Shark Fisheries in the Bay of Bengal, Bangladesh: Status and Potentialities

Support to Sustainable Management of the BOBLME Project

Bangladesh Fisheries Research Institute

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Shark Fisheries in the Bay of Bengal, Bangladesh: Status and Potentialities

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(Based on workshop held on 27 November 2010 at Cox's Bazar)

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Foreword

One of the major Component of regional BOBLME project is Coastal/Marine Natural Resources Management and Sustainable Use. The objective of the component is to promote the development and implementation of demonstrative regional and sub-regional collaborative approaches to address priority common and/or shared natural resource issues which affect the health and status of the Bay of Bengal.

Shark fishery in Bangladesh is not a target/regular fishery, rather incidental as by-catch. But we know that shark products are exported and foreign currency is earned. Shark meat, fin and fin rays are used for human consumption. Shark liver oil is a source of high vitamin-A. Shark hide is also used for the tanning industry.

Besides, being a transboundary species, sharks has got other important ecological roles in the sea, it's a big predator, and acts as an ecological indicator to indicate health of the BoB. Our knowledge about shark fishery is very limited. The aim of this report is to review present status and studies of sharks; catch, conservation, fishing gears and crafts used, shark products produced and preparation techniques; value chain analysis and economics of shark fisheries in Bangladesh. All these would help to prepare a National Plan of Action (NPOA) on sharks which will in turn help to device a regional fishery management plan for sharks for input to Transboundary Diagnostic Analysis approaches in the BOBLME.

The present publication is the outcome of a workshop which was targeted to have better understanding on our shark resources for sustainable exploitation and management. Additional two supplemental papers of interest are also included in the report. I hope the report will provide us a firsthand knowledge on shark fishery in Bangladesh and increase awareness about shark conservation in Bangladesh.

Dr. Md. Gulam Hussain
Director General
Bangladesh Fisheries Research Institute

Acronyms and Abbreviations

BFDC	Bangladesh Fisheries Development Cooperation
BFRI	Bangladesh Fisheries Research Institute
BoB	Bay of Bengal
BOBLME	Bay of Bengal Large Marine Ecosystem
BOBP-IGO	Bay of Bengal Programme-Inter Governmental Organization
CCRF	Code of Conduct for Responsible Fisheries
CITES	Convention on Trade in Endangered Species
COFI	FAO Committee on Fisheries
CPUE	Catch Per Unit Effect
DoF	Department of Fisheries
EEZ	Exclusive Economic Zone
ESBN	Estuarine Set Bag Net
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FD	Forest Department
FRSS	Fisheries Resources Survey System
GEF	Global Environment Facility
GoB	Government of the People's Republic of Bangladesh
ICCAT	International Commission for the Conservation of Atlantic Tunas
IUCN	The World Conservation Union
IUU	Illegal, Unreported, and Unregulated
MCS	Monitoring Control & Surveillance
MoEF	Ministry of Environment and Forest
MoFL	Ministry of Fisheries and Livestock
MSBN	Marine Set Bag Net
MSY	Maximum Sustainable Yield
NGO	Non Government Organisation
NPOA	National Plans of Action
UNDP	United Nations Development Programme

Contents

Workshop Report

The Workshop

The workshop was held at the Conference Hall of the Motel Shaibal, Cox's Bazar on 27 November 2010. The workshop was organized by the Bangladesh Fisheries Research Institute (BFRI) in collaboration with the 'Support to Bay of Bengal Large Marine Ecosystem (BOBLME) project'. A total of 40 participants from Department of Fisheries, Bangladesh Fisheries Research Institute, Bangladesh Fisheries Development Corporation, Institute of Marine Sciences & Fisheries of Chittagong University, Marine Academy, Department of Environment, Department of Forests, NGOs, Traders, Fishers and Journalists were present in the day-long workshop.

Opening Ceremony

The workshop was inaugurated by Dr. M.G. Hussain, Director General, Bangladesh Fisheries Research Institute and National Coordinator, BOBLME- Bangladesh as the Chief Guest. The welcome address and introduction of the workshop was given by Dr. M. Enamul Hoq, National Project Director, Support to Sustainable Management of the BOBLME Project, BFRI. The Inaugural session was Chaired by Dr. S.U. Ahammed, Director (Research & Planning), BFRI.

Technical Session

The technical session was Chaired by Dr. M.G. Hussain. A total of 5 papers were presented in the day-long technical session. The technical session started with the presentation of country status paper on ***Shark fishery in the Bay of Bengal, Bangladesh*** by Dr. A.K. Yousuf Haroon, National Technical Adviser, Support to BOBLME Project, BFRI. Dr. Yousuf elaborated the present staus of shark fishery including harvest locations, gears and crafts used, historical records of catch volume and export earnings from shark products. He reported the presence of 30 species of sharks (representatives of Orectolobiformes and Carcharhiniformes) and 39 species of rays

(representatives of Rhinobatiformes, Myliobatiformes, Pristiformes and Torpediniformes) but no species of skates (representatievs of Rajiformes) and Chimaerids (representatives of Chimaeriformes) from Bangladesh waters. Dr. Yousuf suggested for a review of present stock status; habitat and biology, food and feeding, status and conservation, ecosystem roles of sharks, skates and rays and their use as ecosystem indicators. He also emphasized to devise a BoB regional shark fishery management plan for input to Transboundary Diagnostic Analysis (TDA) which would help in introducing and promoting collaborative fisheries management approaches in the BOBLME region.

The second paper was on ***Catch monitoring and assessment of shark and allied fisheries in the Bay of Bengal*** and was presented by Mr. Bikram Jit Roy, Scientific Officer, Marine Fisheries Survey Management Unit, Marine Fisheries Wing, Department of Fisheries, Chittagong. The third paper was on ***Marine fisheries biodiversity with reference to shark in the Bay of Bengal*** and was presented by Dr. S.M. A. Rashid, Chief Executive, Centre for Advanced Research in Natural Resources and Management (CARINAM), Dhaka. The fourth paper was on ***Shark fishery of Bangladesh and research needs*** and was presented by Dr. Md. Jalilur Rahman, Senior Scientific Officer, Marine Fisheries and Technology Station, BFRI, Cox's Bazar. The last presentation was by Mr. Hossain Islam Bahadur, Secretary, Shark Fishery Traders Welfare Association, Cox's Bazar on ***Trades of shark products in Bangladesh.***

After thread-bare discussions the following recommendations were put forwarded in the workshop. The Chairman of the technical session wrapped up the workshop with few words about the necessity to implement those recommendations for conservation and management of our marine resources including the sharks and concluded the end of the workshop giving thanks to the participants for their active and live participation for making the workshop, on the ***Shark Fisheries in the Bay of Bengal, Bangladesh: Status and Potentialities,*** first of its type in Bangladesh a success.

Summary of Recommendations

Biology & Stock assessment

- Proper recording of species-wise catch data of sharks, skates and rays in landing centers of BFDC are essential;
- Collect catch data of sharks from industrial trawls as (some presenters pointed out that there are some catches in industrial trawls) those are not reflected in Fishery Statistical Year book;
- Updated stock assessment survey on marine fisheries resources including the elasmobranchs (sharks, skates and rays) is needed;
- Research study to understand the migratory patterns of sharks, skates and rays as those are mostly transboundary species;
- Initiatives are to be taken to harvest sharks and other pelagic species by pelagic long-lines as done for pelagic tuna by other BoB countries;
- Develop skilled manpower and appropriate gear technology on pelagic fishing to harness pelagic fisheries resources of Bangladesh;

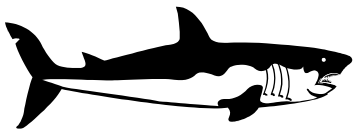
Conservation

- Appropriate law in the Fish Act (at present Fish Act has no forms of restriction for harvesting sharks, while Forestry Act restricts it in Sundarbans area) for sustainable harvesting and conservation of the elasmobranchs;
- Such law should include how many boats (motorized- and non-motorized) and industrial trawlers could be allowed to harvest sharks from which area, in which season and the allowable limit of harvests; in every case proper ways of fishing methods should strictly be followed;

- Coastal areas around Saint Martin's Island and Sundarbans of the BoB should be declared as Marine Protected Area as most sharks use these areas as their nursing grounds;
- Fishing should be completely banned during monsoon period when sea is usually rough in this part of the BoB, this would ensure conservation of the marine fisheries resources and safety of the fishers;

Research & Awareness building

- Prioritize capacity building on taxonomy of elasmobranchs, institutional linkages and research on marine fisheries;
- Immediate steps should be taken to publish a comprehensive taxonomic book/ field guide book on the elasmobranchs for correct identification and its present status of the fishery;
- Establish a modern marine museum at the Marine Fisheries and Technology Station (MFTS) of Bangladesh Fisheries Research Institute (BFRI), Cox's Bazar for capacity building on the taxonomy of marine resources;
- Under the initiatives of the Parjatan Corporation, Bangladesh or Public Private partnership (PPP) a live Marine Aquarium should be established in Cox's Bazar;
- All out measures should be taken to restrict coastal pollution;




Workshop on
Shark Fisheries in the Bay of Bengal, Bangladesh:
Status and Potentialities
27 November 2010
Motel Shaibal, Cox's Bazar
Support to Sustainable Management of the BOBLME Project
Bangladesh Fisheries Research Institute

Shark fishery in the Bay of Bengal, Bangladesh

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Haroon, A.K.Y. 2010. Shark fishery in the Bay of Bengal, Bangladesh. pp. 11-32. *In*: M.E. Hoq, A.K. Yousuf Haroon and M.G. Hussain (eds.) 2011. *Shark fisheries in the Bay of Bengal, Bangladesh: Status and potentialities*. Support to Sustainable Management of the BOBLME Project, Bangladesh Fisheries Research Institute, Bangladesh. 76 p.

Introduction

Bangladesh is one of the marginal coastal countries of the Bay of Bengal Large Marine Ecosystem with a land area of 144,054 km^2, located on the northern tip of the Bay of Bengal and bounded by India on the west, north and north-east and by Myanmar on the east and south-east. Coast line of Bangladesh is about 710 km long stretching from south-west corner of the Sundarbans Mangrove Forest of Satkhira up to Sera deep of the St. Martin's Island in the south-east. Total continental shelf area covers roughly 66,400 km^2 and the exclusive economic zone (EEZ) spans 166,000 km^2 towards open sea and its jurisdiction is up to 200 nautical miles from the beach baseline. The continental slope is about 100,000 km^2. The coastal area is generally shallow where 10 m depth zone spans over 24,000 km^2, 0-40 m depth zone spans around 37,000 km^2 from the beach baseline and 40-100 m depth zone spans around 20,700 km^2. The shelf area of 150 m depth appears to be smooth, few obstacles for bottom trawling, and the continental edge occurs at 160-180 m depths. The slope of continental edge is very steep and seems trawling is not possible in waters deeper than 180 m (Khan *et al.* 1997).

Elasmobranches fishes

Sharks, rays, skates and chimaerids are of great commercial importance worldwide, apart from being a significant link in the marine ecology. Sharks are at the top of most of the ocean's food chains - few creatures prey on them, except perhaps humans. At the other end are the phytoplanktons - tiny free-floating plants. Sharks, without exception, are carnivorous. They are mostly harvested for their liver oil, which is high in vitamin content; for their fins, which are used in soups; and to a lesser extent for their flesh and hides. These groups of fishes are not that economically important for their flesh by the general mass. Only few people of the coastal regions including the tribal people eat them. But their flesh, fins and skins are mostly sun-dried and exported.

Among shark taxonomists conservative estimates of the number of known shark species is now approaching 500. Combined with the 700 or more species of rays and skates there are well over a thousand valid species of elasmobranches. In the past many more species were described only to be discounted later as being synonymous with elasmobranches already described from other geographic areas. In recent years this problem has lessened because taxonomic data has become easier to share over the internet.

Sharks are predominantly marine, oceanic and are widely distributed in the tropical, subtropical and temperate waters of the seas around the world. But a few species enters the brackish water and even the fresh water rivers even beyond the tidal range, like the Ganges, the Tigris and the Zambezi (Migdalsky *et al.* 1989). Sharks of the family Carcharhinidae are the most important group, dominating the fishery all over the world, and this applies equally in Bangladesh.

Classification and taxonomy

Sharks are typically sub-cylindrical in form and are generally drab-coloured creatures, usually with dorsal surfaces of varying shades of gray and brown. Sharks and rays do not have true bones like other fishes (Figs. 1 and 2). They have cartilage instead which is lighter and much more elastic and allows them to bend in very tight circles. Sharks do not have swim bladders. A swim bladder is a gas filled sack inside the body of bony fishes that allows them to stay still

without sinking. Sharks compensate by having a very big liver that is filled with oil. Even so, sharks sink unless they keep swimming forward. The exception is the Sand tiger shark, which swallows air to make it more buoyant. A shark's upper jaw is not fused to its skull like most animals. For general differences between the sharks and fishes see Table 1.

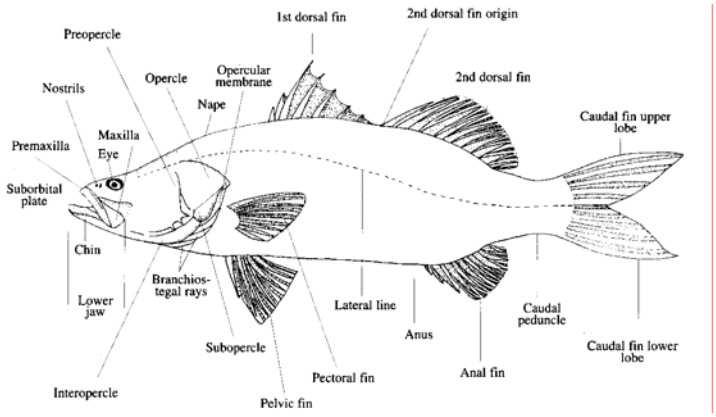

Fig. 1. General features of a bony fish.

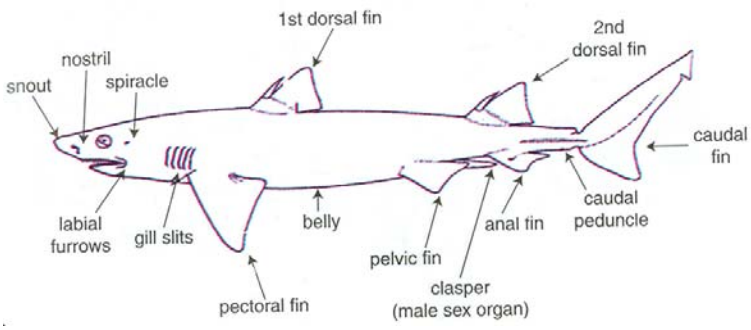

Fig. 2. General features of a shark.

Table 1. General differences between the sharks and fishes.

