Non-Detriment Finding (NDF) of Sri Lanka for Hammerhead sharks; *Sphyrna lewini*, *S. mokarran*, and *S. zygaena*

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 4

Section 2. Intrinsic biological and conservation concerns 12

Section 3: Pressures on species 16

Section 4: Existing management measures 19

Section 5: Non-Detriment Finding and related advice 30

Section 6: Further measures 32

References 34

Appendix I. Global distribution of scalloped, smooth and great hammerhead sharks 37

Appendix 2. National landings of sharks in Sri Lanka, 2005-2015 38

Appendix 3. Catch (t) of hammerhead sharks (SPN) in the Indian Ocean, 1980-2015 39

Appendix 4. Life history parameters for scalloped hammerhead 40

Appendix 5. Sri Lanka National Plan of Action for Sharks 41

Appendix 6. Performance on compliance 42

Appendix 7. Status of Scalloped hammerhead 43

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
Sphyrna lewini (scalloped hammerhead) *Sphyrna mokarran* (greater hammerhead) *Sphyrna zygaena* (smooth hammerhead) FAO Code SPN	Fins (international trade) Meat (fresh and dried salted for human consumption) – *more data are required to confirm international trade of meat.* Skin (international trade - leather) – *more data are required* Jaws & teeth (tourist trade) – *more data are required*	II	Detached fins can be identified to genus level 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) FAO Guides and expert identification by NARA

NEXT STEPS

In view of the above, is the specimen subject to CITES controls? Consult 'Decision and Next Steps' guidance in **Annex 1**	**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 this genus has been incorrectly identified, although fishers and traders may not be able to confirm identification to the species level; hammerhead sharks are very distinctive before the removal of their heads. The fins are readily identifiable using a standard fin identification guide. Lacking sufficient information on the level of export (if any) of meat, jaws and hide from these species.	

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 (attach a map)	Overall population parameters and indices for these species are not available for the Sri Lanka EEZ, nor is information available on stock structure in the Indian Ocean, where there may be some sub-population structure. Further work is required to determine this. All three species are reported to occur as two genetically distinct stocks: one in the Indo-Pacific Ocean, and the other in the Atlantic.	Casper et al. 2005, Denham et al. 2007, Baum et al. 2007
Is this a shared stock (i.e. occurring in more than one EEZ[2] and/or the high seas)?	Yes, these are likely straddling stocks, ranging between Sri Lanka EEZ and that of neighbouring Indian Ocean EEZ's; perhaps into the high seas.	Casper et al. 2005, Denham et al. 2007, Baum et al. 2007
If the stock occurs in more than one EEZ, which other Parties share this stock?	These species are recorded in the EEZ of the other littoral States of the Indian Ocean, and these are likely shared stocks.	Casper et al. 2005, Denham et al. 2007, Baum et al. 2007
If high seas stock, which other Parties share this stock?	In addition to the littoral States, the following IOTC Contracting Parties: China, Belize, European Union, Guinea, Japan, Republic of Korea, and a Cooperating Non-Contracting Party (CNCP): Liberia.	
Which, if any, RFB[3](s) cover(s) the range of this stock?	In the Indian Ocean: * 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), * Regional Organization for the Conservation of the Environment in the Red Sea and Gulf of Aden (PERSGA), *Regional Commission for Fisheries (RECOFI), *South Indian Ocean Fisheries Agreement (SIOFA), *Southwest Indian Ocean Fisheries Commission (SWIOFC).	http://www.iotc.org/ http://www.apfic.org http://www.bobpigo.org https://www.ccsbt.org/ http://www.persga.org/ http://www.fao.org/fishery/rfb/recofi/en http://www.fao.org/fishery/rfb/siofa/en http://www.fao.org/fishery/rfb/swiofc/en
Are all Parties listed above (which fish or share the stock concerned) members of the relevant RFBs?	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.	http://www.wcpfc.int http://www.iotc.org/

[2] Exclusive Economic Zone
[3] Regional Fisheries Body

Are there geographical management gaps?	Regional management: 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 has prohibited the capture, killing or harming of any shark species throughout their EEZ since 2010. 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 the United Kingdom government established a no-take Marine Reserve, prohibiting fishing throughout the 640,000 km^2 area of the British Indian Ocean Territory. The legality of the Chagos Marine Protected Area is disputed by Mauritius.	Maldives Ministry of Fisheries and Agriculture – No. 30-D2/29/2010/32 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
How reliable is the information on origin?	High	
NEXT STEPS		
Is information on origin sufficiently detailed for Question 1.2 to be answered?		**YES**
Consult "Decision and Next Steps" guidance in **Annex 1**. **(Apply this answer at end of Question 1.2)**		**NO**

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 Party) listed in CMS Appendix 1?	Not protected under Sri Lanka legislation or a regional agreement. Sharks have to be landed with all fins attached (2015). *Sphyrna lewini* and *S. mokarran* are listed in CMS Appendix II; Sri Lanka has been a CMS Party since 1990.	CMS website (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 TACis zero or exceeded)?	No	
Taken from a no-take marine protected area or during a closed season?	No	
Taken in contravention of RFBrecommendations, if any?	No	
Listed as a species whose export is prohibited?	No	
Of concern for any other reason?	No	
NEXT STEPS		
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? Consult "Decision and Next Steps" guidance in **Annex 1.**	**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	

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	***S. lewini*:** 180 tonnes (average global annual catch 2011-2015). This is considered a significant underestimate. ***S. mokarran*:** 26 tonnes (average global catch for 2013-2015), only years for which data is reported over the last five years. ***S. zygaena*:** 280 tonnes (average global annual catch 2011-2015). This is considered a significant underestimate.	FAO 2017, Simpfendorfer and Rigby 2016 (Section 2.1.1)
Species distribution	Temperate and subtropical oceans worldwide with reported patchy distribution in tropical waters.	Last and Stevens 2009; Compagno 1984, Simpfendorfer and Rigby 2016 (Section 2.1.2)
Known stocks/populations	Further work is required to determine whether there is structure within the Indian Ocean. ***S. lewini*:** Global stock structure is different between males and females. For females, there are at least four genetically distinct subpopulations: Northwest Atlantic, Southwest Atlantic, Eastern Atlantic, and Indo-West Pacific. For males, there appear to be no genetically distinct populations across and between ocean basins. ***S. mokarran*:** Two known genetically distinct stocks: Atlantic and Indo-Pacific. Possible that there is a single genetic stock between Australia, south Asia and Oceania region, however further work is required to resolve this. ***S. zygaena*:** Each species has two known genetically distinct stocks: Atlantic and Indo-Pacific.	Duncan et al. 2006, Baum et al. 2007, Daley-Engel et al. 2012, NOAA 2013, Heupel et al. 2015, Simpfendorfer and Rigby 2016 (Section 2.1.3)
Main catching countries	***S. lewini*:** Average 2011-2015: Mauritania (67 tonne), Brazil (50 t) and Ecuador (37 t) (FAO 2017) Hammerhead Shark (general): Indonesia (2160 t), Senegal (1115t), Mexico (845 t), Congo (520t), Taiwan Province of China (322 t), Benin (294 t), Liberia (105 t), Sri Lanka (105 t) (FAO 2017). In IOTC: main fleets from 2011-14: Indonesia, EU, Spain ***S. mokarran*:** Average 2011-2015: United States of America (26t). Hammerhead Shark (general): Indonesia (2160 t), Senegal (1115t), Mexico (845 t), Congo (520t), Taiwan Province of China (322 t), Benin (294 t), Liberia (105 t), Sri Lanka (105 t) (FAO 2017). ***S. zygaena*:** Average 2011-2015: Morocco (123t), Ecuador (77t) and Iran (60 t). Hammerhead Shark (general): Indonesia (2160 t), Senegal (1115t),	Mundy-Taylor and Crook 2013, FAO 2017, Simpfendorfer and Rigby 2016 (Section 2.1.4)

