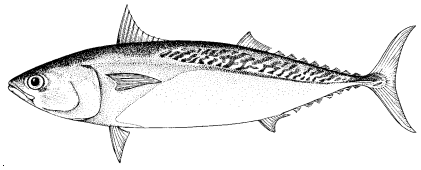
Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi



EXECUTIVE SUMMARY: STATUS OF THE INDIAN OCEAN FRIGATE TUNA (*AUXIS THAZARD*) RESOURCE

TABLE 1. Status of frigate tuna (*Auxis thazard*) in the Indian Ocean.

Area[1]	Indicators – 2011 assessment		2011 stock status determination 2010[2]
Indian Ocean	Catch[3] 2010:	71,023 t	UNCERTAIN
	Average catch[3] 2006–2010:	64,245 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 frigate 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 frigate 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 frigate 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

Frigate tuna (*Auxis thazard*) 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*.

FISHERIES INDICATORS

General

Frigate tuna (*Auxis thazard*) is a highly migratory species found in both coastal and oceanic waters. It is highly gregarious and often schools with other Scombrids. Table 2 outlines some key life history parameters relevant for management.

TABLE 2. Biology of Indian Ocean frigate tuna (*Auxis thazard*).

Parameter	Description
Range and stock structure	Little is known on the biology of frigate tuna in the Indian Ocean. Highly migratory species found in both coastal and oceanic waters. It is highly gregarious and often schools with other Scombrids. Frigate tuna feeds on small fish, squids and planktonic crustaceans (e.g. decapods and stomatopods). Because of their high abundance, frigate tuna are considered to be an important prey for a range of species, especially the commercial tunas. No information is available on the stock structure of frigate tuna in Indian Ocean.
Longevity	Females n.a; Males n.a.
Maturity (50%)	**Age**: n.a.; females n.a. males n.a. **Size:** females and males ~29–35 cm FL.
Spawning season	In the southern Indian Ocean, the spawning season extends from August to April whereas north of the equator it is from January to April. Fecundity ranges between 200,000 and 1.06 million eggs per spawning (depending on size).
Size (length and weight)	Maximum: Females and males 60 cm FL; weight n.a.

n.a. = not available. SOURCES: Froese & Pauly (2009)

Frigate tuna – Catch trends

Frigate tuna is taken from across the Indian Ocean area using drifting gillnets, pole-and-lines, handlines and trolling (Fig. 1). This species is also an important bycatch for industrial purse seiners and is the target of some ring net fisheries. The catch estimates for frigate tuna were derived from very small amounts of information and are therefore highly uncertain.

Estimated catches have increased steadily since the late 1970's, reaching around 15,000 t in the early 1980's and over 45,000 t by the mid-1990's. Catches increased markedly from 2006 and have been in excess of 65,000 t from 2008 (Fig. 2). The average annual catch estimated for the period 2006 to 2010 is 64,245 t with the highest catches recorded in 2010 of 71,023 t (Table 3).

In recent years, the countries attributed with the highest catches are Indonesia (60%), India (17%), I.R. Iran (8%) and the Maldives (6%).

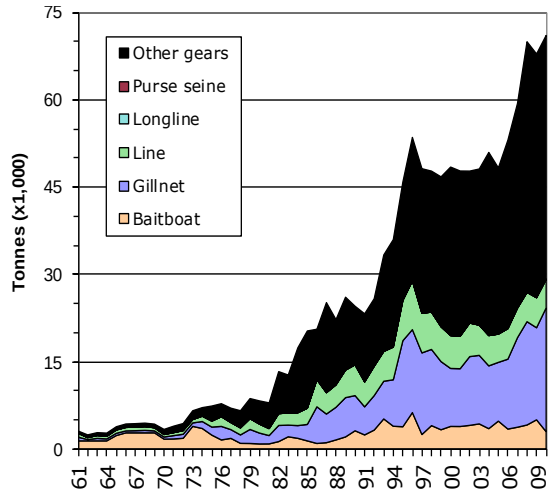


Fig. 1. Frigate tuna: Catches by gear recorded in the IOTC Database (1961–2010).