Organ	Shark	Fish
Air bladder and liver	No air bladder, large liver	Most have air bladder, liver small
Bones and cartilage	Skeleton- cartilaginous	Skeleton- bony
Gill slits	5-7 external gill slits	One pair of gill
Intestine	Short & compact intestine	Small – large intestine
Scales	Placoid scales, denticles	Thin silvery scales
Teeth	Renewable	Not renewable
Tail	Asymmetrical - upper lobe is usually larger than the lower	Symmetrical - upper and lower lobes being same
Reproduction	Internal	External

Reproduction in sharks take place through internal fertilization of the female's eggs. Males are equipped with a pair of copulatory organs called claspers that are located on the inner edges of the pelvic fins. When copulating, the claspers are inserted into the cloaca of the female to transfer the sperm into the oviduct. In some species, only one clasper is inserted at a time, and coitus may last about 20 minutes. The eggs are large and heavily yolk-laden. In most sharks, development is ovoviviparous; in some oviparous; in others viviparous. In the oviparous forms as the egg pass through the oviduct, the nidamental glands secrete the material for the egg case or egg capsule and also some nutritive material, albuminous in nature, surrounding the eggs. The egg capsules of sharks and skates washed ashore on stormy days are called 'mermaids purses' or 'sailors purses'. In skates and rays the egg cases bear stiff pointed horns for fixation at the bottom. The incubation period is prolonged, from 3-4 months to over a year. The young that emerge are able to shift by themselves and lead an independent life. In the viviparous species complete development takes place within the uterus and fully formed young emerge. A sort of connection is established between the embryo and the mother and this, in an elaborate form resembles the placental structure in mammals. The growing embryo draws its nourishment from the yolk, which may pass in the initial stages into the alimentary canal but subsequently the nourishment may reach through the blood vascular system developed between the embryo and the yolk sac. Sharks have extremely low intelligence, and they seem to have no sense of pain. Their sense of smell, however, is particularly well developed.

Many skeletal differences separate sharks from skates and rays, but they can be easily distinguished by the location of the gill openings and the attachment of the edges of the pectoral fins. The gill openings of sharks are at least partly lateral; in skates and rays they are restricted ventrally. The edges of a shark's pectoral fins are not attached to the sides of its head in front of the gill openings; in skates and rays the edges are ahead of the gill openings. Sharks swim by using their bodies and tails; rays, in contrast, are propelled forward by undulating their pectoral fins.

Kingdom: Animalia
Phylum: Chordata
Sub-phylum: Vertebrata
Super-class: Pisces
Class: Osteichthyes (bony fishes)
Chondrichthyes (cartilaginous fish)

Chondrichthyes are divided into 14 orders, of which representatives of 06 orders (with * marks) are reported from Bangladesh waters (Table 2).

Table 2: Different taxonomic orders of sharks, rays, skates and chimaerids.

Sharks
Order 1: HEXANCHIFORMES – Six-gill, Seven-gill and Frilled Sharks
Order 2: SQUALIFORMES - Dogfish Sharks
Order 3: PRISTIOPHORIFORMES – Saw sharks
Order 4: SQUATINIFORMES – Angel sharks
Order 5: HETERODONTIFORMES - Bullhead Sharks
Order 6: *ORECTOLOBIFORMES – Carpet sharks
Order 7: LAMNIFORMES - Mackerel Sharks
Order 8: *CARCHARHINIFORMES - Ground Sharks

Rays
Order 9: *RHINOBATIFORMES - Guitarfishes
Order 10: *MYLIOBATIFORMES – Sting rays, Eagle rays, Butterfly rays, Devil rays, Cow-nose rays
Order 11: *PRISTIFORMES - Sawfishes
Order 12: *TORPEDINIFORMES - Electric rays

Skates
Order 13: RAJIFORMES – Skates

Chimaerids
Order 14: CHIMAERIFORMES - Ratfishes, Rabbitfishes

Shark fishery of Bangladesh

Shark fishery in Bangladesh is not a target fishery; its availability is incidental as by-catch. Works on the biology of elasmobranches fishes (sharks, skates, rays and chimaerids) of Bangladesh is very insignificant and this is probably because of the difficulty in getting adequate statistics and samples. Only the works of Hussain (1969 and 1971), Ahmed and Sarker (1984), Quddus *et al.* (1988), Sarker (1989) and Huda *et al.* (2003) dealt with the taxonomy of shark species of Bangladesh. The book on the marine fishes of Bangladesh (Rahman *et al.* 2009) contained a major part on the elasmobranch fishes. While White and Khan (1985a, 1985b and 1985c), Rahman *et al.* (1995), Mustafa *et al.* (1996) all dealt with the availability and economic importance of the elasmobranches. Roy *et al.* (2007) dealt with status of shark fishing and Haldar (2010) dealt with the necessity for national plan of action for shark fisheries in Bangladesh.

Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it. Sharks are mainly caught by artisanal fishery with drift gill nets (DGNs) used for catching hilsa shad and Indian salmon, set bag nets (SBNs), long lines (LLs) and trammel nets (TNs). These gears are used onboard a wooden mechanized boat and sharks are harvested mostly as by-catch. They usually venture within the 10-80 m depth ranges.

But now a days the shark fishing activities are done mostly by newly introduced ‘Shark nets’. The nets are of 1,500-2,200 meter long, 10-15 m wide with mesh sizes of 400-520 mm. Wooden mechanized boats of 16-17 m long, 4-5 m wide with 45/65 and 75 HP marine diesel engines are used. Each boat carries 15-20 crews and duration of fishing time is around 10-12 day per trip. This type of net is used only in Chittagong areas. Some sharks are also captured as a by-catch of ‘*Lakka Jal’* (large meshed gill nets used for catching Indian Salmon) in Chittagong and Cox’s Bazar areas. These nets are of

3,000-4,000 m long, 10-12 m wide and mesh size is around 220-230 mm. Wooden mechanized boats of 45-65 HP are also used for operating these nets, each boat carries 17-19 crews and duration of fishing is around 10-17 days per trip. Hooks and lines are used only in Cox's Bazar areas for catching sharks as a by-catch. Hooks and lines are also operated by wooden mechanized boat. The boats are usually of 40-50 m long and are with 22-35 HP marine engines. Each boat carries 3-6 crews. The fishing areas are near shore and sometimes off-shore and their fishing duration continues either daily or 2-3 days per trip. Each boat contains 4,000 to 6,000 hooks of between hook size no. 6 and 21 but most fishers' uses hook size no. 9. Mostly small sized sharks, skates and rays are caught in Bangladesh because of the gear limitations. Catch of giant sized sharks are very rare.

- Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it.
- Mostly small sized sharks, skates and rays are caught in Bangladesh because of the gear limitations. Catch of giant sized sharks are very rare.
- Sharks are mainly caught by artisanal fishery with DGNs, SBNs, LLs and TNs.
- Prime catching grounds in the south-west region are Kuakata, Sonar char (island), Ruper char, Fatrar char, Char Gongmoti and Dublar char in Patuakhali and Asar Char, Patharghata areas of Barguna and coastal areas of the Sundarbans.
- In the south-east catching grounds are Sandwip, Kutubdia, Moheshkhali, Cox's Bazar and Teknaf coasts.
- Sharks are also harvested from the four identified fishing grounds such as, South patches, South of south patches, Middle ground and Swatch of no grounds.

Shark catching prime grounds in the south-west region are Kuakata, Sonar char (island), Ruper char, Fatrar char, Char Gongmoti and Dublar char in Patuakhali district and Asar Char, Patharghata areas of Barguna district and coastal areas of the Sunderbans. In the south-east catching grounds are Sandwip, Kutubdia, Moheshkhali, Cox's Bazar and Teknaf coasts. Besides, sharks are also harvested from the four identified fishing grounds such as, South patches, south of south patches, middle ground and swatch of no grounds (Fig. 3). Though Fishery Statistical Year Book does not reflect any catch of sharks by industrial fishing trawlers but Fishery officials of the Marine Fishery Wing of the Department of Fisheries and representatives of Shark Fishery Traders Welfare Association of Cox's Bazar claims that some portion of the catch comes from it. Major landing centers of

sharks are Cox's Bazar, Teknaf, Chittagong, Khulna, Kuakata, Dublar char, Patharghata, Barisal and some small markets along the coasts.

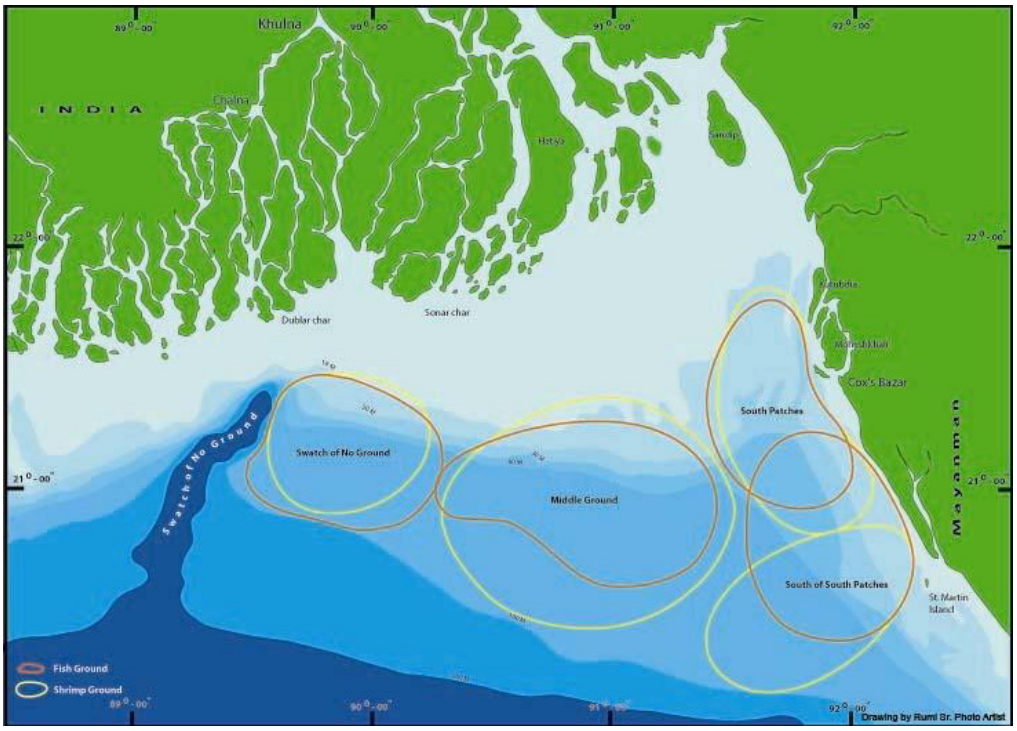

Fig. 3. Shrimp and fish ground in the Bay of Bengal, Bangladesh.

Since whatever is obtained as a by-catch is multi-species catch of multi-gear fishery, no serious effort has ever been made to assess the catch composition or estimates of landings by species on an entire Bangladesh basis. Given also the inadequate information on the biology of the species, especially its growth characteristics, these factors explain the lack of attempt to study population dynamics.

- Major landing centers are Cox's Bazar, Teknaf, Chittagong, Khulna, Kuakata, Dublar char, Patharghata, Barisal and some small markets along the coasts.
- A total of 30 species of sharks (Orectolobiformes and Carcharhiniformes) and 39 species of rays (Rhinobatiformes, Myliobatiformes, Pristiformes and Torpediniformes) were so far recorded from Bangladesh waters but no skates and chimaerids.

Elasmobranches species available in Bangladesh

The smallest shark is *Squaliolosa laticaudus* and the largest shark is *Rhiniodon (Rhincodon) typus*. A total of 30 species of sharks and 39 species of rays were so far recorded from Bangladesh waters but no skates and chimaerids (Table 3).

Table 3. List of sharks and rays reported from Bangladesh waters

Sharks	Rays
1. Chiloscyllium griseum	*35. Rhina ancylostoma*
2. Chiloscyllium indicum	*36. Rhinobatus annandalei*
3. Chiloscyllium punctatum	*37. Rhinobatos granulatus*
4. Stegostoma fasciatum	*38. Rhinobatus obtusus*
5. Rhiniodon (Rhincodon) typus	*39. Rhinobatos thouini*
6. Atelomycterus marmoratus	*40. Rhynchobatus djiddensis*
7. Galeorhinus galeus	*41. Himantura bleekeri*
8. Mustelus (Myrmillo) manazo	*42. Himantura fluviatilis*
9. Mustelus kanekonis	*43. Himantura gerrardi*
10. Chaenogaleus macrostoma	*44. Himantura imbricata*
11. Carcharhinus amblyrhynchoides	*45. Himantura marginata*
12. Carcharhinus amboinensis	*46. Himantura uarnak*
13. Carcharhinus dussumieri	*47. Himantura uarnacoides*
14. Carcharhinus ellioti	*48. Himantura undulata*
15. Carcharhinus falciformis	*49. Himantura walga*
16. Carcharhinus leucas	*50. Dasyatis bennettii*
17. Carcharhinus limbatus	*51. Dasyatis kuhlii*
18. Carcharhinus macloti	*52. Dasyatis zugei*
19. Carcharhinus melanopterus	*53. Urogymnus africana*
20. Carcharhinus sorrah	*54. Taeniura lymma*
21. Galeocerdo cuvier	*55. Aetobatus flagellum*
22. Glyphis gangeticus	*56. Aetobatus narinari*
23. Glyphis glyphis	*57. Aetomylaeus maculatus*
24. Rhizoprionodon acutus	*58. Aetomylaeus nichofii*
25. Scoliodon laticaudus	*59. Gymnura micrura*
26. Triaenodon obesus	*60. Gymnura poecilura*
27. Eusphyra blochii	*61. Mobula diabolus*
28. Sphyrna lewini	*62. Mobula japanica*
29. Sphyrna tudes	*63. Mobula hypostoma*
30. Sphyrna zygaena	*64. Mobula mobular*
31. Anoxypristis cuspidata	*65. Rhinoptera bonasus*
32. Pristis microdon	*66. Rhinoptera javanica*
33. Pristis pectinata	*67. Narcine brunnea*
34. Pristis zijsron	*68. Narcine timlei*

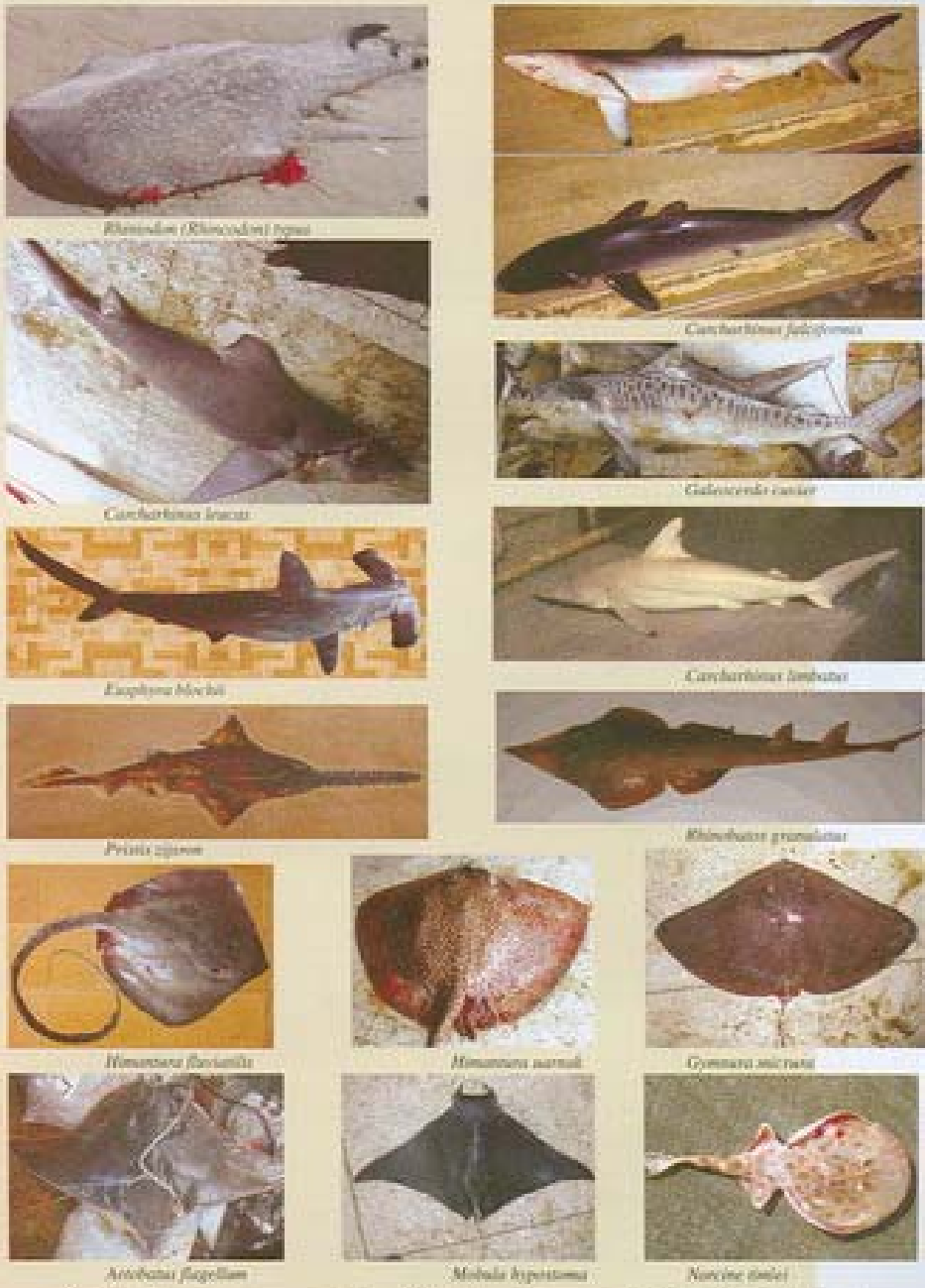

Plate 1. Common representatives of sharks and rays available in Bangladesh waters.

