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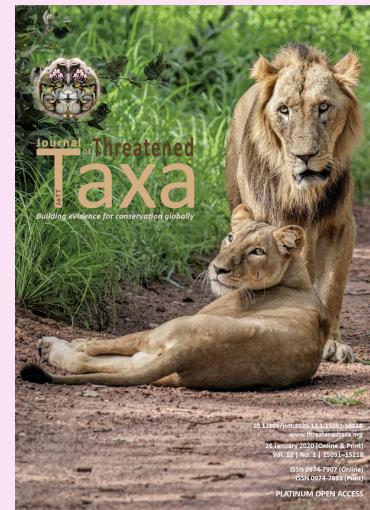
## COMMUNICATION

### AN OVERVIEW OF FISHES OF THE SUNDARBANS, BANGLADESH AND THEIR PRESENT CONSERVATION STATUS

Kazi Ahsan Habib, Amit Kumer Neogi, Najmun Nahar, Jina Oh, Youn-Ho Lee & Choong-Gon Kim

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## An overview of fishes of the Sundarbans, Bangladesh and their present conservation status

Kazi Ahsan Habib<sup>1</sup> , Amit Kumer Neogi<sup>2</sup> , Najmun Nahar<sup>3</sup> , Jina Oh<sup>4</sup> , Youn-Ho Lee<sup>5</sup> & Choong-Gon Kim<sup>6</sup>

<sup>1</sup> Department of Fisheries Biology and Genetics, Faculty of Fisheries, Aquaculture & Marine Science, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh.

<sup>2,3</sup> Aquatic Bioresource Research Lab, Department of Fisheries Biology and Genetics, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh.

<sup>4,5,6</sup> Marine Ecosystem Research Division, Korea Institute of Ocean Science and Technology (KIOST), Busan 49111, Korea.

<sup>1</sup>ahsan.sau@gmail.com (corresponding author), <sup>2</sup>neogi3710@gmail.com, <sup>3</sup>naharnajmun887@gmail.com,

<sup>4</sup>jnoh@kiost.ac.kr, <sup>5</sup>ylee@kiost.ac, <sup>6</sup>kimcg@kiost.ac.kr

**Abstract:** Sundarbans, the largest mangrove forest of the world is located in Bangladesh and India. Studies done on the diversity of fish fauna in the Sundarbans mangrove forest of Bangladesh are sparse and patchy. Here we take the opportunity to provide an updated checklist of the fishes of the Sundarbans, Bangladesh based on primary and secondary data. Field surveys were undertaken in the aquatic habitat of Sundarbans core area along with its adjacent marine habitat from June 2015 to July 2017. Based on published information and primary observations the updated list of fishes covers a total of 322 species belonging to 217 genera, 96 families, and 22 orders. Additionally, four species of fishes, are newly reported in Bangladesh waters, viz., *Mustelus mosis* Hemprich & Ehrenberg, 1899; *Lagocephalus guentheri* Miranda Ribeiro, 1915; *Caranoides hedlandensis* Whitley, 1934; *Uranoscopus cognatus* Cantor, 1849. The global IUCN Red List status of each species has been enlisted. The updated checklist will constitute the reference inventory of fish biodiversity for the Sundarbans, a natural world heritage site.

**Keywords:** Bangladesh, checklist, fish, mangroves, Sundarbans, World Natural Heritage Site.

**Abbreviations:** Dorsal fin D<sub>1</sub>—1<sup>st</sup>Dorsal fin | D<sub>2</sub>—2<sup>nd</sup>Dorsal fin | P<sub>1</sub>—Pectoral fin | P<sub>2</sub>—Pelvic fin | A—Anal fin.

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**Author details:** See end of this article.

**Author contribution:** Kazi Ahsan Habib and Amit Kumer Neogi collected the data and drafted this article; Amit Kumer Neogi, Jina Oh, Kazi Ahsan Habib analysed the morphological and molecular data; Najmun Nahar analysed the morphological characters; Choong-Gon Kim and Youn-Ho Lee reviewed the manuscript.

