IOTC Working Party on Ecosystems and Bycatch (WPEB) Mombasa, Kenya

12-14 October, 2009

Depredation. Improvement of the information flow within IOTC. 2. On the IOTC resolution 08/04 "Concerning the recording of the catch by longline fishing vessels in the IOTC area": how to incorporate depredation information and improve shark catch statistics?

by

Romanov Evgeny [(1)]*, Bach Pascal [(2)]

[(1)] IRD, UMR 212 'Ecosystèmes Marins Exploités', Centre de Recherche Halieutique Mediterraneenne et Tropicale Avenue Jean Monnet, BP 171, 34203 Sète Cedex, France
[(2)] IRD, UMR 212 'Ecosystèmes Marins Exploités', SEMIR, 16, rue Claude Chappe, ZI Développement 2000, 97420, Le Port, La Réunion

* Corresponding author, e-mail: evgeny.romanov@ird.fr , Tel : +33 (0)4 99 57 32 35, Fax : +33 (0)4 99 57 32 95

ABSTRACT

Amendments to IOTC resolution 08/04 “Concerning the recording of the catch by longline fishing vessels in the IOTC area” aimed to improve collection of the data on depredation and shark bycatch in the IOTC regulation area are presented. Summary information on occurrence, vulnerability and identification features of several shark species/groups is given. It was suggested to modify minimum requirement list of species in order to include into statistical coverage shark species/groups, which commonly occurs in the catches and could be easily identified by fishermen.

Depredation

Depredation is usually defined as "*the partial or complete removal of hooked fish or bait from fishing gear…*" by predators like cetaceans, sharks, bone fish, birds, squids, crustaceans and others" distinguishing it from predation, i.e. "*the taking of free swimming fish (or other organisms)…*" (Donoghue et al., 2003; Gilman et al., 2007, 2008). In broader aspect depredation could be attributed to *removal or damage* of the catch (fish, cephalopods, crustaceans, etc.) or bait (if applicable) from *any* fishing gear or stocking facility by predators. It should be distinguished from scavenging on animals escaped from fishing gears non-damaged, injured or dead or on discards form fishing vessels. However both types of behaviour may appear simultaneously or sequentially: attracted by fishing gears scavengers may alternate their behaviour and learn to become depredators (Romanov et al., 2009 in preparation).

Although this problem attracts special attention of the Indian Ocean Tuna Commission (IOTC, 1999, 2000a, 2007) general knowledge about this phenomenon is at the low level and statistics of depredation events are reported irregularly to RFMO like IOTC. Workshop on depredation held by IOTC at Seychelles clearly stated lack of depredation statistics for major fisheries in the region (IOTC, 2007). It was also admitted that collection of such statistics required only minor modification of the logbooks.

Shortly after workshop IOTC undertake major step toward standardization and improvement of logbooks for longline (LL) fisheries (Resolution 08/04 Concerning the recording of the catch by longline fishing vessels in the IOTC area) – type of activity affected by depredation to the greatest extent. However no any follow-up for workshop recommendation was done during this modification: IOTC failed to include any depredation reporting requirement.

Topic of this discussion is to develop advice to IOTC Scientific Committee to accept as recommendation an amendment to the Appendix II of the Resolution 08/04.

An amendment 1 to Resolution 08/04 Concerning the recording of the catch by longline fishing vessels in the IOTC area, Appendix II, Chapter 2-2 CATCH/CAPTURES:

'For each species number of individuals damaged by sharks or cetaceans should be given in brackets after number of individual caught. Numbers of damaged fish should not to be included in the number of individual caught, which are considered as non-damaged individuals'.

An amendment 2 to Resolution 08/04 Concerning the recording of the catch by longline fishing vessels in the IOTC area, Appendix II, Chapter 2-4 REMARKS/REMARQUES:

‘3) Each depredation event (damage of the catch by sharks or cetaceans) should be carefully documented in the remarks. Predators caused damage should be indicated in the remarks based either on visual sighting of predators in the vicinity of the vessel/gear or by *post mortem* traces on damaged fish. Source of identification should be stated in the remarks. Sighting information should include number of individual predators spotted in the vicinity of the gear/vessel.’

Sharks

Sharks are dominates in the bycatch in pelagic longline fisheries in the Indian Ocean both in weight and numbers (Romanov et al., 2008). However catch statistics for all shark species in IOTC area is unreliable (IOTC, 2008). Number of IOTC resolutions demanded member countries to improve shark catch statistics but Resolution 08/04 represent major step to expand mandatory requirements onto premier line of fisheries statistics collections: fisheries logbooks.

Resolution 08/04 presents in Appendix II as a mandatory requirement a list of species which should be reported in the logbook, including number of shark species. Although a note in this appendix stated that ‘These species included in the logbook is regarded as minimum requirement. Optionally other shark and/or fish species should be added. Maybe, other shark and fish species caught frequently would be different by area and fishery.’, this list represent major deviation from species occurred in the tropical Indian Ocean LL fisheries (Romanov et al., 2008). Except blue shark included in the list and ‘mako shark’ which advised confusing reporting of two mako species as one, other abundant pelagic tropical shark species/genera are missed (Table 1). Some species listed in the Appendix II are rarely caught in the IOTC area, their area of distribution have little overlap with IOTC area of responsibility.