Time series catch data of shark and rays in Bangladesh

There is no detailed information on the landings of sharks by gear type. The Department of Fisheries records the landing of sharks (including skates and rays) following a catch assessment model developed in 1983-84. Since then the model has not been revised or improved despite major changes in sample villages and increases in fishing efforts (Haldar 2010). As a result dependable data base on shark catches are absent.

Time series data of sharks and rays obtained from the Fisheries Resources Survey System unit of the DoF is presented in Table 4. Catch statistics reveal that shark landings were around 1.36-1.5% of the marine catch during 2000-02 and are decreasing since then. Present catch during 2008-09 is around 0.76% of the marine catch. Information on shark landings from the BOBP-IGO member countries are also showing decreasing trend since 2005 (Haldar 2010).

Table 4. Gear- and year-wise catch records (in metric tons) of sharks and rays in respect to total marine catch, Bangladesh. Figures in the parenthesis are percentages in respect to total marine catch

Year/Fishery	Total marine catch*	Sharks and rays
2008-09		
Gill nets	514,644	-
Set Bag Nets		1,863 (0.36)
Long Lines		1,921 (0.37)
Trammel Nets		149 (0.029)
	Total =	**3,933 (0.76)**
2007-08		
Gill nets	497,573	2,538 (0.51)
Set Bag Nets		232 (0.05)
Long Lines		1,634 (0.33)
Trammel Nets		363 (0.07)
	Total =	**4,767 (0.96)**
2006-07		
Gill nets	487,438	2,439 (0.50)
Set Bag Nets		258 (0.05)
Long Lines		1,810 (0.37)
Trammel Nets		283 (0.06)
	Total =	**4,790 (0.98)**

Year/Fishery	Total marine catch*	Sharks and rays
2005-06		
Gill nets	479,810	2,442 (0.51)
Set Bag Nets		211 (0.04)
Long Lines		1,706 (0.36)
Trammel Nets		89 (0.02)
	Total =	**4,448 (0.93)**
2004-05		
Gill nets	474,597	2,245 (0.47)
Set Bag Nets		178 (0.04)
Long Lines		1,570 (0.33)
Trammel Nets		92 (0.02)
	Total =	**4,085 (0.86)**
2003-04		
Gill nets	455,207	2,073 (0.45)
Set Bag Nets		175 (0.04)
Long Lines		2,601 (0.57)
Trammel Nets		97 (0.02)
	Total =	**4,946 (1.09)**
2002-03		
Gill nets	431,908	1,945 (0.45)
Set Bag Nets		291 (0.07)
Long Lines		2,725 (0.63)
Trammel Nets		102 (0.02)
	Total =	**5,063 (1.17)**
2001-02		
Gill nets	415,420	2,251 (0.54)
Set Bag Nets		364 (0.09)
Long Lines		3,533 (0.85)
Trammel Nets		86 (0.02)
	Total =	**6,234 (1.50)**
2000-01		
Gill nets	379,497	2,069 (0.54)
Set Bag Nets		327 (0.09)
Long Lines		2,683 (0,71)
Trammel Nets		83 (0.02)
	Total =	**5,162 (1.36)**

* Not only limited to set bag nets, long lines and trammel nets; total catch from industrial and artisanal fishery.
Source: Fishery Statistical Year Book of Bangladesh, Department of Fisheries, Dhaka

Trends of export earnings from shark products

Shark product exports from Bangladesh during 2008-09 was around 266-276 t with a value of around 17.7-18.2 million Taka but showed fluctuations during 17 years of statistics since 1992-93 (Table 5). It reveals that there is a big volume of export for consecutive 3-4 years and then a drop for 1-2 years since 1992-93. Significant amount of shark products are straddled through the transboundary movement from Bangladesh to neighboring countries. This figure excludes all undocumented exports of shark products (hide, fins, crude oil, meat, etc.) to the neighboring India, Myanmar, Singapore and Thailand. Statistics reveal that export earnings of shark products from Bangladesh are decreasing rapidly since 1999-2000 (Haldar 2010).

Not only shark fins, oil, meat but also shark skins are exported from Bangladesh and this plays an important role in the economy. Shark fin, fin rays and dorsal skin of sharks and rays are exported in Singapore, Hong Kong, China and USA (Roy *et al*. 2007).

Table 5. Time series data of shark exports from Bangladesh*

Year	Export (metric tons)**	Value (million Taka***)
2008-09	276.0	17.70
2007-08	266.0	18.20
2006-07	244.0	41.10
2005-06	78.0	8.00
2004-05	1.0	3.90
2003-04	4.0	15.30
2002-03	172.0	223.50
2001-02	263.0	270.70
2000-01	181.0	206.30
1999-2000	262.0	311.70
1998-99	154.0	174.00
1997-98	155.0	107.90
1996-97	113.0	85.5
1995-96	56.0	42.10
1994-95	212.0	166.00
1993-94	45.0	27.90
1992-93	238.4	142.50

* Fisheries Resources Survey System of the DoF,
** also includes some amount of air bladder of fin-fishes, *** US$ 1= Taka 70.00

Shark products and preparation techniques

Shark is being hunted indiscriminately in the south-western and south-eastern coasts of Bangladesh threatening marine ecosystem even though catching shark is banned under the Forest Conservation Act. Catching shark is now a lucrative business for a large number of fishermen as shark skin, meat, fin, teeth, bone is sold at high prices abroad. More and more fishermen are attracted to shark netting as it often brings more profit than catching fish.

Shark meat for human consumption: Sharks are used as food and preparing fish meal as livestock feed. The meat of many shark species is white or slightly pinkish, juicy and agreeable in appearance. Shark meat contains up to 2.5% urea and has high nitrogen content in the form of volatile bases, ammonia and trimethylamine. It therefore has an unpleasant specific odor and pungent-acid taste. The utilization of elasmobranches fishes for food is mostly by the poorer sections of the people in India, Bangladesh, Myanmar, Sri Lanka and the Maldives as the flesh is considered not quite wholesome. Small species of sharks are used for preparing shark meat. The fish is not filleted and the preparation is limited to removal of guts, fins, skin and head.

The fish is washed in fresh running water to remove slime and dirt and the fish is placed on the cutting board. After the fins are removed, the head is also cut off from the dorsal surface behind the gills. After that the belly is cut open. The viscera are removed from the belly by cutting across the throat in front of the pectoral fin girdle. The fish is cut open along the mid-ventral line to beyond the pelvic fins and the fish is turned over and cut off the dorsal fins and tail. Later the fish is skinned by firmly fixing the head on the ‘S’ hook with the dorsal surface up, firmly gripping the belly flap and the base of the pectoral fins and pulling back towards the tail until the skin comes off completely. Then the fish is removed from the hook. The meat is scored longitudinally. The meat is kept in one piece for salting; often-larger pieces may be further cut up to facilitate handling. After preparing the shark fillets, they are cleaned in seawater and coarse salt is rubbed all over. The fillets are then placed directly into the brine tank. Fillets are left to soak for 3-5 days before rinsing in seawater and being put out to dry on drying tables. Sun drying lasts for 4-8 days or more. Quality of the end product is

very variable. The shark meat is packed either fresh or frozen or salted dry according to the requirements of the customer. Present market price of raw shark meat varies between Tk. 70 and 100/kg [Tk. 70 = 1 US$] in Bangladesh (Haldar 2010).

Shark hide for the tanning industry: A special feature of sharks and rays is the surface of the skin known as ‘shagreen’ which is a kind of rough leather with dermal denticles embedded in the skin, used for rasping and polishing. A rare and expensive product known as ‘boroso leather’ can be obtained by polishing the denticles to a high gloss. The hide can also be converted into fancy leather by removing the dermal denticles. This leather can be used for shoes and other value-added products such as wallets, dress belts, handbags and purses. Skins can generally be produced from sharks and rays without damaged skin, which exceed 1.5 m in length. The operation of skinning and salting must not take more than 24 hours. Sharks and rays meant for skinning should not be gutted, iced or frozen beforehand. Fresh water will spoil the skin so only seawater should be used for washing.

For this the shark or ray is generally skinned (Fig. 4) on a platform, usually on the deck of a fishing boat. It can also be done by suspending the fish from a hook through the upper jaw or with the carcass lying belly down on the ground. A large and very sharp knife is used for the operation. All the fins are cut off except the tail. The knife is inserted in the holes already made by the removal of the dorsal fins and cut forward to the upper front of the head and back to the knob near the tail. The tail is cut off just in front of the knob. Later the area around the head is cut, behind the gills and pectoral fins, then ventrally and forward around the edge of the lower jaw. The skin is pulled off gently by freeing it from the carcass with the knife keeping flat against the skin from the head towards the tail. To avoid ‘sour spots’ i.e. areas of tissue breakdown, skinning must be done within 30 minutes. The skin is washed with seawater immediately after skinning to remove blood and slime. Washing with a hose is preferable. The washed skin is immersed in a 6% brine solution for 3-4 hours to facilitate fleshing. Fleshing is the removal of the residual tissue from the fleshy side of the skin after flaying. It is carried out with a ‘beaming knife’ and a stout ‘beaming board’. The beaming knife is a 40 cm long, curved steel blade having a single edge and a handle at each end. A beaming board is made of

hard wood and measures 1 m wide by 1.5 m long with a curvature across the width that matches that of the beaming knife. After fleshing the tail end of the skin is split by cutting around the ventral fin rudiments and vent and through the hole left by the anal fin.

Fig. 4. Left: Fins taken away from the shark for drying, cut fins on the upper right hand side of the picture; **Right:** mid dorsal skin is being removed from a sting ray for drying.

Immediately after fleshing, the skin is washed with seawater and drained for 10 minutes. Mineral salt is applied generously (about one third of skin weight) on the fleshy side and extra salt is rubbed along the cut edges. Salt must be neither powdered nor too coarse in nature. After that the salted skins are laid flat, one on top of the other, flesh side up with ample salt between each layer on a sloped platform so that the brine can drain away. The pile should not exceed 1.5 m in height. The stacked skins must remain in this condition for a maximum period of 5 days. Complete protection from sun and direct sunlight must be maintained during this time. At the end of the curing period the salted skins are removed one by one. The residual salt is shaken off from the cured skins and fresh salt is applied on the flesh side of the skin. The skins are folded with the flesh side inwards to prevent loss of salt, rolled into bundles and tied with twine. The bundled, cured skins are stored in a clean dry storage place after it has been disinfected with insecticides and fungicides. Shark skin is used for making fashionable leather goods like wallets, women's bag, purses, ornament boxes and shoes. Shark skins are dried and sold at Taka 2,500 to Taka 3,000/kg in Bangladesh, Middle Eastern and European countries is the buyer. Shark fat is reported to be used for making medicines and sold at over Taka 3,000/kg in

Bangladesh. Besides, shark teeth and bones are used for making various ornaments.

Shark fins for soup: Large, edible species of sharks are used to obtain suitable fins in Bangladesh. In India the fins of the following four species are usually collected for export:

- Hammerhead/round headed shark, *Sphyrna zygaena*
- Grey dog shark, *Rhizoprionodon acutus*
- Sharp-nosed/yellow dog shark, *Scoliodon laticaudus*
- Black-finned/black tip shark, *Carcharhinus melanopterus*

The fish is thoroughly washed in running water to remove slime and dirt. Fins are the first items removed from the carcass. The first dorsal, both pectorals and the lower caudal lobe are normally cut off and removed. The second dorsal, pelvic fins and anal from larger sharks are also taken. The dorsal and pectoral fins are normally round-cut, often with considerable flesh attached. The lower caudal lobe and sometimes the other fins are straight-cut (Fig.4). The adhering flesh is removed precisely from the cut fins and washed thoroughly in fresh water. Fresh salt is added to the fins in the ratio of 10:1. Cut-sides of the fins are liberally sprinkled with salt and then a little lime is applied. The fins are left as such for 24 hour. The fins are sun-dried on clean mats until the desired level of 7-8% moisture is obtained; this process usually takes 4-7 days. Special care is taken to keep the fins out of any rain, as fresh water immersion encourages egg lying by flies and subsequent growth of maggots. The fins are then packed, stored and exported according the buyers' specific requirements. In the BFDC fish landing centre, Cox's Bazar, Bangladesh it has been seen that the fins of all shark species, be small or large, are collected for export.

Shark fin rays for soup: Fresh and dried fins of edible sharks can also be used for making soups. Shark fins are soaked in clean fresh water, acidified to pH 2.5-5.0 with acetic acid for 48 h. The shagreen is scraped off and soaking continued for 72 h for fresh/raw fins and 120 h for dried fins. The soaking is done to soften the fins. The softened fins are heated/ dried together with 10% acetic acid for 60 minutes for over-dried/long-stored dry fins. The rays are separated manually from the loosened flesh if individual rays are required and washed thoroughly in cold fresh water. In the case of tiny fins, the

rays are separated by gentle agitation using a mechanical stirrer. The fin rays thus separated are dried in the sun on mats spread on clean raised cement platforms until moisture content of 5-8% is attained. The dried fin rays are then taken away from the sun and kept in shade for 30-60 minutes, packed in convenient quantities in polyethylene bags. The dried shark fin rays are stored in a dry, clean area until exported. Market prices of different types and sizes of shark's fin at Cox's Bazar are furnished below (Table 6).