	Mexico (845 t), Congo (520t), Taiwan Province of China (322 t), Benin (294 t), Liberia (105 t), Sri Lanka (105 t) (FAO 2017).	
Main gear types by which the species is taken	Gillnets, longlines, and inshore artisanal fisheries in Sri Lanka. By other nations in trawls, purse seines, gillnets, fixed bottom longlines, pelagic longlines and inshore artisanal fisheries.	NARA pers. comm. Baum et al. 2007, Simpfendorfer and Rigby 2016 (Section 2.1.5)
Global conservation status	IUCN Status *S. lewini*: Globally: Endangered (2007) Western Indian Ocean subpopulation: Endangered (2007) IUCN Status *S. mokarran*: Globally: Endangered (2007) IUCN Status *S. zygaena*: Globally: Vulnerable (2005)	Casper et al. 2005, Denham et al. 2007, Baum et al. 2007
Multilateral Environmental Agreements	CITES Appendix II, reservations by Japan (WCPFC CITES Party) CMS Appendix II (two species only – *S. lewini* and *S. mokarran*), no reservations Sharks MoU Annex 1 (two species only – *S. lewini* and *S. mokarran*)	CITES https://cites.org/eng/prog/shark/index.php CMS http://www.cms.int/en/species Sharks MoU http://www.cms.int/sharks/en/mos2

Part 2. Stock/context-specific information		
Stock assessments	No stock assessments. Due to the lack of data, a stock assessment is currently not feasible for the Indian Ocean. 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. *Sphyrna zygaena* received a vulnerability ranking of No. 6 in the ERA rank for longline gear, with *S. mokarran* and *S. lewini* being No. 9 and 14, respectively.	Murua et al. 2012, Lack et al. 2014, Rice et al. 2015, Simpfendorfer and Rigby 2016
Main management bodies	IOTC Working Party on Ecosystems and Bycatch; IOTC Scientific Committee; Commission. CITES, CMS, BOBLME (Phase 2 – includes regional POA–IUU), CBD, and FAO – IPOA.	Lack et al. 2014
Cooperative management arrangements	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). 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).	UNCLOS Annex 1 www.un.org/unlcos/annex1; http://www.commonoceans.org/home/en/ Lack et al. 2014
Non-membership of RFBs	None.	NA.
Nature of harvest	Taken in Sri Lanka as bycatch in artisanal (gillnet) and semi-industrial (longline/gillnet) fisheries.	PersComm NARA & DFAR

Fishery types	Artisanal (gillnet) and semi-industrial (longline/gillnet) fisheries.	
Management units	In the Indian Ocean, the main body responsible is IOTC, which reports scalloped hammerhead *Sphryna lewini* among the seven main shark species captured in association with fisheries targeting IOTC species. Sri Lanka has developed several national instruments such as new rules, regulations and policy guidelines, 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/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc#sh
Products in trade	Fins are the main product. In some cases, meat, skin, teeth and jaws are also traded. Customs codes for the identification of shark products have been requested and are under development in Sri Lanka.	
Part 3. Data and data sharing		
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. Species specific catch data for hammerhead sharks is available since 2005 (see graph and table in Appendix 2). From 2005 until 2015, a total of 1,579.34 t of hammerhead (all 3 species) shark catch was recorded from a total shark catch of 27,145.09 t.Of this, 1,056.53 t was scalloped hammerhead, 374.12 t was smooth hammerhead, and 148.69 t was great hammerhead. The averages were 96.05 t, 34.01 t, and 13.5t, respectively. For scalloped hammerhead, the maximum was 199.24 t in 2010, and a minimum of 11.65 t in 2008. For smooth hammerhead, the maximum was 61.00 t in 2013, and a minimum of 8.56 t in 2006. For the great hammerhead, the maximum was 51.07 t in 2010, and a minimum of 2.34 t in 2011. Sri Lanka has already submitted annual catch data for 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	http://www.iotc.org/documents/bycatch-datasets-available-0_(2016) (IOTC, 2015; Jayathilaka and Maldeniya, 2015) http://www.iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc#sh

	alternative observer scheme is in place to collect scientific data.	
Are catch and/or trade data available from other States fishing this stock?	Trade data are reported by some Indian Ocean countries (including Sri Lanka) to the FAO.	http://www.fisheries.gov.lk/content.php?cnid=ststc
Reported catches by other States	Access is available to these data, managed by IOTC Secretariat: 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	The limited catch data precludes any analyses of catch trends with confidence.	
Have RFBs and/or other States fishing this stock been consulted during or contributed data during this process?	No	

Sources of information:

Baum et al. 2007; Casper et al. 2005; CITES. 2013a; Clarkeand Nichols 2015; CMS. 2014a; CMS. 2014b; Compagno 1984; Daly-Engel et al. 2012; Denham et al. 2007**;** Duncan and Holland 2006; FAO. 2017; Ferretti et al. 2016; Fields et al. *In prep*.; Heupel et al. 2015; IOTC. 2015; Lack and Meere 2009; Lack et al. 2014; Murua et al. 2012; Rice et al. 2015; Simpfendorferand Rigby 2016.

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 (all three species)	Low	*S lewini*: 8.9 yrs (males), 13.2 yrs (female), Drew et al. 2015 (Indonesia). 5.7 years (male), (Harry et al. 2011; tropical east coast Australia). *S mokarran*: 8.3 years (male and female), (Harry et al. 2011; tropical east coast Australia) *S zygaena*: 11 years (males and females) (Liu and Tsai 2011; Taiwan)
	Medium	
	High	
	Unknown	
b) Median size at maturity	Low	*S lewini*: 229 cm L_{ST} (female), Indonesia (White et al. 2008). 147-175 cm L_{ST} (male), Australia and Indonesia (Harry et al. 2011; Stephens and Lyle 1989; White et al.2008). *S mokarran*: 2280 cm L_{ST} (male and female) (Harry et al. 2011; tropical east coast Australia) *S zygaena*: 250-260 mm TL(male), 2650 mm TL (female) (Stevens 1984, east coast Australia)
	Medium	
	High	
	Unknown	
c) Maximum age/longevity in an unfished population	Low	*S lewini*: 21 years (male) (1 band pair/year) (Harry *et al.* 2011). 35 years (female) (1 band pair/year) (Drew et al. 2015). *S mokarran*: 31.7 years (male) and 39.1 years female) (Harry et al. 2011; east Australia); 42 years (male) (Piercy et al. 2010, Passerottiet al. 2010; south Atlantic) and 45 years (female) (Tovar-Avila 2014; Central Pacific) *S zygaena*: 24 years (male), 25 years (female) (Rosa et al. 2015). Likely underestimates
	Medium	
	High	
	Unknown	
d) Maximum size	Low	*S lewini*: 301 cm TL (male), 346 cm TL (female) (Stephens and Lyle 1989) (observed, not calculated) *S mokarran*: 445 cm L_{ST} (male) (Stephens and Lyle 1989), 439 cm L_{ST} (female) (Harry et al. 2011) (observed) *S zygaena*: 359 cm TL (male), 375 cm TL (female) (Liu and Tsai 2011; Taiwan growth model). 370-400 cm TL,male and female: global estimation from observed(Compagno 1984).
	Medium	
	High	
	Unknown	
e) Natural Mortality rate (M)	Low	*S lewini*: 0.123/year (Harry et al. 2011); 0.107/year (Chen and Yuan 2006). *S mokarran*: 0.126 $year^{-1}$ (Harry 2011) *S zygaena*: Unknown.
	Medium	
	High	
	Unknown	
	Low	

