DRAFT: EXECUTIVE SUMMARY: BIGEYE THRESHER SHARK

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

Status of the Indian Ocean bigeye thresher shark (BTH: *Alopias superciliosus*)

TABLE 1. Bigeye thresher shark: Status bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean

Area[1]	Indicators		2013 stock status determination
Indian Ocean	Reported catch 2012:	465 t	Uncertain
	Not elsewhere included (nei) sharks:	42,793 t	
	Average reported catch 2008–2012:	98 t	
	Not elsewhere included (nei) sharks:	48,708 t	
	MSY:	unknown	
	F_{2012}/F_{MSY}:	unknown	
	SB_{2012}/SB_{MSY}:	unknown	
	SB_{2012}/SB_0:	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence

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		

TABLE 2. Bigeye thresher shark: IUCN threat status of bigeye thresher shark (*Alopias superciliosus*) in the Indian Ocean

Common name	Scientific name	IUCN threat status[1]		
		Global status	WIO	EIO
Bigeye thresher shark	*Alopias superciliosus*	Vulnerable	–	–

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
Sources: IUCN 2007, Amorim et al. 2009

NOTE: IOTC Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*, prohibits retention onboard, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae[2].

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty in the stock status due to lack of information necessary for assessment or to for the development of other indicators of the stock (Table 1). The current IUCN threat status of 'Vulnerable' applies to bigeye thresher shark globally (Table 2). There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. There is no quantitative stock assessment and limited basic fishery indicators currently available for bigeye thresher shark in the Indian Ocean therefore the stock status is highly uncertain. Bigeye thresher sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (+20 years), mature at 9–3 years, and have few offspring (2–4 pups every year), the bigeye thresher shark is vulnerable to overfishing. Therefore stock status remains **uncertain** (Table 1).

Outlook. Current longline fishing effort is directed to other species, however bigeye thresher sharks is a common bycatch these fisheries. Hooking mortality is apparently very high, therefore IOTC regulation 10/12 prohibiting retaining of any part of thresher sharks onboard and promoting life release of thresher shark are apparently ineffective for species conservation. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. However there are few data to estimated CPUE trends, in view of IOTC Resolution 12/09 and

[1] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
[2] Scientific observers shall be allowed to collect biological samples from thresher sharks that are dead at haulback, provided that the samples are part of the research project approved by the Scientific Committee (or the Working Party on Ecosystems and Bycatch).

reluctance of fishing fleet to report information on discards/non-retained catch. The impact of piracy in the western Indian Ocean has resulted in the displacement and subsequent concentration of a substantial portion of longline fishing effort into other areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on bigeye thresher shark will decline in these areas in the near future, which may result in localised depletion. The following should be noted:

- The available evidence indicates considerable risk to the status of the IO stock at current effort levels.
- Two important sources of data that inform the assessment, total catches and CPUE are highly uncertain and should be investigated further as a priority.
- Noting that current catches (probably largely underestimated) are estimated at an average ~98 t over the last five years, ~465 t in 2012, maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE.
- Mechanisms need to be developed by the Commission to encourage CPCs to comply with their reporting requirement on sharks.

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

Bigeye thresher shark in the Indian Ocean are 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* sets out the minimum logbook requirements for purse seine, longline, gillnet, pole and line, handline and trolling fishing vessels over 24 metres length overall and those under 24 metres if they fish outside the EEZs of their flag States within the IOTC area of competence. As per this Resolution, catch of all sharks must be recorded (retained and discarded).
- Resolution 13/06 *on a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries* prohibits, as an interim pilot measure, the retention onboard, transhipment, landing or storing any part or whole carcass of oceanic whitetip sharks (*Carcharhinus longimanus*) (and requests for all other species) by all vessels on the IOTC record of authorised vessels or authorised to fish for tuna or tuna-like species, with the exception of observers who are permitted to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from oceanic whitetip sharks that are dead at haulback and artisanal fisheries for the purpose of local consumption, and will conduct a review and an evaluation of the interim measure in 2016.
- Resolution 12/09 *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence* prohibits fishing vessels flying the flag of IOTC Members and Cooperating non-Contracting Parties (CPCs) from retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae.
- Resolution 11/04 *on a Regional Observer Scheme* requires data on shark interactions to be recorded by observers and reported to the IOTC within 150 days. The Regional Observer Scheme (ROS) started on 1st July 2010.
- Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)* indicated that the provisions, applicable to tuna and tuna-like species, are applicable to shark species.
- Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC* includes minimum reporting requirements for sharks, calls for full utilisation of sharks and includes a ratio of fin-to-body weight for shark fins retained onboard a vessel.

