DRAFT: EXECUTIVE SUMMARY: BLUE SHARK

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

Status of the Indian Ocean blue shark (BSH: *Prionace glauca*)

TABLE 1. Blue shark: Status of blue shark (*Prionace glauca*) in the Indian Ocean

Area[1]	Indicators		2013 stock status determination
Indian Ocean	Reported catch 2012:	21,901 t	Uncertain
	Not elsewhere included (nei) sharks:	42,793 t	
	Average reported catch 2008–2012:	24,204 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. Blue shark: IUCN threat status of blue shark (*Prionace glauca*) in the Indian Ocean

Common name	**Scientific name**	**IUCN threat status[1]**		
		Global status	**WIO**	**EIO**
Blue shark	*Prionace glauca*	Near Threatened	–	–

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

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance and the standardised CPUE series from the Japanese longline fleet, and about the total catches over the past decade (Table 1). The current IUCN threat status of 'Near Threatened' applies to blue sharks 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 blue shark in the Indian Ocean therefore the stock status is highly uncertain. Blue sharks are commonly taken by a range of fisheries in the Indian Ocean and in some areas they are fished in their nursery grounds. Because of their life history characteristics – they are relatively long lived (16–20 years), mature relatively late (at 4–6 years), and have relativity few offspring (25–50 pups every year), the blue shark is vulnerable to overfishing. Blue shark assessments in the Atlantic and Pacific oceans seem to indicate that blue shark stocks can sustain relatively high fishing pressure. Therefore stock status remains **uncertain** (Table 1).

Outlook. Maintaining or increasing effort will probably result in further declines in biomass, productivity and CPUE. 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 certain areas in the southern and eastern Indian Ocean. It is therefore unlikely that catch and effort on blue shark will decline in these areas in the near future, and may result in localised depletion. The following should be noted:

- The available evidence indicates risk to the stock status at current effort levels.
- The two primary sources of data that drive the assessment, total catches and CPUE are highly uncertain and should be investigated further as a priority.

[1] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

- Noting that current reported catches (probably largely underestimated) are estimated at an average ~ 24,204 t over the last five years, ~ 21,901 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

Blue 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 11/04 *on a Regional Observer Scheme* requires data on blue 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 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.
- 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.

Extracts from Resolutions 13/03, 13/06, 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 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

Blue shark: General

Blue shark (*Prionace glauca*) is the most common shark in pelagic oceanic waters throughout the tropical and temperate oceans worldwide (Fig. 1). It has one of the widest ranges of all the shark species and may also be found close inshore. Adult blue sharks have no known predators; however, subadults and juveniles may be preyed upon by shortfin makos, great white sharks, and adult blue sharks. Fishing is a major contributor to adult mortality. Table 3 outlines some of the key life history traits of blue shark in the Indian Ocean.

Fig. 1. Blue shark: The worldwide distribution of the blue shark (source: www.iucnredlist.org)

TABLE 3. Blue shark: Biology of Indian Ocean blue shark (*Prionace glauca*)