Table 6. Market price* of different types and sizes of shark's fin in Bangladesh (as of 2009)

Size of fin (cm)	Price/set raw fins (Tk.)	Price /set salted dry fins (Tk.)
5-10	20.00	800.00
10-15	60.00	1,600.00
15-20	150.00	2,500.00
20-25	400.00	8,000.00
25-38	8,000.00	8,000.00
38-45	9,000.00	8,500.00
45-50	12,000.00	10,500.00
>50	16,000.00	11,000.00

* Source Haldar (2010); Tk. 70 = 1 US$

Shark liver oil: High-value, squalene-rich shark liver oil is used in the tanning and textile industries, as a lubricant and also as a rich source of vitamin-A having a high medicinal value. The livers weigh 10-25% of the shark's body weight and contain 60-70% oil. Indian sharks contain 2 to 180 kg of liver depending upon size, season etc. The easiest method of extracting shark liver oil is to mince the livers after removal from the shark and boil them with water in suitable metal containers. Boiling continues until all the water has evaporated. When the oil floats to the surface it is ladled off. This stage can be recognized in two ways. First, once all the water evaporates, the boiling liquids will no longer steam. Secondly, a thin wooden or cotton splint dipped in the liquid and then placed in the fire will ignite only if the water has been removed. The resulting crude oil is strained through a suitable strainer (usually gunny sack) into a suitable container. Present market price of crude shark oil varies between Tk. 45 and 55/kg in Bangladesh (Haldar 2010).

A more efficient method of extracting shark liver oil is by digesting the chopped livers with 1-2% by weight of sodium hydroxide or 2-

5% of sodium carbonate at 82-85°C. During the operation continuous stirring is required. This method results in the dissolution of all proteinaceous matter and complete release of the oil. The oil is then separated using a centrifuge. The oil is stored in barrels. Exporters using a hand-held refractometer check squalene content of the oil.

For pharmaceutical grade shark liver oil the material is purified and bottled. For consumer acceptance the oil is issued in the form of capsules or as sweetened palatable products. In India, indigenous production of shark liver oil has replaced the imports of cod-liver oil for medicinal purposes since the Second World War. In Bangladesh the Fisheries Technology Laboratory of the then Freshwater Fisheries Research Station at Chandpur was quite successful in producing bottled cod-liver oil back in 1976-78s but it stopped due to unknown reasons since then.

The amount of oil and vitamin content are known to vary much in some species, with different growth stages. The species much sought after for extraction of medicinal oil are those with high vitamin-A content in terms of International units per gram weight of oil, such as *Carcharhinus gangeticus* (97,000 units), *C. melanopterus* (45,450 units), *Sphyrna zygaena* (22,752 units), *Scoliodon sorrakowah* (up to 8,853 units), and *Pristis microdon* (6,618 units). In some of these species, the vitamin-A content has been observed to be inversely proportional to the percentage of oil that the livers possess. Species with only fair maounts of vitamin-A content but widely used for the purposes are *Galeocerdo cuvier, Scoliodon palasorrah, S. walbeehmi, Carcharhinus limbatus, Sphyrna blochii* and *Pristis cuspidatus* (Bykov 1983, Bal and Rao 1990). The oils extracted from some skates and rays with poor vitamin content are used for lubricating machinery or tanning leather. The fishermen also use crude shark oil when the catches are plenty for painting and treating wooden fishing craft/boat (*dhoni* in the Maldives) to prevent settlement of fouling organisms and woodborers.

Conclusion and future needs

- Prepare a National Plan of Action (NPOA) on sharks and devise a regional fishery management plan for sharks for input to Transboundary Diagnostic Analysis (TDA) which would help in introducing and promoting collaborative fisheries management approaches in the BOBLME.
- Review present stock assessments, studies, stock status of sharks;
- Needs proper recording of species-wise catch data of sharks, skates and rays;
- Need to collect catch data of sharks from industrial trawlers as those are not reflected in Fishery Statistical Year book;
- Pelagic shark fishery is not properly exploited; Initiatives are to be taken to harvest sharks and other pelagic species by pelagic long-lines as done for pelagic tuna by other BoB countries; need to develop skilled gear and manpower on pelagic fishing to harness pelagic shark resources of Bangladesh. The survey of the Bay of Bengal by the BIMSTEC, the Department of Fisheries and SEAFDEC, Thailand during 25 October through 21 December 2007 reported harvesting of *Iago garricki*, *Carcharhinus falciformis* and *Pteroplatytrygon violacea* by pelagic longline and drift gill net in the Bangladesh part of the Bay of Bengal (Krajangdara *et al.* 2008);
- Compile habitat and biology, food and feeding, geographical distribution, interest to fisheries, status and conservation, ecosystem roles, species of sharks, skates and rays used as ecosystem indicators;
- Identify and compile harvesting grounds of sharks, skates an rays in Bangladesh; fishing gears and crafts used;
- Understand present annual harvest and commercial value, economic importance; shark products produced and preparation techniques; value chain analysis and economics of shark fisheries in Bangladesh;
- Needs ecosystem-based research study to understand the **i.** migratory patterns of sharks, skates and rays as those are mostly transboundary species; **ii.** trophic interactions, **iii.** predator-prey relationships, **iv.** shark-turtle relationships, **v.** impacts of shark on other predators and preys and **vi.** biodiversity and genetics;
- Study maturity, spawning season, spawning ground and spawning mechanisms, age and growth, mortality, etc.;
- Initiate research on improvement of utilization technology of shark products, extraction of shark liver oil (during 1976-78 the Technological Laboratory of Freshwater Fisheries Research Station, Chandpur of the Department of Fisheries used to produce bottled shark liver oil), value added products (VAPs) using meat, hide and fins, jewellary products using teeth and drying in bad weather conditions (using BFRI developed Fish Dryer);

- Develop a BoB Regional management plan for sharks [device harmonization plan for data collection, standardization, designing and implementation of a sub-regional common fishery data/information system in the BOBLME];
- Prepare and publish a good pictorial taxonomic book for easy identification of elasmobranches species of the Bay of Bengal, Bangladesh;

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References

Ahmed, A.T.N. and M.N. Sarker. 1984. Shark fishery of the Bay of Bengal. J. NOAMI, 1(1): 1-6.

Bal, D.V. and K.V. Rao. 1990. Marine fisheries of India. First revised edition. Tata McGraw-Hill Publishing Company Ltd., New Delhi. 472 p.

Bykov, V.P. (ed.). 1983. Marine fishes. Chemical composition and processing properties. Amerind Publishing Co. Pvt. Ltd., New Delhi, India. 322 p.

Haldar, G.C. 2010. National plan of action for shark fisheries in Bangladesh. pp. 75-89. *In* M.G. Hussain and M.E. Hoq (eds.) Sustainable management of fisheries resources of the Bay of Bengal. Support to Sustainable Management of the BOBLME Project. SBOBLME Pub./Rep. 2, Bangladesh Fisheries Research Institute, Mymensingh. 122 p.

Huda, M.S., M.E. Haque, A.S. Babul and N.C. Shil. 2003. Field gude to finfishes of Sundarban. Aquatic Resources Division, Sundarban. Sundarban Biodiversity Conservation Project, Bangladesh Forest Department, Boyra, Khulna, Bangladesh. 197 p.

Hussain, M.M. 1971. The commercial fishes of the Bay of Bengal. Survey for the development of fisheries in East Pakistan. Chittagong, UNDP Project PAK 22, Project Publication No. 1: 60 p.

Hussain, M.M. 1969. Marine and estuarine fishes of the north-east part of Bay of Bengal. Scientific Researches, East regional Laboratories, Pakistan, Vol. VII (1): 26-55.

Khan, M.G., M. Alamgir and M. N. Sada. 1997. The coastal fisheries of Bangladesh. pp.26-37. *In*: G. Silvestre and D. Pauly (eds.) Status and management of tropical coastal fisheries in Asia. ICLARM Conf. Proc. 53, 208 p.

Krajangdara, T., R. Sujittosakul and M.J. Rahman. 2008. Elasmobranches found in the Bay of Bengal from pelagic longline and drift gill net fishing. pp. 190-194. *In:* The ecosystem-based fishery management in the Bay of Bengal. BIMSTEC, Department of Fisheries and SEAFDEC, Thailand. 250 p.

Migdalski, E.C., G.S. Fichter and N. Weaver. 1989. The fresh and salt water fishes of the world. Greenwich House, New York, USA, 316 p.

Mustafa, M.G., P. Dey. Z.A. Chowdhury, M.N.U Sada, and M.G. Khan. 1996. Bangladesh Marine Fisheries Resources Studies 1994-95. Marine Fisheries Survey Management Unit, Directorate of Fisheries, Bangladesh. 32-35.

Quddus, M.M.A., M.N. Sarker and A.K. Banarjee. 1988. Studies on the Chondrichthyes fauna (sharks, skates and rays) of the Bay of Bengal. J. NOAMI, 5(2): 19-39.

Rahman, A.K.A. S.M.H. Kabir, M. Ahmad, A.T.A. Ahmed, Z.U. Ahmed, Z.N.T. Begum, M.A. Hassan and M. Khondker (eds.). 2009. *Encyclopedia of Flora and Fauna of Bangladesh*. Vol. 24, Marine Fishes. Asiatic Society of Bangladesh, Dhaka. 485 p.

Rahman, A. K. A., M.G. Khan, Z.A. Chowdhury and M.M. Hussain. 1995. Economically important marine fishes and shell fishes of Bangladesh. Department of Fisheries, Dhaka, Bangladesh. 1-12.

Roy, B.J., M.P. Dey, M.F. Alam and N.K. Singha. 2007. Status of shark fishing in the marine water of Bangladesh. UNEP/CMS/MS/Inf/10. 17 p.

Sarker, M.N. 1989. An observation on the landing of sharks in coastal areas of Cox's Bazar region. Bangladesh J. Sci. Res., 7(2): 269-271.

White, T.F. and M.G. Khan. 1985a. Marine fisheries resources survey: Demersal trawling. Survey Cruise Report No. 2. Marine Fisheries Research Management and Development Project, BGD/BD/025, Chittagong, Bangladesh. 10 p.

White, T.F. and M.G Khan. 1985b. Marine Fisheries Resources Survey: Demersal Trawling. Survey Cruise Report No.3. Marine Fisheries Research Management and Development Project, BGD/80/025, Chittagong, Bangladesh, 10p.

White, T.F and M.G. Khan. 1985c. Marine Fisheries Resources Survey: Demersal Trawling. Survey Cruise Report No. 4. Marine Fisheries Research Management and Development Project, BGD/BD/025, /CR4, Chittagong, Bangladesh, 10 p.

Catch monitoring and assessment of shark and allied fisheries in the Bay of Bengal

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Roy, B.J. 2010. Catch monitoring and assessment of shark and allied fisheries in the By of Bengal. pp. 33-42. *In*: M.E. Hoq, A.K. Yousuf Haroon and M.G. Hussain (eds.). 2011. *Shark fisheries in the Bay of Bengal, Bangladesh: Status and potentialities*. Support to Sustainable Management of the BOBLME Project, Bangladesh Fisheries Research Institute (BFRI), Bangladesh. 76 p.

Overview

Shark fishery contributed only a minor portion (0.96% of the total marine fish landing) to the overall fisheries production (0.19%) in Bangladesh. During 2008-2009 a total of 3,933 t of sharks and rays were harvested. Sharks are caught mainly by shark net (modified gill net), sometimes by hooks and lines and trammel nets as well. Rays are mainly caught by hooks and lines and set bag nets.

In Bangladesh sharks and rays are targeted by fishers for trade but sometimes they are caught together with other commercially important species as by-catch. Generally sharks and rays are not eaten by the common people in this country but are consumed by some Hindu and tribal people. There are some small scale sharks processing plants in Bangladesh in the form of cottage industry but it is seasonal.

Sharks and rays species in Bangladesh waters

The country has a vast river net works and 166,000 sq. km. marine

water area including exclusive economic zone (EEZ). In this area 53 species of sharks, skates and rays were reported (Hussain 1971), the highest number 63 was reported by Day (1986) followed by IUCN (2000). Shark harvesting grounds (including marine water area) of Bangladesh is shown in Fig. 1.

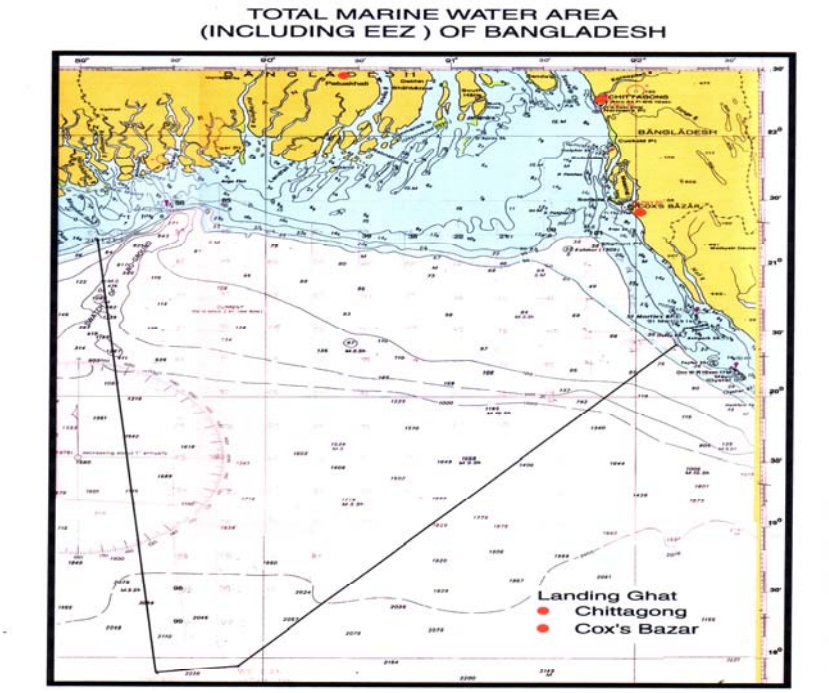

Fig. 1. Total marine water area (including EEZ) of Bangladesh.

But in our study from 2005-2006 to 2009-2010 mainly at Chittagong, Cox's Bazar and partially at Mohipur, Alipur, Kuakata, 11 species of sharks and 16 species of rays were identified (Table 1).

- Fifty three species of sharks, skates and rays were reported by Hussain (1971), the highest number 63 was reported by Day (1986) followed by IUCN (2000).
- Study during 2005-2006 through 2009-2010 mainly at Chittagong, Cox's Bazar and partially at Mohipur, Alipur, Kuakata, revealed the presence of 11 species of sharks and 16 species of rays.