f) Maximum annual pup production (per mature female)	**Medium**	*S lewini*: 12-41 (mean 25-26) if annual cycle; 6-21 (mean 12.5-13) if biennial cycle. (Chen et al. 1988, Liu and Chen 1999, White *et al.* 2008.) *S mokarran*: 3-17 (average 10) (Stevens and Lyle 1989). *S zygaena*: 20-49 (mean 32) (Stevens 1984, east coast Australia), assume annual cycle; 10-24.5 (mean 16) assume biennial cycle
	High	
	Unknown	
g) Intrinsic rate of population increase (r)	Low	*S lewini*: 0.205/year (if 2 band pairs/year); or 0.086/year(if 1 band pair/year). (Chen and Yuan 2006, Liu and Chen 1999) *S mokarran*: Assumed to be similar to *S. lewini* *S zygaena*: Unknown
	Medium	
	High	
	Unknown	
h) Geographic distribution of stock	**Low**	*S lewini*: Medium for Indo-West Pacific female population;low for global male population (Duncanet al. 2006,Baumet al. 2007,NOAA 2013; and Daly-Engel et al. 2012). *S mokarran*: Circumglobal distribution but at least two stocks; Atlantic and Indo-Pacific (Simpfendorfer 2014). *S zygaena*: Circumglobal distribution but at least two stocks; Atlantic and Indo-Pacific (Simpfendorfer 2014)
	Medium	
	High	
	Unknown	
i) Current stock size relative to historic abundance	Low	*All species:* Reported large declines in hammerhead spp complex abundance of 60-99% over recent decades in Atlantic and Indo-Pacific (CITES 2013a), i.e. reduced to <25% of baseline.
	Medium	
	High	
	Unknown	
j) Behavioural factors	Low	*S lewini*: Inshore pupping and high natural predation on juveniles (Baum et al. 2007), aggregating behaviour, and very high at-vessel fishing mortality rates (Morgan and Burgess 2007) *S mokarran*: Generally solitary (Denham et al. 2007) and very high at-vessel fishing mortality rates (Morgan and Burgess 2007) *S zygaena*: Inshore pupping, aggregating behaviour of juveniles (Casper 2005), likely very high at-vessel fishing mortality rates similar to the other hammerheads (Morgan and Burgess 2007)
	Medium	
	High	
	Unknown	
h) Trophic level	Low	*S lewini*: 4.1 (Froese and Pauly 2015) *S mokarran*: 4.3 (Froese and Pauly 2015) *S zygaena*: 4.3 (Froese and Pauly 2015)
	Medium	
	High	
	Unknown	

SUMMARY for Question 2.1

Intrinsic biological vulnerability of species

Provide an assessment of the overall intrinsic biological vulnerability of the species (tick appropriate box below). Explain how these conclusions were reached and the main information sources used.

High	*Medium*	*Low*	*Unknown*

Explanation of conclusion and sources of information used:

All three species have a global distribution, but genetic structuring is evident between ocean basins, with possibly greater structuring occurring within ocean basins. These species are long lived with a large size and late age at maturity, which render them inherently vulnerable to high fishing pressure.Most of the known intrinsic biological factors are, therefore, ranked as high to medium vulnerability for all three species.

The exceptions to medium-high vulnerability include*S. lewini* pup production, which is low to medium vulnerability, and the apparently global distribution of*S. lewini* malesresults in a low vulnerability,compared with medium vulnerability for female *S lewini*. Nonetheless, the Indo-West pacific *S lewini*population is considered to warrant Endangered listing (NOAA US listing process).

The Great Hammerhead *S mokarran*only reproduces once every two years, is very long lived, likely has a low intrinsic rate of increase and has very high bycatch mortality. This combination of parameters makes it vulnerable to over-exploitation and population depletion.

S zygaena, Smooth hammerhead, is also long lived with a large size and late age at maturity which render it inherently vulnerable to high fishing pressure.

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	*S lewini*: IUCN globally Endangered, and Endangered in the Western Indian Ocean (Baum et al. 2007). The only assessment available (Atlantic) identified overfishing on an overfished stock Lack et al. 2014). *S mokarran*: IUCN Globally Endangered (Denham et al. 2007). *S zygaena*: IUCN – Globally Vulnerable (Casper 2005)
	Medium	
	High	
	Unknown	
	Comments:	
Population trend	Low	*All three species:* Population trend decreasing and global stocks of the large hammerhead shark complex are estimated to be at 15-20% of historic baseline (CITES 2013a)
	Medium	
	High	
	Unknown	
	Comments:	
Geographic extent/scope of conservation concern	Low	*S lewini*: Identified threats affect the entire global population of the species and the Indo-West Pacific Population (Baum et al. 2007) *S mokarran*: Identified threats affect the entire global population of the species and the Indo-Pacific population (Denham et al. 2007) *S zygaena*: Identified threats affect the entire global population of the species and the Indo-Pacific population (Casper et al. 2005)
	Medium	
	High	
	Unknown	
	Comments:	

SUMMARY for Question 2.2 **Severity and geographic extent of the conservation concern**			
High	*Medium*	*Low*	*Unknown*

Explanation of conclusion and sources of information used:

The Hammerhead sharks are Vulnerable and depleted, populations of the hammerhead complex have decreased dramatically from baseline levels and the threats are high to both the global and Indian Ocean populations.

See above for sources and Annex for full bibliography.

Section 3: Pressures on species

Worksheet for Question 3.1

What is the severity of trade pressure on the stock of species concerned?

Factor	Level of severity of trade pressure	Indicator/metric
a) Magnitude of legal trade	Low	
	Medium	Reported catches and landings at species and genus levels, but species-specific trade data lacking for hammerheads.
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 83 of Guidance Notes)* 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. 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).

The CITES listing for hammerhead sharks came into effect in September 2014. Fins have been exported since then. The CITES trade database records one export from Sri Lanka to Singapore in 2014 of 160 kg fins of *Sphyrna lewini*, and in 2015 two exports of *Sphyrna zygaena*, also to Singapore, of 50 kg and 100 kg of fins, respectively.

The three hammerhead sharks (scalloped, smooth, and great) collectively formed a significant proportion of the shark fin trade (approximately 5.9%) into Hong Kong (Clarke *et al*. 2006). A more recent study (Fields *in press*) shows that 8.37% of raw fins being processed in Hong Kong are from hammerhead sharks (scalloped, smooth and great).

This assessment is based on high confidence of species identification and levels of catches but insufficient trade data.

b) Magnitude of illegal trade	**Low**	Customs has successfully seized illegal shipments
	Medium	
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 83 of Guidance Notes)* Low **Medium** High	

Reasoning:

Sri Lanka customs seized an illegal shipment of shark fin (and sea cucumber) from a neighbouring Indian Ocean States, where exports are prohibited. Hammerhead fins were present. There have been seizures of attempted illegal exports of CITES listed shark fins from Sri Lanka. These records indicate that customs procedures are operating effectively.

