

ELASMOBRANCH DIVERSITY WITH PRELIMINARY DESCRIPTION OF FOUR SPECIES FROM TERRITORIAL WATERS OF BANGLADESH

A.B.M. Zafaria, Shamsunnahar, Sanjay Chakraborty, Md. Muzammel Hossain¹,
Md. Masud Rana and Mohammad Abdul Baki*

Department of Zoology, Jagannath University, Dhaka-1100, Bangladesh

Abstract: There is a significant lack of data regarding the biodiversity of elasmobranchs in the territorial waters of Bangladesh, since that sharks and rays are not targeted by commercial fishing industry, but rather encountered as a by-catch. This paper updated the diversity of elasmobranchs in the territorial waters of Bangladesh. The study was carried out to identify two coastal areas of Patharghata, Barguna and Cox's Bazar between October, 2015 and September, 2016. Using fish landing station survey techniques, total 20 species of elasmobranch were encountered, including eight species of sharks and 12 species of batoids, under 14 genera, ten families. This is the most expended field based records of elasmobranch fishes of Bangladesh.

Key words: Elasmobranch, assessment, diversity, shark, skate, ray

INTRODUCTION

Elasmobranchs have been evolving independently for at least 450 million years and, by the Carboniferous period, they seem to have developed a life-history pattern similar to that seen today. From a practical point of view the life-history pattern of elasmobranchs make this group of animals extremely susceptible to over fishing (Harold *et al.* 1990). The marine fisheries sector of Bangladesh plays a significant role in the country's economic growth through provision of employment in coastal area and providing source of protein for the population but shark fisheries (sharks and rays) are artisanal fisheries in Bangladesh. Bangladesh is located in the northeast corner of the Bay of Bengal (Churchill 2012), it has a markedly concave coastline-indeed; actually its two principal stretches of coast meet almost at right angles. A few species of shark enter in the brackish water and even in the freshwater rivers beyond the tidal ranges, like the Ganges River (Migdalskiet *al.* 1989). A few works have been completed with the taxonomy of shark species of Bangladesh such as Hussain (1970), Quddus *et al.* (1988), Rahman *et al.* (2009), Roy *et al.* (2014) and Hoq *et al.* (2014). At least 171 species of elasmobranches, representing 68 genera and 34 families, were recorded from fresh or estuarine waters (Martin 2005).

*Author for correspondence: <mabaki@gmail.com>. ¹Department of Fisheries and Aquaculture, Sharklab ADRIA, Dhaka, Bangladesh

Also 27 species of sharks (11 species) and rays (16 species) identified in the Bay of Bengal (Roy *et al.* 2011). Nine shark species belonging to 3 families (Carcharhinidae, Hemiscylliidae and Sphyrnidae) were recorded (Hasan *et al.* 2015). The western Indian Ocean and red sea have an extremely diverse shark fauna including 23 families, 62 genera and at least 115 species. Worldwide there are 730 families, 96 genera and about 350 species of sharks (elasmobranchii) (FAO 1983). About 70 species of sharks was found in Indian waters, though only 18 species are occasionally or frequently caught (Hausfather 2004).

The major shark hunting grounds of Bangladesh include the coastal waters of Kuakata, Sonar Char, Ruper Char, Fatrar Char, Char Gongmoti and Dublar Char in Patuakhali and Ashar Char, Patharghata, Barguna, the Sunderbans, Sandwip, Kutubdia, Moheshkhali, Cox's Bazar and Teknaf (Roy *et al.* 2015). IUCN shark specialist group - 2006 reported that 26% of Northeast Atlantic elasmobranchs threatened within the region (7% critically endangered, 7% endangered, 12% vulnerable) and globally, of the 1038 species of elasmobranchs assessed, 18% are threatened (3% CR, 4% EN, and 11% VU), 13% near threatened, 23% least concern and 46% data deficient (Gibson 2006). Illegal, unregulated and unreported trade is contributing to unsustainable fishing of a number of shark species (CITES 2010). Highest shark fishing countries are Indonesia, India, Taiwan, China, Spain and Mexico and in 2007, global landing was 42% (Camhi *et al.* 2009). Ray fisheries are important in many areas of the western central Pacific, with substantial landings off Thailand and Singapore (Compagno 1998). Certain publications are recognized about sharks' population dynamics, in particular concerning their biology and stock assessment (Vannuccini 1999). However, a few people know about elasmobranchs from the Bay of Bengal due to lack of adequate scientific investigation and advanced technology. Present investigation attempted to provide baseline information on shark, ray and skates species in the Bay of Bengal.

MATERIAL AND METHODS

The present study was carried out from October, 2015 to September, 2016 at two coastal regions, Patharghata area in Barguna and Cox's Bazar area, Chittagong.