Furthermore many missed species have an important conservation status of IUCN, are commonly subjected to finning or represent marketable species. Absence if this species/genera in the IOTC ‘Minimum requirement list of species’ allows non-reporting of this species or reporting as ‘other sharks’ group. It should be stressed that most of species/genera missed could be easily identified by person, who has no specific skills in the species identification.

Below we present summary information on listed and missed abundant species and our suggestion to the amendments to the Appendix II of the Resolution 08/04

Table 1.

Minimum requirement list of species (IOTC resolution 08/04).

Original species list in the IOTC resolution	Uncertainties	Comments	Suggestions
1) Southern bluefin,	1) Southern bluefin,		
2) Albacore,	2) Albacore,		
3) Bigeye,	3) Bigeye,		
4) Yellowfin,	4) Yellowfin,		
5) Skipjack	5) Skipjack	Rare species in LL fisheries. Little vertical overlap with tuna LL gear.	Replace with 'other tuna', which can include skipjack, kawakawa, longtail tuna, dogtooth tuna, etc.
6) Swordfish	6) Swordfish		
7) Marlins	7) Marlins		
8) Shortbill spearfish	8) Shortbill spearfish		
9) Sailfish	9) Sailfish		
10) Blue shark	10) Blue shark		
11) Porbeagle	11) Porbeagle	Little overlap with IOTC managed fisheries. Identification uncertain: similar with great white and mako.	Keep in the list but with less priority.
12) Mako shark	12) Mako sharks	Two species of mako occurs in the IOTC area.	
13) Other sharks	13) Other sharks		
14) Other fishes	14) Other fishes		
	? Thresher sharks	Not in the list. Identification easy.	Include in the list with high priority.
	? Hammerhead sharks	Not in the list. Identification easy.	Include in the list with high priority.
	? Great white	Not in the list. Identification uncertain: similar with porbeagle and mako. Conservation status …	Include in the list with high priority.
	? Crocodile shark	Not in the list. Identification relatively certain.	Include in the list with medium priority.
	? Pelagic stingray	Not in the list. Identification relatively certain.	Include in the list with medium priority.
	? Requiem sharks	Not in the list. Identification very difficult at species level at least 24 species in the area. Relatively certain at genera level.	Include in the list with medium priority.
	? Tiger shark	Not in the list. Identification easy.	Include in the list with medium priority.

Porbeagle. *Lamna nasus* (Bonnaterre, 1788)

Vulnerability and conservation status

Species	IUCN status[1]		
	Global status	WIO	EIO
Lamna nasus	VU	-	-

- Fecundity: **low-medium** (4 pups; range 1-5)

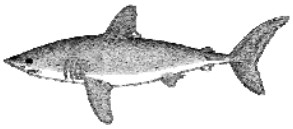
Estimated abundance in the Indian Ocean pelagic fisheries[2] [3] [4]

Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent	rare	absent	unknown	unknown

- Finning practice: **unknown**
- By-catch/release injury rate: **unknown**

- Area overlap with IOTC management area: low (Fig. 1)

Lamna nasus
Porbeagle



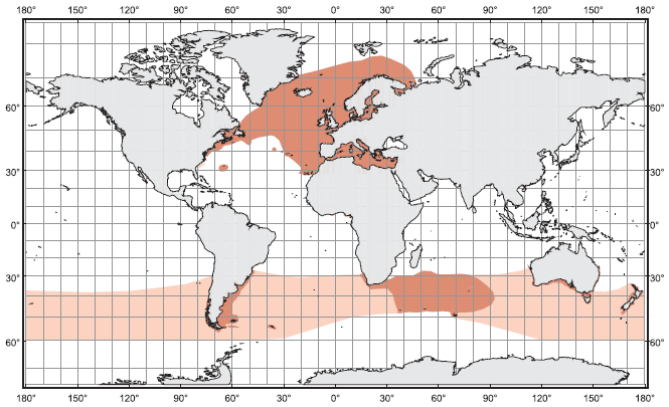


Fig. 1 Distribution area of porbeagle shark (Compagno, 2001).

Identification: could be easily **confused** with mako sharks and great white shark either in the water or on the desk.

Suggestions: Due to little overlap with IOTC managed fisheries and low occurrence in the gear this species could be treated with lower priority but kept in the 'minimum requirement list' of species.

[1] IUCN, 2007.
[2] Based on Romanov, 2002, 2008.
[3] Petersen et al., 2008.
[4] Ariz et al., 2006.

Great white shark. *Carcharodon carcharias* (Linnaeus, 1758)

Vulnerability and conservation status

Species	IUCN status[5]		
	Global status	WIO	EIO
Carcharodon carcharias	VU	-	-

- Fecundity: **low-medium** (2 - ?14)

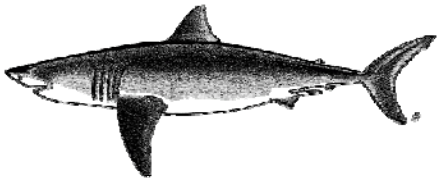
Estimated abundance in the Indian Ocean pelagic fisheries[6] [7] [8]

Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent	unknown (extremely rare?)	absent	rare, beach protecting gillnets?	unknown

- Finning practice: **unknown**
- By-catch/release injury rate: **unknown**

- Area overlap with IOTC management area: high (Fig. 1)

