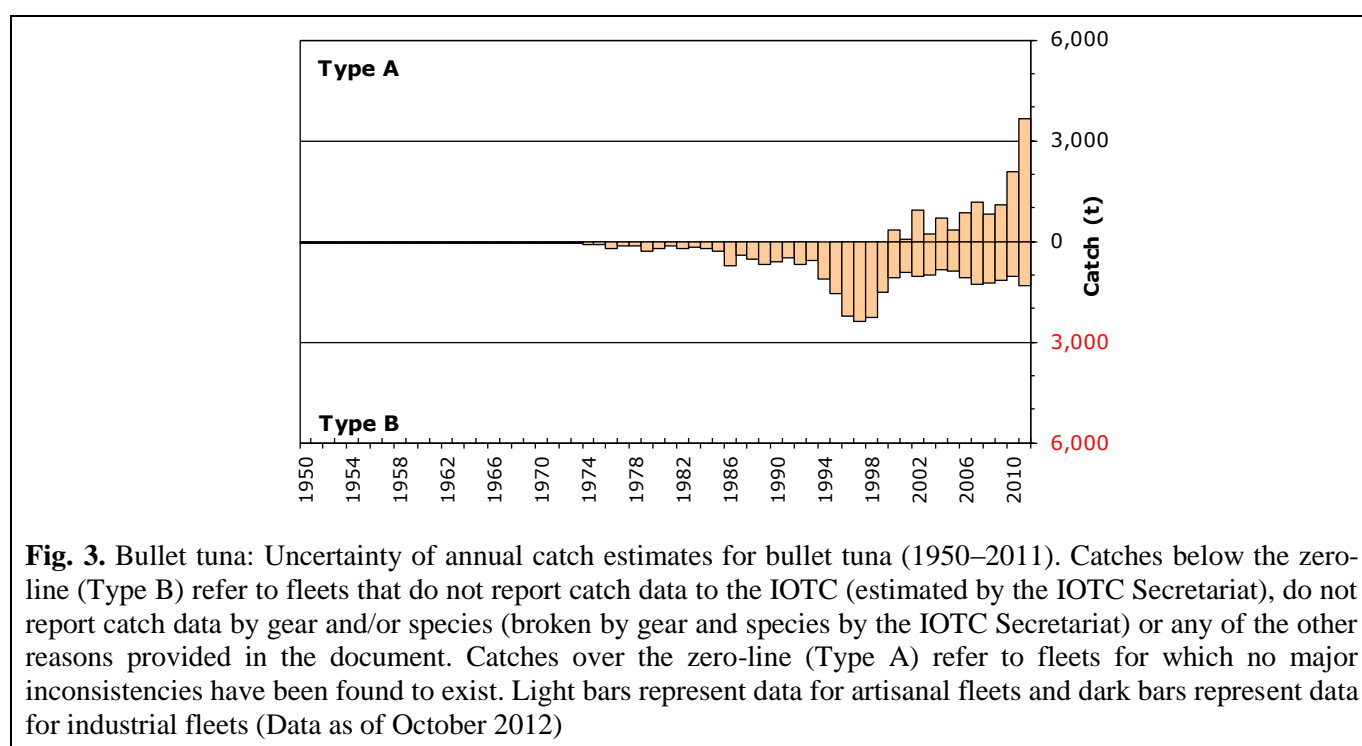


Fig. 3. Bullet tuna: Uncertainty of annual catch estimates for bullet tuna (1950–2011). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the 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 (Data as of October 2012)

- 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 2011, following reviews of catches of frigate tuna and bullet tuna for the coastal fisheries in India, with an increased proportion of frigate tuna to the previously reported total catches of both frigate tuna and bullet tuna.

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. 5).

TABLE. 4. Bullet tuna: Availability of catches and effort series, by fishery and year (1970–2011)². Note that no catch and effort data are available for the period 1950–78

Gear-Fleet	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	00	02	04	06	08	10	
PSS-Indonesia								■	■	■												
PSS-Sri Lanka											■											
GILL-India					■																	
GILL-Indonesia								■	■													
GILL-Sri Lanka								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LINE-India					■																	
LINE-Indonesia								■	■													
LINE-Sri Lanka									■													
LINE-Yemen																			■	■	■	■
OTHR-Sri Lanka													■	■	■	■	■	■	■	■	■	■

