Non-Detriment Finding (NDF) of Sri Lanka for Silky sharks; *Carcharhinus falciformis*

Valid for the two years August 2017 to August 2019

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Non-Detriment Finding:

This Non-Detriment Finding (NDF) was prepared at a workshop held in Colombo in June 2017. It is based on the guidance developed by Mundy-Taylor et al. (2014)[1] and was compiled by:

1. The **Department of Wildlife Conservation** (DWC), as the designated CITES Management Authority,

2. The **Department of Fisheries and Aquatic Resources** (DFAR), *and*

DFAR

3. The **National Aquatic Resources Research and Development Agency** (NARA).

[1] Mundy-Taylor, V., Crook, V., Foster, S., Fowler, S., Sant, G., and Rice, J. 2014. CITES Non-detriment findings guidance for shark species. 2nd, revised version. A framework to assist Authorities in making Non-detriment Findings (NDFs) for species listed in CITES Appendix II. Report prepared for the Germany Federal Agency for Nature Conservation (Bundesamt fur Naturschutz, BfN). Available at https://cites.org/eng/prog/shark/Information_resources_from_Parties_and_other_stakeholders.

Contents

Section 1. Preliminary considerations

Worksheet for Question 1.1(a)
Is the specimen subject to CITES controls?
(How did you identify the species?)

Species name	**Product form**	**CITES Appendix**	**Source of identification**
Silky Shark (*Carcharhinus falciformis*) FAO Code: FAL	Fins (international trade) Meat (fresh and dried salted for human consumption) – *more data is required to confirm international trade of meat.* Skin (international trade - leather) – *more data is required* Jaws & teeth (tourist trade)	Appendix II	Detached fins can be identified using the FAO shark fin guide or the ***isharkfin*** software (FAO, 2016 or http://www.fao.org/ipoa-sharks/tools/software/isharkfin/en/) (Clarke *et al.*, 2006a; Compagno, 1984b) Abercrombie 2016: http://www.pewtrusts.org/~/media/assets/2016/09/pewsharkguidesilkyandthresherenglishprint.pdf FAO Guides and expert identification by NARA

In view of the above, is the specimen subject to CITES controls?	**YES**	**GO TO Question 1.1(b)**
	NOT CERTAIN	Describe concerns in more detail below, and **GO TO Question 1.1(b)**
	NO	**NDF is not required**
Concerns and uncertainties:	There is a low risk that the species has been incorrectly identified; silky shark is an important commercially fished species, comprising 65% of shark catch. Lacking sufficient information on the export of meat and hide.	

Worksheet for Question 1.1(b) **From which stock will the specimen be taken/was the specimen taken?** **(Can origin and stock be confidently identified?)**		
	Description/comments	**Sources of information**
Ocean basin	Indian Ocean	
Stock location/ distribution/ boundaries	Overall population parameters and indices are not available for the Sri Lanka EEZ and no information is available on stock structure in the Indian Ocean. Galvan-Tirado et al. (2013) provided evidence of the existence of distinct Eastern and Western Pacific Ocean populations but it was not possible to definitively reject the hypothesis of panmixia due to the small differences registered as a result of the low levels of mtDNA genetic variation. Preliminary results from ongoing genetic studies suggest that, for management purposes, Silky Shark in the Eastern Pacific Ocean should be divided into two stocks, approximately along the equator.	IOTC Silky Shark Executive summary (IOTC, 2015) (Galvan-Tirado *et al.*, 2013) www.iucnredlist.org). http://maps.iucnredlist.org/map.html?id=39370) and the global distribution proposed by Bonfil (2008) (see maps Appendix 1) (Aires-da-Silva *et al.*, 2013)
Is this a shared stock (i.e. occurring in more than one EEZ[2] and/or the high seas)?	Yes, straddling stock ranging between Sri Lanka EEZ, the high seas and likely other Indian Ocean EEZ's.	(Mejuto J. *et al.*, 2005) (Galvan-Tirado *et al.*, 2013; Kohin *et al.*, 2006) (Kohler *et al.*, 1998)
If the stock occurs in more than one EEZ, which other Parties share this stock?	The stock occurs in the EEZ of the other littoral states of the Indian Ocean.	http://www.iotc.org/about-iotc/structure-commission
If a high seas stock, which other Parties fish this stock?	In addition to the above, the following IOTC Contracting Parties: China, Belize, European Union, Guinea, Japan, Republic of Korea. And Cooperating Non-Contracting Party (CNCP): Liberia.	
Which, if any, RFB(s)[3] cover(s) the range of this stock?	With respect to the Indian Ocean region: * Indian Ocean Tuna Commission (IOTC), *Asia-Pacific Fishery Commission (APFIC), *The Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), *Commission for the Conservation of Southern Bluefin Tuna (CCSBT), *the Regional Organization for the Conservation of the Environment in the Red Sea and Gulf of Aden (PERSGA),	http://www.apfic.org http://www.bobpigo.org https://www.ccsbt.org/ http://www.fao.org/fishery/rfb/swiofc/en http://www.persga.org/ http://www.fao.org/fishery/rfb/recofi/en http://www.fao.org/fishery/rfb/siofa/en

[2] Exclusive Economic Zone

[3] Regional Fisheries Body

	* Regional Commission for Fisheries (RECOFI), * South Indian Ocean Fisheries Agreement (SIOFA), and *Southwest Indian Ocean Fisheries Commission (SWIOFC).	http://www.fao.org/fishery/rfb/swiofc/en
Are all Parties listed above (which fish or share the stock concerned) Members of the relevant RFB(s)?	Yes. They are Members or Cooperating Non-Contracting Parties of IOTC. Most are CITES Parties and/or CMS, and some are also Signatories of the CMS Sharks MoU.	https://cites.org/eng/disc/parties/chronolo.php (http://www.cms.int/sharks/en/signatories-range-states)
Are there geographical management gaps?	Regional management: Retention of Silky Shark is prohibited in ICCAT and WCPFC but not in the Indian Ocean/IOTC. All Tuna RFMOs have adopted prohibitions on finning and encourage the release of live sharks (of all species) where possible. International measures: The FAO IPOA-Sharks (International Plan of Action-Sharks) underscores the responsibilities of fishing to coastal states for sustaining shark populations, ensuring full utilisation of retained shark species and improving shark data collection and monitoring. The formally adopted FAO Port State Measures Agreement is an agreement to prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing. This agreement requires that any inspections conducted on fishing vessels entering ports includes verification that all species exploited have been taken in compliance with international law, international conventions and measures of RFMOs. National measures in the Indian Ocean: The Republic of Maldives protected silky sharks throughout their EEZ. In 1998 they declared a ten-year moratorium on shark fishing in the 12 miles surrounding the seven most prominent tourist atolls. From the 1st of March 2009, they expanded the shark fishing ban to include any fishery killing, capturing or extracting any shark species inside and within 12 miles from the outer atoll rim of all Maldivian Atolls. In 2010, they banned shark fishing within the EEZ of the Maldives prohibiting the capture, killing or harming of any shark species.	CITES listing proposal, CoP 17 Proposal 42. https://www.iccat.int/en/RecsRegs.asp - Recommendation Silky Sharks 2011-08 http://www.wcpfc.int/sharks Maldives Ministry of Fisheries and Agriculture - No. FA-A1/29/98/39, 1998 Maldives Ministry of Fisheries and Agriculture - No. FA-D/29/2009/20, 2009 Maldives Ministry of Fisheries and Agriculture – No. 30-D2/29/2010/32
How reliable is the information on origin?	High	
Is information on origin sufficiently detailed for Question 1.2 to be answered? *(Apply this answer at end of Question 1.2)*		**YES**
Worksheet for Question 1.2		

Was (will) the specimen (be) legally obtained and is export allowed?			
Is the species:	**Description/comments**		**Sources of information**
Protected under wildlife legislation, a regional biodiversity Agreement, or (for a CMS[4] Party) listed in CMS Appendix I?	Not protected under Sri Lanka legislation or a regional agreement. Sharks have to be landed with all fins attached (2015). *Silky sharks are listed on CMS Appendix II; Sri Lanka has been a CMS Party since 1990.*		http://www.cms.int/en/page/appendix-i-ii-cms http://www.cms.int/en/parties-range-states
Sourced from illegal fishing activities (e.g. in contravention of finning regulations, or where a TAC[5] is zero or exceeded)?	No.		
Taken from a no-take marine protected area or during a closed season?	No.		
Taken in contravention of RFB recommendations, if any?	Not in the Indian Ocean/IOTC. *N.B. WCPFC and ICCAT prohibit silky shark catch.*		http://www.wcpfc.int/sharks https://www.iccat.int/en/RecsRegs.asp
Listed as a species whose export is prohibited?	No		
Of concern for any other reason?	No		
In view of the above and the final section of the Worksheet for Question 1.1(b), was the specimen legally acquired and can exports be permitted?	**YES**	**GO TO Question 1.3**	
	SOME DOUBT	Describe concerns in more detail below, and **GO TO Question 1.3**	
	NO	Export cannot be permitted, **NDF is not required**	
Concerns and uncertainties:	None.		

[4] Convention on Migratory Species.
[5] Total Allowable Catch

Worksheet for Question 1.3
What does the available management information tell us?

Part 1. Global-level information

	Description/comments	Sources of information
Reported global catch	This species is caught in both Indian Ocean FAO Areas (51 and 57). Reported catch in 2014 and 2015: 2,894 t and 3,204 t. Average reported catch 2011–2015: 3,700 t. Nine countries declared Silky Shark catches to IOTC in 2014 (*see Appendix 2 reported catches tables and charts*). These values are considered a significant underestimate. Since a peak of reported silky shark catches in 1999 in Eastern Indian Ocean, there has been a decline in the catches. This trend is based almost exclusively on data from the Sri Lankan longline-gillnet combination fisheries.	http://www.fao.org/fishery/area/search/en http://www.iotc.org/data/datasets
Species distribution	Silky sharks are highly migratory and mostly pelagic species distributed from continental slopes to open ocean. They also range to inshore areas, edges of continental shelves, and over deep-water reefs. It demonstrates strong fidelity to seamounts and natural or man-made objects (FADs- Fish Aggregating Devices) floating at the sea surface associated with schools of tuna.	(Bonfil, 2008; Clarke *et al.*, 2011a; Compagno *et al.*, 2005; Compagno, 1984a; Filmalter *et al.*, 2013)
Known stocks/ populations	Population dynamics and structure are poorly known, although life history parameters seem to vary geographically, perhaps reflecting the existence of distinct stocks for different ocean basins. Three groups, likely constituting distinct populations are identifiable: a distinct group in the Northwest Atlantic, another in the west and central Pacific, and a third in the eastern Pacific (Bonfil, 2008).	www.iucnredlist.org (Bonfil, 2008)
Main catching countries	The main catching countries (reporting catch) are members of IOTC: Eastern IO (Area 51): Sri Lanka, Taiwan, China, Indonesia. Western IO (Area 57): Iran I.R; Taiwan, China. *Other countries may be catching but not reporting data.*	(IOTC, 2015; Jayathilaka and Maldeniya, 2015; MRAG, 2012; Murua *et al.*, 2013)
Main gear types by which the species is taken	Tropical tuna purse seine using fish aggregating devices (FADs), tuna longline; gillnet, ring-net (very low numbers)	(Amande *et al.*, 2010; Moazzam and Nawaz, 2014; MRAG, 2012; Murua *et al.*, 2013)
Global conservation status	*Current IUCN Status:* Globally: Near Threatened (*Under review*, 2017) *Previous IUCN Status:* Globally: Near Threatened (2009) Western Indian Ocean: Near Threatened (2012) Eastern Indian Ocean: Near Threatened (2012)	Rigby *et al*. 2016: http://www.iucnredlist.org/details/39370/0
Multilateral Environmental Agreements	Silky Shark is listed on the Convention on Migratory Species (CMS) Appendix II and on Annex 1 of the Memorandum of Understanding on the Conservation of Migratory Sharks (since 20 February 2016).	Convention on Migratory Species http://www.cms.int/en/species http://www.cms.int/sharks/en/mos2