Carcharodon carcharias
Great white shark



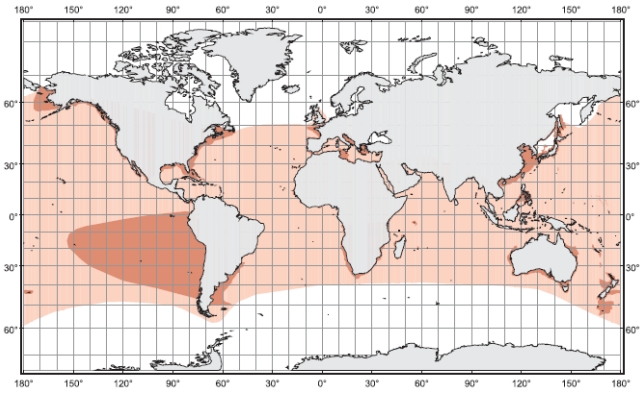


Fig. 2 Distribution area of great white shark (Compagno, 2001).

Identification: could be easily **confused** with mako sharks and porbeagle in the water.

Suggestions: Due to low occurrence in the gear this species could be treated with lower priority despite high overlap with IOTC managed fisheries but included in the 'minimum requirement list' of species.

[5] IUCN, 2007.
[6] Based on Romanov, 2002, 2008;
[7] Petersen et al., 2008
[8] Ariz et al., 2006.

Thresher sharks

Vulnerability and conservation status

Species	IUCN status[9]		
	Global status	WIO	EIO
Alopias pelagicus	DD/VU	-	-
Alopias superciliosus	DD/VU	-	VU
Alopias vulpinus	DD/VU	-	VU

- Fecundity: **low** (2 pups) – **medium** (6 pups, rarely)

Estimated abundance in the Indian Ocean pelagic fisheries[10]

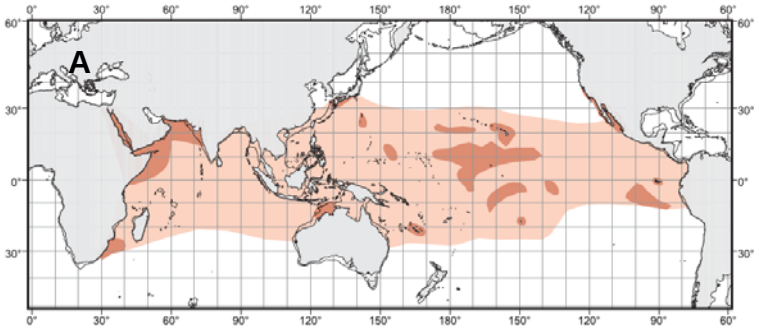
Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent-rare?	abundant	absent	unknown (-common ???)	unknown

- Finning practice: **often** (Clarke et al., 2006, Clarke, 2008)
- By-catch/release injury rate: **unknown, probably high: high mortality due to tail hooking**

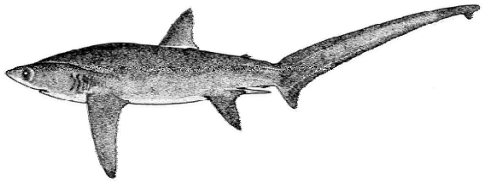
- Area overlap with IOTC management area: high (Fig. 3a, b, c)

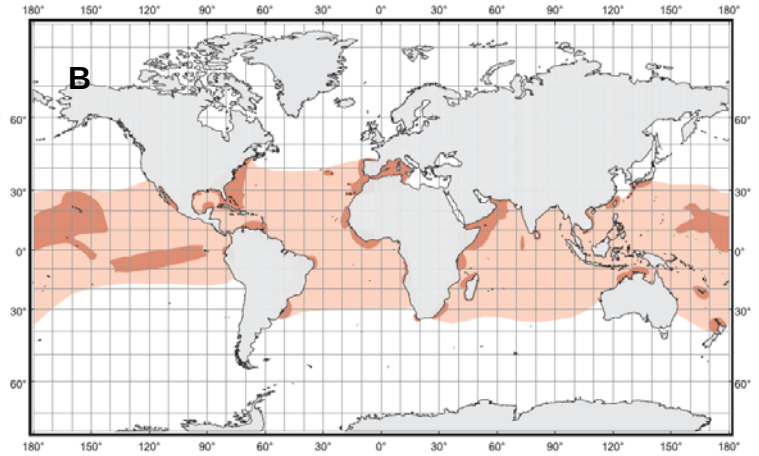
[9] IUCN, 2007.
[10] Based on Romanov, 2002, 2008, Romanov et al., 2008;

Alopias pelagicus
Pelagic thresher



Alopias superciliosus
Bigeye thresher





Alopias vulpinus
Common thresher

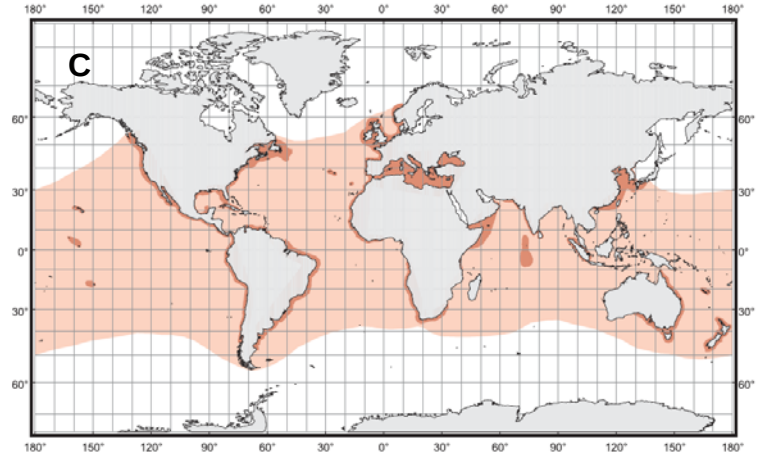


Fig. 3. Distribution area of thresher sharks. A. Pelagic thresher, B. Bigeye thresher, C. Common thresher (Compagno, 2001)