Parameter	Description
Range and stock structure	In the tropical Indian Ocean, the greatest abundance of blue sharks occurs at depths of 80 to 220 m, in temperatures ranging from 12 to 25°C. The distribution and movements of blue shark are strongly influenced by seasonal variations in water temperature, reproductive condition, and availability of prey. Long-distance movements have been observed for blue sharks, including transoceanic route from Australia to South Africa. The blue shark is often found in large single sex schools containing individuals of similar size. Subtropical and temperate waters appears to be nursery grounds south of 20°S, where small blue sharks dominate, but where all range of sizes from 55 to 311 cm FL are recorded. In contrast mature fish (FL > 185cm) dominate in the off-shore equatorial waters. Area of overlap with IOTC management area = high. No information is available on stock structure.
Longevity	Bomb radiocarbon dating of Indian Ocean blue sharks showed that males of 270 cm FL may attain 23 years of age. Preliminary data for Indian Ocean shows that male may reach 25 and females 21 years old. In the Atlantic Ocean, the oldest blue sharks reported were a 16 year old male and a 15 year old female. Longevity is estimated to be around 20 years of age in the Atlantic.
Maturity (50%)	Age: Sexual maturity is attained at about 4–6 years for males and 5–7 years for females. Size: not available for the Indian Ocean. In the Atlantic 182–218 cm TL for males; 173–221 cm TL for females. In the South Pacific: 229–235 cm TL for males and 205–229 cm TL for females.
Reproduction	Blue shark is a viviparous species, with a yolk-sac placenta. Once the eggs have been fertilised there is a gestation period of between 9 and 12 months. Litter size is quite variable, ranging from four to 135 pups and may be dependent on the size of the female. The average litter size observed from the Indian Ocean is 38, very similar to the one reported in the Atlantic Ocean, 37. Generation time is about 8–10 years. In Indian Ocean, between latitude 2 ºN and 6 ºS, pregnant females are present for most of the year. • Fecundity: relatively high (25–50) • Generation time: 8–10 years • Gestation Period: 9–12 months • Annual reproductive cycle
Size (length and weight)	Maximum size is around 380 cm FL. New-born pups are around 40 to 51 cm TL. Length–weight relationship for both sexes combined in the Indian Ocean is $TW=0.159*10^{-4} * FL^{2.84554}$.

Sources: Gubanov & Gigor'yev 1975, Pratt 1979, Anderson & Ahmed 1993, ICES 1997, Scomal & Natansen 2003, Mejuto et al. 2005, Francis & Duffy 2005, Mejuto & Garcia-Cortes 2006, IOTC 2007, Matsunaga 2007, Nakano & Stevens 2008, Rabehagosoa et al. 2009, Romanov & Romanova 2009, Anon 2010, Romano & Campana 2011

Blue shark: Fisheries

Blue sharks are often targeted by some semi-industrial and artisanal fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and anecdotally in the purse seine fishery). However, in recent years longliners are occasionally targeting this species, due to an increase in its commercial value worldwide. The blue

shark appears to have a similar distribution to swordfish. Typically, the fisheries take blue sharks between 180–240 cm FL or 30 to 52 kg. Males are slightly smaller than the females. In other Oceans, angling clubs are known to organise shark fishing competitions where blue sharks and mako sharks are targeted. Sport fisheries for oceanic sharks are apparently not so common in the Indian Ocean.

There is little information on the fisheries prior to the early 1970's, and some countries continue not to collect shark data while others do collect them but do not report it to IOTC. It appears that substantial catches of sharks have gone unrecorded in several countries. Furthermore, many 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 the statistics are limited by the lack of species-specific data and data from the major fleets.

The practice of shark finning is considered to be regularly occurring and on the increase for this species (Clarke et al. 2006, Clarke 2008) and the bycatch/release injury rate is unknown but probably high.

Preliminary estimations of at-haulback mortality showed that 24.7% of the blue shark specimens captured in longline fisheries targeting swordfish are captured dead at time of haulback (Table 4). Specimen size seems to be a significant factor, with larger specimens having a higher survival at-haulback (Coelho et al. 2011).

TABLE 4. Blue 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	rare	abundant		rare	unknown	unknown
At vessel mortality	unknown	13 to 51 %	0 to 31%	unknown	unknown	unknown
Post release mortality	unknown	19%		unknown	unknown	unknown

Sources: Boggs 1992, Romanov 2002, 2008, Diaz & Serafy 2005, Ariz et al. 2006, Peterson et al. 2008, Romanov et al. 2008, Campana et al. 2009, Poisson et al. 2010, Coelho et al. (2011), Coelho et al. (2013a).