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## INTRODUCTION

Mangroves are intertidal forested wetlands confined to the tropical and subtropical regions (Tomlinson 1986). The total area of the mangroves in the globe is an estimated 18.1 million ha (Spalding et al. 1997). The Sundarbans, the single largest tract of mangrove forest in the world covers about 1 million hectares in the delta of the river Ganges, Brahmaputra, and Meghna. Among the total area 60% lies in Bangladesh and the rest in India. This transboundary ecosystem is extremely important both ecologically and economically as it provides a nursery and breeding area for key fishes including those of the Bay of Bengal. The Sundarbans in Bangladesh covers an area of 6,017km<sup>2</sup> along its southwestern part sharing 4,143km<sup>2</sup> of land and 1,874km<sup>2</sup> of water bodies comprising of hundreds of creeks, canals, small and large rivers, and estuaries. This mangrove forest was declared a Ramsar site by the Convention of Wetlands of International Importance in 1992 and declared as a Natural World Heritage Site by UNESCO in 1997 (Figure 1). Despite continued degradation, the Sundarbans contributes 3% to the country's gross domestic product out of 5% contribution of the country's forestry sector (Roy & Alam 2012).

The fish diversity of the brackish water ecosystem of the Sundarbans is usually associated with tolerance to a wide range of salinity fluctuation and migration. The freshwater fish species having low salinity tolerance enter into upper estuarine zone mainly in the period of ebb tide, while marine fishes are usually confined to the lower zone. Though some species travel freely in the whole salinity area for a major part of the year, very few can be considered as 'native' (Mishra 2017). Basically, most of the fish species enter into the brackish waters of the Sundarbans and spend for a certain period of their life cycle there either for shelter and feeding or for spawning purposes. The major threat to fishes of the Sundarbans region are environmental changes, reduction of freshwater discharge during lean seasons, increased salinity, use of destructive fishing gear (e.g., set bag net, small mesh size gill net), over exploitation, extraction of resources, and pollution.

Information regarding the diversity of fish in the Sundarbans of Bangladesh is scattered. Fishes of the Sundarbans were first described in the study of Hamilton (1822). He described about 71 fish species in the Gangetic estuaries and 51 of them occurred from the Sundarbans. After the independence of Bangladesh in 1971, several researchers and authors published different scientific and conference papers, project reports, guides and books on fish faunal diversity especially since 1978. Only some of them can be considered as valid references on the species

availability in the Sundarbans waters such as Seidensticker & Hai (1983), Rahman (1989), Acharya & Kamal (1994), Chantarasri (1994), Bernacsek (2001), Bernacsek & Haque (2001), Shah & Hossain (2006), and Rahman et al. (2009). The main objective of the present study is to assess the existing fish fauna of Sundarbans and accumulate all fish species from the valid records made so far. Additionally, we have reviewed the present fishing practices in the Sundarbans detrimental to fish biodiversity, and the national policies made for fisheries management and conserving fish diversity.

## METHODS

We consulted the primary and previously published articles, records, and books on ichthyological studies in the Sundarbans to build this checklist. These collections are mainly taken for preparing the list of the fishes known to occur in the Sundarbans and their valid identification and confirmation. Unbiased and sincere efforts were made in accumulating such a valuable treasure.

In the present survey, specimens of fishes were sampled between June 2015 and July 2017 from the major rivers of the Sundarbans, viz., Baleswar, Shabsa, Passur, Shela, Kobadak, Kalindi, Kholpetua, and a few of the tidal estuaries, and adjacent marine habitat in the Sundarbans, with the help of local fishermen during fishing (Figure 1). The fishes were also collected from the fish markets inside or near the Sundarbans of Khulna, Bagherhat, and Satkhira districts. The spellings of scientific names and species validity were checked following Fishbase (Froese & Pauly 2018) and the California Academy of Sciences Catalog of Fishes (Eschmeyer et al. 2018). The arrangement of families and order are made according to Nelson (2006) and Laan et al. (2014). The identification was made by using FAO fish species catalogues which present detailed taxonomic accounts of all known species of individual families. As the checklist is intended to be a master reference for the Sundarbans habitat conservation and management, we consulted the latest global IUCN Red List status of each species (IUCN 2018). For habitat preference, we consulted previous data, our primary observation, reference website (Froese & Pauly 2018) and different reference books (Siddiqui et al. 2007; Rahman et al. 2009). DNA barcoding through mitochondrial COI gene sequencing was done for the newly recorded species during the present survey and the sequence was submitted to GenBank.