Identification: **very easy at genera level**

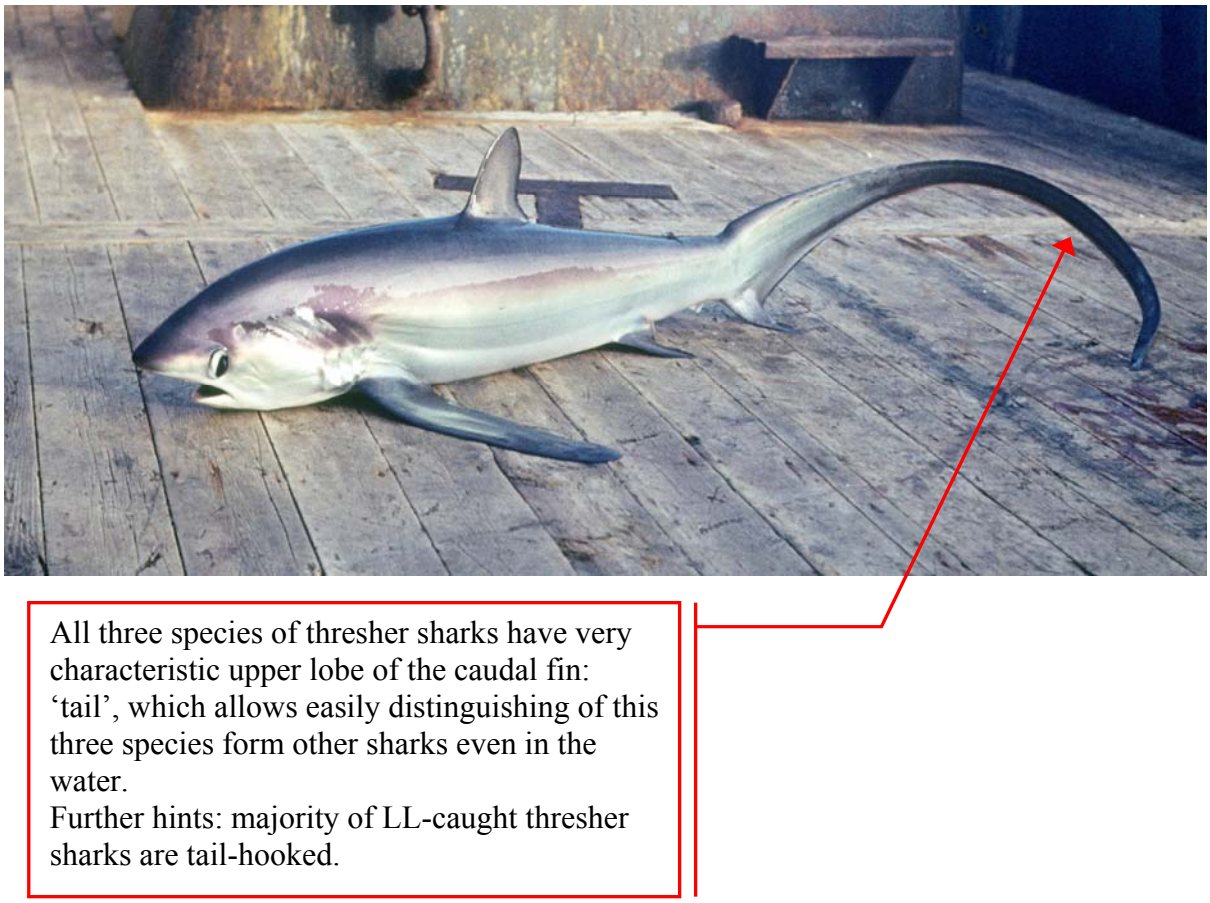


Fig. 4. Identification features of the thresher sharks. Photo: © E. Romanov.

Suggestions: Due to high overlap with IOTC managed fisheries and high occurrence in the LL gear these species should be treated with high priority and included in the 'minimum requirement list' of species.