Blue shark: Catch trends

The catch estimates for blue shark (Table 5) are highly uncertain as is their utility in terms of minimum catch estimates. Five CPCs have reported detailed data on sharks (i.e. Australia, EU (Spain, Portugal and United Kingdom), South Africa, I.R. Iran and Sri Lanka) while thirteen CPCs have reported partial data or data aggregated for all species (i.e. Belize, China, Japan, Rep. of Korea, Indonesia, Mozambique, Malaysia, Oman, Seychelles, Mauritius, Philippines, UK-territories, Vanuatu). For CPCs reporting longline data by species (i.e. Australia, Spain, Portugal, United Kingdom and South Africa), 71% of the catch of sharks by longliners, all targeting swordfish, were blue sharks.

TABLE 5. Blue shark: Catch estimates for blue shark in the Indian Ocean for 2010 to 2012

Catch		2010	2011	2012
Most recent catch (reported)	Blue shark	25,330 t	26,361 t	21,901 t
	nei-sharks	51,581 t	53,658 t	42,793 t
Mean catch (reported) over the last 5 years (2008–2012)	Blue shark			24,204 t
	nei-sharks			48,708 t

Nei-sharks: not elsewhere indicated sharks

Note that the catches recorded for sharks are thought 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 2011 twelve countries reported catches of blue sharks in the IOTC region.

Blue shark: Nominal and standardised CPUE Trends

Statistics not available at the IOTC Secretariat by species.

There are no surveys specifically designed to assess shark catch rates in the Indian Ocean. Trends in localised areas might be possible in the future (for example, from the Kenyan recreational fishery). Historical research data shows overall decline in CPUE while mean weight of blue shark in this time series are relatively stable (Romanov et al. 2008).

Trends in the Japanese CPUE series (Fig. 2) suggest that the longline vulnerable biomass was more or less stable during 2000–2006 and subsequently increased to higher levels for the period 2007–11 (Hiraoka & Yokawa 2012). Due

to identification problems prior to 1994 this series was only analysed and presented since the period when species-specific identification became available.

The standardised CPUE of blue shark catches by the Portuguese longline fleet in the Indian Ocean show little variability between 1999–2012 (Fig. 2; Coelho et al. 2013b).

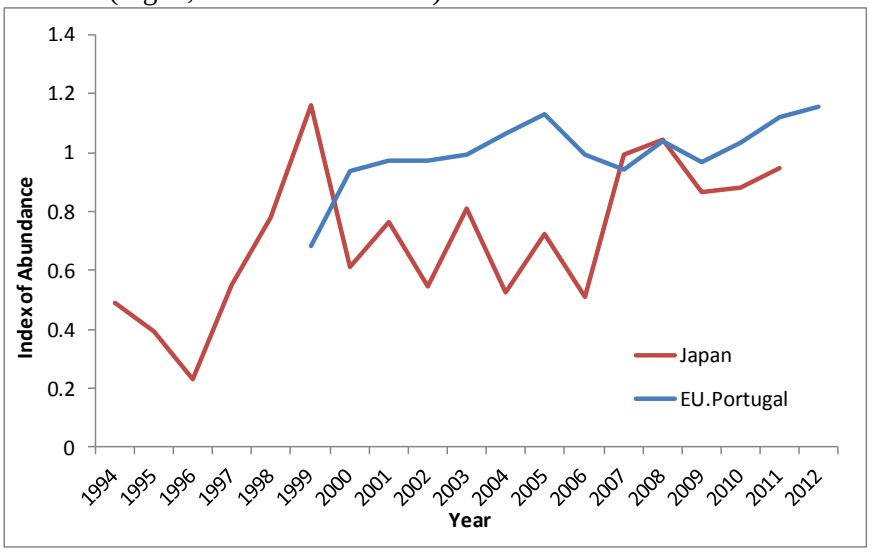

Fig. 2. Blue shark: Comparison of the blue shark standardised CPUE series for the longline fleets of Japan and EU,Portugal.

Blue shark: Average weight in the catch by fisheries

Data not available.

Blue shark: Number of squares fished

Catch and effort data not available.

STOCK ASSESSMENT

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

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