Extracts from Resolutions 13/03, 13/06, 12/09, 11/04 and 05/05

RESOLUTION 13/03 ON THE RECORDING OF CATCH AND EFFORT BY FISHING VESSELS IN THE IOTC AREA OF COMPETENCE

Para. 1. Each flag CPC shall ensure that all purse seine, longline, gillnet, pole and line, handline and trolling fishing vessels flying its flag and authorized to fish species managed by IOTC be subject to a data recording system.

Para. 8 (start). The flag State and the States which receive this information shall provide all the data for any given year to the IOTC Secretariat by June 30th of the following year on an aggregated basis.

RESOLUTION 13/06 ON A SCIENTIFIC AND MANAGEMENT FRAMEWORK ON THE CONSERVATION OF SHARK SPECIES CAUGHT IN ASSOCIATION WITH IOTC MANAGED FISHERIES

Para. 8. CPCs, especially those targeting sharks, shall submit data for sharks, as required by IOTC data reporting procedures.

RESOLUTION 12/09 ON THE CONSERVATION OF THRESHER SHARKS (FAMILY ALOPIIDAE) CAUGHT IN ASSOCIATION WITH FISHERIES IN THE IOTC AREA OF COMPETENCE

Para. 2 Fishing Vessels flying the flag of an IOTC Member or Cooperating non-Contracting Party (CPCs) are prohibited from retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae, with the exception of paragraph 7.
Para. 3 CPCs shall require vessels flying their flag to promptly release unharmed, to the extent practicable, thresher sharks when brought along side for taking on board the vessel.
Para. 4 CPCs shall encourage their fishers to record and report incidental catches as well as live releases. These data will be then kept at the IOTC Secretariat.

RESOLUTION 11/04 ON A REGIONAL OBSERVER SCHEME

Para. 10. Observers shall:

b) Observe and estimate catches as far as possible with a view to identifying catch composition and monitoring discards, by-catches and size frequency

Resolution 10/02 MANDATORY STATISTICAL REQUIREMENTS FOR IOTC MEMBERS AND COOPERATING NON-CONTRACTING PARTIES (CPC'S)

Para. 3. The provisions, applicable to tuna and tuna-like species, shall also be applicable to the most commonly caught shark species and, where possible, to the less common shark species.

RESOLUTION 05/05 CONCERNING THE CONSERVATION OF SHARKS CAUGHT IN ASSOCIATION WITH FISHERIES MANAGED BY IOTC

Para. 1. CPCs shall annually report data for catches of sharks, in accordance with IOTC data reporting procedures, including available historical data.

Para. 3. CPCs shall take the necessary measures to require that their fishermen fully utilise their entire catches of sharks. Full utilisation is defined as retention by the fishing vessel of all parts of the shark excepting head, guts and skins, to the point of first landing.

FISHERIES INDICATORS

Bigeye thresher shark: General

Bigeye thresher shark (*Alopias superciliosus*) is found in pelagic coastal and oceanic waters throughout the tropical and temperate oceans worldwide (Fig. 1). Found in coastal waters over the continental shelves, sometimes close inshore in shallow waters, and on the high seas in the epipelagic zone far from land; also caught near the bottom in deep water on the continental slopes (Compagno 2001). It can be found near the surface, and has even been recorded in the intertidal, but it is commonest below 100m depth, occurs regularly to at least 500 m deep and has been recorded to 723 m deep (Compagno 2001, Nakano et al. 2003). No predation on bigeye thresher sharks has been reported to date; however it may be preyed upon by makos, white sharks, and killer whales. Fishing is the major contributor to adult mortality. This species used its long tail to attack prey (Compagno 2001, Aalbers et al. 2010). Table 3 outlines some of the key life history traits of bigeye thresher shark in the Indian Ocean.