Table 1. Species composition of sharks' and rays' during 2005-06 to 2009 10 in Chittagong and Cox's Bazar

Sl. No	Species name	English name
Sharks		
1.	*Rhizoprionodon acutus*	Milk shark
2.	*Scoliodon laticaudus*	Dog shark (Sharp nose shark)
3.	*Sphyrna blochii*	Arrow headed hammerhead shark
4.	*Sphyrna zygaena*	Smooth hammer head shark
5.	*Stegostoma fasciatum*	Zebra shark
6.	*Chiloscyllium indicum*	Ridge back cat shark
7.	*Galeocerdo cuvier*	Tiger shark
8.	*Carcharhinus melonoptera*	Black shark
9.	*Carcharhinus leucas*	Bull shark
10.	*Carcharhinus amblyrhynchos*	Grey shark
11.	*Carcharhinus falciformis*	Silky shark
Rays		
1.	*Himantura walga*	Scaly sting ray
2.	*H. uarnak*	Banded whiptail (Honey Comb) sting ray
3.	*H. bleekeri*	Whiptail sting ray
4.	*H. undulata*	Leopard whip ray
5.	*H. gerrardi*	Whit spotted whip ray
6.	*Rhinoptera javanica*	Javanese cow ray
7.	*Gymnura micrura*	Short tail butterfly ray
8.	*G. poecilura*	Long tail butterfly ray
9.	*Aetomylaeus nichofii*	Nieuhof's eagle ray
10.	*Mobula diabulus*	Devil ray (Bat ray)
11.	*Narcine timlei*	Black spotted electric ray
12.	*Taeniura sp.*	Fantail ray
13.	*Anoxypristis cuspidata*	Knife tooth sawfish
14.	*Rhina ancylostoma*	Bow mouth head guitar fish
15.	*Rhinobatos granulatus*	Granulated shovel nose ray
16.	*Rhynchobatus djiddensis*	White spotted shovel nose ray

Source: Marine Fisheries Survey Management Unit (MFSMU), DoF, Chittagong, yearly report.

Commercial landing of sharks and rays in Bangladesh

In Bangladesh species-wise catch is not recorded rather only by groups of sharks and rays are recorded. In the year 2008-2009 a total of 3,933 t of sharks and rays were harvested. During 2007-08, 2006-07, 2005-06 and 2004-05 total exploitation of sharks and rays were 4,767 t, 4,790 t, 4,448 t and 4,085 t respectively (Fig.2).

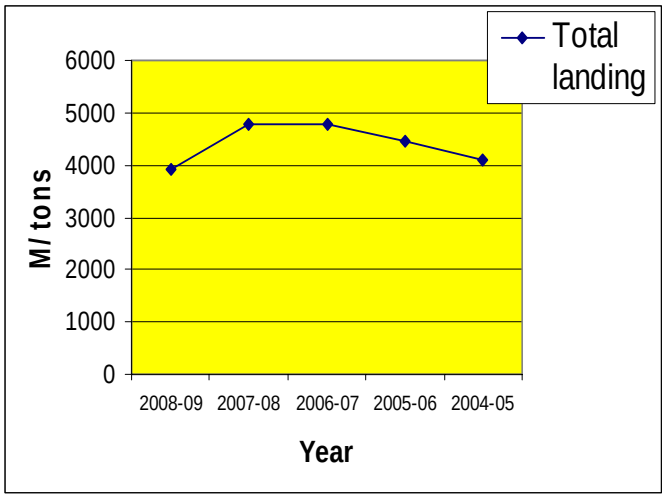

Fig. 2. Time-series data of total landing of sharks and rays in Bangladesh.

Landing of sharks and rays in Chittagong and Cox's Bazar

The trends of sharks and rays landing has decreased gradually from 2005-06 to 2009-10. It was observed that sharks and rays were exploited as a by-catch more or less throughout the year. But commercial harvesting is done during September-May period. During the year 2005-2006 a total 431.372 t of sharks and rays were exploited. In the year 2006-07, 2007-08, 2008-09 and 2009-10 total landing of sharks and rays were 350.621 t (sharks 92.418 t and rays

258.203 t), 197.1698 t (sharks 76.929 t and rays 120.340 t), 180.915 t (sharks 91.258 t and rays 83.657 t) and 172.266 (sharks 120.478 t and rays 51.788 t) respectively (Fig. 3).

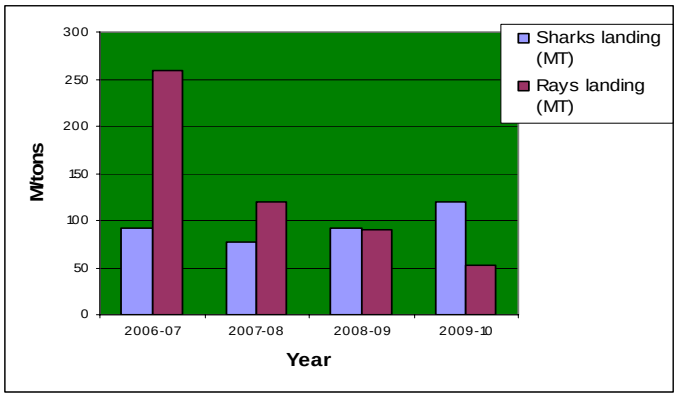

Fig. 3. Landing trends of sharks and rays in Chittagong and Cox's Bazar during 2005-06 to 2009-10.

Catch rate and percentage composition of sharks and rays in Chittagong and Cox's Bazar

The highest and lowest catch of sharks were 120.478 t and 92.418 t during 2009-10 and 2006-07 respectively in the overall sharks and rays' catch composition. Highest and lowest catch of rays were 258.203 t and 51.788 t in the year 2006-07 and 2009-10 respectively (Fig. 3). The highest and lowest percentage composition of sharks were 69.94 and 26.36 during 2009-10 and 2006-07 respectively in the total catch of sharks and rays (Table 2). During 2006-07 and 2009-10 the maximum and minimum catch percentage of rays were 73.64 and 30.06 respectively (Table 2).

Table 2. Composition of sharks and rays catch during 2006-2010.

Sl. No	Year	% composition of sharks	% composition of rays
1.	2006-07	26.36	73.64
2.	2007-08	38.97	61.03
3.	2008-09	50.44	49.56
4.	2009-10	69.94	30.06

Source: MFSMU, DoF, Chittagong, yearly report.

Gear wise exploitation of sharks and says with allied fishery

Shrimp trawl net is the main gear that catches small-sized rays (juveniles), few numbers of juvenile sharks and sometimes large-sized rays comes as by-catch, these are usually unreported because most of the time those are thrown into the sea as trash. Only in artisanal fishing all sharks and rays are reported as volume, not by species. During 2004-05 to 2007-08 shark net (a modified gill net) fishing was the main gear that harvested sharks as targeted species but sometimes sharks are caught by other gill nets associated with hilsa shad (*Tenualosa ilisha*), rup chanda (silver pomphret), lakkha (Indian salmon) fishing and other pelagic fishery.

- Shrimp trawl net is the main gear that catches small-sized rays (juveniles), few numbers of juvenile sharks and sometimes large-sized rays comes as by-catch.
- During 2004-05 to 2007-08 shark net (a modified gill net) fishing was the main gear that harvested sharks as targeted species.
- Sharks are also caught by other gill nets associated with hilsa shad (*Tenualosa ilisha*), rup chanda (silver pomphret), lakkha (Indian salmon) fishing and other pelagic fishery.
- Long line, marine set bag net and trammel net fishing are used to catch rays and sharks.

In long line fishing mainly rays and some sharks are caught as targeted species but sometimes sharks and rays are harvested with the jewfish, grunter, catfish and other demersal fishes. Rays are sometimes caught by set bag net fishing (mainly by MSBN, marine set bag nets) as by-catch and some sharks are harvested by trammel nets fishing as well. During 2008-09 long line (hooks and lines) contributed 48.84% and set bag net and trammel net fishing contributed 47.37% and 3.79% respectively (Table 3). At this time no gill net fishing is recorded for shark fishery.

Table 3. Gear-wise exploitation (%) of sharks and rays in Bangladesh

Sl. No	Years	Gill net fishing (%)	Long line fishing (%)	Set bag net fishing (%)	Tramel net fishing (%)
1.	2008-09	-	48.84	47.37	3.79
2.	2007-08	53.24	34.28	4.87	7.61
3.	2006-07	50.92	37.79	5.39	5.90
4.	2005-06	54.90	38.36	4.74	2.0
5.	2004-05	54.06	38.43	4.36	2.25

Utilization of sharks and rays

There are only a few small-scale sharks processing plants in the form of cottage industries of fishermen families, operated mostly by fisher folks and stakeholders. This is due to the irregular supply of raw materials for continuous operation of these plants. Sharks are mostly utilized as fresh meat, dried and smoked formed. A small number of sharks' jaws and even teeth are sold as rare souvenir. Sharks and rays skin is used for making hand bags and money bags and wood polish paper etc.

Rays are mostly consumed fresh and dried form. Currently all sharks and rays' species are accepted as table food. But only 03 number of shark species (dog shark, milk shark and hammer headed shark) and only 02 rays species (whiptail sting ray and leopard whip ray) are most popular locally as table food.

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- Sharks are mostly utilized as fresh meat, dried and smoked formed. A small number of sharks' jaws and even teeth are sold as rare souvenir. Sharks and rays skin is used for making hand bags and wallets and wood polish paper etc.
- Rays are mostly consumed fresh and dried form.
- Only 03 numbers of shark (dog shark, milk shark and hammer headed shark) and 02 members of ray (whiptail sting ray and leopard whip ray) are most popular locally as table food.

Marketing of sharks and rays

Local usage and marketing study conducted at five lading stations (BFDC, Fishery ghat, Alipur, Mohipur, Kuakata) showed that shark meats are consumed locally, shark fins are mostly exported in Hong Kong, China, Singapore and USA. The price of fresh whole shark is sold at Tk. 40-70/kg. Shark species only from the family Carcharhinidae are sold at higher price.

Rays' fresh meat is sold at higher prices of Tk. 50-80/kg, as compared to the shark meat. Shark fins' (as dried form) prices ranges from US $ 20-35/kg (fin lengths 5 to 40 cm). Sun-dried rays' skins (dorsal part) and tails are exported abroad.

Trade of sharks and rays and their products

Export of sharks' fins, skin, jaw, teeth and rays' skin and tail have been reported since 1980. Shark fins are traded internationally for use in the Asian delicacy. During 2008-2009 foreign exchange earning was Tk. 1.77 crore from exporting of 276 t of shark fins and fish maws (Table 4).

Table 4. Export volume and earning from sharks and their products

Sl. No	Year	Export volume (t)	Earning (Tk. crore)
1.	2008-09	276	1.77
2.	2007-08	266	1.82
3.	2006-07	244	4.11
4.	2005-06	78	0.80
5.	2004-05	01	0.39

Monitoring and Evaluation of status of shark fishery

It is observed that (2005-06 to 2009-10) catch of small-sized, juveniles of sharks and rays have increased with the decrease of large-sized sharks and rays. The total landing of sharks and rays are gradually decreasing (Fig. 3). Shark species such as milk shark, *Rhizoprionodan acutus*; dog shark, *Scoliodon laticandus* and smooth hammerhead shark, *Sphyrna zygaena* are common and relatively abundant. A few shark species were rarely found, these are bull shark, C*archarhinus leucas*; *g*ray shark, *C. amblyrhynchus* and silky shark, *C. falciformis*. Rays' species such as whip tail sting ray, *Himantura bleekeri*; leopard whip ray, *H. undnlata*; white spotted string ray, *H. gerrardi.* honeycomb whip ray, *H. uarnak*; butterfly ray, *Gymnura* sp. and granulated shovelnose ray, *Rhinobatos granulatus* are common and harvested more or less in every month.

But a few rays' such as knife tooth sawfish, *Anoxypristis cuspidata*; fantail sting ray, *Taeniura* sp.; black spotted electric ray, *Narcine timlei* and bow mouth head guitar fish, *Rhina ancylostoma* are rarely found.

There is no regulation of shark banning or no National Plan of Action (NPOA) for shark exploitation and trading in the Fisheries Act. As a result fishermen are harvesting sharks both as targeted and non-targeted species as by-catch. It seems that due to over-exploitation and harvesting of under-sized young ones, catch rate would decline in future. The overall objective of the NPOA shark is to ensure the conservation and management of sharks and rays and their long-term sustainable use and identify and provide special attention in particular to vulnerable or threatened sharks' and rays' stocks.

Conclusions

Total quantity of shark fishing is an important part of Bangladesh fish production and most of the artisanal boats/trawlers regularly harvests sharks as targeted or non-targeted catch. Increased exploitation of shark is of particular concern in the light of their slow rate of reproduction, late maturity and small population size. As a result, sharks are susceptible to over fishing and slow to recover if over fished. There has been a realization that the stocks are becoming endangered and some management is required. It is hoped that the NPOA-shark will provide some useful guidelines on how to conserve our shark fishery for biodiversity conservation and for future generation.

References

Day, F. 1986. The fishes of India being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon. Volume 1 & 2. Today and Tomorrow's Book Agency, New Delhi, India.

Hussain, M. M. 1971. The commercial fishes of the Bay of Bengal. Survey for the development of fisheries in East Pakistan. Chittagong, UNDP Project PAK 22, Project Publication No. 1: 60 p.

IUCN (The World Conservation Union). 2000. Red book of threatened fishes of Bangladesh. IUCN Bangladesh Country Office, House 3A, Road 15 (new), Dhanmondi R/A, Dhaka-1209, Bangladesh, 116 p.

Trades of shark products in Bangladesh

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Bahadur, H.I. 2010. Trades of shark products in Bangladesh. pp. 43-50. *In*: M.E. Hoq, A.K. Yousuf Haroon and M.G. Hussain (eds.) 2011. Shark fisheries in the Bay of Bengal, Bangladesh: Status and potentialities. Support to Sustainable Management of the BOBLME Project, Bangladesh Fisheries Research Institute, Bangladesh. 76 p.

Introduction

Sharks are beautiful creatures of the seas. Like bony marine fishes they venture in the seas and the oceans of the world. In the Bay of Bengal, they live at different places at different stages of their life. Sharks are mostly fish and shrimp eater. Being the top predator, these creatures maintain the ecological balance of the seas by preying on the small fishes and other resources. Unless harvested they would either die or caught by other fishers' of the neighboring countries and the BoB, Bangladesh once might be full of small fishes' population. Sharks meat, hide, liver and guts, bones, teeth, fins, etc. are all usable and exportable, nothing is thrown away. Cox's Bazar area has an organized Shark Fishery Traders Welfare Association (SFTWA) and they harvest sharks and rays from the BoB in a rational way for their livelihood and enhancing national economy through foreign exchange earning of non-traditional shark products. A total of 43 members comprise the SFTWA, Cox's Bazar.

Harvesting grounds and landing centers

Sharks including rays are harvested mainly from the coastal areas of Mohipur, Dhal char, Shib char, Sonadia channel and Teknaf coasts of border water areas of Myanmar. Sharks are mainly caught from deeper waters, while rays are caught from shallow waters. Mostly motorize wooden trawlers (artisanal fishery) are used for catching sharks and rays. Sharks are harvested mostly as by-catch; it is not a target fishery. As far as our knowledge goes industrial trawler fleets also harvest some portion of the landed sharks and rays. Major sharks' landing centers are Cox's Bazar, Teknaf, Chittagong, Khulna, Kuakata, Dublar char, Patharghata, Barisal and some small markets along the coasts.

- Sharks' harvesting season spans over November to May, while rays' harvesting season spans over September to May. Each fishing trip lasts for 5-7 days.
- Sharks are captured as a by-catch of '*Lakka jal'* (large meshed gill nets used for catching Indian Salmon) and *Ilish jal* (hilsa net) in Chittagong and Cox's Bazar.