Worksheet for Question 3.2

What is the severity of fishing pressure on the stock of species concerned?

Factor	**Level of severity of fishing pressure**	**Indicator/metric**
a) Fishing mortality (retained catch)	**Low**	
	Medium	
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low **Medium** High	
Reasoning: Hammerhead sharks comprise 11% of shark catches in Sri Lankan waters. 7% scalloped hammerhead, 4% smooth hammerhead. Greater hammerhead catches are very rare.		
b) Discard mortality	**Low**	
	Medium	
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low Medium **High**	
Reasoning: Hammerhead sharks tend not to survive capture in gill nets, and rarely survive for long when hooked on longlines. Therefore, regulations urging the release of live juvenile and pregnant sharks will not often apply since it is legal to retain dead catch.		
c) Size/age/sex selectivity	Low	
	Medium	
	High	

	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low **Medium** High	
Reasoning: Landings in Sri Lanka comprise all size classes, but there is a predominance of adults, suggesting that nursery grounds are not being fished to any significant level. Size structure data (by 10 cm classes) are being submitted to IOTC. Landings in Sri Lanka comprise all size classes, but there is a predominance of adults, suggesting that nursery grounds are not being fished to any significant level. Size structure data (by 10cm classes) are being submitted to IOTC. See Annexes.		
d) Magnitude of illegal, unreported and unregulated (IUU) fishing	Low	
	Medium	
	High	
	Unknown	No information available.
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* **Low** Medium High	
Reasoning 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 currently implementing an NPOA- IUU fishing, in line with the FAO IPOA-IUU fishing.		

Section4: Existing management measures

Worksheet for preliminary compilation of information on existing management measures

Existing management measures	Is measure generic or species-specific?	Descriptions/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 5)**. 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: Shark species of the Family Alopidae. *Alopias vulpinus (Thresher shark)* *Alopias superciliosus (Big-eye thresher shark)* *Alopias pelagicus (Pelagic theresher shark)* 2. *Carcharhinus longimanus* (Oceanic white-tip shark) 3. *Rhincodon typus*(Whale shark) Penalty for non-compliance with this requirement is imprisonment and/or a fine.
REGIONAL/INTERNATIONAL		
Shark in the Indian Ocean are currently subject to a number of Conservation and Management Measures adopted by the Indian Ocean Tuna Commission:		
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.
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.

		Data on shark interactions recorded by observers should be reported to the IOTC within 150 days.
Resolution 15/02 Mandatory Statistical Reporting Requirements for IOTC 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 17/05 on 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.
CITES	Species-specific	Listing of three species of hammerhead sharks on Appendix II of CITES in 2013, in force since 2014.
CMS	Species-specific	Lists Scalloped hammerhead and Great hammerhead in Appendix II and in Annex I of the Sharks MOU.
Other National measures	Generic	See Worksheet 1.1b for information on shark fishing prohibitions in other Indian Ocean EEZs.

<table>
<tr><th colspan="4">Worksheet for Question 4.1
Are existing management measures appropriately designed and implemented to mitigate the pressures affecting the stock/population of the species concerned?</th></tr>
<tr><th>Factor</th><th>Existing management measure(s)</th><th>Relevant monitoring, control and surveillance (MSC) measure(s)</th><th colspan="2">Overall assessment of compliance regime (tick as appropriate)</th></tr>
<tr><td colspan="5">TRADE PRESSURE</td></tr>
<tr><td rowspan="5">a) Magnitude of legal trade</td><td rowspan="4">Sri Lanka’s CITES regulations.</td><td rowspan="4">The Department of Fisheries Sri Lanka issues a no-objection letter after a positive fin identification report is provided by NARA.</td><td>Unknown (no information on compliance)</td><td>✓</td></tr>
<tr><td>Poor (limited relevant compliance measures in place)</td><td></td></tr>
<tr><td>Moderate (some relevant compliance measures in place)</td><td></td></tr>
<tr><td>Good (comprehensive relevant compliance measures in place)</td><td></td></tr>
<tr><td colspan="3">Reasoning/comments
No information from other states fishing in the Indian Ocean.</td></tr>
<tr><td rowspan="5">b) Magnitude of illegal trade</td><td rowspan="4">In Sri Lanka, a fish and fishery related products import, export and re-export regulation is currently in the process of being adopted.</td><td rowspan="4">Sri Lanka Customs has seized smuggled shark fins entering the country, and attempted exports without documentation.</td><td>Unknown (no information on compliance)</td><td></td></tr>
<tr><td>Poor (limited relevant compliance measures in place)</td><td></td></tr>
<tr><td>Moderate (some relevant compliance measures in place)</td><td>✓</td></tr>
<tr><td>Good (comprehensive relevant compliance measures in place)</td><td></td></tr>
<tr><td colspan="3">Reasoning/comments</td></tr>
</table>

<table>
<tr><th>Factor</th><th>Existing management measure(s)</th><th>Relevant monitoring, control and surveillance (MSC) measure(s)</th><th colspan="2">Overall assessment of compliance regime (tick as appropriate)</th></tr>
<tr><td colspan="5">FISHING PRESSSURE</td></tr>
<tr><td rowspan="5">a) Fishing mortality (retained catch)</td><td rowspan="4">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.</td><td rowspan="4">In Sri Lanka at present there are observers on board vessels greater than 24 meters in length. For smaller vessels, however 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. All high seas vessels are inspected before departure and after arrival.</td><td>Unknown (no information on compliance)</td><td></td></tr>
<tr><td>Poor (limited relevant compliance measures in place)</td><td>✓</td></tr>
<tr><td>Moderate (some relevant compliance measures in place)</td><td></td></tr>
<tr><td>Good (comprehensive relevant compliance measures in place)</td><td></td></tr>
<tr><td colspan="4">Reasoning/comments
Since 2005, it was decided to combine all the shark catches instead of reporting species-wise data since there was a very low contribution of shark to the total large pelagic fish production. However, species-wise catch reporting was restarted in 2011 in order to comply with adopted resolutions for sharks by the Indian Ocean Tuna Commission (IOTC). This sampling programme has been conducted since 2011 and 14 shark species (including two hammerhead species) have been reported throughout this study. The 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).</td></tr>
<tr><td rowspan="3">b) Discard mortality</td><td rowspan="3">Not applicable.</td><td rowspan="3">Not available.</td><td>Unknown (no information on compliance)</td><td>✓</td></tr>
<tr><td>Poor (limited relevant compliance measures in place)</td><td></td></tr>
<tr><td>Moderate (some relevant compliance measures in place)</td><td></td></tr>
</table>

			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. However, most hammerhead sharks are already dead when hauled to the vessel.	In Sri Lanka, several sampling programmes have been implemented recently. Data are not yet available but will be submitted to IOTC.	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			
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 currently implementing an NPOA- IUU fishing, in line with the FAO IPOA-IUU fishing.			

Worksheet for Question 4.2 **Are existing management measures effective (or likely to be effective) in mitigating the pressures affecting the stock/population of the species concerned?**					
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?** *(tick as appropriate)*	
TRADE PRESSSURE					
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.				