Part 2. Stock/context-specific information		
	Description/comments	**Sources of information**
Stock assessments	No quantitative stock assessment or fishery indicators of status are currently available for silky shark in the Indian Ocean, therefore the stock status is highly uncertain. An ecological risk assessment (ERA) was conducted for the Indian Ocean by the IOTC Working Party on Ecosystem and Bycatch (WPEB) and the Scientific Committee (SC) in 2012. Silky shark received a high vulnerability ranking (No. 4) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, and with a high susceptibility to longline gear. Silky Shark was estimated as the second most vulnerable shark species in the ERA ranking for purse seine gear, due to its low productivity and high susceptibility for purse seine gear. *Stock assessment and stock status indicators conducted elsewhere showed that populations are in decline:* The Scientific Committee of the Western Central Pacific Fisheries Commission (WPFC) stock assessment, based on 1995-2009 data, stated that overfishing is occurring and it is highly likely the Silky Shark stock is overfished. "*Current estimates of stock depletion are that the total biomass has been reduced to 30% of theoretical equilibrium virgin biomass*" (Rice and Harley 2013). An update to the Silky Shark standardised Catch-Per-Unit-Effort in the Western Central Pacific Ocean extended the data series to 2014 and reported a decline since 2010; the stock likely maintain their overfished status and an updated stock assessment is warranted (Rice et al. 2015). In the eastern Pacific Ocean, a stock assessment has been in process for a couple of years and stock status indicators show the population is in decline, especially in the south.	(IOTC, 2015; Murua *et al.*, 2012) (IOTC–2012–SC15–INF10 Rev_1) (Murua *et al.,* 2012) (IOTC-2015-SC18-ES21 [E]) http://www.iotc.org/documents/status-indian-ocean-silky-shark-fal-carcharhinus-falciformis-0 Silky Shark Supporting Information http://www.iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc#sh (Rice and Harley, 2013) (Rice *et al.,* 2015) (Aires-da-Silva *et al.*, 2013) (Aires-da-Silva *et al.*, 2014) (Lennert-Cody *et al.,* 2016, 2017)
Main management bodies	IOTC: Working Party on Ecosystems and Bycatch; Scientific Committee; Commission. CITES, CMS, BOBLME (Phase 2), CBD, and FAO – IPOA.	
Cooperative management arrangements	In addition to arrangements and support to scientific bodies and expert groups for the implementation of the Common Fisheries Policy (ICES- International Council for Exploration of the Sea, STECF Scientific Technical and Economic Committee for Fisheries, JRC-Joint Research Centre etc), the European Union supports through voluntary contributions scientific research for sharks and mitigation of bycatch in the RFMOs to which it is Party (e.g. IOTC, WCPFC, IATTC, ICCAT). The Areas Beyond National Jurisdiction Program (ABNJ) aims to improve cooperation between tuna RFMOs. The IOTC and WCPFC are trialling a Bycatch Data Exchange Protocol Template (BDEP) that aims to provide a framework for consistent management of bycatch data within RFMOs. A 2016 IOTC report recommends that this BDEP continue in 2017 for the Indian Ocean (IOTC–2016–WPDCS12–28 Rev_1).	http://www.commonoceans.org/home/en/ UNCLOS Annex 1 Highly Migratory species www.un.org/unlcos/annex1 http://www.commonoceans.org/tuna-biodiversity/en/ IOTC–2016–WPDCS12–28 Rev_1. http://www.iotc.org/documents/bycatch-data-exchange-protocol-indian-ocean

Non-membership of RFBs	All of the main catching countries (Sri Lanka, Taiwan, China, Indonesia, Iran I.R) are Members of IOTC.	(MRAG, 2012; Murua et al., 2013) http://www.iotc.org
Nature of harvest	Silky Shark are taken in Sri Lanka as bycatch in artisanal (gillnet) and semi-industrial (longline/gillnet) fisheries. Elsewhere in the Indian Ocean, by other IOTC members, they are taken in industrial fisheries (pelagic longline tuna, swordfish fisheries, and the tuna purse seine fishery). *Indirect threats to silky sharks include entanglement in FADs and ghost nets.*	Pers Comm NARA & DFAR (IOTC, 2015)
Fishery types	In Sri Lanka, the majority of silky sharks are caught as bycatch in tuna longline and gillnet fisheries. By other fleets they are taken in tropical tuna purse seine fishery using FADs (with large bycatch of juveniles).	(Amandè *et al.*, 2011; Clarke *et al.*, 2011b; Filmalter *et al.*, 2013; Filmalter *et al.*, 2011; IOTC, 2015; Moreno *et al.*, 2016; MRAG, 2012; Taquet *et al.*, 2007)
Management units	In the Indian Ocean, the main body responsible is IOTC. Sri Lanka has developed several national instruments such as policy guidelines, law and regulations, by incorporating IOTC Resolutions and other conservation and management measures stipulated under ratified conventions, and a plan of action to guide the process of implementation of the commitments made under IOTC, and in certain cases have gone beyond such requirements. *CCSBT endorses all IOTC Resolutions and Recommendations on bycatch.*	http://www.iotc.org https://www.ccsbt.org
Products in trade	* Meat (fresh & dried (mostly)) is utilised domestically for human consumption in Sri Lanka. Extent of meat trade (if any) is currently unknown. Fins and skin enter international trade. Jaws and teeth are used in the tourism industry. Silky shark ranks among the three most important sharks in the global shark fin trade: Reported export of shark fins (*all species combined*) in 2016 from Sri Lanka: 36 t. Average 2013–2016: 35.2 t. Value of exported shark fins in 2016: LKR 133 million. From 2009-2015, the quantity of shark fins exported annually from Sri Lanka has varied from 32 - 91 tonnes at a value ranging from LKR 128-231 million (MFARD 2016, Appendix 3). Shark fins have been exported from Sri Lanka since the late 1960s and trade has developed rapidly since the 1990's due to demand and its high economic value. In 1999 the country exported about 89 tonnes of shark fins worth LKR 170 million (about US$ 1.1 million). The shark fin industry in Sri Lanka is poorly documented and the only source of information available are export figures maintained by Sri Lanka Customs. The retail value of fins varies with species, fin type condition, and regional preference (FAO, 2009). In 2009, the fins were exported to 6–10 countries, including China, Hong Kong SAR, Singapore, Malaysia, Maldives and China.	www.iucnredlist.org. (Clarke, 2008; Clarke, 2015; Clarke *et al.*, 2006b) Sri Lankan Ministry of Fisheries & Aquatic Resources Development (MFARD): http://www.fisheries.gov.lk/content.php?cnid=ststc See Tables in Appendix 3.

	Most of the products go to China, Hong Kong SAR, and Singapore where they are further processed.	

Part 3. Data and data sharing		
	Description/comments	**Sources of information**
Reported national catch(es)	*Reported shark bycatch:* Total for 2015: 3,232 t. Average total for 2011-2015: 2,756 t. In gillnets: 1,732t t Average in gillnets for 2011–2015: 1,384 t. In longlines: 1,387 t Average in longlines for 2011–2015: 1,516 t. Sri Lanka has had a large fishery for Silky Shark for over 40 years. Species specific catch data for sharks is available since 2005 (see graph and table in Appendix 4). From 2005 until 2015, a total of 12,505.13 t of silky shark catch was recorded from a total shark catch of 27,145.09 t. The average annual catch over this period was 1,136.83 t with a maximum of 1,940.67 t recorded in 2011, and a minimum of 750 t recorded in 2015. FAO also records silky shark catches in the Indian Ocean by Iran and Taiwan, and small amounts by Portugal, Tanzania and Mozambique. Sri Lanka has already submitted annual catch data for silky sharks in 2016 using logbooks and sampling programs at landing sites (large pelagic fishery survey) according to IOTC data reporting resolutions. Observers' raw data are currently being collected for vessels larger than 24 m in length (currently only 4 vessels larger than 24 m operate in Sri Lanka), however not for the rest of the fleet fishing on the high seas due to the size of the vessels and practical feasibility. At present an alternative observer scheme is in place to collect scientific data.	http://www.iotc.org/documents/bycatch-datasets-available-0 (last updated by IOTC in August 2016) (IOTC, 2015; Jayathilaka and Maldeniya, 2015) Silky Shark Supporting Information http://www.iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc#sh
Are catch and/or trade data available from other States fishing this stock?	Trade data are reported to the FAO by some Indian Ocean countries, (including Sri Lanka) and States fishing in the Indian Ocean.	http://www.fisheries.gov.lk/content.php?cnid=ststc
Reported catches by other States	Access to these data managed by IOTC Secretariat are available: Nominal Catches, Catch and Effort, Size frequency data.	http://www.iotc.org/data/datasets http://www.iotc.org/documents/bycatch-datasets-available-0 (2016)
Catch trends and values	Despite the lack of sufficient data, there is some anecdotal information suggesting that Silky Shark abundance has declined over recent decades in the Indian Ocean, including from Indian longline research surveys. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean and therefore the stock status is uncertain.	(IOTC, 2015)

Have RFBs and/or other States fishing this stock been consulted during or contributed data during this process?	No, but this NDF will be made public in order to enable other range states to make informed decisions for the management of the stock as a whole for the Indian Ocean.	

References *This section is derived from:* Aires-da-Silva (2013), Aires-da-Silva (2014), Amandè *et al*. (2011), Amande *et al*. (2010), Bonfil (2008), Clarke *et al*. (2011a), Clarke (2008), Clarke (2015), Clarke *et al*. (2011b), Clarke *et al*. (2006a), Clarke *et al*. (2006b), Compagno *et al*. (2005), Compagno (1984a), Compagno (1984b), FAO (2009), FAO (2016), Filmalter *et al*. (2013), Filmalter *et al*. (2011), Galvan-Tirado *et al*. (2013), Clarke (2006), IOTC (2015), Jayathilaka & Maldeniya (2015), Kohin *et al*. (2006), Kohler *et al*. (1998), Lennert-Cody *et al*. (2016), Lennert-Cody *et al*. (2017), Mejuto *et al*. (2005), MFARD (2016), Moazzam & Nawaz (2014), Moreno *et al*. (2016), MRAG (2012), Murua *et al*. (2013), Murua *et al*. (2012), Rice & Harley (2013), Rice *et al*. (2015), and Taquet *et al*. (2007).

Section 2. Intrinsic biological and conservation concerns		
Worksheet for Question 2.1: What is the level of intrinsic biological vulnerability of the species?		
Intrinsic biological factors	**Level of vulnerability**	**Indicator/metric**
a) Median age at maturity	Low	
	Medium	The age of sexual maturity varies between region. In the Indian Ocean, it has been estimated to be around 13 years for males and 15 years for females (Hall *et al.*, 2012). This is significantly older than reported for silky sharks in the Pacific Ocean (Oshitani *et al.*, 2003; Joung *et al.*, 2008), Gulf of Mexico (Bonfil *et al.*, 1993) and Atlantic Ocean (Branstetter, 1987).
	High	
	Unknown	
b) Median size at maturity	Low	
	Medium	
	High	Silky shark size at maturity also varies between ocean regions, ranging globally from 180 to 225 cm TL for males, and 200–245 cm TL for females. In the Indian Ocean, size at maturity has been estimated at 207.6 cm TL for males and 215.6 cm TL for females (Hall et al., 2012). In Aldabra atoll, a 208.4 cm male was immature while individuals of 239 cm and above were fully mature (Stevens, 1984). A 216.1 cm TL mature virgin female has been observed while individuals of 220.3 and 220.7 cm TL were fully mature and no longer virgin. (Branstetter, 1987, Bonfil et al., 1993, Galvan-Tirado *et al.*, 2015, Springer, 1960, Oshitani *et al.*, 2003, Joung *et al.*, 2008, Strasburg, 1958.)
	Unknown	
c) Maximum age/longevity in an unfished population	Low	
	Medium	In the Indian Ocean, the maximum ages recorded for males and females were 20 and 19 years (Hall *et al.*, 2012). In the Gulf of Mexico, 20 years for males and 22 years for females (Bonfil *et al.*, 1993), and in the Pacific Ocean, 8 years were recorded for males and 13 years for females (Oshitani *et al.*, 2003).
	high	
	Unknown	
d) Maximum size	Low	
	Medium	L infinity is 277.3 cm TL for males (n=78) in the Indian Ocean (Hall *et al.*, 2012).
	High	L infinity is 320.4 cm TL for females (n=90) in the Indian Ocean (Hall *et al.*, 2012). In southern Gulf of Mexico, maximum size is 330 cm long (Compagno, 1984).
	Unknown	
	Low	