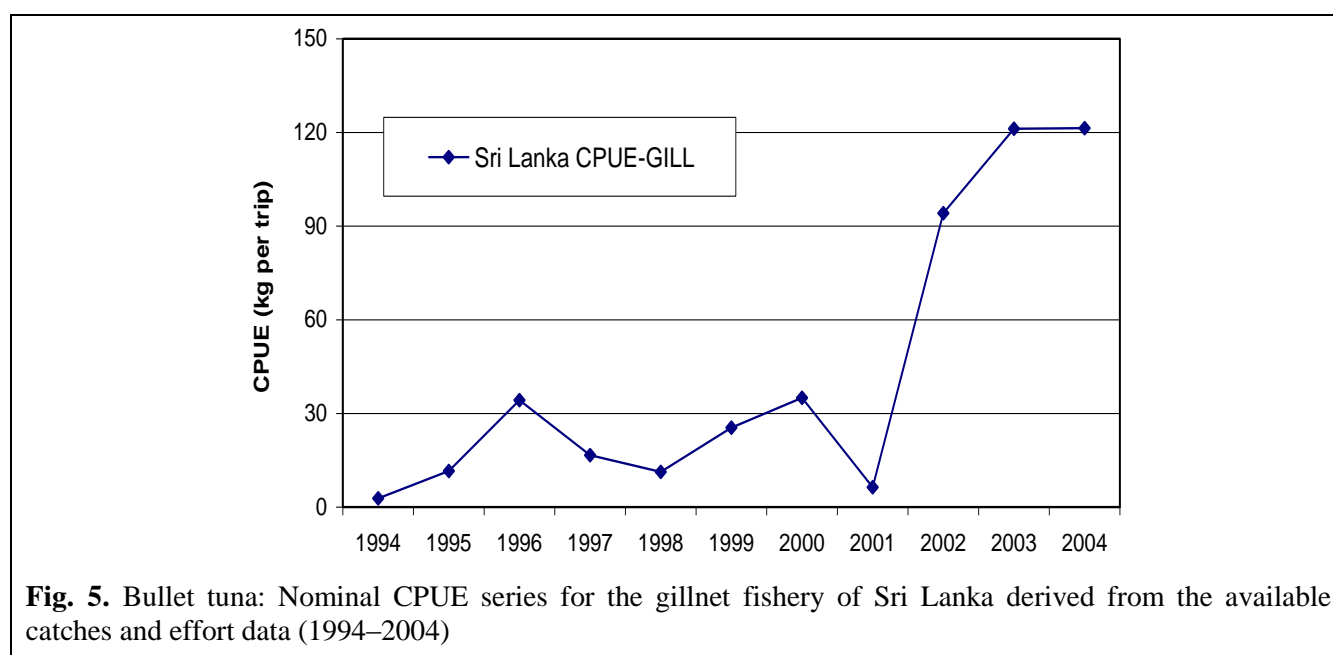


Fig. 5. Bullet tuna: Nominal CPUE series for the gillnet fishery of Sri Lanka derived from the available catches and effort data (1994–2004)

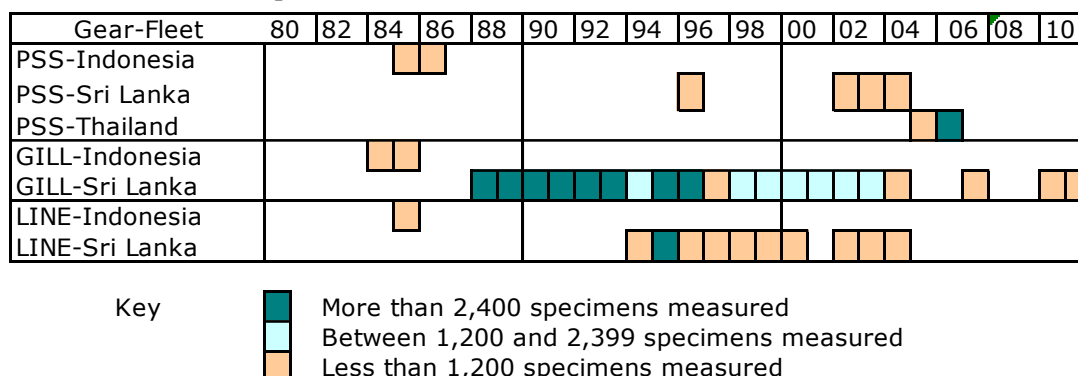
Bullet tuna – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- 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 (Table 5).