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?** *(tick as appropriate)*	
TRADE PRESSSURE					
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 of shark fins (suggesting that some other Indian Ocean states may need to improve their controls). Shark fin exports without appropriate permits have also been seized by Sri Lankan Customs.				
FISHING PRESSURE					
a) Fishing mortality (retained catch)		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 is limited management expert advice provided by IOTC and Sri Lanka is consistent with its recent recommendations, however no data are available for other nations.				
FISHING PRESSSURE					
b) Discard 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	
		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.				

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 PRESSSURE					
c) Size/age/sex selectivity	**No information**	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				
d) Magnitude of IUU fishing	**No information**	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)**
Trade pressures			
a) Magnitude of legal trade	High **Medium** Low Unknown	High **Medium** Low	Yes **Partially** No Insufficient Information **Not applicable
a) 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

b) Discard mortality	High Medium **Low** Unknown	**High** Medium Low	Yes 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? *(e.g. for improvements to monitoring/management)*	**YES** *- go to **Step 6** and list recommendations for measures to improve monitoring/management under Reasoning/comments below*	**NO**

Reasoning/comments:

This Hammerhead shark (*Sphyrna* spp.) NDF for Sri Lanka is "**Positive with Conditions**" to enable trade to continue 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 two years, to gauge progress against the recommendations in Section 6 and update it with newly acquired data, before agreeing 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 Hammerhead Sharks

Recommendation	*Potential leads*
Population monitoring: Maintain, and if possible, expand observer programmes on board and port sampling (data collection at landing sites) to improve species-specific data on composition of catches by size, sex and maturity (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 (Also other Indian Ocean fishing States, IOTC, BOBP-IGO)
Research: Investigations into key biological/ecological parameters, life-history and behavioural traits, and the identification of potential mating, pupping and nursery grounds. More data on species, size, maturity and sex structure of hammerhead landings. Socio-economic studies on shark fisheries, trade and alternative livelihoods	DFAR, NARA, universities, and NGO's in Sri Lanka. (Also other Indian Ocean fishing States, IOTC, BOBP-IGO) IGOs and iNGOs
Fisheries monitoring: Improved species-specific fisheries data on catches and landings are needed to ensure harmonisation of data from different sources (e.g. IOTC and FAO).	Sri Lanka DFAR, NARA (Also other Indian Ocean fishing States, IOTC, BOBP-IGO)
Monitoring of domestic and international trade: Implementation of specific catch or trade documentation schemes for sharks. Pursue with Sri Lanka Customs the request to introduce HS codes for all shark products, to permit the collection of better data on imports and exports. Improve present methodology for the random sampling of fins for export, in conjunction with Sri Lanka Customs. New data collection initiatives to quantify more precisely hammerhead shark fin exports and identify and monitor hammerhead shark fins, and meat & other products (if any) at species level.	Sri Lanka Customs department, DFAR, NARA (Also other Indian Ocean fishing States) IGOs, NGOs

Section 6.2: Improvement in management is required

Management recommendations for Hammerhead Sharks

Recommendation	***Potential leads***
Implementation of and improved compliance with existing fisheries management regulations (national, regional and international), including: • Shark Fisheries Management Regulation, 2015 • National regulations prohibiting gillnets longer than 2.5 km on the high seas. • Fish catch data regulation, 2014	DFAR and NARA
Implementation and regular review of shark plans (e.g. SL-NPOA-Sharks) and participate in the development of a regional shark plan, similar to the RPOA-IUU fishing.	DFAR, BOBLME
Adopt measures, where possible, to avoid and reduce hammerhead shark bycatch mortality in all fisheries.	DFAR, industry bodies, fishers, and IOTC
Adopt measures to avoid and reduce hammerhead shark bycatch mortality in long line fisheries, e.g. • promote the use of hook and leader designs that minimize hammerhead shark bycatch. For example: circle hooks instead of j-hooks, and monofilament instead of wire-leaders.	NARA, DFAR, industry bodies, and RFBs
Conduct an assessment to evaluate potential options for the introduction of export quotas (such as an export cap/limit based on relation to export of total shark fin tonnage in recent years) to better regulate trade and fisheries of shark species.	DFAR (for quota) & DWC (for CITES permits), based on NARA advice
Identify coastal nursery grounds and consider mitigation by reducing fishing pressures on pregnant females and juveniles through avoidance of critical habitat	NARA, DFAR
Develop a fisher awareness program aimed to: • 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.	DFAR/NARA/NGO's
Finalise the introduction of HS codes for all shark products to collect improved data on imports and exports.	DFAR/SL Customs
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
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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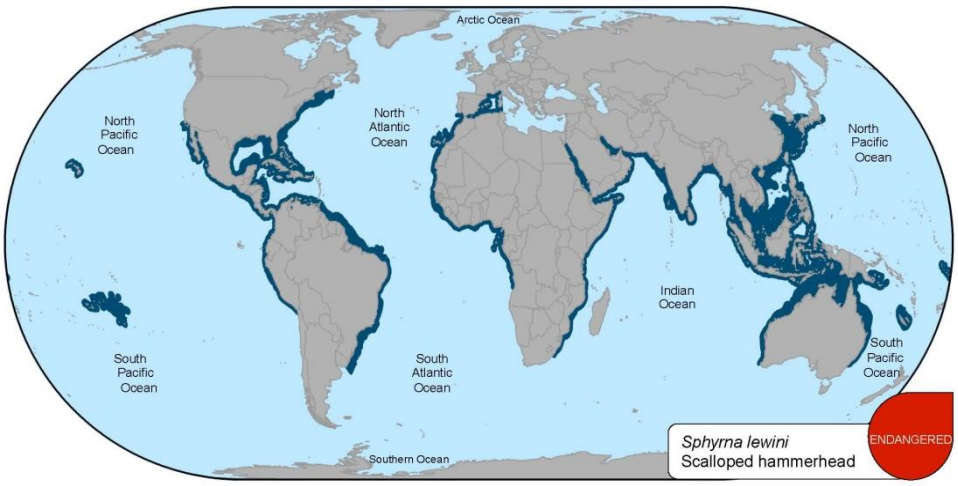
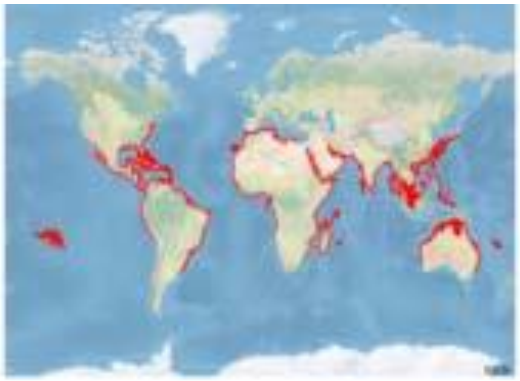
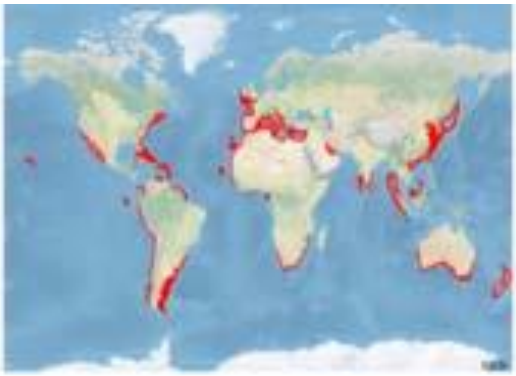
Appendix I. Global distribution of scalloped, smooth and great hammerhead sharks