Barguna: Patharghata area, located in between 22°14' and 22°58' north latitudes and in between 89°53' and 90°05' east longitudes. Harvesting depth is 5 to 30 m. It is bounded by Mathbaria and Bamna upazilas on the north, Bay of Bengal on the south, Barguna Sadar and the Bishkhali river on the east, Sarankhola upazila and the Haringhata river on the west.

Cox's Bazar area: Cox's Bazar area, located in between 21°24' and 21°36' north latitudes and in between 91°59' and 92°08' east longitudes. Harvesting depth is 10 to 50 m. It is bounded by Chakaria upazila on the north, Bay of Bengal and Ramu upazila on the south, Ramu upazila on the east, Maheshkhali upazila, Maheshkhali channel and Bay of Bengal on the west.

Regular survey was held at two landing stations to investigate species. Species-wise sharks and rays samples were collected from both landing stations. Unidentified species were preserved in 10% formalin solution, transported to laboratory to find out major morphological characteristics at taxonomic level. All species were identified based on the morphological features according to Munro (1955), Compagno (1981), Quddus *et al.* (1988), Talwar and Jhingran (1994), FAO. (1994), Bonfil and Mohammad (2003), Michael (2005), Raje *et al.* (2007), Rahman *et al.* (2009).

Calculation of length-length relationships: Length-length relationship was calculated by using equation $Y = a+bX$, (Alam *et al.* 2012), Where Y = various body lengths, X = total length, a = proportionality constant and b = regression coefficient.

RESULTS AND DISCUSSION

During study period a total of 20 species (sharks and rays) under 10 families were identified (Table 1). Among them three families (Sphyrnidae, Hemigaleidae, Carcharhinidae) of shark, and seven families (Dasyatidae, Gymnuridae, Mobulidae, Rhinopterae, Myliobatidae, Rhinobatidae, Narcinidae) of Rays were recorded. Among eight shark species, four species were recorded earlier by Roy (2010), five species were reported by Roy *et al.* (2014), and five species by Hoq *et al.* (2014). Among ray species, five species were reported by Roy (2010), three species were earlier Roy *et al.* (2014) and nine species were by Hoq *et al.* (2014). Preliminary information of four significant species describes below as distribution.

Hooktooth shark, *Chaenogaleus macrostoma* (Bleeker, 1852)

Synonym: *Hemigaleus balfouri* Day, 1878; *Hemigaleus macrostoma* Bleeker 1852. Common name: Hooktooth shark, Bengali name: China rihangor. (Fig. 1)

Recorded total length is 80 cm approximately. Upper side color is bronzy grey and lower side white. Two dorsal fin is present and pectoral fin large then 1st dorsal fin. Maximum total length is 100cm and small fishes, crustaceans and cephalopods are used as food. The species is Viviparous (with a yolk-sac placenta) (Compagno 1984).

Table 1. Checklist of Shark and Ray species in Bangladesh

Order	Family	Genus	Species	Roy 2010	Roy et al. 2014	Hoq et al. 2014	Present study
Carcharhini- formes	Sphyrnidae	<i>Sphyrna</i>	<i>Sphyrnalewini</i> (Griffith and Smith 1834)		✓	✓	✓
			<i>Sphyrna blochii</i> (Cuvier 1816)	✓			
	Hemigaleidae	<i>Chaenogaleus</i>	<i>Sphyrna zygaena</i> (Linnaeus 1758)	✓			
			<i>Chaenogaleus macrostoma</i> (Bleeker 1852)				✓
			<i>Galeocerdo cuvier</i> (Peron and Lesueur in Lesueur 1822)	✓	✓	✓	✓
	Carcharhinidae	<i>Galeocerdo</i>	<i>Scoliodon laticaudatus</i> (Müller and Henle 1838)	✓	✓	✓	✓
			<i>Rhizoprionodon acutus</i> (Rüppell 1837)	✓	✓	✓	✓
			<i>Rhizoprionodon</i>	<i>Rhizoprionodonoliginx</i> (Springer 1964)	✓	✓	
			<i>Carcharhinus</i>	<i>Carcharhinus limbatus</i> (Müller and Henle 1839)			✓
				<i>Carcharhinus melanopterus</i> (Quoy and Gaimard 1824)	✓	✓	
				<i>Carcharhinus dussumieri</i> (Müller and Henle 1839)		✓	✓
				<i>Carcharhinus leucas</i> (Müller and Henle 1839)	✓	✓	
				<i>Carcharhinus falciiformis</i> (Müller and Henle 1839)	✓	✓	✓
				<i>Carcharhinus amblyrhynchos</i> (Bleeker 1856)	✓		
				<i>Carcharhinus amboinensis</i> (Müller and Henle 1839)			✓
				<i>Carcharhinus sorrah</i> (Müller and Henle 1839)		✓	✓

Conted.)

(Contd.)