Hammerhead sharks

Vulnerability and conservation status

Species	IUCN status[11]		
	Global status	WIO	EIO
Eusphyra blochii	**NT**	-	-
Sphyrna lewini	**NT**/EN	-	LC
Sphyrna mokarran	**EN**	EN	DD
Sphyrna zygaena	**NT**	-	LC

- Fecundity: **medium-high** (6-40+ pups)

Estimated abundance in the Indian Ocean pelagic fisheries[12]

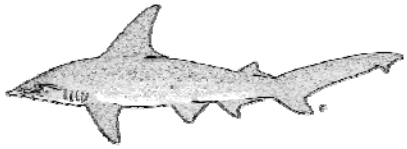
Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	rare-common[13]	common	absent	unknown (common ???)	unknown

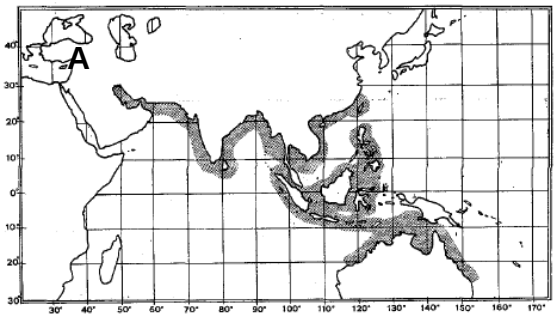
- Finning practice: **very often** (Clarke et al., 2006, Clarke, 2008, Holmes et al., 2009)
- By-catch/release injury rate: **unknown**

- Area overlap with IOTC management area: **high** (Fig. 5a, b, c, d)

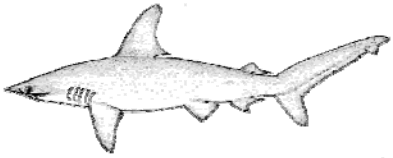
[11] IUCN, 2007.
[12] Based on Romanov, 2002, 2008; Romanov et sl., 2008a
[13] Depends on schools type

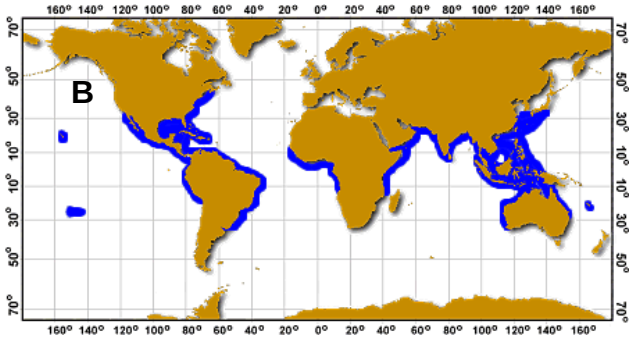
Eusphyra blochii
Winghead shark



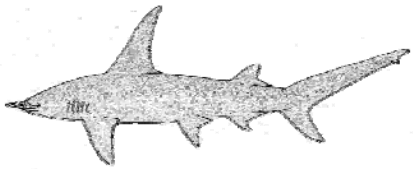


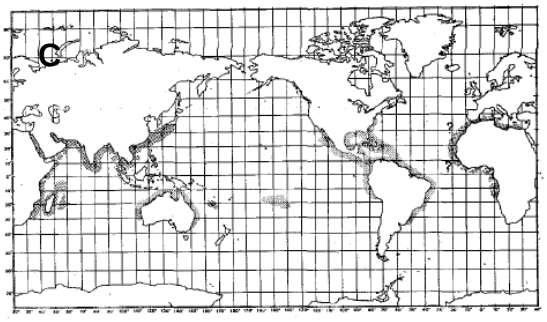
Sphyrna lewini
Scalloped hammerhead





Sphyrna mokarran
Great hammerhead





Sphyrna zygaena
Smooth hammerhead

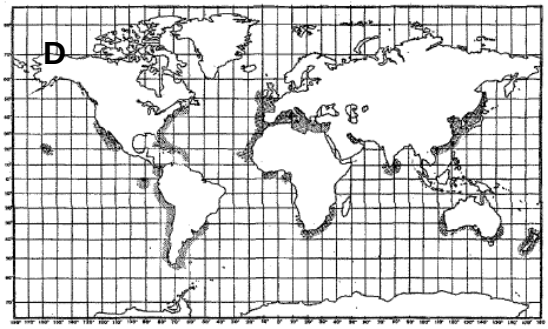


Fig. 5. Distribution area of the hammerhead sharks. A. Winghead shark, B. Scalloped hammerhead, C. Great hammerhead, D. Smooth hammerhead. A, B, D: Compagno (1994), C. FAO, 2009.