World distribution map for *S. lewini* courtesy of IUCN



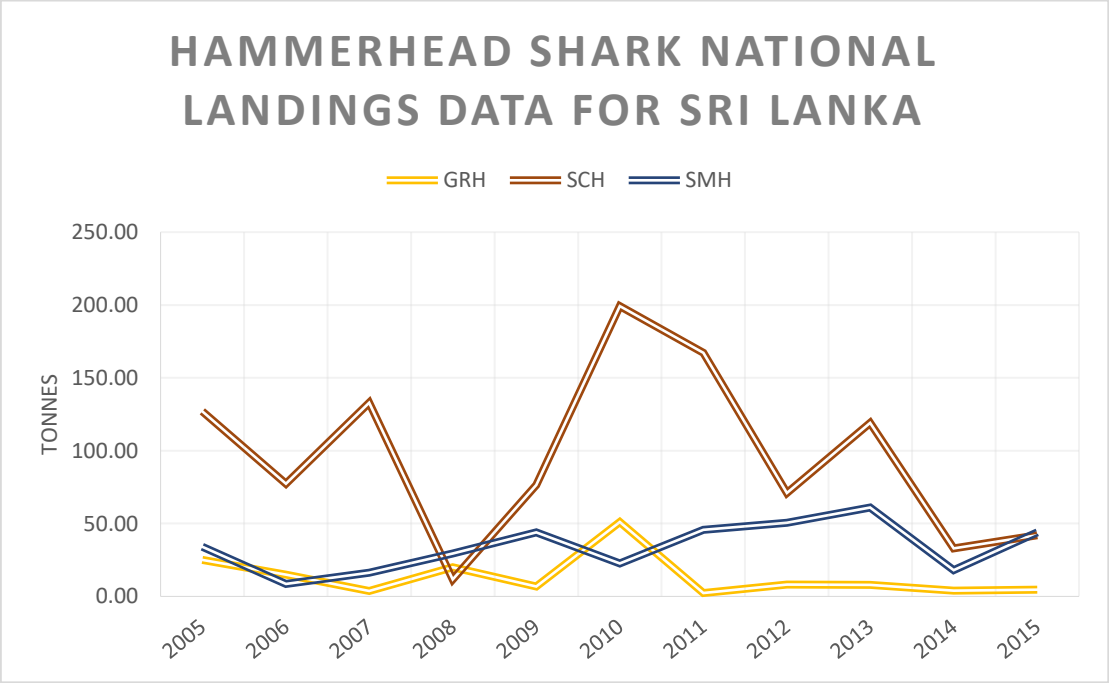
Great hammerhead, *Sphyrna mokarran*



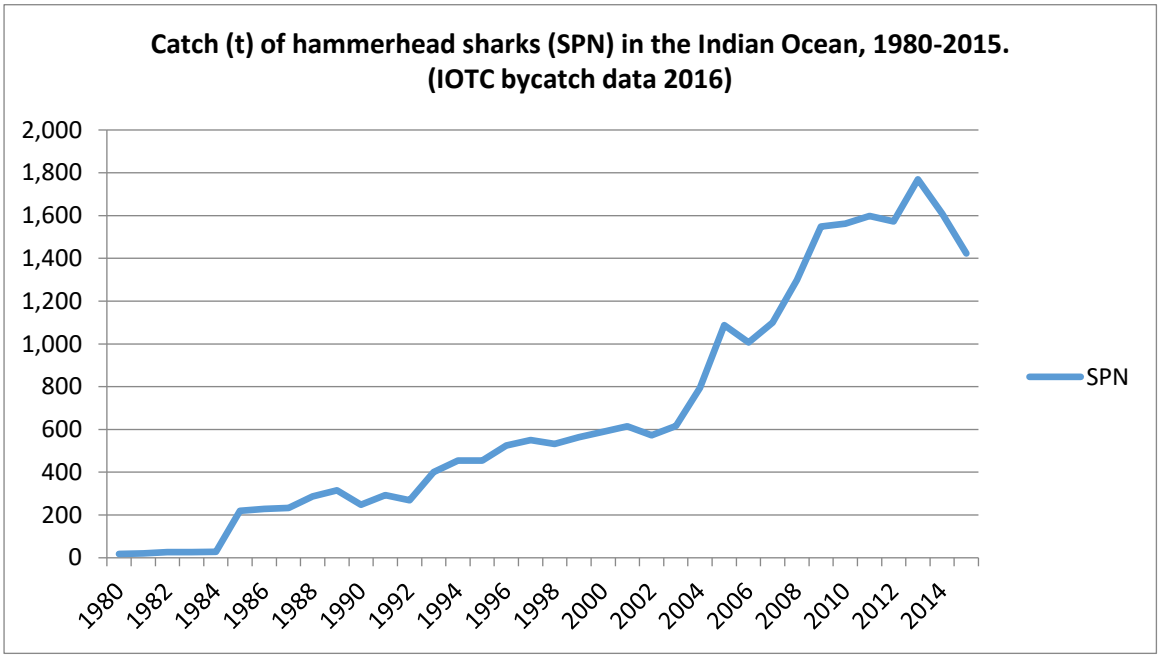
Smooth hammerhead, *Sphyrna zygaena*

Appendix 2. National landings of sharks in Sri Lanka, 2005-2015 (2016 data currently being compiled)

Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Blue Shark	118.0	78.7	83.2	64.2	99.1	323.8	831.0	284.0	183.0	203.0	207.0
Bigeye thresher	813.0	426.9	602.9	505.9	327.8	514.1	495.1	465.0	-	-	-
Silky Shark	1,060.0	978.6	837.9	910.6	898.6	1,623.8	1,940.7	1,136.0	1,247.0	1,122.0	750.0
Great Hammerhead	25.0	15.0	3.7	19.9	6.8	51.1	2.3	8.1	8.0	4.0	4.7
Hammerhead shark	19.0	12.1	20.1	17.8	17.5	30.4	69.4	52.0	70.0	14.0	9.6
Longfin mako shark	101.0	61.4	153.1	84.8	67.4	277.3	453.0	149.0	41.0	78.0	87.0
Oceanic whitetip Shark	59.0	73.0	122.5	74.2	19.6	137.6	192.1	329.0	-	-	-
Pelagic Thresher Shark	127.0	77.3	132.8	11.6	76.4	199.2	167.1	71.0	119.0	33.0	42.0
Scalloped Hammerhead	10.0	14.8	9.8	23.9	15.9	19.1	49.0	63.0	56.0	41.0	49.0
Shortfin Mako Shark	15.0	324.6	403.8	126.0	408.2	929.3	144.9	560.5	-	88.0	19.0
Smooth Hammerhead	34.0	8.6	16.2	29.5	43.9	22.7	45.7	50.6	61.0	18.0	44.0
Spoitail Shark	11.0	1.7	3.0	1.2	77.7	8.6	1.6	8.7	19.0	10.0	-
Thresher Shark		28.3	0.1	1.3	-	-	-	-	-	-	-
Total	**2,392.0**	**2,101.0**	**2,389.0**	**1,871.0**	**2,059.0**	**4,137.0**	**4,392.0**	**3,176.8**	**1,804.0**	**1,611.0**	**1,212.3**



Appendix 3. Catch (t) of hammerhead sharks (SPN) in the Indian Ocean, 1980-2015. (IOTC bycatch data 2016)



Appendix 4. Life history parameters for scalloped hammerhead (source CITES E-COP16-Prop-43)