e) Natural mortality rate (M)	**Medium**	Pacific: 0.179 (Smith *et al.,* 1998). Atlantic: 017-0.21 (Cortes 2002). Gulf of California: 0.26 (Furlong-Estrada *et al.,* 2014).
	High	
	Unknown	A study is in progress in the Indian Ocean.
f) Maximum annual pup production (per mature female)	Low	
	Medium	Numbers of pups per litter vary between oceans: from 1 or 2, to a maximum of 10–16 (Branstetter, 1987; Oshitani *et al*., 2003; Joung *et al*. 2008), with 2-14 reported in the eastern Indian Ocean (Hall *et al.*, 2012). Gestation period: 12–24 months, with females reported to give birth once every year, every two years or sometime in between (Clarke *et a*l. 2015).
	High	
	Unknown	
g) Intrinsic rate of population increase (r)	Low	
	Medium	
	High	Rated High (FAO 2016), based on: north Atlantic: 0.078, South Atlantic: 0.042 (Cortés *et al.*, 2015).
	Unknown	
h) Geographic distribution of stock	**Low**	Widespread and highly migratory
	Medium	
	High	
	Unknown	
i) Current stock size relative to historic abundance	Low	
	Medium	
	High	
	Unknown	Likely low, if similar to the WCPO (Rice & Harley 2013).
j) Behavioural factors	Low	
	Medium	
	High	Neonates and young juveniles up to a few years old live in coastal reef nursery grounds. They are, at this stage, demersal and semi-pelagic and vulnerable to bottom and pelagic longlines. Juveniles then move more offshore, tending to aggregate on floating objects (natural, or man-made FADs); they demonstrate strong fidelity to seamounts and are often associated with schools of tuna (Bonfil, 2008). There is segregation by size: sub-adults are found in offshore nursery areas, adults even further offshore (Compagno, 1984). Critical habitats are unknown.
	Unknown	
k) Trophic level	Low	
	Medium	
	High	4.5 Based on diet studies (Froese and Pauly, 2015)

	Unknown	

SUMMARY for Question 2.1 Intrinsic biological vulnerability of species			
High	*Medium*	*Low*	*Unknown*

Please refer to appendix 5 for further detail on the life history by region for *C. falciformis.*

- The Silky Shark is an abundant, oceanic and epipelagic carcharhinid, with a circumglobal distribution in tropical and subtropical waters.
- Its critical habitats are unknown.
- Silky Shark reproduction is well understood. Several studies have reported aspects of its reproductive biology, with regional variations in birth period, gestation and size at maturity.
- They are relatively long lived (over 20 years), mature relatively late (6–12 years), and have relativity few offspring (<20 pups every one or two years). These life history characteristics make it vulnerable to overfishing. The very high proportion of *C. falciformis* with lengths <50 cm TL in current catches places stock sustainability at risk. Therefore, in the Indian Ocean Ecological Risk Assessment, it was estimated as one of the least productive shark species.
- Silky Shark are commonly taken by a range of fisheries in the Indian Ocean. In Sri Lanka, the market demand for sharks is strong and these are often caught in gillnet-longline fisheries.
- There is a concern about the magnitude of the hidden mortality of silky sharks entangled in FADs, considering the large number deployed by the tropical tuna purse seine fisheries.

This conclusion is derived primarily from: Bonfil (2008), Bonfil *et al*. (1993), Branstetter (1987), Clarke *et al*. (2015), Compagno (1984), Cortés (2002), Cortés *et al*. (2015), FAO (2016), Froese and Pauly (2015), Furlong-Estrada *et al*. (2014), Galvan-Tirado et al. (2015), Hall *et al*. (2012), Joung *et al*. (2008), Oshitani *et al*. (2003), Smith *et al*. (1998), Springer (1960), Stevens (1984), Strasburg (1958).

Worksheet for Question 2.2: What is the severity and geographic extent of the conservation concern?		
Conservation concern factors	**Level of severity / scope of concern**	**Indicator/metric**
Conservation or stock assessment status	Low	
	Medium	
	High	Indian Ocean Ecological Risk Assessment: highly vulnerable
	Unknown	
Comments: The ecological risk assessment (ERA) for the Indian Ocean (Murua *et al.,* 2012) was a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Silky shark received a high ERA vulnerability ranking (No. 4) for longline gear because it was estimated as one of the least productive shark species, and highly susceptible to longline gear. It was ranked as the second most vulnerable species to purse seine gear, due to its low productivity and high susceptibility to this gear. IUCN Red List Status: Globally: Near Threatened (under review, 2017).		
Population trend	Low	
	Medium	
	High	

	Unknown	Indian Ocean: There are no stock assessment trend data available

Comments:

The quality of the data reported in official landing statistics is generally poor.

Filmalter *et al*. (2013) estimated that 480,000-960,000 Silky Shark become entangled and die annually in Indian Ocean FADs. While this does not inform a population trend, this high level of mortality is of concern. John and Varghese (2009) reported a decline in silky shark longline CPUE in the Indian EEZ. Anderson and Juaharee (2009) concluded that silky shark abundance in the Maldives was almost certainly less than 50% of what it was 20 years ago, and perhaps as little as 10%. These results are based on qualitative interviews with a limited sample size and only in a small area and therefore cannot be extrapolated to the entire Indian Ocean.

Eastern Pacific: Standardised Catch-Per-Unit-Effort declined by 32% in the North-Eastern Pacific and 60% in the South-Eastern Pacific from 1994-2015 (Lennert-Cody et al. 2016). IATTC Res C-16-06 establishes conservation measures for silky sharks.

Western Central Pacific: A stock assessment concluded that fishing mortality has depleted stock biomass by 70% from theoretical virgin stock biomass, and estimated spawning mass declined by 33% from 1995-2009 (Rice and Harley 2013). The recent CPUE trend is declining (Rice et al. 2015). WCPFC CMM 2013-08 prohibits the retention of silky shark.

Atlantic: estimates of population decline by 91% from 150-1990 (Baum and Myers 2004). In 2011, ICCAT prohibited the retention of silky sharks caught in ICCAT fisheries.

Geographic extent/ scope of conservation concern	None	
	Low	
	Medium	
	High	Identified threats affect the global population of the species
	Unknown	

Comments:

SUMMARY for Question 2.2
Severity and geographic extent of conservation concern

Assess the overall severity and geographic extent of the conservation concern for this species or stock (tick appropriate box below). Explain how conclusions were reached and the main sources of information used.

High	*Medium*	*Low*	*Unknown*

Explanation of conclusion and sources of information used:

This is a low productivity species that is subject to high or very high fishing pressure. Population trends in the other major ocean basins, combined with limited trend data and information on threats from the Indian Ocean, indicate that the status of the Indian Ocean stock is also of concern. The conservation needs of and threats to this species are therefore high in the Indian Ocean.

Given the importance of this species in various fisheries and the lack of data to evaluate the population trend in the Indian Ocean, Silky Shark population should be constantly monitored to assure their conservation and wise management.

This conclusion is derived primarily from: Anderson and Jauharee (2009), Baum and Myers (2004), John and Varghese (2009), Lennert-Cody *et al*. (2016) Murua *et al*. (2013), Rice and Harley (2013), Rice *et al*. (2015)

Section 3. Pressures on species

Worksheet for Question 3.1: What is the severity of trade pressure on the stock of the species concerned?

Factor	Level of severity of trade pressure	Indicator/metric
(a) Magnitude of legal trade	Low	
	Medium	Reported shark catches and landings trends; recorded exports
	High	
	Unknown	
	Level of confidence: Low / Medium / **High**	

Reasoning

Sharks are of commercial importance in the marine fisheries sector in Sri Lanka. They are taken in large quantities for local consumption as a low-cost protein source for low and middle-income families, and to obtain shark fins, which is an export-oriented product, and to a lesser extent for the extraction of liver oil (the latter is from dogfish sharks). Though pelagic shark catches are incidental or a by-catch of fisheries mainly targeting tuna in Sri Lanka, sharks are retained for their meat and fins, and complete utilisation of sharks is practiced in Sri Lanka, in fresh or dry forms. The present catch is dominated by Silky shark, which has remained dominant over the past decade.

A considerable declining trend of shark landings has been observed during the last fifteen years, initially due to increased fishing effort on tuna, followed in recent years by strong implementation of new regulations on sharks and strengthening of legal provisions mainly focusing on conservation of Thresher sharks, oceanic white tip sharks and whale sharks. Trade volume / market of fins is decreasing over time due to the declining price of this product (Herath, 2012; Jayathilaka and Maldeniya, 2015). Landings of Silky Shark declined from 1,900 t in 2011 to 1,100 t in 2014 (Jayathilaka and Maldeniya, 2015).

Silky Shark ranks among the three most important sharks in the global shark fin trade, with between half a million and one and a half million Silky Shark traded annually (http://www.iucnredlist.org). Reported export of shark fins (all species combined) in 2016: 36 t. Average exported fins from 2013–2016: 35.2 t.

References include: MFAR (2017), and BOBLME 2013.

(b) Magnitude of illegal trade	**Low**	
	Medium	
	High	
	Unknown	
	Level of confidence: Low / **Medium** / High	

Reasoning:

There have been seizures of smuggled shark fin (and sea cucumber) arriving in Sri Lanka originating from neighbouring countries. All trade is permitted in legally obtained silky sharks in Sri Lanka subject to national regulations and CITES.

Worksheet for Question 3.2: What is the severity of fishing pressure on the stock of the species concerned?		
Factor	**Level of severity of trade pressure**	**Indicator/metric**
(a) Fishing mortality (retained catch)	Low	
	Medium	
	High	
	Unknown	
	Level of confidence: Low / **Medium** / High	
Reasoning: Despite the lack of data, there is some anecdotal information suggesting that silky shark abundance has declined over recent decades, including from Indian longline research surveys.		
(b) Discard mortality	Low	
	Medium	Longline gear: at vessel mortality varies with fisheries from medium to high
	High	Purse seine: A large proportion of sharks are dead at retrieval and survival rates of released individuals is low
	Unknown	Gillnets: in Sri Lanka all gillnet silky shark catch is retained. The situation in other countries is unknown.
	Level of confidence: Low / **Medium** / **High**	

Reasoning:

In Sri Lanka discard mortality is very low because all silky sharks caught are retained. There are concerns about discard mortality by other fleets operating in the Indian Ocean and affecting the same stock.

Few studies have established at-vessel mortality rates in longline fisheries. Estimates in the swordfish longline fishery varied from 11% (Musyl et al., 2011) to 55.8 and 66.3% (Beerkircher et al., 2002; Coelho et al., 2012).

Three studies (published between 2014 and 2016) examined the mortality of this species associated with tropical purse seine gear. The high estimates of silky shark's at-vessel mortality (59–69%) and high estimates of overall mortality rates (81–95%) reflect the harsh conditions encountered by sharks during purse seine fishing operations in the western and central Pacific Ocean (Hutchinson *et al.*, 2013; Hutchinson *et al.*, 2015) and in the Indian Ocean (Poisson et al., 2014). The at-vessel-mortality rate recorded for this species in the Eastern Pacific Ocean (Eddy et al., 2016) was lower (59%).

The mortality rates estimated onboard tropical purse seiners appear to be high but it is worth noting that the contribution of the purse seine fishery to total pelagic shark mortality in the Indian Ocean is believed to be extremely small compared to gillnets fisheries (Poisson et al., 2014). Nevertheless, traditional FADS entangling sharks could increase the fishing mortality of the fishery by a factor of 5 to 10 (Filmalter et al., 2013). The post release mortality rates for Silky Shark were estimated at 15.8% by Hutchinson et al. (2015), 52% by Poisson et al. (2014) and of 28% by Eddy et al. (2016). Despite these differences, the total mortality rate observed in the equatorial eastern Pacific Ocean (EPO) (92%) was comparable to the value obtained in the Indian Ocean (81%) (Poisson et al. 2014) and in the West and Central Pacific Ocean (84%) (Hutchinson et al. 2015).