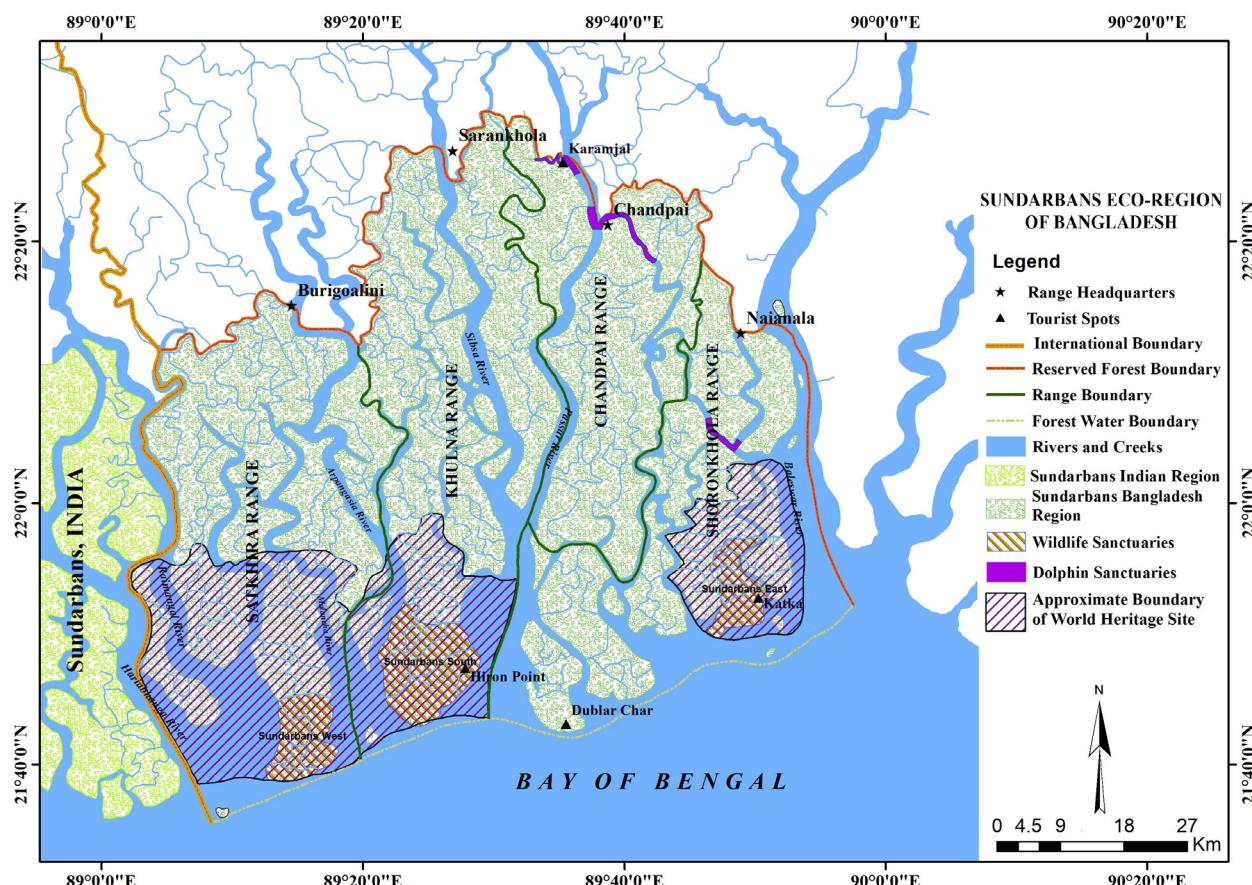


Figure 1. Map showing the location of Sundarbans, Bangladesh where the fishes were recorded from June 2015 to July 2017.