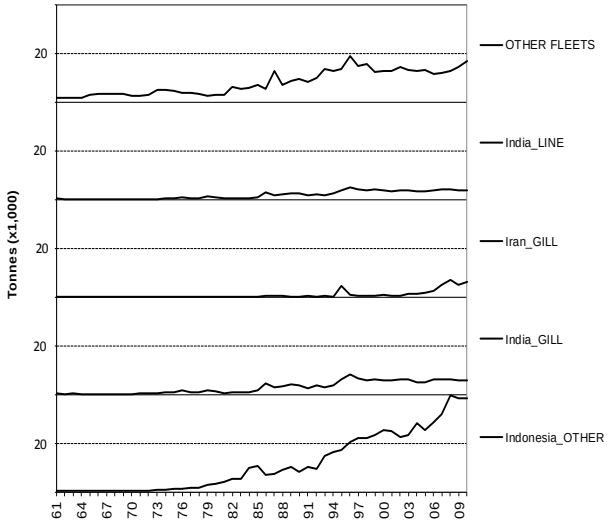


Fig. 2. Frigate tuna: Catches recorded in the IOTC Database for main fishing fleets (1961–2010).

TABLE 3. Best scientific estimates of the catches of frigate 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	12	895	7,260	16,206	26,427	26,124	24,302	25,149	29,707	27,186	31,173	33,847	41,434	40,262	40,294
Gillnet	265	406	1,268	3,713	9,958	9,978	9,949	11,840	11,816	10,830	10,156	12,051	15,390	17,758	15,864	21,291
Line	372	560	1,015	2,889	5,997	5,653	5,592	5,778	5,197	5,214	4,867	5,257	5,088	5,046	5,169	4,919
Other	1,721	2,477	3,088	3,514	6,319	6,360	6,081	5,808	5,926	5,186	6,074	4,576	5,017	5,715	6,555	4,519
Total	**2,358**	**3,456**	**6,265**	**17,376**	**38,479**	**48,419**	**47,746**	**47,728**	**48,089**	**50,938**	**48,283**	**53,057**	**59,342**	**69,954**	**67,849**	**71,023**

Frigate tuna – Uncertainty of catches

Retained catches are uncertain (Fig. 3), notably for the following fisheries:

- Artisanal fisheries of Indonesia: Indonesia did not report catches of frigate tuna by species or by gear for 1950–2004; catches of frigate tuna, bullet tuna and other species were reported aggregated for this period. The IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004 by gear and species. The Indonesian catches estimated for frigate tuna represent around 60% of the total catches of this species in the Indian Ocean in recent years.
- Artisanal fisheries of India: Although India reports catches of frigate tuna they are not always reported by gear. The IOTC Secretariat has allocated the catches of frigate tuna by gear for years in which this information was not available. In recent years, the catches of frigate tuna in India have represented 17% of the total catches of this species in the Indian Ocean.
- Artisanal fisheries of Mozambique, Myanmar and Somalia: None of these countries have reported catches to the IOTC Secretariat, thus catch levels are unknown.
- Other artisanal fisheries: The catches of frigate tuna and bullet tuna are seldom reported by species and, when reported by species, they usually refer to both species (due to mislabelling, with all catches assigned to the frigate tuna).
- Industrial fisheries: The catches of frigate tuna recorded for industrial purse seiners are thought to be a fraction of those retained on board. Due to this species being a bycatch, its catches are seldom recorded in the logbooks, nor can they be monitored in port. The EU recently reported catch levels of frigate tuna for its purse seine fleet, for 2003–2007, estimated using observer data.
- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of frigate tuna for its purse seine fleet, for 2003–2007, estimated using observer data.
- Changes to the catch series: The catch series of frigate tuna has changed substantially from those estimated 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. Overall, the new catches estimated for Indonesian fisheries are three times higher than those recorded in the past.