There is considerable concern within IOTC about the unknown but potentially severe impacts of gillnets on a wide range of bycatch species.

This conclusion is derived primarily from: Beerkircher *et al.* (2002), Coelho *et al*. (2012), Eddy *et al*. (2016), Filmalter *et al.* (2013), Herath (2012), Hutchinson *et al*. (2013), Hutchinson *et al*. (2015), Jayathilaka & Maldeniya (2015), Musyl *et al*. (2011), and Poisson *et al*. (2014).

Factor	Level of severity of trade pressure	Indicator/metric
(c) Size/age/ sex selectivity	Low	
	Medium	
	High	Tropical purse seine fisheries are highly selective for certain size-age classes, juvenile Silky Shark comprise the largest component of the incidental elasmobranch catch and dead discards taken in tropical tuna purse seine fisheries.
	Unknown	
	Level of confidence: Low / **Medium** / High	

Reasoning:

In Sri Lanka, of the 449 individuals of silky sharks sampled, 239 (53.2%) were females and 210 (46.8%) were males, resulting in a sex ratio significantly different from 1:1 at 95% confidence interval ($P<0.05$). The total length (TL) of recorded silky sharks ranged from 40 cm to 270 cm. Total length of females was in the range of 51-248 cm whereas the total length of males was in the range of 56-237 cm. The average length of females was 102.7 cm (SD = ±38.1, n=236) whereas the average length of males was 105.7 cm (SD = ±39.7, n= 206) (BOBLME 2013).

Silky Shark are commonly taken by a range of fisheries at all stages of their life.

(d) Magnitude of illegal, unreported and	Low	
	Medium	
	High	
	Unknown	Information about this factor is unavailable

unregulated (IUU) fishing	*Level of confidence:* **Low**	Medium	High

Reasoning:

Silky Shark are commonly taken by a range of fisheries. There are some concerns about the volume of sharks possibly extracted when taking into account the magnitude of the Not elsewhere included (nei) sharks provided by IOTC which are:

Not elsewhere included (nei) sharks in 2015: 57,032t. Average Not elsewhere included (nei) sharks from 2013–2015: 49,586 t.

The 2016 IOTC Compliance report noted that Sri Lanka was compliant with IOTC's IUU provisions (IOTC-2016-CoC13-CR27 Rev1). Sri Lanka has developed and is now implementing an NPOA – IUU fishing in line with FAO IPOA-IUU.

Section 4. Existing management measures		
Worksheet for Preliminary compilation of information on existing management measures		
Existing management measures	**Is the measure generic or species-specific?**	**Description/comments/sources of information**
(SUB-)NATIONAL		
Fisheries and Aquatic Resources Act (FARA) No.2 of 1996 Fisheries Regulation of Foreign Fishing Boats Act (FFBA), No 59 of 1979	*Generic*	Sri Lanka has developed several national instruments such as policy guidelines, law and regulations, and plan of action to guide the process of implementation of the commitments made under the above treaties. FARA (1996) is the main legal instrument that provides for the management, regulation, conservation and development of fisheries and aquatic resources in Sri Lanka, and gives effect to Sri Lanka's obligations under certain international and regional fisheries agreements. FFBA (1979) provides for regulation, control and management of fishing activities by the foreign boats in Sri Lankan waters. Both these acts are administered by the Department of Fisheries and Aquatic Resources (DFAR) (Jayathilaka and Maldeniya, 2015). Some current regulations enacted provide some protection for shark.
Landing of fish species of shark and skate Regulations, 2001 (Gazette 1206/20 of 17 October 2001) *Rescinded in 2015 and replaced by Shark Fisheries Management Regulations, 2015.*	*Shark finning (generic)*	The Regulation forbids the practice of shark finning (slicing off fins of sharks caught) onboard fishing vessels and discarding the carcasses at sea). Fisheries are required to land fish belonging to the species of shark or skate while the fins of such species of fish are attached to such fish. Landing the fins which have been removed from any fish belonging to the species of shark or skate is prohibited. Penalty for non-compliance with this requirement is imprisonment of either description for a term not exceeding six months or a fine not exceeding LKR 50 000 or both such imprisonment and fine.
Fish catch data collection regulation, 2014	*Generic*	According to this regulation, every person who uses mechanized fishing boat, over the length of 32 feet, registered under the registration of fishing boats regulations, 1980 published in the Gazette extra ordinary no. 109 of October 3, 1980 for fishing in Sri Lanka waters shall maintain a log book issued by the DFAR. (Herath, 2012; Jayathilaka and Maldeniya, 2015)
Fisheries and Aquatic Resources Amendment Act, 2004	*generic*	According to this amendment, the use of poisonous explosives or stupefying substances or other noxious or harmful materials for fishing is prohibited, and fines for such offences have been increased.
High Seas Fishing Operations Regulation, 2014	*generic*	This regulation is enacted to manage high seas fishing operations.
2015 Port State Measures Regulation to combat IUU fishing	*generic*	Adopted from IOTC Resolution 10/11 on Port State Measures.

Sri Lanka National Shark Plan	*Generic*	The Sri Lanka National Plan of Action for the conservation and management of sharks (SLNPOA- sharks) contains measures that are being implemented for the conservation and management of shark resources in Sri Lankan waters and high-seas **(see Appendix 6)**. Sri Lanka has developed NPOA – IUU in line with FAO IPOA-IUU.
Regulation on gillnet	*Generic*	Gillnets longer than 2.5 km are now prohibited in Sri Lankan domestic legislation on the high-seas
Shark Fisheries Management Regulations, 2015	*Shark fishing*	The Regulation forbids the practice of shark finning (slicing off fins of sharks caught) onboard fishing vessels and discarding the carcasses at sea). Fisheries are required to land fish belonging to the species of shark or skate while the fins of such species of fish are attached to such fish. Landing the fins which have been removed from any fish belonging to the species of shark or skate is prohibited. The following shark species are fully protected: *Alopias vulpinus* (Thresher shark) *Alopias superciliosus* (Big-eye thresher shark) *Alopias pelagicus* (Pelagic thresher shark) *Carcharhinus longimanus* (Oceanic white-tip shark) *Rhincodon typus* (Whale shark) Penalty for non-compliance with this requirement is imprisonment and/or a fine.
Existing management measures	**Is the measure generic or species-specific?**	**Description/comments/sources of information**
REGIONAL/INTERNATIONAL		
IOTC Resolution 15/01 on the recording of catch and effort data by fishing vessels in the IOTC area of competence	*Generic*	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. 10 (start). The Flag State shall provide all the data for any given year to the IOTC Secretariat by June 30th of the following year on an aggregated basis.
IOTC Resolution 11/04 on a regional observer scheme	*Generic*	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.
IOTC Resolution 15/02 mandatory statistical reporting requirements for Contracting Parties and Cooperating Non-Contracting Parties (CPCs)	*Species-specific*	Para. 2. Estimates of the total catch by species and gear, if possible quarterly, that shall be submitted annually as referred in paragraph 7 (separated, whenever possible, by retained catches in live weight and by discards in live weight or numbers) for all species under the IOTC mandate as well as the most commonly caught elasmobranch species according to records of catches and incidents as established in Resolution 15/01 on the recording of catch and effort data by fishing vessels in the IOTC area of competence (or any subsequent superseding Resolution).
IOTC Resolution 05/05 concerning the conservation of sharks caught in	*Species-specific and generic*	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

association with fisheries. *Superseded by IOTC Resolution 17/05.*		defined as retention by the fishing vessel of all parts of the shark excepting head, guts and skins, to the point of first landing.
IOTC Resolution 17/05 on the conservation of sharks caught in association with fisheries managed by IOTC.	*Generic*	Para. 2. Full utilisation of shark catches, with the exception of prohibited species. Para. 3. Prohibits the removal of fins on board vessels and the landing or carrying of fins that are not naturally attached before the point of first landing. Para. 6. CPCs shall report data for catches of sharks, in accordance with IOTC data reporting procedures. Para. 11. CPCs shall undertake research to make fishing gear more selective, look into prohibiting wire leaders, improve knowledge on biological data of sharks, mating/pupping areas and improve handling practices.
CMS	*Species-specific*	Listing of silky sharks on Appendix II of CMS in 2014.
CITES	*Species-specific*	Listing of silky sharks on Appendix II of CITES in 2016.

Worksheet for Question 4.1: Are existing management measures appropriately designed and implemented to mitigate pressures affecting the stock?				
Factor	**Existing management measure(s)**	**Relevant monitoring, control and surveillance (MCS) measure(s)**	**Overall assessment of compliance regime** *(tick as appropriate)*	
TRADE PRESSURE				
(a) Magnitude of legal trade	In 2015, India introduced a ban on the export of all shark fins. Sri Lanka and CITES.	N/A. The Department of Fisheries Sri Lanka issues a no-objection letter after a positive fin identification report is provided by NARA.	**Unknown (no information on compliance)**	✓
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments: No information from other states fishing in the Indian Ocean. The market demand for both sharks and rays is strong (MRAG, 2012).			
(b) Magnitude of illegal trade	In Sri Lanka, a fish and fishery related products import, export and re-export regulation is currently in the process of being adopted.	Sri Lanka has seized smuggled shark fins entering the country.	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	✓
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments: Issues of IUU fishing by Sri Lankan flagged vessels in earlier years have now been addressed. The 2016 IOTC Compliance report noted that Sri Lanka was compliant with IOTC's IUU provisions (IOTC-2016-CoC13-CR27 Rev1). Sri Lanka has developed and is now implementing an NPOA – IUU fishing in line with FAO IPOA-IUU.			
FISHING PRESSURE				
(a) Fishing mortality	Under the Shark Fisheries Management Regulation of 2015, it is regulated that	In Sri Lanka at present there are observers on board for vessels greater than 24 meters in length, and for smaller vessels sampling takes place upon	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	✓

Worksheet for Question 4.1: Are existing management measures appropriately designed and implemented to mitigate pressures affecting the stock?				
Factor	**Existing management measure(s)**	**Relevant monitoring, control and surveillance (MCS) measure(s)**	**Overall assessment of compliance regime** *(tick as appropriate)*	
(retained catch)	logbooks are maintained, and that live sharks, especially juveniles and pregnant sharks, are released.	arrival of the vessel at landing sites, and the Coastguard has been notified to conduct random inspections of vessels at sea. All high seas vessels are inspected before departure and after arrival.	Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments: Species-specific data collection through port sampling has been underway since 2005 and has improved over the years. Sri Lanka has been in compliance with IOTC shark resolutions since 2014. The sampling programme collects data on 14 shark species throughout and all information was collected by well-trained full time Field Research Assistants of NARA and Fisheries Inspectors of the Department of Fisheries. In 2015, onboard observation programme was started to collect large pelagic fishery data of multiday fisheries. Observers were trained to collect data and identified large pelagic fish species as well as sea turtles, mammals and seabirds (Jayathilaka and Maldeniya, 2015). IOTC compliance continues to be improved.			
(b) Discard mortality	Not applicable.	Not available.	**Unknown (no information on compliance)**	✓
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments: It is assumed that all dead sharks caught, except prohibited species, are retained on-board.			
(c) Size/age/ sex selectivity	Under the Shark Fisheries Management Regulation of 2015, it is regulated that logbooks are maintained, and that live sharks, especially juveniles and pregnant sharks, are released.	In Sri Lanka, several sampling programmes have been implemented recently. Data are not yet available.	**Unknown (no information on compliance)**	✓
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments:			

Worksheet for Question 4.1: Are existing management measures appropriately designed and implemented to mitigate pressures affecting the stock?				
Factor	**Existing management measure(s)**	**Relevant monitoring, control and surveillance (MCS) measure(s)**	**Overall assessment of compliance regime** *(tick as appropriate)*	
	NA.			
(d) Magnitude of IUU fishing	Sri Lanka: NPOA-IUU fishing. Other fishing nations unknown.	In Sri Lanka at present there are observers on board for vessels greater than 24 meters in length, and for smaller vessels sampling takes place upon arrival of the vessel at landing sites, and the Coastguard has been notified to conduct random inspections of vessels at sea.	**Unknown (no information on compliance)**	✓
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments: Issues of IUU fishing by Sri Lankan flagged vessels in earlier years have now been addressed. The 2016 IOTC Compliance report noted that Sri Lanka was compliant with IOTC's IUU provisions (IOTC-2016-CoC13-CR27 Rev1). Sri Lanka has developed and is now implementing an NPOA – IUU fishing in line with FAO IPOA-IUU.			