Myliobati- formes	Dasyatidae	<i>Himantura</i>	<i>Himantura arriak</i> (Forsskål 1775)	✓	✓	✓	✓
			<i>Himantura walga</i> (Müller & Henle 1841)	✓	✓	✓	✓
			<i>Himanturapastinacoides</i> (Bleeker 1852).			✓	
			<i>Himantura undulata</i> (Bleeker 1852)	✓	✓	✓	✓
			<i>Himantura gerrardi</i> (Gray 1851)	✓	✓	✓	✓
			<i>Himantura uarnacoides</i> (Bleeker 1852)		✓	✓	✓
			<i>Himantura bleekeri</i> (Blyth 1860)	✓	✓	✓	✓
		<i>Dasyatis</i>	<i>Dasyatis zugei</i> (Müller and Henle 1841)			✓	✓
			<i>Dasyatis kuhlii</i> (Müller and Henle 1841)			✓	✓
			<i>Dasyatis bennettii</i> (Müller and Henle 1841)				✓
		<i>Urogymnus</i>	<i>Urogymnus asperrimus</i> (Bloch and Schneider 1801)		✓	✓	✓
		<i>Pastinachus</i>	<i>Pastinachus gracilicaudus</i> (Last & Manjaji-Matsumoto 2010)			✓	✓
		<i>Taeniura</i>	<i>Taeniura sp.</i>	✓			
		<i>Pteroplatytrygon</i>	<i>Pteroplatytrygonviolacea</i> (Bonaparte 1832)			✓	
	Gymnuridae	<i>Gymnura</i>	<i>Gymnura japonica</i> (Temminck and Schlegel 1850)		✓		
			<i>Gymnura poecilura</i> (Shaw 1804)	✓	✓	✓	✓
			<i>Gymnura micrura</i> (Bloch and Schneider 1801)	✓			
		<i>Mobula</i>	<i>Mobula kuhlii</i> (Müller and Henle 1841)		✓	✓	✓
			<i>Mobula diabolus</i> (Shaw 1804)	✓			
			<i>Mobula japonica</i> (Müller and Henle 1841)			✓	✓



Fig. 1. *Chaenogaleus macrostoma* (Bleeker, 1852) © M. M. Hossain

Chaenogaleus macrostoma (Bleeker, 1852) is record form Patharghata, Barguna District (22°14' and 22°58' north latitudes, 89°53' and 90°05' east longitudes) in Bangladesh as distribution but it's caught irregularly by inshore gillnet fisheries in the Bay of Bengal. *Chaenogaleus macrostoma* (Bleeker, 1852) was reported from 22 countries/islands and occurrence in Pakistan, India, Sri Lanka, Singapore, Thailand, Vietnam, China, Taiwan, Java and Sulawesi in Indonesia. Indo-West Pacific: Persian Gulf (Compagno 1998).

Special notes: According to IUCN Red list this species is Vulnerable (VU) (A2bd + 3bd) in the world and also CITES and CMS were not evaluating the species.

Blacktip shark, *Carcharhinus limbatus* (Müller and Henle, 1839)

Synonym: *Carcharhinus natator* Meek and Hildebrand 1923, *Carcharias-aethlorus* Jordan and Gilbert 1882, *Carchariasehrenbergi* Klunzinger 1871; *Carcharias microps* Lowe 1841. Common Name: Blacktip shark, Bengali Name: Bolihangor. (Fig. 2)

Recorded total length is 120 cm approximately but maximum total length 275 cm male (Lafrance 1994). Snout is pointed and moderately long. Dorsal side is dark gray or blue to brown and ventral surface is white. The first dorsal fin of the shark is slightly posterior to the pectoral fins. Black color tips are present in the first and second dorsal fins, pectoral fins, pelvic fins, and lower caudal fin lobes. This shark is found in coastal and offshore or adjacent to central and often off river mouths, estuaries, muddy bays, mangrove swamps, lagoons, and coral reef drop-offs (Compagno 1984).

The species is found worldwide in tropical and warm temperate waters (Compagno 1984) but recorded form Patharghata, Barguna District (22°14' and 22°58' north latitudes, 89°53' and 90°05' east longitudes) in Bangladesh as distribution. *Carcharhinus limbatus* (Müller and Henle 1839) is one of the most

abundantly caught species in Bimini, Bahamas (Kessel 2010). This shark is a target species as commercial shark fishery in the United States and the Gulf of Mexico (Branstetter and Burgess 1997).



Fig. 2. *Carcharhinus limbatus* (Müller and Henle 1839). © M. A. Baki

Special notes: According to IUCN Red list, this species is Near Threatened (NT) in the world but CITES and CMS were not evaluating the species.