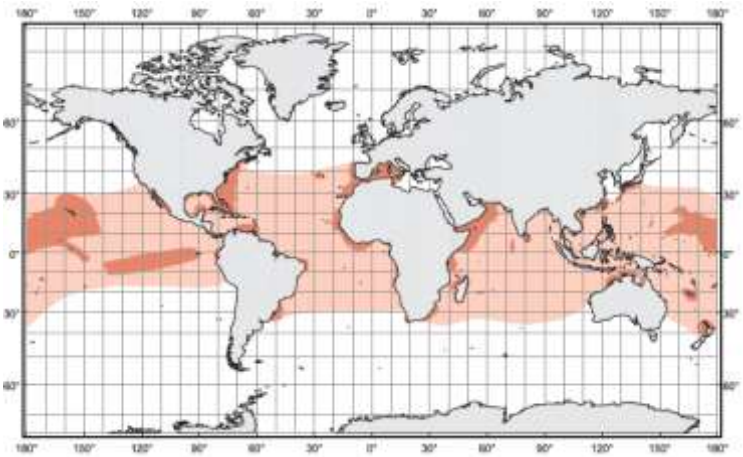

Fig. 1. Bigeye thresher shark: The worldwide distribution of the bigeye thresher shark (source: FAO)

TABLE 3. Bigeye thresher shark: Biology of Indian Ocean bigeye thresher shark (*Alopias superciliosus*)

Parameter	Description
Range and stock structure	In the tropical Indian Ocean, the greatest abundance of bigeye thresher shark occurs at depths of 50 to 300 m, in temperatures ranging from 8 to 25°C. It is considered a highly migratory species, however, no published information on horizontal movements of bigeye thresher shark is known for the Indian Ocean. This species exhibits a prominent diurnal pattern in vertical distribution spending daytime at the depth between 200 and 700 m depth and migrating to the upper layers at night. Bigeye thresher shark is a solitary fish however it is often caught in the same areas and habitats as pelagic thresher sharks *Alopias pelagicus.* Area of overlap with IOTC management area = high. No information is available on stock structure.

Longevity	No ageing studies is known for the Indian Ocean. In the Pacific Ocean (China, Taiwan Province) the oldest bigeye thresher sharks reported were a 19 year old male and a 20 year old female for fish ~ 370 cm TL. Taking into consideration that maximum length is exceed 400 cm longevity is apparently around 25–30 years. In the Eastern Atlantic Ocean, the maximum ages reported in a recent life history study were 22 years for females and 17 years for males.
Maturity (50%)	Age: Sexual maturity is attained at 12–13 years (females), 9–10 years (males). Size: Males mature at 270–300 cm total length (TL) and females at 332-355 cm TL. Size at 50% maturity from the eastern Atlantic Ocean was estimated at 206 cm FL for females (95% CI: 199–213 cm FL), and 160 cm FL for males (95% CI: 156–164 cm FL)
Reproduction	Bigeye thresher shark is an aplacental viviparous with oophagy species. • Fecundity: very low (2–4) • Generation time: around 15 years (due to oophagy) • Gestation Period: 12 months • Reproductive cycle: unknown Of the thresher sharks, the Bigeye Thresher has the lowest rate of annual increase, estimated at 1.6% under sustainable exploitation, or 0.002–0.009.
Size (length and weight)	Maximum size is around 461 cm TL. New-born pups are around 64–140 cm TL. Length–weight relationship for both sexes combined in the Indian Ocean is $TW=0.155*10^{-4}*FL^{2.97883}$

Sources: Chen et al. 1997, Lui et al. 1998, Compagno 2001, Nakano et al. 2003, Weng & Block 2004, Amorim et al. 2007, Cortés 2008, Dulvy et al. 2008, Smith et al. 2008, Stevens et al. 2010, Fernandez-Carvalho et al. 2011, Fernandez-Carvalho et al. in press

Bigeye thresher shark: Fisheries

Bigeye thresher shark are often targeted by some recreational, semi-industrial and artisanal fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries) (Table 4). Typically, the fisheries take bigeye thresher sharks between 140–210 cm FL or 40 to 120 kg (Romanov pers comm). In Australia thresher sharks used to be a target of sport fishermen. Sport fisheries for oceanic sharks are apparently not so common in other Indian Ocean countries.

There is little information on the fisheries prior to the early 1970's. Some countries still fail to collect shark data while others do collect it but fail to report to IOTC. It appears that significant catches of sharks have gone unrecorded in several countries. Furthermore, many existing catch records probably under-represent the actual catches of sharks because they do not account for discards (i.e. do not record catches of sharks for which only the fins are kept or of sharks usually discarded because of their size or condition) or they reflect dressed weights instead of live weights. FAO also compiles landings data on elasmobranchs, but their statistics are limited by the lack of species-specific data and data from the major fleets. Thresher sharks were marketed both locally and in European markets until at least up until early 2011 despite IOTC Resolution 12/09. The practice of shark finning is considered to be regularly occurring and on the increase for this species (Clarke et al. 2006, Clarke 2008). The post-release mortality is unknown but probably high. In longline fisheries bigeye thresher sharks are often hooked by the tail (Compagno 2001, Romanov pers comm) and die soon afterward. Therefore they are discarded dead if not retained. In most cases discarded sharks are not recorded in fisheries logbooks. Therefore the current measures (notably Resolution 12/09) appear to have limited conservation effect while contributing to further loss of fisheries data. Other types of conservation efforts such as protected areas should be considered for this species group by the WPEB, taking into account a detailed analysis of catch distribution and 'hotspots' of abundance derived from research data.