Identification: **very easy at genera level**

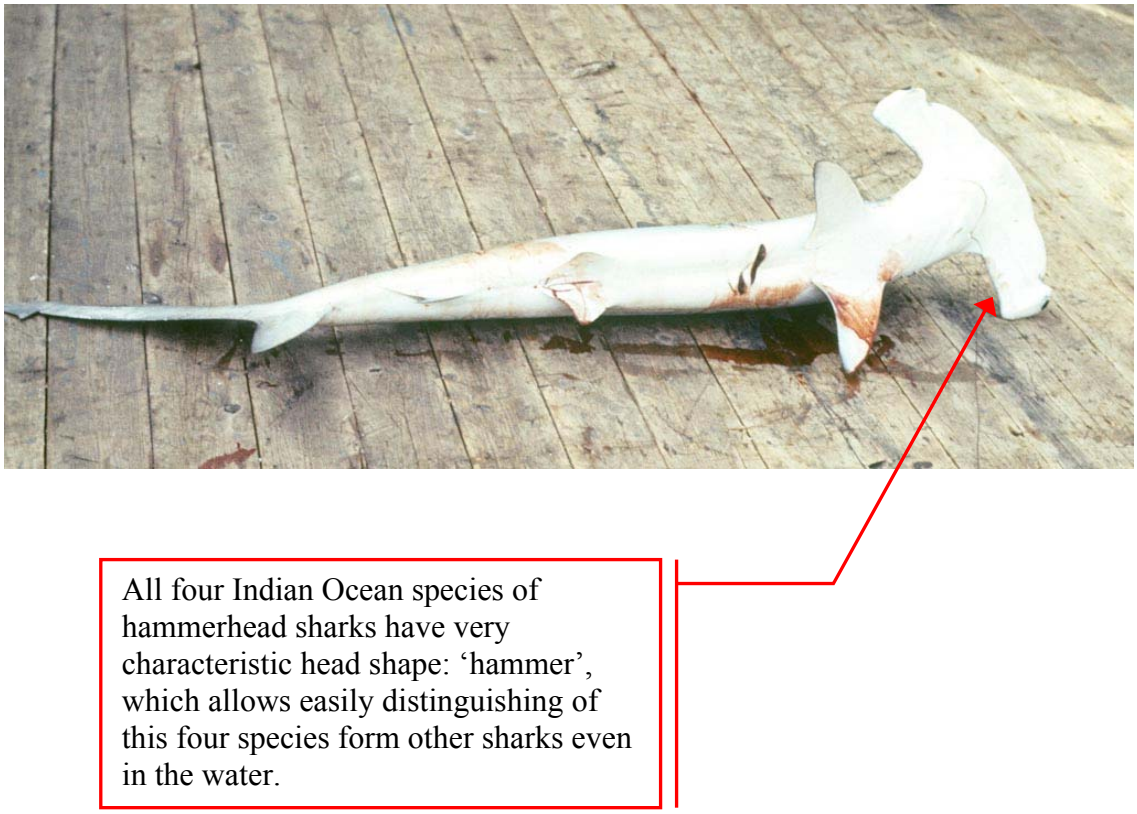


Fig. 6. Identification features of the hammerhead sharks. Photo: © E. Romanov.

Suggestions: Due to high overlap with IOTC managed fisheries and common occurrence in the LL gear these species should be treated with high priority and included in the ‘minimum requirement list’ of species.

Crocodile shark. *Pseudocarcharias kamoharai* (Matsubara, 1936)

Vulnerability and conservation status

Species	IUCN status[14]		
	Global status	WIO	EIO
Pseudocarcharias kamoharai	NT	-	-

- Fecundity: **medium** (4 pups)

Estimated abundance in the Indian Ocean pelagic fisheries[15] [16]

Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent	rare-abundant	absent	unknown	rare in trawls

- Finning practice: **absent or rare**
- By-catch/release injury rate: **high**

- Area overlap with IOTC management area: high (Fig. 7)

Pseudocarcharias kamoharai
Crocodile shark

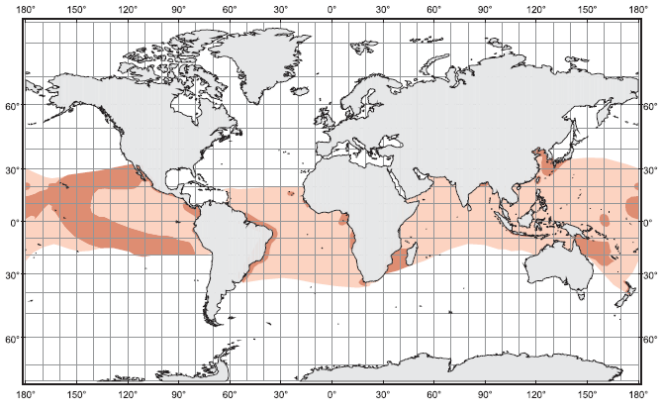


Fig. 7. Distribution area of the crocodile shark (Compagno, 2001),

[14] IUCN, 2007.
[15] Based on Romanov, 2002, 2008, Romanov et al., 2008b.
[16] Petersen et al., 2008.

Identification: Relatively easy. Very characteristic in appearance epi- mesopelagic shark – the only species in the family Pseudocarchariidae.