There are about 19-20 motorized wooden trawlers in the Cox's Bazar area which exclusively catches sharks and rays. A total of about 12-13 *bahadders* (traders and money lenders) own those boats. Four boats are of 45 HP and rests 15 are of 22-23 HP. As far the SFTWAs' knowledge goes there is around 20 such kind of motorized wooden trawlers in Mahipur area of Patuakhali. SFTWA has no statistics about shark fishing motorized wooden trawlers in Chittagong and Teknaf regions. The SFTWA came to know that some industrial trawlers also catch sharks but they have no clear information and statistics about that.

Hooks and lines are used only in Cox's Bazar areas for catching sharks. The boats are usually of 40-50 m long and are with 22-35 HP marine engines. Each boat carries 3-6 crews. The fishing areas are near shore and sometimes off-shore and their fishing duration continues either daily or 2-3 days per trip. Each boat contains 4,000 to 6,000 hooks of between hook size no. 6 and 21 but most fishers' uses hook size no. 9.

Sharks are captured as a by-catch of '*Lakka jal*' (large meshed gill nets used for catching Indian Salmon) and *Ilish jal* (hilsa net) in Chittagong and Cox's Bazar areas. These nets are of 3,000-4,000 m long, 10-12 m wide and mesh size is around 220-230 mm. Wooden mechanized boats of 45-65 HP are also used for operating these nets, each boat carries 17-19 crews and duration of fishing is around 10-17 days per trip. Often they are caught by *Behundi jal* (set bag nets). Long lines are also used for netting sharks and rays.

Iron hooks of about 3-4.5 foot long, fixed with iron chain and set at 6 feet apart in thick nylon twine of *ilish jal* are used for catching sharks. Baited hooks are hanged in mid- or near the bottom water. While usual hooks of size no. 6-7 are used for catching all kinds of rays (sting rays, shovel nose rays, bat rays and devil rays). These hooks are non-baited and its keel is removed. Hooks are set at 6 inches apart, 100 such hooks are set in one rope and hanged near the bottom water.

Harvesting season

Sharks' harvesting season spans over November to May, while rays' harvesting season spans over September to May. Each fishing trip lasts for 5-7 days. Fishing boats sail for netting sharks and rays during *dala* period (neap tide) and returns during *goan* period (full tide).

Share distribution of harvest

Bahadder (money lender) provides the boat, nets, hooks, food, fuel and potable water for the voyage. All sorts of operational costs of harvest are first deducted from the total sale amount. Even costs of any loss of nets or hooks are deductable. But replacements of hooks are done every 5 years and repair of nets, as and when necessary, are borne by the *bahadder* and are not deductable. After deduction of these the amount is equally divided into two; *bahadder* takes half and the rest half goes to the fishers/fishing crews. Here again the

chief fisherman gets 2 parts, boat driver 1.5 part, second chief fisherman gets 1.5 part and the rest fishermen each gets 1 part.

Shark products

Various kinds of shark and ray products those are traded in Cox's Bazar and Chittagong area are shown here in tabular form (Table 1).

Table 1. Various products of sharks and rays traded in Cox's Bazar

Shark products	Type	Size	Price (Taka)	Remarks
Meat	Fresh/iced		70/kg	In-country and Myanmar
	Cut pieces, salted, sun-dried		250/kg	In-country and Myanmar
Hide	Sun-dried, without salt		350/kg	Sold to retailer in Chittagong
Fins	Sun-dried, slightly salted	2-4 inches	1,200/kg	For fins >6-8 inches size must be in sets while weighing in kgs. Two pectorals, one dorsal and lower smaller lobe of the tail collected from an individual shark makes a set (4 fins).
		4-6 inches	1,700/kg	
		6-8 inches	2,200/kg	
		8-10 inches	3,500/kg	
		10-12 inches	5,500/kg	
		12-14 inches	6,000/kg	
		14-16 inches	6,500/kg	
		18-20 inches	8,000/kg	
		>20 inches	8,500/kg	
Back bone	Sun-dried		250/kg	Nomads (*bedey*) buy those for making *tabij*.
Skull and other bones	Sun-dried		200/kg	China and other foreign countries
Tooth	Sun-dried	>2 inches	5,000/kg	
Liver	Crude liver oil extracted after fermentation and boiling	Drums of 250 kg	15,000-17,000/drum depending on the purity	Sold to wholesalers at Dhaka and Chittagong. Usually 120 kg of oil can be extracted from 200 kg of liver
Guts	Sun-dried,		150/kg	Usually tribal people buy

	without slat			for preparing different kinds of food items
Rays				
Shovel nose rays Products				
Meat	Fresh/iced		70-100/kg	In-country and Myanmar
Meat	Cut pieces, salted, sun-dried		250/kg	
Hide	Sun-dried, without salt	>500 g	300/kg	
Skull	Sun-dried		200/kg	
Beak bone	Sun-dried after boiling		500/kg	Exported to China
Fins	Sun-dried, slated	2-4 inches	800/kg	For fins >4-6 inches size must be in sets while weighing in kgs. Two dorsal and the tail lobe collected from an individual shovel nose ray make a set (3 fins)
		4-6 inches	1,400/kg	
		>6 inches	2,850/kg	
Liver	Crude liver oil extracted after fermentation and boiling	Drums of 250 kg	12,000-13,000/drum depending on the purity	Sold to wholesalers at Dhaka and Chittagong
Guts	Not suitable for extracting crude liver oil	Drums of 250 kg	2,000/drum	Sold to poultry/fish feed mills for making poultry/fish feeds
Sting rays products				
Meat	Fresh/iced		65/kg	
	Cut pieces, salted, sun-dried		180-250/kg	
Hide	Sun-dried	<150 g	300/kg	
		>150 g	770/kg	
Bones	Sun-dried		200/kg	
Liver	Crude liver oil extracted after	Drums of 250 kg	12,000-13,000/drum	Sold to wholesalers at Dhaka and Chittagong.

	fermentation and boiling		depending on the purity	Usually 50 kg of oil can be extracted from 200 kg of liver
Saw sharks products				
Saw	Sun-dried		500-1,000/piece	
Meat	Fresh/iced		70-100/kg	
	Cut pieces, salted, sun-dried		250/kg	
Fins		>10 inches	10,000/kg	Two dorsal fins and the tail lobe make a set (03 fins). Always sold in sets
Liver and guts	Crude liver oil extracted after fermentation and boiling	Drums of 250 kg	12,000-13,000/drum depending on the purity	Mixed with the livers of shovel nose and sting rays for extracting oil
Devil/bat rays products				
Meat	Fresh/iced		35-50/kg	

Yearly landing and trade volume

In 2009 a total of 400 t sharks and rays were landed at the BFDC Fish Landing Center at Cox's Bazar. In the same year the amount of trades related to sharks and shark products (hide 20 t, fins 4-5 t, teeth 200 kg, bones 1 t and liver oil 10 t) were around Taka 2.0-2.5 Crores.

Conclusions

There are 43 active members of the Shark Fishery Traders Welfare Association (SFTWA) of Cox's Bazar and their main objective is welfare of the shark traders and social welfare for the artisanal fishers. We feel that it is the need of the time for conservation and development of the shark fishery in the Bay of Bengal, Bangladesh. If we can conserve and develop this fishery and exploit it in a rational way then we could have a better livelihood and the forex earning would increase as well from this non-traditional shark products. Again we strongly urge the concerned administrative wing of the Govt. to control piracy, robbery, hijacking and taking ransom from the poor fishers in the sea.

Shark fishery of Bangladesh and research needs

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Importance of shark fishery

Ecosystem importance: Sharks, including skates and rays fisheries play a very important role in the marine ecosystem. Most of the shark species are highly carnivorous in nature and placed in the last segment of the food chain and thus very important in maintaining the harmony in the marine ecosystem. However, the number of shark species is reported to be declining, being highest number reported as 63 in 1978, followed by 56 in 2000 and finally, 22 in 2007 (Day 1978, IUCN 2000, Roy *et al*. 2007, Haldar 2010). In the IUCN list, the Kala hangor (Black shark, *Carcharhinus limbatus*) is marked as vulnerable species and Karati hangor (Saw shark, *Pristis microdon*) is marked as endangered species (Fig. 1). Abundance and population size of each of the existing species are also declining, resulting in a threat on the harmony of the marine ecosystem in the Bay of Bengal. However, in the deep sea region, the large pelagic sharks (Fig. 2) are distinctly dominating (37%) compared to other pelagic fin fishes (Rahman 2007 and Krajangdara *et al.* 2008).

Fig. 1. Endangered saw shark, *Pristis microdon*.

Fig. 2. Large pelagic sharks (*Alopias pelagicus*) caught in the deep sea region of the Bay of Bengal.

Economic importance: The demersal trawl surveys that were conducted in the 1980s in the Bay of Bengal highlighted the economic importance of sharks, skates and rays and placed them within the commercially harvested important fin-fishes (Khan *et al*. 1989). The economic activities depending on the shark fisheries are growing remarkably day by day, both in domestic and export markets. Shark fins are very delicious and have become highly valuable 100% exportable commodity. Shark liver oil is also very useful and valuable both for domestic and export markets. At the

moment, the shark liver oil is being produced following different traditional crude methods, used and sold only in crude form. But there exists huge demand for its scientific industrial extraction and refinement (Fig. 3).

Fig. 3. Traditional crude methods of shark liver oil extraction.

The demand of shark meat is also increasing in domestic as well as export market, resulting in production of various value added products (Fig. 4). The value added products are produced using traditional drying methods with slight modifications for different species and demands of the consumers. Normally, whole body of sharks traditionally sliced and mixed with salt and then sun-dried. The dried products are consumed predominantly by the tribal people and to some extent exported to Myanmar. The soft and white meat from the snout of the guitar fish (*Rhinobatos granulatus*) has special demand in the export market.

Fig. 4. Value added shark meat products:
a. sliced whole body meat and **b.** white meat from the snout.

The dried skins of skates are highly valuable and 100% exportable and constitute the major bulk of the shark fishery (Fig. 5). Very small sized sharks are dried and used in fish/poultry feed production chain. Cartilaginous backbones of large sharks are valuable for different traditional treatment purposes. Shark teeth and jaws are useful for ornamental use (Fig. 6). In fact, no parts of sharks, skates and rays remain unutilized. However, most of the procedures of the traditional methods have got the potentials for further improvement considering hygiene, efficacy and refinement.

Fig. 5. Production of exportable dried skins of skates.

Fig. 6. Dried cartilaginous backbones, jaws and teeth of sharks used as medicinal and ornamental purposes.

Scope of shark fishery

In this article, the group name 'shark' would include not only the taxonomic group called shark, but also other similar cartilaginous fish or Elasmobranches like skates and rays. So, the shark fishery would obviously include the fishery of sharks, skates and rays and the fishery would include harvesting, preservation, processing, marketing and utilization (Fig. 7).

Fig. 7. Typical pictures of sharks and rays available in the commercial fishery of Bangladesh.

Types of shark fishery

Heavily harvested demersal shark fishery: Like other fisheries in Bangladesh, shark fisheries are also concentrated targeting demersal species in the shallower regions. Hence the major gears are used targeting bottom living sharks, skates and rays (Hussain and Rahman 2010). As a result, the demersal shark populations and their production have been declining. The total production of shark is reported to be declining, being highest quantity reported as 5,162 t in 2001 and then gradually declined to 4,085 t in 2005 and then further declined to 3,933 t in 2009 (FRSS 2001, 2005 and 2009). Fisheries Resources Survey System (FRSS) of the Department of Fisheries mainly publishes annual booklet on catch statistics of fisheries resources in Bangladesh including sharks (FRSS 2001, 2005, 2007 and 2009). However, no comprehensive and species-wise catch data are published from the research point of view on sharks. Roy *et al*. (2007) provided the group-wise percentage analysis of sharks, skates and rays in the commercial fishery. In the commercial catches,

sometimes shark species dominated than skates and rays or vice versa depending on the method and place of fishing (Fig. 8). They found, 10 species of sharks contributed about 24.26%, 02 species of skates contributed only about 3.04% and 10 species of rays contributed the remaining major bulk (72%) of the total catch of shark fishery in Chittagong and Cox's Bazar region. They indicated that the shark fishery were limited to the 30-50/70 meter depth zone where the sharks were fished as a by-catch by many multi-species gear-like trawls and drift gill net, estuarine set bag nets (ESBNs), marine set bag nets (MSBNs), hooks and lines which were used all along our coast. In the shark fishery only shark net is used as commercially for sharks, skates and rays and in some area only hook and line.

Fig. 8. Piles of commercial shark species: **a.** sharks dominated and **b.** rays dominated catches.

- Shark fishery is concentrated targeting demersal species in the shallower regions limited to the 30-50/70 meter depth zones and major gears are used targeting bottom living sharks, skates and rays.
- Sharks are harvested as a by-catch by many multi-species gear-like trawls, drift gill nets, estuarine set bag nets, marine set bag nets and hooks and lines.
- Total production of sharks was 5,162 t in 2001 and then gradually declined to 3,933 t in 2009.
- No comprehensive and species-wise catch data on sharks are recorded by the Fishery Resources Survey System of the Department of Fisheries.

Poorly harvested pelagic shark fishery: In the pelagic region of the deep sea, sharks are poorly harvested and in the commercial catches deep sea pelagic sharks are rarely found. BIMSTEC member countries implemented a deep-sea resource survey project entitled "Ecosystem-Based Fishery Management in the Bay of Bengal" during 25 October through 21 December 2007 and found that pelagic sharks were dominated in the deep sea region (Rahman 2007 and Krajangdara *et al.* 2008). Important shark species that contributed about 48% of the pelagic long line catches during the survey were: Thresher shark *(Alopias pelagicus)*, Big eye thresher shark (*A. superciliosus)*, Silky shark (*Carcharhinus falciformis)* and pelagic skate (*Pteroplatytrygon violacea*) (Fig. 9).

Fig. 9. Some deep sea pelagic shark species: **a.** Big eye thresher shark (*Alopias superciliosus)*; **b.** Silky shark (*Carcharhinus falciformis)*; and **c.** pelagic skate (*Pteroplatytrygon violacea*).

Research needs

Although the sharks are very important groups of marine fin-fish, very little works have so far been done on its species-wise stock assessment, life-history, biology, biodiversity and sustainable utilization in the marine waters of Bangladesh. Therefore, a lot of scope is available to conduct various comprehensive studies on its

stock assessment, life-history, biology, biodiversity and sustainable utilization. However, the following areas may get priorities in undertaking research works in these fields.