Growth rate (von Bertalanffy k)	0.13 yr^{-1} (M, NW Atlantic) 0.09 yr^{-1} (F, NW Atlantic) 0.13 yr^{-1} (M, eastern Pacific) 0.15 yr^{-1} (F, eastern Pacific) 0.22 yr^{-1} (M, western Pacific) 0.25 yr^{-1} (F, western Pacific)	Piercy *et al*. (2007) Tolentino and Mendoza (2001) Chen *et al*. (1990)
Size at Maturity	131 cm FL (M, NW Atlantic) 180-200 cm FL (F, NW Atlantic) 152 cm FL (M, western Pacific) 161 cm FL (F, western Pacific) 108-123 cm FL (M, northern Australia) 154 cm FL (F, northern Australia) 138-154 cm FL (M, SW Atlantic) 184 cm FL (F, SW Atlantic) 135 cm FL (M, Indo-Pacific) 175-179 cm FL (F, Indo-Pacific)	Piercy (personal communication) Tolentino and Mendoza (2001) Chen *et al*. (1988) Stevens and Lyle (1989) Hazin *et al*. (2001) White *et al*. (2008)
Age at Maturity	6 years (M, NW Atlantic) 15-17 years (F, NW Atlantic)	Piercy (personal communication)
Observed longevity	30.5 years (NW Atlantic) 12.5 years (eastern Pacific) 14 years (western Pacific)	Piercy *et al*. (2007) Tolentino and Mendoza (2001) Chen et al. (1990)
Gestation period	8-12 months (Global)	Piercy (personal communication) Chen *et al*. (1988) Hazin *et al.* (2001) White *et al*. (2008)
Reproductive Periodicity	2 years	Piercy (personal communication) Chen *et al*. (1988) Hazin *et al*. (2001) White *et al*. (2008)
Litter size (mean)	Global range=12-41 23 (NW Atlantic) 14 (SW Atlantic) 25-26 (Indo-Pacific) 14 Eastern Pacific	Piercy (personal communication) Chen *et al*. (1988) Hazin *et al.* (2001) White *et al.* (2008) Tapiero (1997)
Generation time (T)	20 years	Cortés *et al*. (2008)
Population growth rates (r)	0.09 $year^{-1}$	Cortés *et al*. (2009)

Appendix 5. Sri Lanka National Plan of Action for the conservation and management of 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 6. 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:

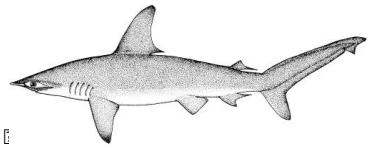
* Catch and Effort for the surface fisheries at IOTC Standard, as required by Resolution 15/02.
* Size frequency for the surface fisheries (Gillnet) at IOTC Standard, as required by Resolution 15/02.
* Size frequency for the longline fisheries at IOTC Standard, as required by Resolution 15/02.

Appendix 7. Status of Scalloped hammerhead (IOTC 2016)

Scalloped hammerhead shark Updated: December 2016

EXECUTIVE SUMMARY: SCALLOPED HAMMERHEAD SHARK

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



Status of the Indian Ocean Scalloped Hammerhead Shark (SPL: *Sphyrna lewini*)

CITES APPENDIX II species

TABLE 1. Status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean.

Area[1]	Indicators		2016 stock status determination
Indian Ocean	Reported catch 2015[2]:	52 t	
	Not elsewhere included (nei) sharks[3] 2015:	57,125t	
	Average reported catch 2011–2015:	75 t	
	Av. not elsewhere included (nei) sharks[3] 2011–15:	49,785 t	
	MSY (1,000 t) (80% CI):	unknown	
	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):		

[1]Boundaries for the Indian Ocean = IOTC area of competence
[2]Proportion of catch estimated or partially estimated by IOTC Secretariat for 2015: 0%
[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 ($SB_{year}/SB_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)		
Not assessed/Uncertain		

TABLE 2. IUCN threat status of scalloped hammerhead shark (*Sphyrna lewini*) in the Indian Ocean.

Common name	Scientific name	IUCN threat status[3]		
		Global status	WIO	EIO
Scalloped hammerhead	*Sphyrna lewini*	Endangered	Endangered	–

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, Baum 2007

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. The current IUCN threat status of 'Endangered' applies to scalloped hammerhead sharks globally and specifically for the western Indian Ocean (Table 2). The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2012 (Murua et al., 2012) 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. Scalloped hammerhead shark received a low vulnerability ranking (No. 14) in the ERA rank for longline gear because it was estimated as one of the least productive shark species, but was also characterised by a lower susceptibility to longline gear. Scalloped hammerhead shark was estimated as the sixth most vulnerable shark species in the ERA ranking for purse seine gear, but with lower levels of vulnerability compared to longline gear, because the susceptibility was lower for purse seine gear. There is a paucity of information available on this species and this situation is not expected to improve in the short to medium term. Scalloped hammerhead sharks are commonly taken by a range of fisheries in the Indian Ocean. They are extremely vulnerable to gillnet fisheries. Furthermore, pups occupy shallow coastal nursery grounds, often heavily exploited by inshore fisheries. Because of their life history characteristics – they are relatively long lived (over 30 years), and have

relativity few offspring (<31 pups each year), the scalloped hammerhead shark is vulnerable to overfishing. There is no quantitative stock assessment or basic fishery indicators currently available for scalloped hammerhead shark in the Indian Ocean therefore the stock status is **uncertain** (Table 1).

Outlook. Maintaining or increasing effort can result in declines in biomass and productivity. 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 scalloped hammerhead shark will decline in these areas in the near future.

Management advice. A precautionary approach to the management of scalloped hammerhead 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 be noted:

- **Maximum Sustainable Yield (MSY)**: Unknown.
- **Reference points**: Not applicable.
- **Main fishing gear** (2011–15): Gillnet-longline; longline-gillnet; longline (fresh).
- **Main fleets** (2011–15): Sri Lanka; NEI-Fresh

SCALLOPED HAMMERHEAD SHARK

SUPPORTING INFORMATION

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

CONSERVATION AND MANAGEMENT MEASURES

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 all sharks must be recorded (retained and discarded).
- 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.
- 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.

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

Scalloped hammerhead shark: General

Scalloped hammerhead shark (*Sphyrna lewini*) is widely distributed and common in warm temperate and tropical waters (**Fig. 1**). It is also found in estuarine and inshore waters. In some areas, the scalloped hammerhead shark forms large resident populations while in other areas large schools of small-sized sharks are known to make seasonal migrations polewards. Their aggregating behaviour makes large schools highly vulnerable to fishing and therefore high CPUEs may be recorded even when stocks are severely depleted (Baum et al. 2007). An assessment of the population rebound potential of 26 shark species in the Pacific Ocean ranked *Sphyrna lewini* as one of the species with

the poorest ability to recover from increased mortality (Smith et al. 1998). Scalloped hammerhead sharks feed on pelagic fishes, rays and occasionally other sharks, squids, lobsters, shrimps and crabs. TABLE 1 outlines some of the key life history traits of scalloped hammerhead shark in the Indian Ocean.