## RESULTS

Based on the previously published information, specimens housed in the Aquatic Bioresource Research Lab., SAU and observations in the present study, the updated list of fishes of Sundarbans, Bangladesh provides information of 322 species belonging to 217 genera of 96 families and 22 orders (Table 1). In the present checklist, we have not considered any description. The column named as “present study” of Table 1, signifies our primary data collected between July 2015 and June 2017 and “previous literature” signifies the names which were enlisted in previous work on Sundarbans conducted by different scholars. Among the enlisted fish, Chondrichthyes (cartilaginous fish) contains 23 genera, 11 families and six orders whereas bony fish (Osteichthyes) covers 194 genera, 85 families and 16 orders. Maximum numbers of fishes (165 species, 50.24%) were recorded from order Perciformes in Sundarbans, Bangladesh. The number of fish species recorded under 22 orders is given at Figure 2.

In the present article, we report four new distributional records of fishes from the Sundarbans region of

Bangladesh, viz., *Mustelus mosis* Hemprich & Ehrenberg, 1899; *Lagocephalus guentheri* Miranda Ribeiro, 1915; *Carangooides hedlandensis* Whitley, 1934; *Uranoscopus cognatus* Cantor, 1849 (Image 1).

### Order Carcharhiniformes

#### Family Triakidae

##### Genus *Mustelus* Linck 1790

##### *Mustelus mosis* Hemprich & Ehrenberg, 1899

**Materials examined:** Specimens collected from Bangladesh: Sundarbans: Dubla: Alorkol; coordinate 21.71N, 89.59E (Image 1A); coll. Habib and Neogi, 03.ii.2016; one specimen (Specimen voucher F1602sb-73). GenBank accession number MF588562.

**Identification:** Body color reddish-grey above and dull white ventrally. Small sized shark, with an elongate and slender body; snout markedly pointed and long. Mouth triangular, with well-developed labial folds. Skin fairly smooth.

**Order Tetraodontiformes****Family Tetraodontidae****Genus *Lagocephalus* Swainson, 1839*****Lagocephalus guentheri* Miranda Ribeiro, 1915**

**Materials examined:** Specimens collected from Bangladesh: Sundarbans: Dubla: Alorkol; coordinate 21.71N, 89.59E (Image 1B); coll. K.A. Habib, 03.ii.2016; three specimens (Specimens voucher F1602sb-65-2, F1602sb-64, F1602sb-65-3). GenBank accession numbers MF588654, MF588655, MF588656.

**Identification:** Fin formula D 22-23; P<sub>1</sub> 14; P<sub>2</sub> 6; A 19-21. Color of dorsal side of the body is brown with several dark bands crossing over the back; a silver-white band running on the side of the body was found in the holotype. The dorsal fin dusky. The caudal fin dark brown or almost black with the dorsal and ventral white tips. The pectoral and anal fins pale. Body stout and small sized fishes, covered with small spinules on back, abdomen and throat; caudal fin rounded.

**Order Perciformes****Family Carangidae****Genus *Carangoides* Bleeker, 1851*****Carangoides hedlandensis* Whitley, 1934**

**Materials examined:** Specimens collected from Bangladesh: Sundarbans: Dubla: Alorkol; coordinate 21.71N, 89.59E (Image 1C); coll. Habib and Neogi,

16.xii.2016; two specimens (Specimens voucher F1612sb-69, F1612sb-66). GenBank accession numbers MF588553, MF614771.

**Identification:** Fin formula D<sub>1</sub> VIII; D<sub>2</sub> I/22 P<sub>1</sub> 19; P<sub>2</sub> I/5; A II+I/17. Body color bluish-green above and silvery white below; dorsal fin dusky; filamentous soft rays black, soft dorsal fin yellow; pectoral and anal fins silvery; caudal fin yellowish green; pectoralfin dusky. A black opercular spot present. Body strongly compressed and very deep. Eye diameter about equal to or larger than snout length. Central rays of dorsal and anal fins elongated. Scales small; breast naked. Lateral line anteriorly with a moderate regular arch.