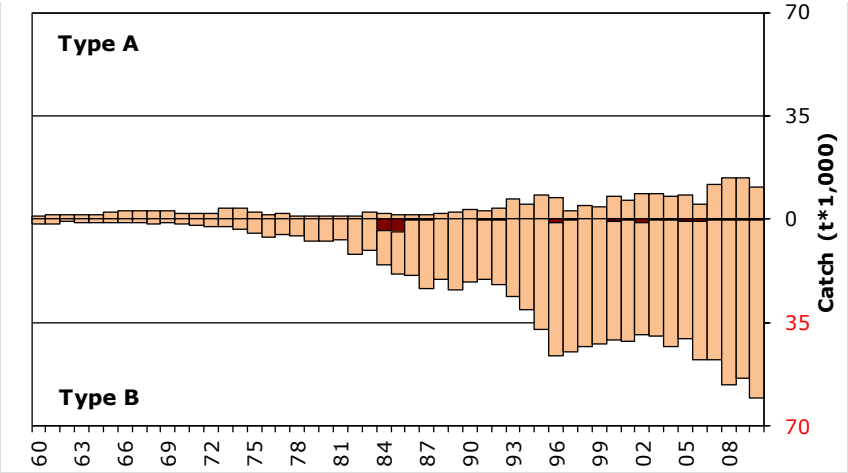


Fig. 3. Frigate tuna: Uncertainty of annual catch estimates (1960–2010) (Data as of October 2011)
Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species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

Frigate tuna – Effort trends

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

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

Standardised CPUE series have not yet been developed. Catch-and-effort series are available from some fisheries but they are considered highly incomplete. In most cases catch-and-effort data are only available for short periods. Reasonably long catch-and-effort series (extending for more than 10 years) are only available for Maldives baitboats and troll lines (Fig. 4) and Sri Lanka gillnets. The catches and effort recorded for Sri Lankan gillnets are, however, thought to be inaccurate due to the dramatic changes in CPUE recorded between consecutive years.

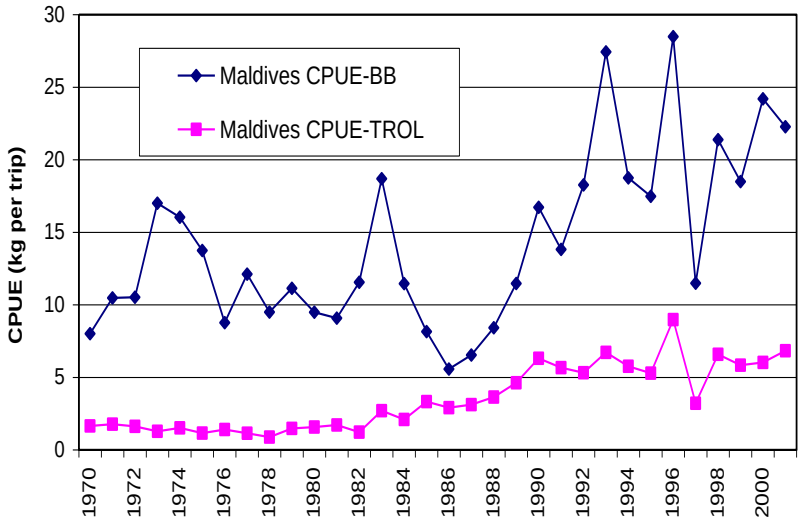


Fig. 4. Frigate tuna: Nominal CPUE series for the baitboat (BB) and line (LINE) fisheries of Maldives derived from the available catches and effort data (1970–2001).

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

- The size of frigate tuna taken by Indian Ocean fisheries typically ranges between 20–50 cm depending on the type of gear used, season and location. The fisheries operating in the Andaman Sea (coastal purse seines and troll lines) tend to catch frigate tuna of small to medium size (15–40cm) while the gillnet, baitboat and other fisheries operating in the Indian Ocean catch usually larger specimens (25–50cm). Length frequency data for the bullet tuna is only available for some Sri Lanka fisheries and periods. These fisheries catch bullet tuna ranging between 15–35 cm.
- Trends in average weight can only be assessed for Sri Lankan gillnets and Maldivian pole-and-lines but the amount of specimens measured has been very low in recent years. The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme). Unfortunately, data collection did not continue in most countries after the end of the IPTP activities.
- Catch-at-Size(Age) tables are not available for the frigate 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 frigate 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 Maldives baitboat and line fisheries (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. Frigate tuna (*Auxis thazard*) stock status summary.

Management Quantity	Aggregate Indian Ocean
2010 catch estimate (1000 t)	71.0
Mean catch from 2006–2010 (1000 t)	64.2
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>.