TABLE 4. Bigeye thresher shark: Estimated frequency of occurrence and bycatch mortality in the Indian Ocean pelagic fisheries.

Gears	PS	LL		BB/TROL/HAND	GILL	UNCL
		SWO	TUNA			
Frequency	absent	Common		rare	unknown	unknown
Fishing Mortality	no	high	high	unknown	unknown	unknown
Post release mortality	N/A	unknown	unknown	unknown	unknown	unknown

Sources: Boggs 1992, Anderson & Ahmed 1993, Romanov 2002, 2008, Ariz et al. 2006, Peterson et al. 2008, Romanov et al. 2008.

Bigeye thresher shark: Catch trends

The catch estimates for bigeye thresher shark are highly uncertain, as is their utility in terms of minimum catch estimates (Table 5). Five CPCs have reported detailed data on sharks (i.e. Australia, EU (Spain, Portugal and United Kingdom), I.R. Iran, South Africa, and Sri Lanka) while thirteen CPCs have reported partial data or data aggregated for all species (i.e. Belize, China, Indonesia, Japan, Rep. of Korea, Malaysia, Mozambique, Oman, Philippines, Seychelles, Mauritius, UK-territories, Vanuatu).

TABLE 5. Bigeye thresher shark: Catch estimates for bigeye thresher shark in the Indian Ocean for 2010 to 2012.

Catch		2010	2011	2012
Most recent catch (reported)	bigeye thresher	8 t	5 t	465 t
	nei-sharks	51,581 t	53,658 t	42,793 t
Mean catch (reported) over the last 5 years (2008–2012)	bigeye thresher			98 t
	nei-sharks			48,708 t

Note that reported shark catches are incomplete. The catches of sharks are usually not reported and when they are they might not represent the total catches of this species but simply those retained on board. It is also likely that the amounts recorded refer to weights of processed specimens, not to live weights. In 2012, 1 country reported catches of bigeye thresher sharks in the IOTC area of competence.

A recent project estimated possible thresher shark catches for fleets/countries based on the ratio of shark catch over target species by metier (Murua et al 2013). The estimation was done using target species nominal catch from the IOTC database and assuming that target catches have been accurately declared. The estimated catch from this study highlighted that the possible underestimation of thresher shark in the IOTC database is considerable (i.e. the estimated catch is around 70 times higher than the declared/report and contained in the IOTC database).

Bigeye thresher shark: Nominal and standardised CPUE trends

Data not available at the IOTC Secretariat. There are no surveys specifically designed to assess shark catch rates in the Indian Ocean. Historical research data shows overall decline both in CPUE and mean weight of thresher sharks (Romanov pers comm).

Bigeye thresher shark: Average weight in the catch by fisheries

Data not available.

Bigeye thresher shark: Number of squares fished

Catch and effort data not available.

STOCK ASSESSMENT

No quantitative stock assessment for bigeye thresher shark has been undertaken by the IOTC Working Party on Ecosystems and Bycatch.

LITERATURE CITED

Aalbers SA, Bernal D, Sepulveda CA (2010) The functional role of the caudal fin in the feeding ecology of the common thresher shark Alopias vulpinus. J Fish Biol 76: 1863–1868

Anderson RC, Ahmed H (1993) The shark fisheries in the Maldives. FAO, Rome, and Ministry of Fisheries, Male, Maldives

Amorim A, Baum J, Cailliet GM, Clò S, Clarke SC, Fergusson I, Gonzalez M, Macias D, Mancini P, Mancusi C, Myers R, Reardon M, Trejo T, Vacchi M, Valenti SV (2009) *Alopias superciliosus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 15 September 2013

Ariz J, Delgado de Molina A, Ramos ML, Santana JC (2006) Check list and catch rate data by hook type and bait for bycatch species caught by Spanish experimental longline cruises in the south-western Indian Ocean during 2005. IOTC–2006–WPBy–04