Annandale's guitarfish, *Rhinobatos annandalei* (Norman, 1926)

Synonym: Not evaluated; Common name: Annandale's guitarfish; Local name: Pitambori. **(Fig. 3)**

Recorded total length is 55 cm approximately. Snout elongate, anteriorly flattened, Stout tail, confluent with trunk. Pectoral fins expanded, attached to the head from nostrils to $\frac{1}{2}$ the snout length. Dorsal fins relatively large, pelvic fins single lobed, caudal fin not bilobed, mouth is short and relatively straight, teeth is small molariform, Spiracles well developed. It is ovoviviparous (Dulvy and Reynolds 1997).



Fig. 3: *Rhinobatos annandalei* (Norman 1926), © M. M. Hossain

This ray species recorded from Patharghata, Barguna district (22°14' and 22°58' north latitudes, 89°53' and 90°05' east longitudes) in Bangladesh as distribution. This species enters in the river but mainly occurs in the marine water. Generally it occurs in Indian Ocean: India, Sri Lanka, Pakistan and also possibly from the Gulf (Talwar and Jhingran 1994).

Special notes: According to IUCN red list, insufficient information is available on the species *Rhinobatos annandalei* (Norman, 1926), distribution, biology and capture in fisheries to assess it beyond Data Deficient (Valenti 2009). CITES and CMS were not evaluating the species.

Bennett's stingray, *Dasyatis bennettii* (Müller and Henle 1841)

Synonym: *Trygon bennettii* Müller and Henle, 1841; Common name: Bennett's stingray; Local name: Shaplapata mach. (Fig. 4)

Recorded disc width (DW) is 50 cm and total length 130cm approximately but the species reaches a maximum total length (TL) at least 275 cm male (Lafrance 1994). Snout tip of *Hemitrygon bennettii* (Müller and Henle 1841) with rhomboid disc triangular and moderately protruding. Species color is yellowish brown upside, becoming darker on the tail fold, and below is lightly. Pectoral fin disk like diamond-shaped, tail is whip-like, stinging spine present on the upper surface of the tail, dermal denticles present in the middle of the back side. Tail length about three times disc length; disc and snout longer; head length about half of disc wide. Small bony fishes and crustaceans used as food (Thollot 1996).



Fig. 4. *Dasyatis bennettii* (Müller and Henle 1841), © M. M. Hossain.

The species is newly recorded from Cox's Bazar district (21°24' and 21°36' north latitudes and in between 91°59' and 92°08' east longitudes) in Bangladesh as distribution but found in northwest pacific: Indonesia (Java) to central China, including Taiwan (Compagno 1984).

Special note: According to IUCN red list, insufficient information is available on the species *Dasyatis bennettii* (Müller and Henle 1841), distribution, biology and capture in fisheries to assess it beyond Data Deficient (Valenti 2016). CITES and CMS are not evaluating the species. Ray fisheries are very important in many areas but no specific information on catches and abundance of population, comparative anatomical study is available.

Length-length relationship (LLR) of *S. laticaudus* and *R. acutus*:

About 12500 individuals were observed from the area during this study. The number of individuals varied from 274 in case of species *Scoliodon laticaudus* to 256 for *Rhizoprionodon acutus* measuring length from the BFDC, Patharghata during October to November. In *S. laticaudus* the highest total length (TL) and standard length (SL) were recorded 56.6 and 54.6 cm in October and the lowest TL and SL were recorded 26.5 and 24.4 cm in November. The highest mean value of TL was 40.61 ± 5.461 cm in November the lowest was 40.08 ± 5.504 cm in October. The highest mean value of SL was 39.06 ± 5.381 cm in November the lowest was 38.68 ± 5.36 cm in October. In October the LLR of *S. laticaudus* was revealed that the value of "a" "b" and the coefficient value were 0.237, 0.970 and 0.960, respectively. In November values were 0.406 0.972 and 0.994 respectively. In *R. acutus* the highest TL and SL were recorded 60.5 cm and 58.1 cm in November and the lowest TL and SL were recorded 27.5 and 26.6 cm in November. The highest mean value of TL was 43.75 ± 6.79 cm in November the lowest was 43.72 ± 8.18 cm in October. The highest mean value of SL was 42.22 ± 6.564 cm in November the lowest was 42.00 ± 7.866 cm in October. In October the LLR of *R. acutus* was revealed that the value of "a" "b" and the coefficient value was 0.795, 0.942 and 0.960, respectively. In November values were 0.052, 0.963 and 0.994, respectively. The value of LLR ($r^2 > 0.9$) indicated that they are highly significant and highly correlated.

CONCLUSION

This study provides a set of identification characteristics of newly reported shark and ray species morphologically where in eight species of sharks and 12 species of rays were identified. No previous data of the length-length relationships of the *Scoliodon laticaudus* and *Rhizoprionodon acutus* was available from Bangladesh and this data updated the fish base information. This basic

data will help in establishing a sustainable management plan for sharks and rays of Bangladesh.

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