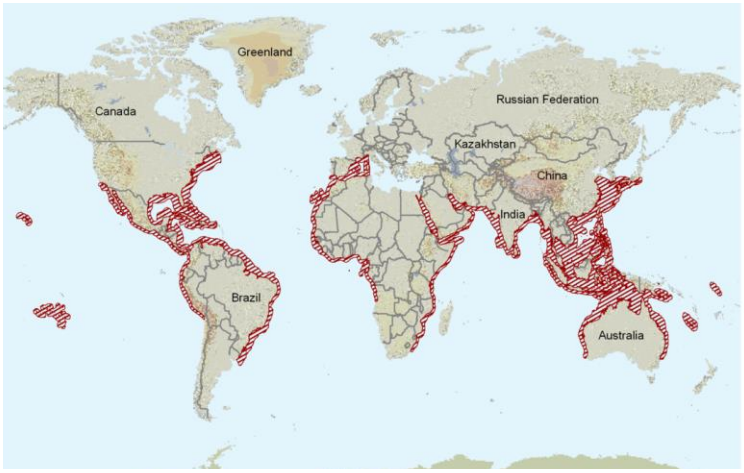


Fig. 1. Scalloped hammerhead shark: The worldwide distribution of the scalloped hammerhead shark (source: www.iucnredlist.org)[1].

TABLE 1. Scalloped hammerhead shark: Biology of Indian Ocean scalloped hammerhead shark (*Sphyrna lewini*).

Parameter	Description
Range and stock structure	The scalloped hammerhead shark is widely distributed and common in warm temperate and tropical waters down to 900 m. It is also found in estuarine and inshore waters. In some areas, the scalloped hammerhead shark forms large resident populations. In other areas, large schools of small-sized sharks are known to migrate seasonally polewards. Area of overlap with IOTC management area = high. There is no information available on stock structure.
Growth and Longevity	The maximum age for Atlantic Ocean scalloped hammerheads is estimated to be over 30 years with the largest individuals reaching over 310 cm TL. In the Eastern Indian Ocean, females are reported to reach 350 m TL
Maturity (50%)	Males in the Indian Ocean mature at around 140-165 cm TL. Females mature at about 200-220 cm TL. In the northern Gulf of Mexico females are believed to mature at about 15 years and males at 9–10 years.
Reproduction	The scalloped hammerhead shark is viviparous with a yolk sac-placenta. Litters consist of 13–41 pups, varying by area. The reproductive cycle is annual and the gestation period is 9–10 months. The nursery areas are in shallow coastal waters. □ Fecundity: medium (<41 pups) □ Generation time: 17–21 years □ Gestation Period: 9–10 months □ Reproductive cycle is annual
Size (length and weight)	The maximum size for Atlantic Ocean scalloped hammerheads is estimated to be over 310 cm TL. In the Eastern Indian Ocean, females are reported to reach 350 m TL New-born pups are around 45–50 cm TL at birth in the eastern Indian Ocean.

Sources: Stevens & Lyle 1989, De Bruyn et al. 2005, White et al. 2008, Jorgensen et al. 2009, Kembaren et al. 2013.

Scalloped hammerhead shark: Fisheries

Scalloped hammerhead sharks are often targeted or taken as an incidental bycatch by some semi-industrial, artisanal and recreational fisheries and often for industrial fisheries (pelagic longline tuna and swordfish fisheries and purse seine fishery) (**TABLE 2**). There is little information on the fisheries prior to the early 1970s, and some countries do not to 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

[1] Map of distribution in the Indian Ocean is not correctly represent species distribution, which is much wider, including Madagascar, Seychelles – whole Mascarene shoals and islands chain (E. Romanov pers. comm.) and to Maldives (Randall and Anderson 1993).

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 IUCN assessment for each of the major geographic regions where the scalloped hammerhead occurs (Baum et al. 2007), suggests a 64% decline in abundance over the study period, based largely on the observations by De Bruyn et al. (2005) and Dudley & Simpfendorfer (2006) which indicate that in localised areas of the western Indian Ocean CPUE of *Sphyrna lewini* declined significantly from 1978–2003 in shark net catches off the beaches of Kwa-Zulu Natal, South Africa. It observed that *Sphyrna lewini* is captured throughout much of its range in the Indian Ocean, including illegal targeting of the species in several areas. Landings reported to FAO by Oman, surveys of landings sites in Oman and interviews with fishers also suggest that catches of *Sphyrna lewini* have declined substantially (IUCN 2007, Baum op. cit. 2007). The species faces heavy fishing pressure in the region, and similar declines in abundance are also inferred in other areas of its range. Papers presented at the IOTC WPEB in 2013 and 2016 show harvesting of scalloped hammerhead neonates and juvenile pups in the artisanal fisheries of both Kenya and Indonesia (Kiilu, 2016).

The practice of shark finning is considered to be regularly occurring and on the increase for this species (Clarke et al. 2006, Clarke 2008, Holmes et al. 2009) and the bycatch/release injury rate is unknown but probably high.

TABLE 2. Estimated frequency of occurrence and bycatch mortality in the Indian Ocean pelagic fisheries.

Gears	PS	LL		BB/TROL/HAND	GILL	UNCL
		SWO	TUNA			
Frequency	rare	common		absent	common	unknown
Fishing Mortality	unknown	unknown	unknown	unknown	unknown	unknown
Post release mortality	unknown	unknown	unknown	unknown	unknown	unknown

Sources: Romanov 2002, 2008, Dudley & Simpfendorfer 2006, Romanov et al. 2008

Scalloped hammerhead shark: Catch trends

The catch estimates for scalloped hammerhead (**TABLE 3**) are highly uncertain as is their utility in terms of minimum catch estimates. Five CPCs have reported detailed data on sharks (i.e. Australia, EU (Spain, Portugal and United Kingdom), I.R. Iran, South Africa, and Sri Lanka) while thirteen CPCs have reported partial data or data aggregated for all species (i.e. Belize, China, Japan, Rep. of Korea, Indonesia, Malaysia, Oman, Seychelles, Mauritius, Philippines, UK-territories, Vanuatu).

TABLE 3. Catch estimates for scalloped hammerhead shark* in the Indian Ocean for 2013 to 2015.

Catch		2013	2014	2015
Most recent catch (reported)	Scalloped hammerhead shark	119 t	33 t	52 t
	nei-sharks	52,043 t	43,062 t	58,454 t

* catches likely to be misidentified with the smooth hammerhead shark (*S. zygaena*) which is an oceanic species.
Nei-sharks: sharks not elsewhere included

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 four countries reported catches of scalloped hammerhead sharks in the IOTC region.

A recent project estimated possible hammerhead shark catches for fleets/countries based on the ratio of shark catch over target species by metier (Murua et al., 2013). The estimation was done using target species nominal catch from the IOTC database and assuming that target catches have been accurately declared. The estimated catch from this study highlighted that the possible underestimation of oceanic whitetip shark in the IOTC database is considerable (i.e. the estimated catch is around 80 times higher than the declared/report and contained in the IOTC database). Although this figure needs to be further investigated, it gives a global figure of the level of underreporting for scalloped hammerhead shark in the Indian Ocean.

Scalloped hammerhead shark: Nominal and standardised CPUE trends

Data not available at the IOTC Secretariat. However, Indian longline research surveys, in which scalloped hammerhead sharks contributed up to 6% of regional catch, demonstrate declining nominal catch rates over the period 1984–2006 (John & Varghese 2009). Nominal CPUE in South African protective net shows steady decline from 1978.

Scalloped hammerhead shark: Average weight in the catch by fisheries

Data not available.

Scalloped hammerhead shark: Number of squares fished

Catch and effort data not available.

STOCK ASSESSMENT

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

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