Worksheet for Question 4.2: Are existing management measures effective/likely to be effective in mitigating pressures affecting the stock/population?					
Factor	**Existing management measure(s)**	**Are relevant data collected and analysed to inform management decisions? (e.g. landings, effort, fisheries independent data)**		**Is management consistent with expert advice?**	
TRADE PRESSURE					
(a) Magnitude of legal trade	*To be developed for compliance with CITES provisions*	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management	✓	Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		Consistent	

	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes **Partially** No Insufficient information				
	Reasoning/comments: There are current efforts to monitor the sharks' landings and shark fin trade and these may continue to provide insights into the trade. Implementation of the CITES listing will provide much better indication of the magnitude of legal trade from the Indian Ocean and the levels of management. The market demand for both sharks and rays is strong and these may often be the target of gillnet fisheries. This implies that suggestions to introduce bycatch mitigation measures for gillnets would be ineffective (i.e. not implemented) in the case of elasmobranchs (MRAG, 2012).				
(b) Magnitude of illegal trade	*To be developed for compliance with CITES provisions*	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management	✓	Not consistent	
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes Partially No **Insufficient information**				
	Reasoning/comments: Sri Lanka has demonstrated its capacity to identify and seize illegal imports and attempted exports of shark fins. This suggests that some other Indian Ocean states may need to improve their controls.				
Factor	**Existing management measure(s)**	**Are relevant data collected and analysed to inform management decisions? (e.g. landings, effort, fisheries independent data)**		**Is management consistent with expert advice?**	
FISHING PRESSURE					
(a) Fishing mortality		No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management	✓	Not consistent	

(retained catch)		Some relevant data are collected AND analysed to inform management		**Expert advice partially implemented**	✓
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes Partially No **Insufficient information**				
	Reasoning/comments: There is limited management expert advice provided by IOTC and Sri Lanka is consistent with its recent recommendations, however no data is available for other nations. In Sri Lanka sampling at major landing sites are conducted to collect data which includes fishing operation related parameters, catch and effort data, and biological data.				
Factor	**Existing management measure(s)**	**Are relevant data collected and analysed to inform management decisions? (e.g. landings, effort, fisheries independent data)**		**Is management consistent with expert advice?**	
FISHING PRESSURE					
(b) Discard mortality	Procedures on FADs management plan, IOTC resolution 17/08.	**No data OR data are of poor quality OR data are not analysed (adequately) to inform management**	✓	No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management		**Expert advice partially implemented**	✓
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes **Partially** No Insufficient information				
	Reasoning/comments: FAD management is a rapidly developing field that is under discussion within IOTC. The IOTC Scientific Committee has advised consideration of a temporary FAD closure and other measures. Reducing or prohibiting the use of FADs in the Indian Ocean will have a beneficial effect on silky sharks by significantly reducing silky shark discard and hidden mortality. A condition on FADs is included in Section 6 of this NDF.				

Factor	Existing management measure(s)	Are relevant data collected and analysed to inform management decisions? (e.g. landings, effort, fisheries independent data)		Is management consistent with expert advice?	
FISHING PRESSURE					
(c) Size/age/ sex selectivity	Procedures proposed in FADs management plan, IOTC resolution 17/08.	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management	✓	**Expert advice partially implemented**	✓
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes **Partially** No Insufficient information				
	Reasoning/comments: Condition on FADs included in Section 6 of this NDF.				
(d) Magnitude of IUU fishing	*NA*	**No data OR data are of poor quality OR data are not analysed (adequately) to inform management**	✓	**No expert advice on management identified**	✓
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes Partially No **Insufficient information**				
	Reasoning/comments *NA.*				

Section 5. Non-Detriment Finding and related advice			
Based on the outcomes of the previous steps, is it possible to make a positive NDF (with or without associated conditions) or is a negative NDF required?			
Step 2: Intrinsic biological vulnerability and conservation concern			
Intrinsic biological vulnerability (Question 2.1)			**High** Medium Low Unknown
Conservation concern (Question 2.2)			**High** Medium Low Unknown
Step 3: Pressures on species			**Step 4: Existing management measures**
Pressure	**Level of severity (Questions 3.1 and 3.2)**	**Level of confidence (Questions 3.1 and 3.2)**	**Are the management measures effective* at addressing the concerns/pressures/impacts identified? (Question 4.2)** **taking into account the evaluation of management appropriateness and implementation under Question 4.1*
Trade pressures			
(a) Magnitude of legal trade	High **Medium** Low Unknown	**High** Medium Low	Yes **Partially** No Insufficient information Not applicable**
(b) Magnitude of illegal trade	High Medium **Low** Unknown	High **Medium** Low	Yes Partially No **Insufficient information** Not applicable**
** Only to be used where the trade pressure severity was assessed as "Low" for any of the Factors in **Step 3** and a judgement is made that the impacts on the shark stock/population concerned are so low that mitigation is not required.			
Fishing pressures			
(a) Fishing mortality (retained catch)	High **Medium** Low Unknown	High Medium **Low**	Yes **Partially** No Insufficient information Not applicable**
	High	**High**	Yes

(b) Discard mortality	**Medium** Low **Unknown**	**Medium** Low	Partially No **Insufficient information** Not applicable**
(c) Size/age/sex selectivity of fishing	**High** Medium Low Unknown	High **Medium** Low	Yes Partially No **Insufficient information** Not applicable**
(d) Magnitude of IUU fishing	High Medium Low **Unknown**	High Medium **Low**	Yes **Partially** No Insufficient information Not applicable**

Only to be used where the fishing pressure severity was assessed as "Low" for any of the Factors in **Step 3 and a judgement is made that the impacts on the shark stock/population concerned are so low that mitigation is not required.

A) Can a positive NDF be made?	**YES** - *go to B*	**NO** - *go to **Step 6** and list recommendations for measures to improve monitoring/management under Reasoning/comments below*
B) Are there any mandatory conditions to the positive NDF?	**YES** - *list under Reasoning/comments below and go to C*	**NO** - *go to C*
C) Are there any other further recommendations?	**YES** - *go to **Step 6***	**NO**

***Reasoning/comments**:*

This silky shark (*Carcharhinus falciformis)* NDF for Sri Lanka is "**positive with conditions**" to enable trade to continue in this newly-listed species while improvements are made to existing fisheries and trade management and monitoring frameworks, and while additional research activities and management measures are adopted as outlined in Section 6.

This NDF will be re-evaluated after 2 years, to gauge progress against the recommendations in Section 6 and update it with newly acquired data, before agreeing to a new biennial NDF for 2019-2021.

Section 6. Further measures

Section 6.1: Improvement in monitoring or information is required

Monitoring and data recommendations for Silky Shark in the Indian Ocean

Recommendation	*Potential leads*
Population monitoring: Maintain and if possible expand observer programmes to improve species-specific data on size, sex, and maturity composition of catches and discard levels. (e.g. the programme recently implemented by Sri Lanka's NARA (National Aquatic Resources Research & Development Agency) and DFAR (Department of Fisheries and Aquatic Resources)	NARA, DFAR in Sri Lanka. IOTC Parties, BOBP-IGO for Indian Ocean.
Research: Investigations into key biological/ecological parameters, life-history and behavioural traits, discard survival, and the identification of potential mating, pupping and nursery grounds. Socio-economic studies on shark fisheries, trade, and alternative livelihoods.	DFAR, NARA, universities, and NGO's in Sri Lanka. IOTC, BOBP-IGO, FAO/ IGOs, NGOs, BOBLME for Indian Ocean.
Fisheries monitoring: Improved species-specific fisheries data on catches (including discards) and landings are needed to ensure harmonisation of data from different sources (e.g. IOTC and FAO). Look into establishing an informal communication group (e.g. WhatsApp) consisting of shark identification experts (both local and international), in order to identify sharks and/or shark products with a camera photo at short notice.	DFAR, NARA and NGOs in Sri Lanka. IOTC, BOBP-IGO, NGOs for Indian Ocean.
Monitoring of domestic and international trade: Implementation of specific catch or trade documentation schemes for sharks. New data collection initiatives to quantify more precisely silky shark fin exports and identify and monitor silky shark fin and meat products at species level. Pursue with Sri Lanka Customs on the request to introduce HS codes for all shark products to collect better data on imports and exports. Improve present methodology for the random sampling of fins for export in conjunction with Sri Lanka Customs. Looking into the options or necessity of developing a risk index for exporters that will enable screening of high risk exporters upon receival of export permit request.	DFAR and Customs in Sri Lanka. IOTC Parties, IGOs, NGOs in Indian Ocean.

Section 6.2: Improvement in management is required

Management recommendations for Silky Shark in the Indian Ocean

It is difficult to draw clear conclusions regarding the effectiveness of existing management due to the lack of data available. But, the FAO Panel (2016) noted that "*a CITES Appendix II listing would be expected to result in better monitoring and reporting of catches entering international trade from silky shark populations*". Improved monitoring should enable new or enhanced assessments of stock status and the subsequent adoption of management measures that ensure the sustainability of harvests where these are still permitted.

Management recommendations for Silky Shark in the Indian Ocean

Recommendation	***Potential leads***
Continue to monitor compliance with existing fisheries management regulations (national, regional and international), including: • IOTC Res 13-08 on the deployment of non-entangling Fish Aggregating Devices (FADs) to reduce silky shark bycatch; • Shark Fisheries Management Regulation, 2015 • better enforcement of the high seas operation license regulation, with specific relation to the prohibition of gillnets longer than 2.5 km in the high seas. • Fish catch data regulation, 2014, incorporating the use of electronic logbooks • Incorporate CITES elements alongside future capacity building for Port State Measures Agreement.	DFAR and NARA
Review implementation of Sri Lanka NPOA-Sharks and when updating NPOA, make a special focus on a plan for silky sharks, encourage and take part in regional initiatives to develop a regional shark plan.	DFAR (with NARA)
Support IOTC proposals to avoid and reduce silky shark bycatch mortality in purse seine fisheries, e.g. • prohibition and destruction of entangling FADs in line with IOTC Resolution 17/08 • promoting/mandating the use of hoppers and other measures on board vessels to facilitate sorting and release of shark bycatch • developing a management plan to monitor and reduce numbers of FADs, including by regulating the use of supply vessels • avoid targeting tuna aggregations smaller than 10 tons	DFAR
Adopt measures to avoid and reduce silky shark bycatch and post-release mortality in long line fisheries, e.g. • promote the use of hook and leader designs that minimize silky shark bycatch. For example: circle hooks instead of j-hooks, and monofilament instead of wire-leaders. • Promote the carriage on board fishing vessels of equipment to facilitate the live release of sharks. • Share experience of bycatch avoidance, reduction, and improving post-release mortality with other silky shark fishing states, including through FAO and the CITES Animals Committee.	DFAR, IOTC
Finalise the introduction of HS codes for all shark products to collect improved data on imports and exports.	DFAR/SL Customs
Work towards establishing a voluntary annual national silky shark fin export quota, based on the appropriate conversion factor from recent whole landings of silky sharks to dried fin weight.	DFAR/DWC/NARA
Develop a fisher awareness program aimed to:	DFAR/NARA/NGO's