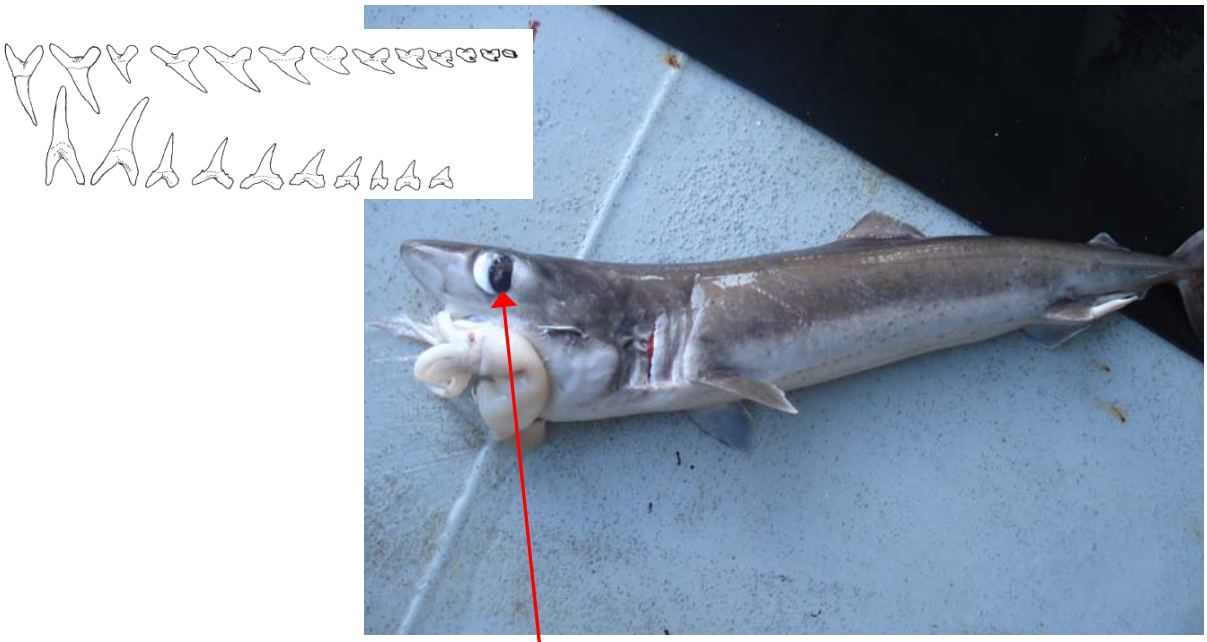


Fig. 8. Identification features of the crocodile sharks. Photo: © P. Bach.

Could be **confused** with species of Odontaspididae family (sand tigersharks), dogfish (Squalidae)

Suggestions: Due to high overlap with IOTC managed fisheries and highly variable occurrence in the LL gear this species could be treated with medium or high priority and included in the 'minimum requirement list' of species.

Pelagic stingray. *Pteroplatytrygon violacea* (Bonaparte, 1832)

Vulnerability and conservation status

Species	IUCN status[17]		
	Global status	WIO	EIO
Pteroplatytrygon violacea	LC	-	-

- Fecundity: **medium** (4 pups)[18]

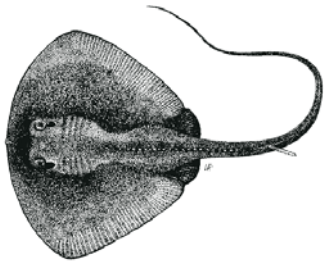
Estimated abundance in the Indian Ocean pelagic fisheries[19]

Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent	rare-abundant	absent	unknown	rare in trawls

- Finning practice: **n/a**
- By-catch/release injury rate: **high**

- Area overlap with IOTC management area: high (Fig. 9)

Pteroplatytrygon violacea
Pelagic stingray



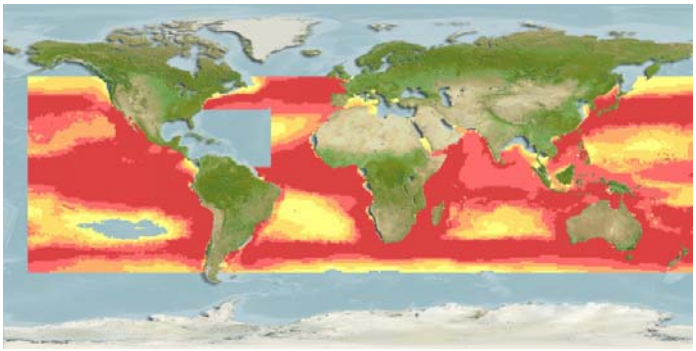


Fig. 9. Distribution area of the crocodile shark (Froese, Pauly, 2009).

[17] IUCN, 2007.
[18] Forselledo et al., 2008.
[19] Based on Romanov, 2002, 2008, Romanov et al., 2008a.

Identification: Relatively easy. The only truly pelagic species of stingray. Could be **confused** with species of Mylobatidae family.

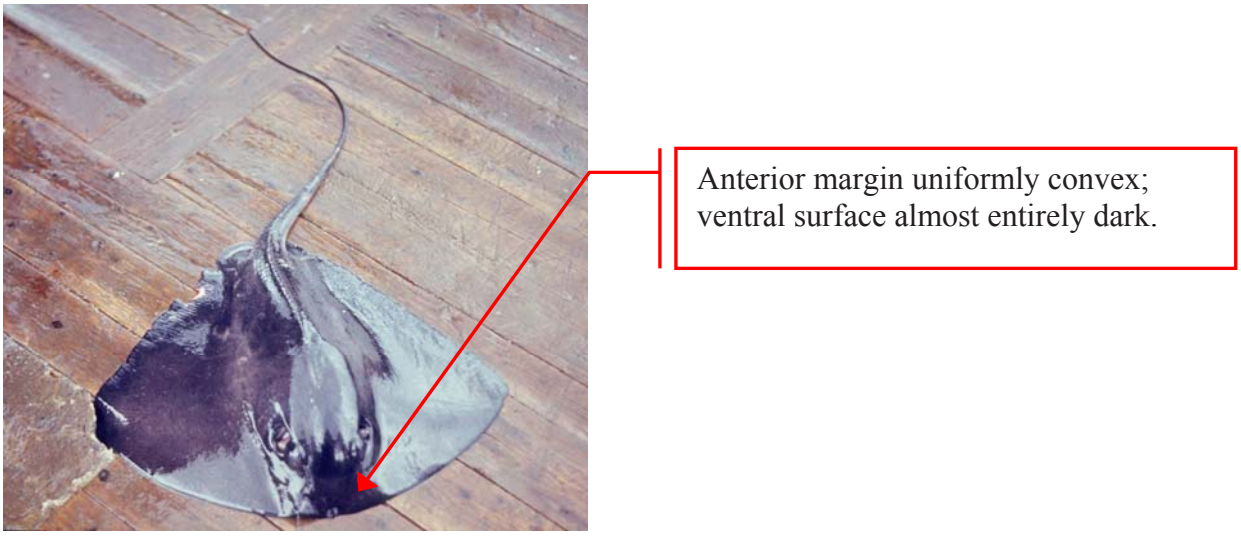


Fig. 10. Identification features of the pelagic stingray. Photo: © E. Romanov.