Ecosystem based studies

The need for applying an ecosystem approach to fisheries management is now globally accepted and has been endorsed in a range of international decision making organizations. This approach represents a move away from fisheries management systems that focus only on the sustainable harvest of target species, towards the systems and decision making processes that balance environmental well-being with human and social well being, within improved governance frameworks (APFIC 2009). As the shark populations are vital in maintaining the harmony in the marine ecosystem, any management strategy should be based on the ecosystem based approach. To understand the role of sharks in the ecosystem, the following areas should get priorities in conducting future research:

- Trophic interaction
- Predator-prey relationship
- Shark-turtle relationships
- Impacts of shark on other predators and preys
- Biodiversity and genetics

Anthropogenic activities

Anthropogenic activities, i.e., human activities are vital in sustainable utilization of an exploitable fish population and these activities are mainly performed by the fishers. Fishermen are common people and they live on marine ecosystems. Fishers have to be aware of their connection with the ecosystem; however, fishers are not guardian of the ecosystem. Marine ecosystems are not only fisher's responsibility; instead it should be a shared responsibility between all stakeholders. The government needs to convince fishers that their resources are on their hands for proper management, they have to take ownership in which process the Government can help as a guide. To understand different anthropogenic activities and their respective management options, the following issues need to be studied with utmost priorities:

- Species and size-wise catch assessment
- Appropriate harvesting technology
- Source and impacts of pollutant
- Exploitation level

Reproductive and population biology

Due to the increasing popularity of the sharks and shark products in the national and international markets, fishing pressure on shark is increasing alarmingly day by day throughout the world, resulting in a gradual depletion of the stocks in some region of the Bay of Bengal. Therefore, it is very essential to know the spawning and nursery seasons of those species as a pre-requisite to formulate a management plan. However, a complete management plan will again depend on the investigation of the spawning and nursery grounds of those species in future. Some areas to address are:

- Maturity, spawning season, spawning ground and spawning mechanisms
- Age and growth, mortality, etc.

Improvement of utilization technology

Various shark species caught by the marine fishers are being utilized following different traditional age-old methods resulting in loss of qualities of various value added shark products. Therefore, modern extraction and utilization procedure for the production of quality value added shark products are essential. The following areas should get priorities for the improvements:

- Extraction of shark liver oil
- Value added shark products using shark meats
- Drying in bad weather (BFRI-Fish Dryer may be recommended).

Conservation, management and utilization guidelines

Applying the ecosystem approach and assessing the ecological status of the species a well-designed conservation strategy for the threatened shark species, a sound management policy for the

commercially important species and finally, an improved utilization protocol for the harvested resources should be developed and implemented as soon as possible.

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References

APFIC (Asia Pacific Fisheries Commission). 2009. Application of the Ecosystem Approach to Fisheries and Aquaculture, an article published in the website of the commission, retrieved on 18 May 2009.

Day, F. 1978. The Fishes of India, Being A Natural History of the Fishes Known to Inhabit the Seas and Freshwater of India, Burma and Ceylon, Vol-1, New Delhi. pp. 730-745.

FRSS (Fisheries Resources Survey System). 2001, 2005, 2007, 2009. Fishery Statistical Year Book of Bangladesh 2000-01, 2004-05, 2006-07, 2008-09, Department of Fisheries, Dhaka, Bangladesh.

Haldar, G.C. 2010. National plan of action for shark fisheries in Bangladesh. pp 75-89. *In*: M.G. Hussain and M.E. Hoq (eds.). Sustainable Management of Fisheries Resources of the Bay of Bengal. Support to BOBLME Project, Bangladesh Fisheries Rsearch Institute, Bangladesh. 122 p.

Hussain, M.G. and M.J. Rahman 2010. Marine fisheries resources of Bangladesh: Stock status and management issues. pp 37-51. *In*: M.G. Hussain and M.E. Hoq (eds.). Sustainable Management of Fisheries Resources of the Bay of Bengal. Support to BOBLME Project, Bangladesh Fisheries Rsearch Institute, Bangladesh. 122 p.

IUCN (International Union for the Conservation of Nature) 2000. The Threatened Fishes of Bangladesh. IUCN-The World Conservation Union, Dhaka Bangladesh.

Khan, M.G., M.G. Mustafa, N.M. Sada and Z.A. Chowdhury. 1989. Bangladesh offshore marine fishery resources studies with special reference to the Penaeid shrimp stocks 1988-89. A report based on R.V. Anusandhani shrimp trawling survey results, Cruise No. GOB 49 to 54. 213 p.

Krajangdara, T., R. Sujittosakul and M.J. Rahman. 2008. Elasmobranches found in the Bay of Bengal from pelagic longline and drift gill net fishing. pp. 190-194. *In:* The ecosystem-based fishery management in the Bay of Bengal. BIMSTEC, Department of Fisheries and SEAFDEC, Thailand. 250 p.

Rahman, M.J. 2007. Ecosystem-Based Fishery Management in the Bay of Bengal (A deep-sea resource survey Project Implemented by BIMSTEC). A brief national report, Bangladesh. 13 p.

Roy, B.J., M.P. Dey M.F. Alam and N.K. Singha 2007. Status of shark fishing in the marine water of Bangladesh. UNEP/CMS/MS/Inf/10. 17 p.

Sharks - a threatened biodiversity in the coastal water of Bangladesh

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Background

Sharks are long-lived aquatic animals that exhibit slow growth, late maturity, low fecundity, low productivity, and high natural survivorship for all age classes. They are valuable and versatile fisheries resources of the sea. Apex predators, such as large sharks, also play an important role in maintaining healthy marine ecosystems (Arcand and Paul 2007). Not only the meat and fins but even the skin, bones and internal organs of sharks are used for human consumption in South Asia, Indian coast, Sri Lanka, Maldives. Shark fin, appreciated in Chinese cuisine, is a valuable product derived from shark fisheries. It is not clear whether new directed shark fisheries have developed in response to new market demands. The social and economic importance of sharks is increased by the fact that fisheries based on these species are often not regulated, and therefore have proven an accessible alternative when other fish species are depleted, restricted or seasonally unavailable.

Shark fishery in Bangladesh

Shark fisheries in Bangladesh are a non-targeted fishery. Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it. Sharks are mainly caught by artisanal fishery with drift gill nets used for catching hilsa shad and Indian salmon, set bag nets, long lines and trammel nets. These gears are used onboard a wooden mechanized boat and sharks are harvested mostly as by-catch. But now a days the shark fishing activities have accelerated due to abundance of under sized sharks in southern Bay of Bengal coast and thus threatened coastal biodiversity. Some large sharks are captured in fishing nets and the fishermen force them to be landed. Sharks are also harvested as a by-catch of '*Lakka jal'* (large meshed gill nets used for catching Indian Salmon) in Chittagong and Cox's Bazar coast.

In southern coast of Kuakata, dog sharks (*Scoliodon sorrakowa)* are harvested deliberately by the fishermen. Some saw sharks are also harvested by the fishermen. Three landing centers of sharks were identified in Patuakhali-Barguna region. Major one is in Khajura fish drying area of Kuakata sea beach, Patuakhali. Some are landed at the mouth of Goura khal near Mohipur bazar, Kalapara, Patuakhali. Another landing center is in Patharghata of Barguna district. The fishermen harvest dog sharks from November to April. Peak season of dog shark harvesting was observed in February to March. Major gear used is drift net.

IUU fishing of sharks in Bangladesh coast

The unsustainable international trade in sharks, fins, derivatives, and the illegal, unreported, and unregulated (IUU) fishing of sharks for the fin trade poses a global threat to wild populations of sharks and to their associated ecosystems. On 2 March 2009, at the Rome meeting of the FAO Committee on Fisheries (COFI) a group of NGO's brought attention to the dismal record of shark conservation efforts: "Ten years since adoption of the Shark International Plan of Action (IPOA), most fishing nations have not completed national plans of action or imposed basic fishing limits for these particularly slow growing animals. Regional Plans of Action (RPOA) have not been developed, shark fisheries data remain inadequate, and most fining bans are too lenient" (Paul 2009).

- Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it.
- Mostly small sized sharks, skates and rays are caught in Bangladesh because of the gear limitations. Catch of giant sized sharks are very rare and in most cases accidental.
- Sharks are mainly caught by artisanal fishery with drift gill net, set bag net, long lines and trammel nets.
- Sharks are also harvested from the four identified fishing grounds such as, South patches, south of south patches, middle ground and swath of no grounds.

A total of 18 shark species listed as endangered and ten listed as critically endangered in the IUCN Red List of Sharks and Rays (IUCN 2008). It is estimated that 75 to 100 million sharks are killed each year for their fins only and the number is growing annually by 6% (Lack and Sant 2008). The bodies of these sharks, without their fins, are thrown back into the sea where the sharks bleed to death. Finning also hinders the collection of species-specific data, making it very difficult to estimate population sizes, monitor catches, landings, and trade in sharks and shark derivatives. Hammerhead, short fin mako, blue, sandbar, bull, silky and thresher sharks are the most sought after in the huge black market for fins in South-Asian markets. Some of the IUU fishing of sharks in Bangladesh coast is highlighted below:

December 2004, Cox's Bazar

A 7 m long and 1 m wide whale shark [*Rhiniodon* (*Rhincodon*) *typus*] was accidentally entangled in drift gill net along Cox's Bazar coast, which was then deliberately brought in the shore. The approx. weight of the shark was about 2,000 kg.

March-June 2005, Patuakhali

About 200 fishing trawlers deliberately caught under-sized sharks and rays during the end of fishing season in southern coast of the Bay of Bengal. Fishermen landed about 30 sizable sharks daily and then transported them to Chittagong for further processing.

August 2006, Sundarbans

About 8-10 m long saw shark was reported to be caught by the fishing boats in Sundarbans coast. This is a regular activity there.

December 2006, Cox's Bazar

A 8 m long and approx. 4,000 kg Australian shark [*Carcharhinus* spp.] was accidentally entangled in set bag net of FV Rashidia in the deep sea off the Cox's Bazar coast, which was then bitten and brought to the shore. According to the statement of crews of FV Rashidia, in a month they caught about 5 such sharks weighing 1,500 to 2,000 kg each.

It was reported that at least 4 cases of whale shark [*Rhiniodon* (*Rhincodon*) *typus*] weighing 1,500-3,000 kg were forcefully killed by the fishermen off the Cox's Bazar coast. Fishermen acknowledged the fishing of large number of undersized sharks in the Bay of Bengal. The sharks normally escape from fishing nets, but the fishermen catch them using set bag nets.

January-February 2008

A 7 m long and weighing 1,500 kg whale shark [*Rhiniodon* (*Rhincodon*) *typus*] was caught by crews of FV Salma, which was then sold at Tk. 60,000 in the local market. At least 2 similar sized whale sharks were sold in a week in the BFDC Fishery Ghat of Cox's Bazar.

The Bangladesh Coast Guard and officials of Sundarbans Forest Division recovered 8 sharks from 4 fishing trawlers in the Sundarbans east coast. Each of the sharks was about 2 m long and weighed over 50 kg. At least 50 shark processing centers were reported to have sprung up in the southern coastal areas. Traders from Chittagong invests money and go to Barguna and Patuakhali to encourage fishermen for catching sharks and it is reported that at least 2,000 fishermen, working on 250 trawlers are involved in catching and processing sharks. Fishermen illegally caught 3,000-4,000 young sharks per night in these areas.

December 2010

Fishermen desperately harvested young shark of 20-25 cm sizes and used them for sun drying in the Kuakata beach of Patuakhli. About 1,000-3,000 such sharks are landed by each fishing boat. Young sharks (15-20 numbers/kg) are caught during high tide in 15-20 km deep sea. Sharks normally remain live for 3-5 hours, so without icing fishermen can easily land sharks within 5-7 hours fishing trips.

National Plan of Action for the Shark Fishery (NPOA-Shark)

Absence of monitoring, control and surveillance (MCS) and control on illegal, unregulated and unreported (IUU) fishing causes both recruitment and growth over fishing of sharks in most BoB countries including Bangladesh. Moreover, data and information about this fishery is very meager. Thus, foremost priority of management of the fishery should be accumulation of available data, information, and statistics and develop a National Plan of Action (NPOA). Although

the number of countries adopting NPOA for sharks is increasing slowly and the European Union (EU) and Pacific Islands' Forum Fisheries Agency (FFA) have, or shortly will have, Regional Plans of Action (RPOA) for Sharks; as most shark stocks remain unmanaged (Paul 2009). Very little catch data is recorded at the species level, because fining makes species identification incredibly difficult, and IUU fishing makes accurate stock assessment impossible. Numerous shark stocks around the Bay of Bengal are overfished. There is an extraordinary amount of IUU fishing and trade on sharks, fins and other body parts. As a result, entire populations of sharks and rays are in threat of disappearing.

A very large proportion of IUU fishing for sharks is carried out with the specific intention of harvesting fins. Most of it appears to involve finning – removal of the fins and discarding of the carcasses at sea. While strengthening national and regional prohibitions on shark fining will clearly not be sufficient to eliminate IUU fishing for sharks, the fact remains that, if shark fishers were required to land sharks at port with their fins attached to their bodies, the incentive to fish illegally for sharks would be greatly reduced.

- Sharks are harvested indiscriminately both as target and non-target fishery for its valuable fins, hides and bones.
- In the absence of MCS and control on IUU, in most BoB countries including Bangladesh, shark populations are depleted indiscriminately.
- NPOA, RPOA and IPOAs are needed for holistic management and conservation of sharks (elasmobranch fishes) globally.

Conclusions

Regional BOBLME project supported by the Global Environment Facility and other donors have a plan to conserve sharks (biodiversity and stocks) in the Bay of Bengal and also develop and exert efforts for the implementation of NPOA-shark in the region. Support to BOBLME Project, Bangladesh has advanced a step ahead through first round of consultation in November 2010 to identify the status, potentialities, available data, statistics and data gaps and hopes to make a draft NOPA-shark by 2011 for submission to the Govt. for implementation.

References

Arcand, P. and L. Paul. 2007. Global shark fin trade, destroying biodiversity and ecosystems. Hawaii Audubon Society. Honolulu, USA.

IUCN. 2008. The IUCN *Shark Specialist Group* (SSG). IUCN web site www.incnredlist.org.

Lack, M. and G. Sant, 2008. Illegal, unreported and unregulated shark catch: A review of current knowledge and action. Department of the Environment, Water, Heritage and the Arts and TRAFFIC, Canberra. 8 p.

Paul, L. 2009. International trade in shark fins and illegal, unreported and unregulated shark fishing. Hawaii Audubon Society, Honolulu, USA. 8 p.