• improve identification of juvenile and pregnant sharks and techniques to maximize live release • improve logbook data recording, in particular for the upcoming electronic logbooks. • provide an overview and increase awareness of shark biology, global status, and management measures in place both locally and internationally.	
Increase awareness for shark processors, traders, and exporters regarding CITES requirements for the export of products derived from CITES listed shark species (this includes export permits accompanied by the Legal Acquisition Finding and Non-Detriment Findings).	DFAR/NARA/NGO's
Look into the potential of developing a national FAD Development Plan for the management of the use of FADs and expand implementation of the management of FADs defined in IOTC Resolution 17/08.	DFAR
Continue trend of improving compliance under IOTC (IOTC-2016-CoC13-CR27 Rev1[E]).	DFAR
Sign the CMS Sharks MoU to access additional support for the management of shark bycatch in Sri Lanka.	DWC/DFAR
Submit a report/information document by April 2019 for CITES CoP18, detailing progress achieved in implementing the silky shark and hammerhead NDF and its listed conditions/recommendations.	DWC/DFAR

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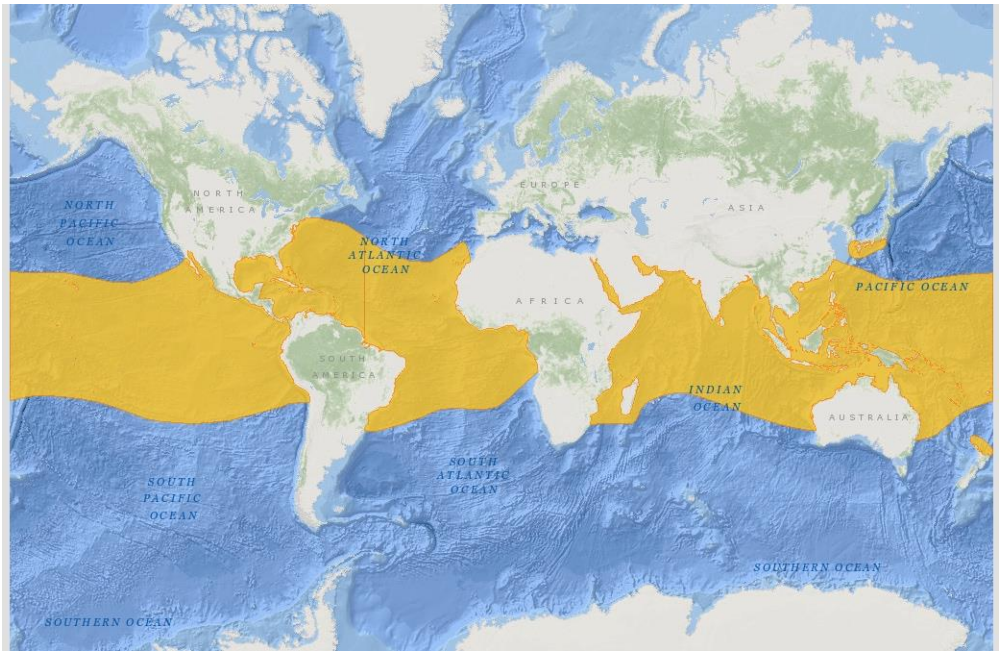
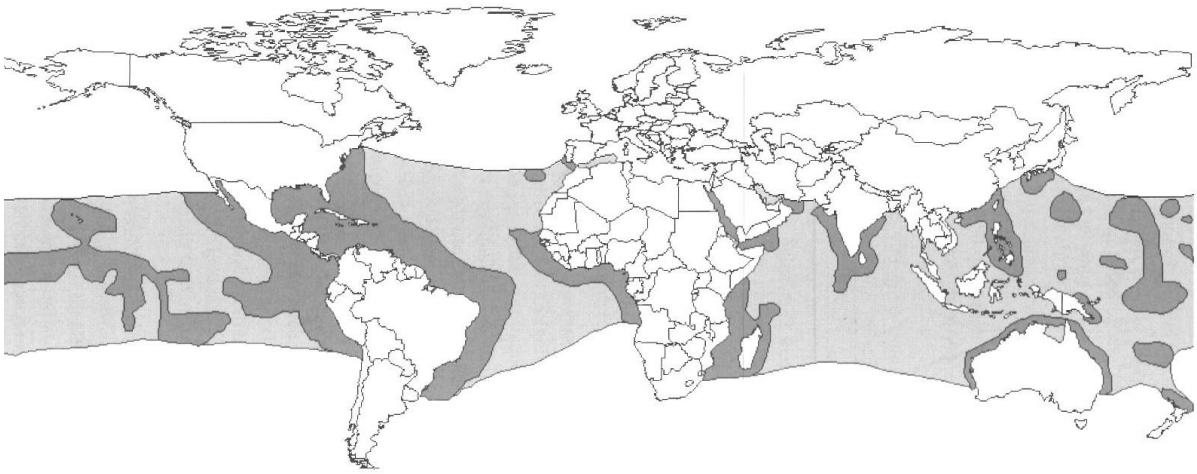
Appendix 1. The worldwide distribution of the silky shark

http://maps.iucnredlist.org/map.html?id=39370



Global distribution of Silky Shark. The dark shading shows well-established distribution areas, while the light shading shows uncertain distribution (expected or possible presence or records in need of confirmation) (Bonfil, 2008).



Appendix 2. Reported catches of silky shark in the Indian Ocean

Reported catches of Silky Shark in Western Indian Ocean (WIO) and Eastern Indian Ocean (EIO) by fleet in a) 2014 and b) 2015 (source: IOTC Nominal Catch data base)

a) 2014

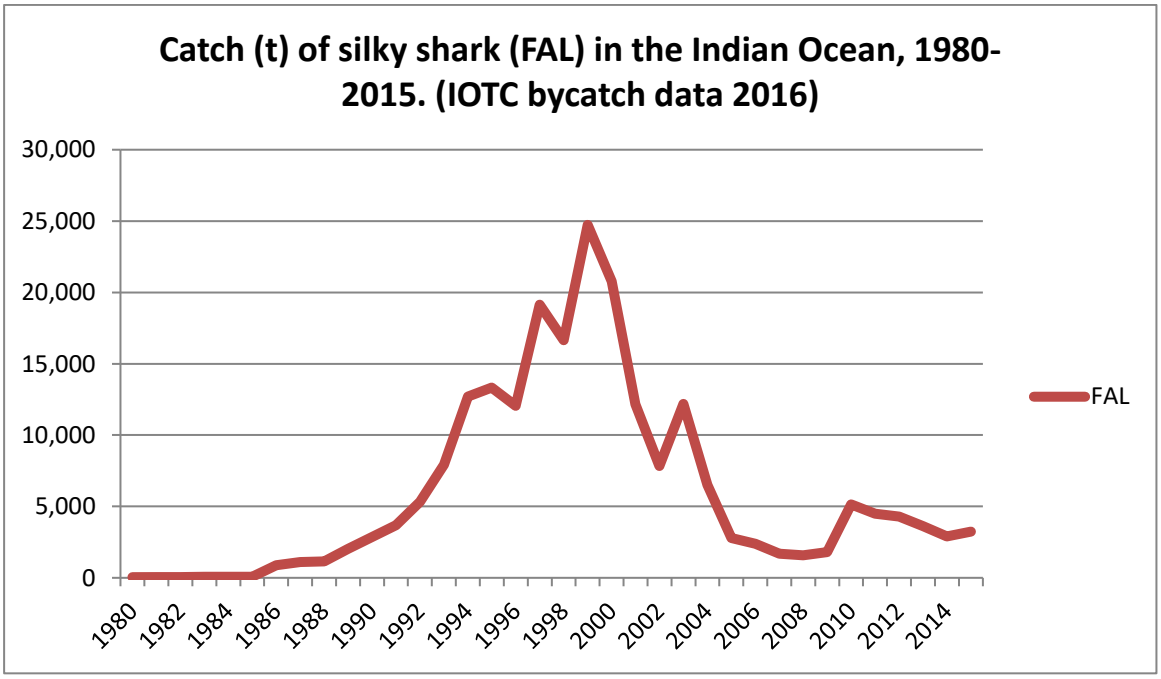
Fleet	Area IOTC	TypeFishery	Gear	Catch/Capture(t)
TAIWAN,CHINA	WIO	Industrial Fishing	Fresh Longline	95
TANZANIA	WIO	Industrial Fishing	Fresh Longline	1
NEI.FRESH	WIO	Industrial Fishing	Fresh Longline	6
IRAN ISLAMIC REP.	WIO	Artisanal Fishing	Gillnet	1107
TAIWAN,CHINA	WIO	Industrial Fishing	Longline	204
NEI.FROZEN	WIO	Industrial Fishing	Longline	17
MADAGASCAR	EIO	Artisanal Fishing	Troll Line	112
TAIWAN,CHINA	EIO	Industrial Fishing	Fresh Longline	17
INDONESIA	EIO	Industrial Fishing	Fresh Longline	194
SRI LANKA	EIO	Industrial Fishing	Fresh Longline	800
NEI.FRESH	EIO	Industrial Fishing	Fresh Longline	1
SRI LANKA	EIO	Artisanal Fishing	Gillnet	178
SRI LANKA	EIO	Artisanal Fishing	Longline	144
TAIWAN,CHINA	EIO	Industrial Fishing	Longline	5
INDONESIA	EIO	Industrial Fishing	Longline	12
NEI.FROZEN	EIO	Industrial Fishing	Longline	1
TOTAL				2894