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

- 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. Length distributions derived from the data available for some selected fisheries are shown in 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 (1980–2011)³. Note that no length frequency data are available for the period 1950–83



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
2011 catch estimate	4,949 t
Mean catch from 2007–2011	2,961 t
MSY (80% CI)	unknown
Data period used in assessment	–
F_{2011}/F_{MSY} (80% CI)	–
B_{2011}/B_{MSY} (80% CI)	–
SB_{2011}/SB_{MSY}	–
B_{2011}/B_0 (80% CI)	–
SB_{2011}/SB_0	–
$B_{2011}/B_{0, F=0}$	–
$SB_{2011}/SB_{0, F=0}$	–

³ 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

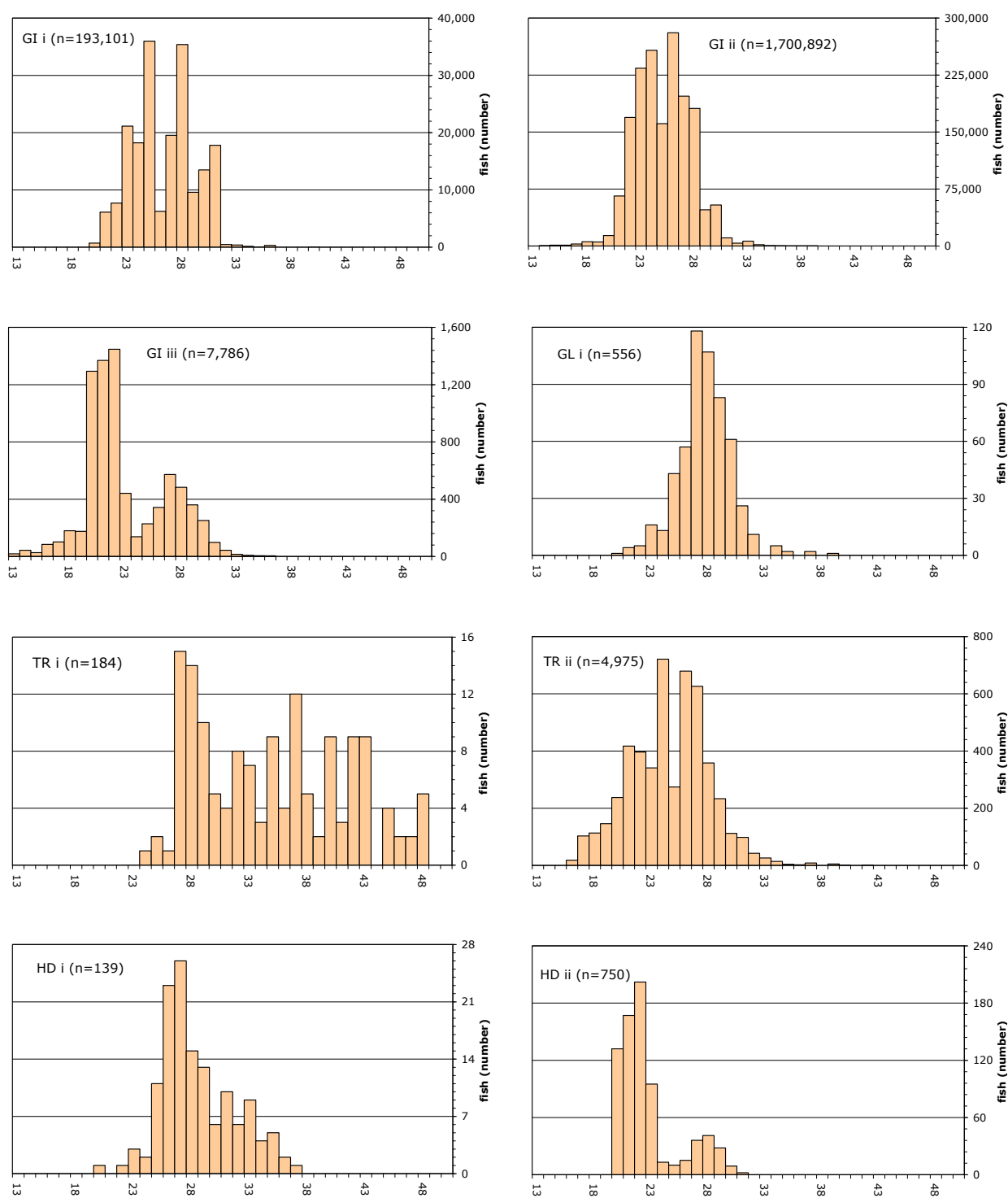


Fig. 6. Bullet tuna: Length frequency distributions (total amount of fish measured by 1cm length class by decade) derived from the data available at the IOTC Secretariat for selected fisheries and periods. GI: Gillnet fisheries: i. Sri Lanka 1980–89, ii. Sri Lanka 1990–99, iii. Sri Lanka 2000–06. GL: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

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