Boggs CH (1992) Depth, capture time and hooked longevity of longline-caught pelagic fish: timing bites of fish with chips. Fish Bull 90: 642–658

Chen C-T, Liu K-M, Chang Y-C (1997) Reproductive biology of the bigeye thresher shark, *Alopias superciliosus* (Lowe, 1939) (Chondrichthyes: Alopiidae), in the northwestern Pacific. Ichthyl Res 44(3): 227–235

Clarke S (2008) Use of shark fin trade data to estimate historic total shark removals in the Atlantic Ocean. Aquat Living Res 21:373-381

Clarke SC, McAllister MK, Milner-Gulland EJ, Kirkwood GP, Michielsens CGJ, Agnew DJ, Pikitch EK, Nakano H, Shivji MS (2006) Global estimates of shark catches using trade records from commercial markets. Ecol Lett 9: 1115–1126

Compagno LJV (2001) Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). FAO Species Catalogue for Fishery Purposes. No 1. Vol. 2. FAO, Rome (Italy). 269 p

Cortés E (2008) Comparative life history and demography of pelagic sharks. In: M. Camhi, E.K. Pikitch and E.A. Babcock (eds), Sharks of the Open Ocean, pp. 309-322. Blackwell Publishing

Dulvy NK, Baum JK, Clarke S, Compagno LJV, Cortes E, Domingo A, Fordham S, Fowler S, Francis MP, Gibson C, Martinez J, Musick JA, Soldo A, Stevens JD, Valentih S (2008 You can swim but you can't hide: the global status and conservation of oceanic pelagic sharks and rays. Aquatic Conservation: Mar Freshw Ecosys 18: 459–482

Fernandez-Carvalho J, Coelho R, Erzini K, Santos MN (2011) Age and growth of the bigeye thresher shark, Alopias superciliosus, from the pelagic longline fisheries in the tropical Northeastern Atlantic Ocean, determined by vertebral band counts. Aquat Living Res 24(4): 359–368

Fernandez-Carvalho J, Coelho R, Amorim S, Santos MN (2011) Maturity of the bigeye thresher (*Alopias superciliosus*) in the Atlantic Ocean. ICCAT SCRS Doc. 2011/086

IUCN (2007) IUCN Species Survival Commission's Shark Specialist Group. Review of Chondrichthyan Fishes

Liu K-M, Chiang P-J & Chen C-T (1998) Age and growth estimates of the bigeye thresher shark, *Alopias superciliosus*, in northeastern Taiwan waters. Fish Bull 96: 482–491

Murua H, Santos MN, Chavance P, Amande J, Seret B, Poisson F, Ariz J, Abascal FJ, Bach P, Coelho R, Korta M (2013) EU project for the provision of scientific advice for the purpose of the implementation of the EUPOA sharks: a brief overview of the results for Indian Ocean. IOTC–2013–WPEB09–19

Nakano H, Matsunaga H, Okamoto H, Okazaki M (2003) Acoustic tracking of bigeye thresher shark *Alopias superciliosus* in the eastern Pacific Ocean. Mar Ecol Prog Ser 265: 255–261

Petersen S, Nel D, Ryan P, Underhill L (2008) Understanding and mitigating vulnerable bycatch in southern African trawl and longline fisheries. 225 p. WWF South Africa Rep Ser

Romanov EV (2002) Bycatch in the tuna purse-seine fisheries of the western Indian Ocean. Fish Bull 100:90-105

Romanov EV (2008) Bycatch and discards in the Soviet purse seine tuna fisheries on FAD-associated schools in the north equatorial area of the Western Indian Ocean. Western Indian Ocean J Mar Sci 7:163–174

Romanov E, Bach P, Romanova N (2008) Preliminary estimates of bycatches in the western equatorial Indian Ocean in the traditional multifilament longline gears (1961-1989) IOTC Working Party on Ecosystems and Bycatch (WPEB) Bangkok, Thailand. 20-22 October, 2008. 18 p

Stevens JD, Bradford RW, West GJ (2010) Satellite tagging of blue sharks (*Prionace glauca*) and other pelagic sharks off eastern Australia: depth behaviour, temperature experience and movements. Mar Biol 157: 575–591

Weng KC, Block BA (2004) Diel vertical migration of the bigeye thresher shark (*Alopias superciliosus*), a species possessing orbital retia mirabilia. Fish Bull 102: 221–229