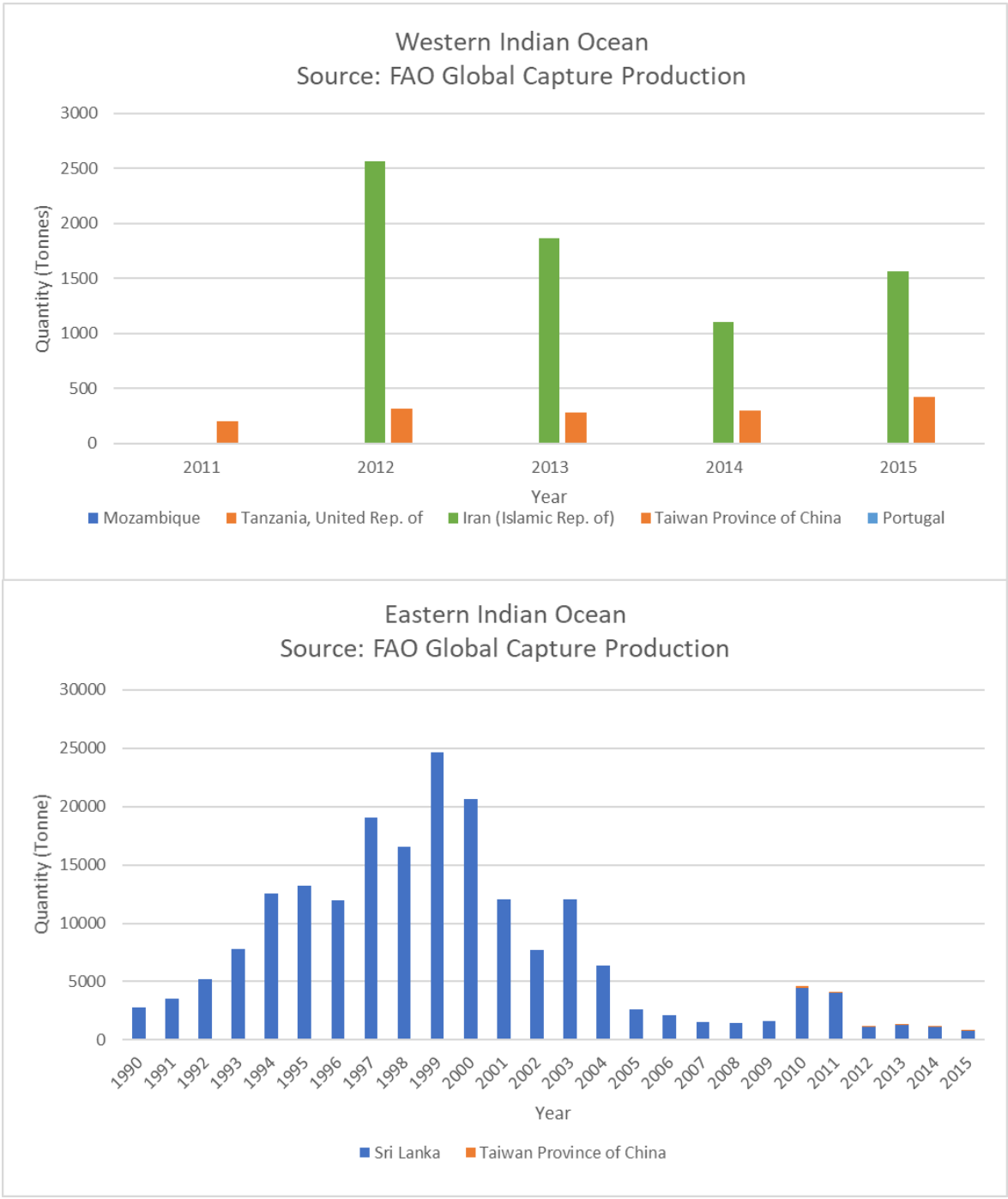
b) 2015

Fleet	Area IOTC	Fishery Type	Gear	Catch/Capture (t)
TAIWAN,CHINA	WIO	Industrial Fishing	Fresh Longline	187
NEI.FRESH	WIO	Industrial Fishing	Fresh Longline	9
IRAN ISLAMIC REP.	WIO	Artisanal Fishing	Gillnet	1567
TAIWAN,CHINA	WIO	Industrial Fishing	Longline	229
NEI.FROZEN	WIO	Industrial Fishing	Longline	15
COMOROS	WIO	Artisanal Fishing	Troll Line	1
MADAGASCAR	EIO	Artisanal Fishing	Troll Line	112
TAIWAN,CHINA	EIO	Industrial Fishing	Fresh Longline	129
INDONESIA	EIO	Industrial Fishing	Fresh Longline	292
SRI LANKA	EIO	Industrial Fishing	Fresh Longline	454
NEI.FRESH	EIO	Industrial Fishing	Fresh Longline	1
SRI LANKA	EIO	Artisanal Fishing	Gillnet	165
SRI LANKA	EIO	Artisanal Fishing	Longline	134
TAIWAN,CHINA	EIO	Industrial Fishing	Longline	3
INDONESIA	EIO	Industrial Fishing	Longline	6
Total				3204

Average of reported catches of Silky Shark by fleet 2011-2015 (source: IOTC Nominal Catch data base)

Fleet	2011	2012	2013	2014	2015	Average
EU.UK	1	1	0	0	0	1
EU.PORTUGAL	5	7				6
INDONESIA	42	72	79	206	298	139
IRAN ISLAMIC REP.	0	2560	1865	1107	1567	1420
SRI LANKA	4025	1138	1246	1122	753	1657
MADAGASCAR	112	112	112	112	112	112
MOZAMBIQUE	4	4				4
NEI.FRESH				7	10	6
NEI.FROZEN	37	50	32	18	15	30
TAIWAN,CHINA	262	336	290	321	448	331
TANZANIA	5	6	1	1		3
COMOROS					1	1
TOTAL	4493	4286	3625	2894	3204	3700





Silky shark landings per country/per sub-area between 2011 and 2015 (IOTC Data base)

Appendix 3: Fin trade in Sri Lanka

Table 5: Shark fin exports from Sri Lanka (2007 and 2008 up to August)

Country	2007 (kg)	2008 (kg) up to August
China, Hong Kong SAR	63 247	28 756
Malaysia	2 786	503
Singapore	190	1 279
Maldives	200	0
Bahrain	162	0
Australia	60	0
China	0	4 210
Cyprus	0	162
Mauritius	0	2 500
Taiwan, Province of China	0	1 500

(Sources: FAO, 2009)

Table 6: Quantity and value of shark fins exported from Sri Lanka (Source: Statistical Unit, Dept. of Fisheries and Aquatic Resources).

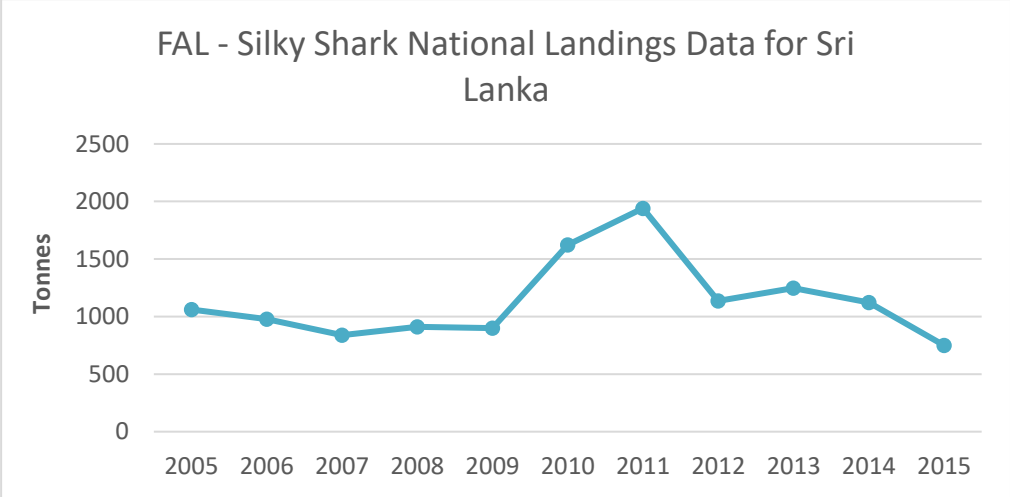
Year	Quantity (tonnes)	Value (Rs. million)
1990	51.38	35.13
1991	182.24	108.62
1992	89.55	135.16
1993	58.60	98.93
1994	81.15	110.37
1995	126.88	162.81
1996	52.3	111.51
1997	83	183.0
1998	77	138.0
1999	89	170.0
2000	119	305.0
2001	85	242.0
2002	83	215.0
2003	83	336.0
2004	110	343.0
2005	74	165.0
2006	75	140.0
2007	67	127.0

(Sources: FAO, 2009)

Export	2009	2010	2011	2012	2013	2014	2015
Quantity (Tonne)	65	69	91	56	34	32	39
Value (Rs. Million)	171	172	231	152	128	151	171

Table: Export quantity and value of shark fins from Sri Lanka (Source: MFARD 2016)

Appendix 4. National landings of silky sharks in Sri Lanka from 2005 to 2015



National landings of all recorded shark species in Sri Lanka (in tonnes): 2005 to 2015

Common Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTALS:
Blue Shark (BSH)	118.00	78.69	83.20	64.22	99.13	323.85	831.01	284.00	183.00	203.00	207.00	**2,475.10**
Bigeye thresher shark (BTH)	813.00	426.95	602.92	505.91	327.84	514.09	495.12	465.00	0.00	0.00	0.00	**4,150.83**
Silky shark (FAL)	1,060.00	978.60	837.87	910.60	898.57	1,623.83	1,940.67	1,136.00	1,247.00	1,122.00	750.00	**12,505.13**
Great hammerhead shark (GRH)	25.00	15.01	3.71	19.93	6.83	51.07	2.34	8.10	8.00	4.00	4.70	**148.69**
Lonfin mako shark (LFM)	19.00	12.14	20.08	17.82	17.54	30.36	69.45	52.00	70.00	14.00	9.60	**331.99**
Oceanic whitetip shark (OWT)	101.00	61.40	153.05	84.75	67.38	277.35	452.99	149.00	41.00	78.00	87.00	**1,552.92**
Pelagic thresher shark (PTH)	59.00	72.95	122.51	74.23	19.65	137.57	192.09	329.00	0.00	0.00	0.00	**1,006.99**
Scalloped hammerhead shark (SCH)	127.00	77.32	132.82	11.65	76.36	199.24	167.13	71.00	119.00	33.00	42.00	**1,056.53**
Shortfin mako shark (SFM)	10.00	14.81	9.77	23.94	15.92	19.07	49.03	63.00	56.00	41.00	49.00	**351.54**
Unidentified sharks (SHK)	15.00	324.58	403.75	126.01	408.16	929.29	144.88	560.47	0.00	88.00	19.00	**3,019.14**
Smooth hammerhead shark (SMH)	34.00	8.56	16.23	29.45	43.94	22.71	45.66	50.56	61.00	18.00	44.00	**374.12**
Spottail shark (SPT)	11.00	1.72	3.04	1.20	77.68	8.57	1.64	8.66	19.00	10.00	0.00	**142.51**
Thresher shark (THR)	0.00	28.26	0.05	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**29.59**
TOTAL (tonnes):	**2,392.00**	**2,101.00**	**2,389.00**	**1,871.00**	**2,059.00**	**4,137.00**	**4,392.00**	**3,176.79**	**1,804.00**	**1,611.00**	**1,212.30**	**27,145.09**

Appendix 5. Life history characteristics noted by region for *C. falciformis*

Ocean	**Area**	**Median age at maturity (years)**	**Maturity TL (cm)**	**Maximum age (years)**	**Maximum TL (cm)**	**Litter size**	**Gestation period** (months)	**References**
Indian	Eastern IO	M: 13 F: 15	M: 207.6 F: 215.6	M: 20 F: 19	M: 277.3 F: 320.4	2-14		(Hall *et al.*, 2012)
	Southeastern Africa		M: 240 F: 248-260					(Bass *et al.*, 1973)
	Aldabra Atoll		M: 239 F: 216					(Stevens, 1984b)
Atlantic	Gulf of Mexico		M: 225 F: 232-245	M: 20 F: 22	314			(Bonfil *et al.*, 1993)
	Unspecified		M: 220 F: 250					(Cadenat and Blache, 1981)
	Northwest Gulf of Mexico	M: 6–7 F: 7–9	M: 210–220 F: >225			2-12	12	(Branstetter, 1987)
	Equatorial		M: 210- 230 F: 230			4 -15		(Hazin *et al.*, 2007)
	Equatorial		M: 180-200 F: 205-210			7-25		(Lana, 2012)
	Florida coast		M: 218 F: 234		307			(Springer, 1960)
	Gulf of Guinea		F: 238		300			(Bane, 1966)
Pacific	Western central		Male: 210-214 F: 202-218					(Bonfil, 2008)
	Baja California		M: 182 F: 180			2-9	11-12	(Hoyos-Padilla *et al.*, 2011)
	Baja California	7-8 (both)						(Sanchez-de Ita *et al.*, 2011)
	Northeastern Taiwan	M: 9.3 F: 9.2-10.2	M: 212.5 F: 210-220			8-10		(Joung *et al.*, 2008)
	Unspecified	M: 5-6 F: 6-7	M: 180-187 F: 193-200	M:8 F:13	245	1-16		(Oshitani *et al.*, 2003)
	Eastern Australia		M: 214 F: 202-208					(Stevens, 1984a)
	Northern Australia		M: 210 F: 215		243			(Stevens and McLoughlin, 1991)
	Central Pacific		F: 202-208					(Strasburg, 1958)

Appendix 6. Sri Lanka National Plan of Action for Sharks (2013)

The following ten strategic objectives have been identified in line with IPOA-sharks for achievement by the implementation of SLNPOA-sharks.

1) Ensure that shark catches from directed and non-directed fisheries are sustainable.

2) Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use.

3) Identify and provide special attention, in particular to vulnerable or threatened shark stocks.

4) Contribute to the protection of biodiversity and ecosystem structure and function

5) Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.

6) Minimize unutilized incidental catches of sharks.

7) Minimize waste and discards from shark catches in accordance with article of the Code of Conduct for Responsible Fisheries

8) Encourage full use of dead sharks.

9) Facilitate improved species-specific catch and landings data and monitoring of shark catches.

10) Facilitate the identification and reporting of species-specific biological and trade data.

The SLNPOA-sharks is due to be reviewed in 2017.

Appendix 7. Performance on compliance

In the IOTC compliance report (Sri Lanka) (IOTC-2016-CoC13-CR27 Rev1) it is mentioned that

Sri Lanka has not reported:

* Nominal catch on sharks to IOTC Standard, as required by Resolution 05/05.
* Catch and effort on sharks to IOTC Standard, as required by Resolution 05/05.
* Size frequency on sharks, as required by Resolution 05/05.