সমুদ্র উপকূলে অবাধে হাঙ্গর শিকার

হুমকির মুখে দেশীয় মৎস্য সম্পদ

আমির হোসেন আমু, *মংলা থেকে*

সুন্দরবন সংলগ্ন সমুদ্র উপকূলীয় অঞ্চলজুড়ে অবাধে হাঙ্গর শিকার চলছে। বন আইনে হাঙ্গর শিকার নিষিদ্ধ থাকলেও তা কার্যকর হচ্ছে না। ফলে একদিকে সমুদ্রের ভারসাম্য বিনষ্ট হচ্ছে; অপরদিকে হুমকির মুখে পড়ছে দেশীয় মৎস্য সম্পদ। জেলেদের একাধিক সূত্র জানায়, উপকূলীয় এলাকার জেলে নামে একশ্রেণীর দুর্বৃত্ত চক্র হাঙ্গর শিকারের দিকে ঝুঁকে পড়ছে। ইলিশ মৌসুম শেষ হওয়ার পরপরই মূলত ওইসব জেলে বিস্তীর্ণ সমুদ্র উপকূলে হাঙ্গর শিকারে নামে। সম্প্রতি কোস্টগার্ড হাঙ্গর শিকার রোধে কড়াকাড়ি আরোপ করায় জেলে নামে ওই দুর্বৃত্ত চক্র তাদের কৌশল বদল করেছে। এখন বেশিরভাগ জেলে রাতেই হাঙ্গর শিকার করে থাকে। প্রতি রাতে উপকূলীয় এলাকায় ৩-৪ হাজার ভাটকা হাঙ্গর ধরা পড়ছে। শিকারকৃত হাঙ্গর ৫টকি ও কাঁচা আকারে পাচার হয়ে যায় প্রতিবেশী দেশসমূহে। ব্যাংকক, মিয়ানমার চীন, ভিয়েতনামসহ মধ্য প্রাচ্যের বিভিন্ন দেশে হাঙ্গরের ব্যাপক চাহিদা রয়েছে। সাধারণত উপজাতীয় লোকজন হাঙ্গর খেতে বেশি পছন্দ করে। ওইসব দেশে হাঙ্গরের মাংস, চামড়া, দাঁত, হাড় দিয়ে রমকারি জিনিসপত্র তৈরি হয়। এছাড়া চামড়া দিয়ে অলংকার রাখার বাক্স, তলোয়ার রাখার খাপ, মানিব্যাগ, বেল্ট ও জুতা তৈরি করা হয়। লিভার দিয়ে তৈরি হয় বিভিন্ন বাহারি কসমেটিকস, দাঁত ও চোয়াল দিয়ে তৈরি হয় রকমারি গহনা, পাকস্থলি ও কলিজা দিয়ে তৈরি হয় ব্যান্ডার চিকিৎসার তেল। এসব কারণে দেশে-বিদেশে হাঙ্গরের ব্যাপক চাহিদা রয়েছে। আকার ভেদে হাঙ্গরের দাম কম-বেশি হয়ে থাকে। বড় একটি হাঙ্গর দেড় মণ পর্যন্ত ওজন হয়। আর বড় এ হাঙ্গরের দাম পড়ে ২০-২৫ হাজার টাকা। একশ্রেণীর মহাজন ও আড়তদার প্রতিবছর হাঙ্গর ব্যবসায় লাখ লাখ টাকা পুঁজি বিনিয়োগ করে।

মংলায় বঙ্গোপসাগরের সুন্দরবন সংলগ্ন এলাকা থেকে উদ্ধার করা হাঙ্গর যুগান্তর

এসব ব্যবসায়ী সুন্দরবন সংলগ্ন বিভিন্ন চর ও দ্বীপাঞ্চলে ঘাঁটি গেড়ে নিরাপদে হাঙ্গর ব্যবসা চালিয়ে যাচ্ছে। বিশেষ করে উপকূলের সোনার চর, আশার চর, রূপার চর, চর গঙ্গামতি, ফাপতরার চর এলাকায় হাঙ্গর ব্যবসায়ীদের আনাগোনা সবচেয়ে বেশি বলে জানা গেছে। অতি মুনাফালোভী ওই ব্যবসায়ী স্থানীয় জেলেদের দাদন দিয়ে হাঙ্গর শিকারে উদ্বুদ্ধ করে। যার ফলে জেলে নামের সংঘবদ্ধ চক্র সামুদ্রিক এ মৎস্য সম্পদ ধ্বংসের অশুভ তৎপরতায় লিপ্ত হয়। সূত্র জানায়, বেশিরভাগ জেলেই গভীর রাতে হাঙ্গর শিকারে নামে। চোরাইপথে আহরণকৃত হাঙ্গর ট্রলারের পাটাতনের নিচে করে তীরে এবং ব্যবসায়ীদের মোকামে আনা হয়। ডিসেম্বর থেকে মে পর্যন্ত জেলেদের জালে বেশি হাঙ্গর ধরা পড়ে বলে জেলেদের সূত্রে জানা গেছে। শিকারকৃত ভাটকা হাঙ্গর ব্যবসায়ীদের মোকামে এনে ৫টকি করা হয়। আবার অনেক সময় ট্রলারযোগে সমুদ্রপথেই প্রতিবেশী দেশসমূহে পাচার করা হয়। গত ফেব্রুয়ারি মাসে মংলা কোস্টগার্ড ও বন বিভাগ যৌথ অভিযান চালিয়ে সুন্দরবন সংলগ্ন দুবলারচর এলাকা থেকে দু'দফায় ছোট-বড় ১৩টি হাঙ্গরসহ জেলেদের একটি ট্রলার আটক করে। বন আইনে সুন্দরবন উপকূলে হাঙ্গর শিকার নিষিদ্ধ থাকলেও বন বিভাগের উদাসীনতায় তা কার্যকর হচ্ছে না। অভিযোগ রয়েছে, বন বিভাগের একশ্রেণীর অসৎ কর্মকর্তা ও কর্মচারী 'নগদনারায়ণে' তুষ্ট হয়ে জেলেদের হাঙ্গর শিকারে প্রত্যক্ষ সহায়তা করে আসছে। আর এতে করে সরকার বিপুল পরিমাণ রাজস্ব হারাচ্ছে। অপরদিকে সমুদ্রের ভারসাম্য বিনষ্টের পাশাপাশি দেশীয় মৎস্য সম্পদ ধ্বংস হচ্ছে। স্থানীয় মৎস্য বিশেষজ্ঞদের মতে, দেশীয় মৎস্য সম্পদ রক্ষায় আইনের বাস্তবায়ন জরুরি।

As shark slaughter continues, a defender targets fin trade*

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Fordham, S. 2010. As shark slaughter continues, a defender targets fin trade. pp. 69-76. *In*: M.E. Hoq, A.K. Yousuf Haroon and M.G. Hussain (eds.). 2011. Shark fisheries in the Bay of Bengal, Bangladesh: Status and potentialities. Support to Sustainable Management of the BOBLME Project, Bangladesh Fisheries Research Institute, Bangladesh. 76 p.

Few fisheries are as controversial as the trade in sharks to meet the thriving market for shark fin soup. The number of sharks killed is staggering; scientists who have studied the shark fin business say that 22 million pounds of shark fins— representing millions of dead sharks— are traded every year in Hong Kong, the center of the finning market. Public revulsion is growing over finning, which often involves catching sharks and slicing off their fins while the fish are alive, leaving them to drift to the bottom and die. Largely as a result of this trade, scientists estimate that one third of the world's 1,044 shark species are now threatened with extinction.

*In an interview with **Yale Environment 360**, shark conservationist Sonja Fordham discussed the main aspects of that conservation strategy, which include setting catch limits on sharks worldwide, requiring sharks to be landed with their fins attached, seeking protection for threatened sharks under the Conservation on International Trade in Endangered Species (CITES), and enlisting the public in the fight to protect shark populations.*

*article collected from website

Yale Environment 360: I have been reading about these absolutely phenomenal numbers of sharks— in the tens of millions— that are killed every year. What is the latest, best scientific estimate?

Sonja Fordham: The best science-based figure is 26 to 73 million sharks.

Ye360: Per year?

Fordham: Per year. That does not mean that all those sharks were finned, because a lot of shark meat is actually increasingly being used.

Ye360: What demand is driving this trade? How much of it is growth in China and Asia and the demand for shark fin soup?

Fordham: Shark fin soup is a traditional celebratory dish, a Chinese delicacy. It used to be reserved for royalty and very high levels of society. There obviously has been a boom in the Chinese economy, where more and more people can afford to serve it at their banquets or weddings. It's a very traditional dish, and these kind of attitudes are not changing overnight. But they are changing. There are a lot of groups working in that region in Asia, trying to educate the public and getting celebrities to pledge to not serve shark fin soup.

Most shark species are particularly vulnerable to overfishing. They tend to grow slowly and mature late, and have few young. And we know of many cases of serious shark depletion around the world. As you've probably read, a good proportion of sharks and rays around the world are deemed threatened by IUCN. So we know that there are very few well-managed shark fisheries in the world, and that these species in general are prone to overfishing and need to be managed even more cautiously than we would do with other marine fish.

Ye360: In fact, there is very little shark management, and very few countries have quotas. Can you talk about that?

Fordham: Sharks do suffer from being a low priority, and that comes from a number of factors, including public perception. Although people are becoming more enlightened about sharks, there are a lot of people who still remember "*Jaws*" and are afraid of sharks. And so there has not been a public clamoring for conservation, like you would have for dolphins or sea turtles. And that of course spills over into the government world, so governments have not had much pressure to conserve sharks. We have a much longer history of managing fisheries for more traditional food fish like cod and tuna. Although it is not as if fisheries for cod and tuna are shining examples of fisheries management, either.

Ye360: The European Union has banned finning, along with 25 other countries. What's the EU's record on slowing down the shark trade?

Fordham: The EU has banned shark finning, but their enforcement standards are among the most lenient in the world. They have a lot of loopholes in their shark-finning ban. For starters, the EU allows landing of shark fins and shark bodies in different places. You could drive a truck through that loophole. It is important to keep the fins on the shark until it is landed. And we have seen this happen in recent years; Central America has been a leader in this approach. The US in a couple of years ago mandated that the fins stay on the sharks for their Atlantic and Gulf of Mexico fisheries, and there is legislation on Capitol Hill to extend that to Pacific fisheries. We hope this is an option that the EU is considering. It is obviously the simplest and really the only foolproof way to make sure the sharks were not finned.

Ye360: Do you know what these fins are fetching per kilogram?

Fordham: The estimate is $125 to $415 per kilogram.

Ye360: What is the state of shark populations in European waters?

Fordham: The EU has a particularly high percentage of shark and ray species that are considered threatened. And they have some very clear cases of serious depletion of shark species that have been valuable not just for their fins, but for their meat, such as the spiny dogfish and the porbeagle shark.

Ye360: What is the status of sharks in the Mediterranean?

Fordham: We did an IUCN Red List report on the Mediterranean and called it the most dangerous place to be if you are a shark; 42 percent of the species threatened with extinction. Some species like sawfish are considered extinct already.

Ye360: What are the other hotbeds globally of the trade, where the fishing has pushed species to a threatened or endangered status?

Fordham: You have another hot spot off of southeast Africa. Other parts of Asia are a big concern, but then we run into the problem of a lack of data. And globally very few countries are limiting shark catch at all. About 25 countries plus the EU have finning bans, but we have these varying standards for enforcement. And then we have no international catch limits on sharks. There is nothing that says, "Here's the tonnage that you guys can take every year and divide it among the different countries." We do not have that yet for sharks.

We have finally seen some sharks get listed under the appendices of CITES, but still very few. This past March, at the last CITES conference of the parties, there were four proposals to list eight shark species.

Ye360: What species are on the CITES list?

Fordham: In 2002, we saw the first listing for basking sharks and whale sharks. They are on Appendix II, which is not a ban on trade— it just sets up mechanisms for tracking and regulating trade, if needed. In 2004, the great white shark was added to Appendix II. In 2007, we had all species of sawfish listed on CITES. Sawfish are technically rays with long, toothed snouts. They are the most endangered species within the shark and ray class.

Ye360: We are obviously removing a huge number of these top-of-the-food-chain predators. What's the impact on the whole marine ecosystem?

Fordham: We do not know as much as we did like to know, but generally predators are important to keeping ecosystems in balance. Different predator species play different roles. A spiny dogfish might serve one role as a predator and a great white shark might serve a different role. But in general, these predators keep other populations in check and weed out the weak and the wounded of prey populations.

Ye360: The biggest component of the shark kill is the blue shark, right?

Fordham: Yes, they are one of the most abundant sharks. A lot of the sharks that are finned are blue sharks; they happen to be one of the most resilient or prolific sharks. On the other hand, they are taken without limit almost everywhere. But in the Atlantic, for example, blue sharks are getting to the point where they could become overfished soon.

Ye360: How long do some of the longer-lived shark species live?

Fordham: Usually in the neighborhood of decades, but I think

that one of the longest lifetimes estimated for a dogfish on the west coast of the US at 100 years.

Ye360: What is the Chinese government doing about the shark trade? Certainly the fin trade seems to be centered there. Is the Chinese government taking any action?

Fordham: Not that I know of. China has in the last few years become much more vocal at international fishery and trade meetings, and it is mostly in opposition to shark conservation. They were the leading opponents of proposals to list these eight shark species under CITES this year. They were not as vocal about their positions before, but certainly now they are getting more and more vocal.

Ye360: In any anti-conservation way?

Fordham: Yes, more vocal and strident.

Ye360: Has the rise of the shark fin trade, and the concomitant increase in the killing of sharks, tracked China's economic rise?

Fordham: Yes, we saw a real rise starting in the 1980s. But we have many more conservation groups just in the last few years, trying to convince people not to eat shark fin soup, and working to influence Asian governments more directly. And there's clearly much more public awareness of finning. When I talk to people on a plane, just about everybody has heard about shark finning. My arguments tend to be about waste and how finning can lead to unsustainable fisheries. But, clearly, a big thing people are concerned about is cruelty. Many people are appalled at the cruelty of finning live sharks and that is clearly a driving force in more and more countries adopting finning bans.

I would like to add something on the issue of finning, because

it does get the most attention, that it is really important to know that even if we had perfect finning bans all over the world, that alone would not save sharks. We also need concrete limits on shark catches. Around the world, too many sharks are being killed, whether it is for their fins or meat, or both, or by accident.

Ye360: Can you list four or five areas of agreement among shark scientists and shark conservationists about what needs to be done now to reverse, or at least slow, the slaughter of tens of millions of sharks a year?

Fordham: I would start with the public, which is why it is so important to get the word out about the shark's plight. The public can help by speaking up for the sharks, and that can be at many different levels — the ultimate authority in the US is with the Department of Commerce. People need to demand better protections for sharks, and that would encourage governments to take our recommendations to set limits on shark fishing, based on scientific advice. Governments are becoming sensitized that they need to do more for sharks, to set catch limits and to make sure they are enforced.

Ye360: What about the role of marine protected areas in shark conservation?

Fordham: There seems to be increasing government commitment to protecting 10 percent of the world's oceans. That clearly can have a benefit for sharks. It depends on the species and how big the protected area is, and how much of the shark's habitat is included in it. But just like finning bans, marine protected areas alone would not be sufficient. The most wide ranging sharks, like blue sharks, are going to swim out of protected areas, where they will be killed for their fins and their meat.

It should be clear that a lot of these species are already so depleted that they should be fully protected, along with their habitats. We also need to require that sharks are landed with their fins attached. And when species are taken by many countries, we need international protections like we have seen for the thresher shark. We are hoping that in a couple weeks either the US or the EU, or both, will propose some sort of agreement on limiting catch for mako sharks in the Atlantic, through ICCAT. That would be a major step forward.

Ye360: Would you recommend that consumers in the EU and the US not eat any sharks or rays for the foreseeable future?

Fordham: I do not get involved in the detail of which animals are good to eat, and which are not. But there are a lot of groups making good seafood lists. If people are committed to eating sustainable seafood, they can check the lists from the Monterey Bay Aquarium or the Blue Ocean Institute. But generally there are very few shark fisheries in the world that are well managed. So the chances are the shark is not coming from a well-managed fishery.

Sonja Fordham

One of the lead conservationists campaigning against shark overfishing is Sonja Fordham, who worked for the Ocean Conservancy and the Shark Alliance before founding her own group, Shark Advocates International, earlier 2010. Fordham, Deputy Chairperson of the International Union for the Conservation of Nature's Shark Specialist Group, is collaborating with scientists and fellow conservationists on an ambitious agenda to restore shark populations.