Suggestions: Due to high overlap with IOTC managed fisheries and highly variable occurrence in the LL gear this species could be treated with medium or high priority and included in the 'minimum requirement list' of species.

Tiger shark. *Galeocerdo cuvier* (Peron & LeSueur, 1822)

Vulnerability and conservation status

Species	IUCN status[20]		
	Global status	WIO	EIO
Galeocerdo cuvier	NT	-	-

- Fecundity: **high** (10-82 pups)

Estimated abundance in the Indian Ocean pelagic fisheries[21] [22]

Gears	PS	LL	BB/TROL/HAND	GILL	UNCL
Abundance	absent	rare-common	absent	unknown	unknown

- Finning practice: **common** (Clarke et al.,. 2006, Holmes et al., 2009)
- By-catch/release injury rate: **unknown**

- Area overlap with IOTC management area: high (Fig. 10)

Galeocerdo cuvier
Tiger shark

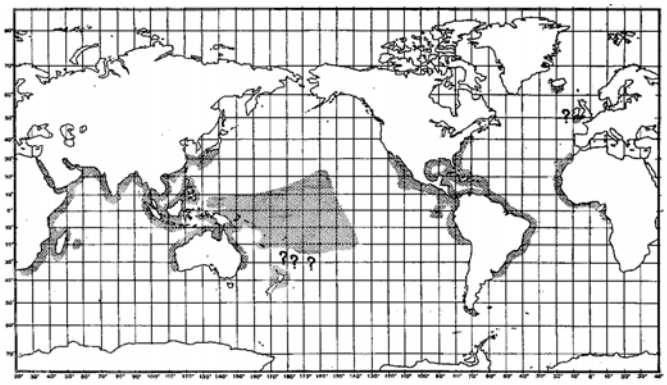


Fig. 10. Distribution area of the tiger shark (Compagno, 2001),

Identification: Relatively easy. Big coastal-pelagic shark with characteristic shape of head.

[20] IUCN, 2007.
[21] Based on Romanov, 2002, 2008, Romanov et al., 2008a.
[22] Petersen et al., 2008.

List of abbreviations

IOTC – Indian Ocean Tuna Commission
IRD – Institut de recherche pour le développement, France
IUCN – the World Conservation Union
IUCN Red list categories used:
EN – Endangered,
DD – Data Deficient,
LC – Least Concern
NT – Near Threatened,
VU – Vulnerable,

REFERENCES

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

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

Clarke, S. C., M. K. McAllister, E. J. Milner-Gulland, G. P. Kirkwood, C. G. J. Michielsens, D. J. Agnew, E. K. Pikitch, H. Nakano, and M. S. Shivji. 2006. Global estimates of shark catches using trade records from commercial markets. Ecology Letters 9:1115-1126.

Compagno, L. J. V. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of sharks species known to date. Part 1. Hexanchiformes to Lamniformes. 4[1], 249 p. 1984. Rome (Italy), FAO. FAO Fisheries Synopsis.

Compagno, L. J. V. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of sharks species known to date.Part 2. Carcharhiniformes. 4[2], 251-655. 1984. Rome (Italy), FAO. FAO Fisheries Synopsis.

Compagno, L. J. V. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). 2[1], 269 p. 2001. Rome (Italy), FAO. FAO Species Catalogue for Fishery Purposes.

FAO, 2009. FAO Species Identification and Data Programme (SIDP). Aquatic Species Fact Sheets. *Sphyrna lewini*. http://www.fao.org/fishery/species/2028/en

Froese, R. and D. Pauly. Editors. 2009. FishBase. World Wide Web electronic publication. www.fishbase.org, version (08/2009).

Holmes, B. H., D. Steinke, and R. D. Ward. 2009. Identification of shark and ray fins using DNA barcoding. Fisheries Research 95:280-288.

IUCN Species Survival Commission's Shark Specialist Group. Review of Chondrichthyan Fishes. 15, 72 p. 2007. Information Press, Oxford, UK., IUCN–The World Conservation Union, the United Nations Environment Programme (UNEP) and the Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals (CMS).IUCN and UNEP/ CMS Secretariat, Bonn, Germany. Technical Report Series.

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

Romanov, E. V. 2002. Bycatch in the tuna purse-seine fisheries of the western Indian Ocean. Fishery Bulletin 100:90-105.

Romanov, E. V. 2008. Bycatch and dscards in the Soviet purse seine tuna fisheries on FAD-associated schools in the north equatorial area of the Western Indian Ocean. Western Indian Ocean Journal of Marine Science 7:163-174.

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

Romanov, E.V., Ward, P., Levesque, J.C., Lawrence, E., 2008b. Preliminary analysis of crocodile shark (Pseudocarcharias kamoharai) distribution and abundance trends in pelagic longline fisheries IOTC Working Party on Ecosystems and Bycatch (WPEB) Bangkok, Thailand. 20-22 October, 2008. 29 p.