Sri Lanka has not implemented:

* the observer scheme, no deployment, no observer coverage at sea for vessel < 24m, as required by Resolution 11/04.
* the requirement on Report on import, landing and transhipment of tuna and tuna-like fish products in ports, as required by Resolution 10/10.
* the requirement on the List of designated ports, as required by Resolution 10/11.
* the observer scheme for artisanal landing, as required by Resolution 11/04

Sri Lanka has not provided:

* observer report, as required by Resolution 11/04.
* the mandatory annual report on BET, as required by Resolution 01/06.

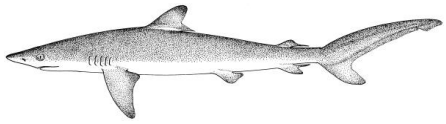
Sri Lanka has not reported:

* Catch and Effort for the surface fisheries at IOTC Standard, as required by Resolution 15/02.
* Size frequency for the surface fisheries (Gillnet) at IOTC Standard, as required by Resolution 15/02.
* Size frequency for the longline fisheries at IOTC Standard, as required by Resolution 15/02.

Appendix 8. Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*). IOTC 2016.

EXECUTIVE SUMMARY: SILKY SHARK

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



Status of the Indian Ocean silky shark (FAL: *Carcharhinus falciformis*)

TABLE 1.Silky shark: Status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean.

Area[1]	Indicators		2016 stock status determination
Indian Ocean	Reported catch[2] 2015: Not elsewhere included (nei) sharks[3] 2015: Average reported catch 2011–15: Av. not elsewhere included (nei) sharks[3] 2011–15:	3,232 t 57,125t 3,707 t 49,785 t	
	MSY (1,000 t) (80% CI): F_{MSY} (80% CI): SB_{MSY} (1,000 t) (80% CI): F_{2014}/F_{MSY} (80% CI): SB_{2014}/SB_{MSY} (80% CI): SB_{2014}/SB_0 (80% CI):	unknown	

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 14%
[3]Includes all other shark catches reported to the IOTC Secretariat, which may contain this species (i.e., SHK: sharks various nei; RSK: requiem sharks nei).

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		

TABLE 2. Silky shark: IUCN threat status of silky shark (*Carcharhinus falciformis*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[3]		
		Global status	WIO	EIO
Silky shark	*Carcharhinus falciformis*	Near Threatened	Near Threatened	Near Threatened

IUCN = International Union for Conservation of Nature; WIO = Western Indian Ocean; EIO = Eastern Indian Ocean
[3]The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only
Sources:IUCN 2007, 2012

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. There remains considerable uncertainty about the relationship between abundance and the nominal CPUE series from the main longline fleets, and about the total catches over the past decade (Table 1). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (IOTC–2012–SC15–INF10 Rev_1) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery, by combining the biological productivity of the species and its susceptibility to each fishing gear type. Silky shark received a high vulnerability ranking (No. 4) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, and with a high susceptibility to longline gear. Silky shark was estimated as the second most vulnerable shark species in the ERA ranking for purse seine gear, due to its low productivity and high susceptibility for purse seine gear. The current IUCN threat status of 'Near Threatened' applies to silky sharks in the western and eastern Indian Ocean and globally (Table 2). There is a paucity of information

available on this species but several recent studies have been carried out for this species in the recent years. Silky sharks are commonly taken by a range of fisheries in the Indian Ocean. Because of their life history characteristics – they are relatively long lived (over 20 years), mature relatively late (at 6–12 years), and have relativity few offspring (<20 pups every two years), the silky shark can be vulnerable to overfishing. Despite the lack of data, there is some anecdotal information suggesting that silky shark abundance has declined over recent decades, including from Indian longline research surveys, which is described in the full Executive Summary for silky shark sharks. There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is **uncertain**.

Outlook. Maintaining or increasing effort can probably result in 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 silky shark will decline in these areas in the near future, and may result in localised depletion.

Management advice. A precautionary approach to the management of silky shark should be considered by the Commission. Mechanisms need to be developed by the Commission to encourage CPCs to comply with their recording and reporting requirement on sharks, so as to better inform scientific advice.

The following key points should also be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–15): Gillnet; gillnet-longline; longline (fresh); longline-gillnet.
- **Main fleets** (2011–15): Sri Lanka; I.R. Iran; Taiwan,China.

SILKY SHARK

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

Silky shark in the Indian Ocean are currently subject to a number of Conservation and Management Measures adopted by the Commission:

- Resolution 15/01 *on the recording of catch and effort data 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 sharks silky sharks must be recorded by longline and purse seine fleets (retained and discarded).
- Resolution 15/02 *Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)* indicated that the provisions, applicable to tuna and tuna-like species, are applicable to shark species.
- 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 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 15/01,15/02, 11/04 and 05/05

RESOLUTION 15/01 ON THE RECORDING OF CATCH AND EFFORT DATA 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. 10 (start). The Flag State 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 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 15/02 MANDATORY STATISTICAL REPORTING REQUIREMENTS FOR IOTC CONTRACTING PARTIES AND COOPERATING NON-CONTRACTING PARTIES (CPCS)

Para. 2. Estimates of the total catch by species and gear, if possible quarterly, that shall be submitted annually as referred in paragraph 7 (separated, whenever possible, by retained catches in live weight and by discards in live weight or numbers) for all species under the IOTC mandate as well as the most commonly caught elasmobranch species according to records of catches and incidents as established in Resolution 15/01 *on the recording of catch and effort data by fishing vessels in the IOTC area of competence* (or any subsequent superseding Resolution).

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

Silky sharks: General

Silky sharks (*Carcharhinus falciformis*) are one of the most abundant large sharks inhabiting warm tropical and subtropical waters throughout the world (**Fig. 1**). TABLE 1 outlines some of the key life history traits of silky shark in the Indian Ocean.

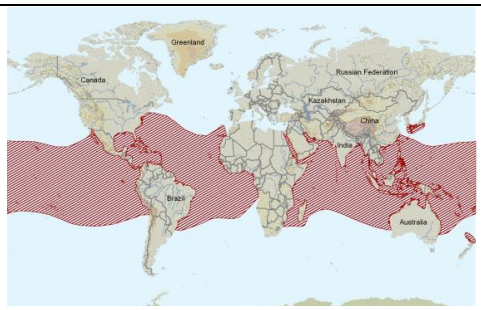


Fig. 1. The worldwide distribution of the silky shark (source: www.iucnredlist.org).

TABLE 1. Silky shark: Biology of Indian Ocean silky sharks (*Carcharhinus falciformis*).

Parameter	Description
Range and stock structure	Essentially pelagic, the silky shark is distributed from slopes to the open ocean. It also ranges to inshore areas and near the edges of continental shelves and over deepwater reefs. It also demonstrates strong fidelity to seamounts and natural or man-made objects (like FADs) floating at the sea surface. Silky sharks live down to 500 m. Typically, smaller individuals are found in coastal waters. Small silky sharks are also commonly associated with schools of tuna, particularly under floating objects. Large silky sharks associate with free-swimming tuna schools. Silky sharks often form mixed-sex schools containing similar sized individuals. Area of overlap with IOTC management area = high. No information is available on stock structure.
Longevity	20+ years for males; 22+ years for females in the southern Gulf of Mexico and maximum size can reach 350 cm long. In the Pacific area it was estimated to be around 25 years. Generation time was estimated to be between 11 and 16 years in the Gulf of Mexico years.
Maturity (50%)	The age of sexual maturity is variable. In the Indian Ocean it has been estimated to be around 15 years for females and 13 years for males. In the Atlantic Ocean, off Mexico, silky sharks mature at 10–12+ years. By contrast in the Pacific Ocean, males mature at around 5-6 years and females mature at around 6–7 years. Size: 215 cm TL for females; 207 cm TL for males in the Eastern Indian Ocean. 239 cm TL for males; 216 cm TL for females in Aldabra atoll. In South Africa: 240cm TL for males and 248-260cm TL for females.
Reproduction	The silky shark is a placental viviparous species with a gestation period of around 12 months. Females give birth possibly every two years. The number of pups per litter ranges from 9-14 in the Eastern Indian Ocean, and 2–11 in the Pacific Ocean. • Fecundity: medium (<20 pups) • Generation time: 11–16 years • Gestation period: 12 months • Reproductive cycle is biennial
Size (length and weight)	Maximum size is around 350 cm long FL. New-born pups are around 75–80 cm TL or less at birth. Reported as 56–63 cm TL in the Maldives. 78–87 cm TL in South Africa. Length–weight relationship for both sexes combined in the Indian Ocean is $TW=0.160*10\text{-}4 * FL^{2.91497}$.

Sources: Strasburg 1958, Bass et al. 1973, Stevens 1984, Anderson & Ahmed 1993, Compagno & Niem 1998, Smith et al. 1998, Mejuto et al. 2005, Matsunaga 2007, Romanov & Romanova 2009, Hall et al. 2012

Silky sharks: Fisheries

Silky sharks are often targeted by some semi-industrial, artisanal and recreational fisheries and are a bycatch of industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery) (**TABLE 2**). Sri Lanka has had a large fishery for silky shark for over 40 years.

There is little information on the fisheries prior to the early 1970s, and some countries do not collect shark data while others collect it but do not report it to IOTC. It appears that significant 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.

TABLE 2. Silky 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	common	abundant		common	abundant	abundant
Fishing Mortality	study in progress	study in progress	study in progress	unknown	unknown	unknown
Post release mortality	81% (85% brailed individuals, 18% meshed individuals).	unknown	unknown	unknown	unknown	unknown

Sources: Romanov 2002, 2008, Ariz et al. 2006, Peterson et al. 2008, Romanov et al. 2008, Poisson 2014

Silky sharks: Catch trends

The nominal catches for silky shark reported to the IOTC Secretariat are highly uncertain as is their utility in terms of minimum catch estimates (**TABLE 3**). For CPCs reporting longline data by species, between 0 and 2% of the catch of sharks were silky sharks. For CPCs reporting gillnet data by species, I.R. Iran and Sri Lanka, 23% and 11% of the catches of shark were silky sharks respectively.

TABLE 3. Silky shark: Catch estimates for silky shark in the Indian Ocean for 2013 to 2015.

Catch		2013	2014	2015
Most recent catch (reported)	Silky shark	3,627 t	2,896 t	3,232 t
	nei-sharks	50,274 t	41,453 t	57,032 t

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 2015, seven countries reported catches of silky sharks in the IOTC region.

A recent project estimated possible silky shark catches for fleets/countries based on the ratio of shark catch over target species by metier (Murua et al 2013). This estimation was based on nominal catches of target species from the IOTC database under the assumption that target catches are declared correctly. The study highlighted that the catch data on oceanic whitetip sharks in the IOTC database may be a considerable underestimate (i.e. total estimated catches were approximately 10 times higher than that declared in the IOTC database). Another study estimated that the number of silky sharks entangled in the nets beneath FADs is much higher than previously thought, ranging between 480,000 and 960,000 individuals per year, assuming a presence of between 3,750 and 7,500 active FADs (Filmater et al. 2013). The authors also acknowledged that solutions exist to mitigate the problem through the exclusion of meshed materials in the subsurface structure of the FAD, as is currently being implemented by the European purse seine. FAD management plans must be submitted to the IOTC and guidelines are set out in IOTC Resolution 15/08 *Procedures on a fish aggregating devices (FADs) management plan, including a limitation on the number of FADs, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species.*

Silky sharks: Nominal and standardised CPUE trends

Data not available at the IOTC Secretariat. However, Maldivian shark fishermen have reported significant declines in silky shark abundance (Anderson 2009). In addition, Indian longline research surveys, in which silky sharks contributed 7% of catch, demonstrate declining nominal catch rates over the period 1984–2006 (John & Varghese 2009). No long-term data for purse-seine CPUE are available; however there is anecdotal evidence of a five-fold decrease in silky shark catches per set between 1980s and 2005.

Silky sharks: Average weight in the catch by fisheries

Data not available.

Silky sharks: Number of squares fished

Catch and effort data not available.

STOCK ASSESSMENT

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

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