**Order Perciformes****Family Uranoscopidae****Genus *Uranoscopus* Linnaeus, 1758*****Uranoscopus cognatus* Cantor, 1849**

**Materials examined.** Specimens collected from Bangladesh: Sundarbans: Dubla: Alorkol; coordinate 21.71N; 89.59E (Image 1D); coll. Habib and Neogi, 21.ii.2017; three specimens (Specimens voucher F1702sb-29, F1702sb-30, F1702sb-31).

**Identification.** Fin formula D<sub>1</sub> IV; D<sub>2</sub> I/8; P<sub>1</sub> 14; P<sub>2</sub> I/5; A III/8. Body color grayish above and minute black dots on upper third body; silvery below; opercle golden. Body compresses; anterior moderately and posterior deeply.

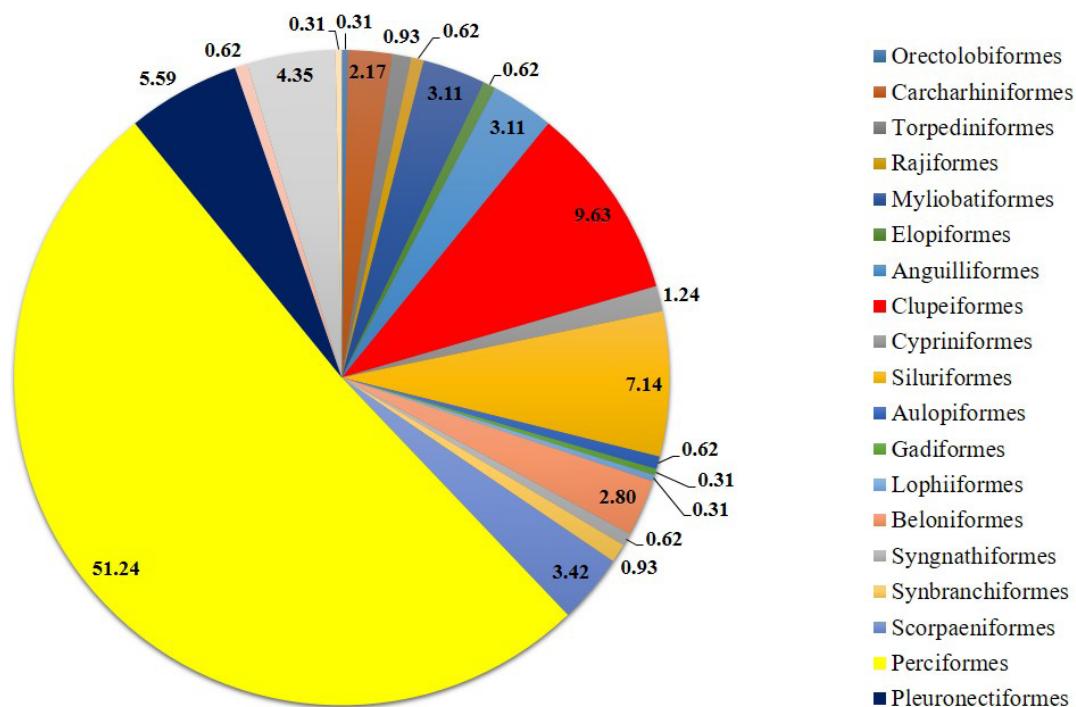
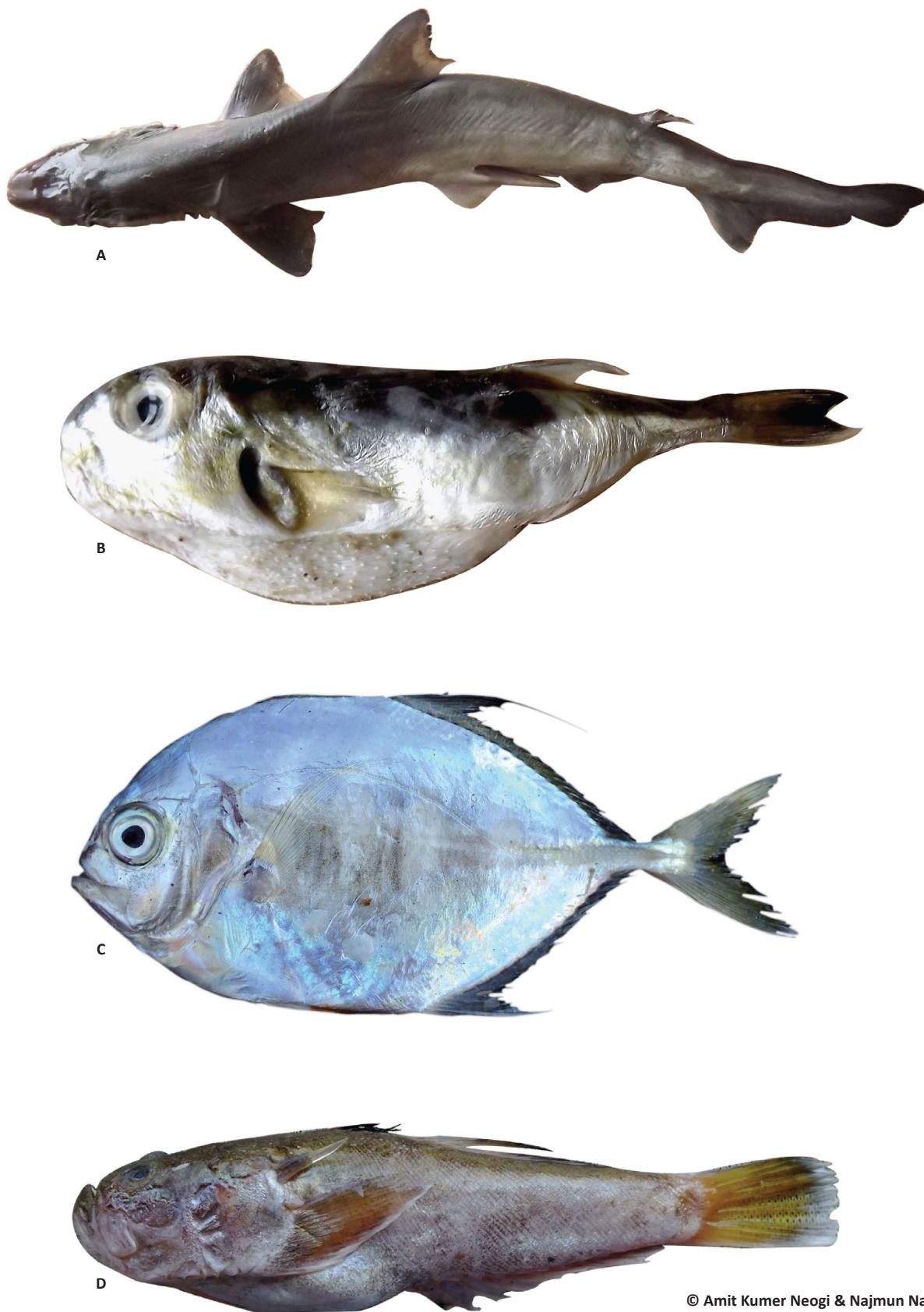


Figure 2. Order-wise distribution of listed fishes of the Sundarbans, Bangladesh.



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Image 1. Four new country records from the Sundarbans, Bangladesh: A—*Mustelus mosis* Hemprich & Ehrenberg, 1899 | B—*Lagocephalus guentheri* Miranda Ribeiro, 1915 | C—*Carangoides hedlandensis* Whitley, 1934 | D—*Uranoscopus cognatus* Cantor, 1849.

**Table 1.** List of fish species from the Sundarbans including their order and family status, english name, local name, scientific name, Global IUCN Red List status, earlier literature record and their habitats (Abbreviations: EN—Endangered | VU—Vulnerable | NT—Near Threatened | LC—Least Concern | DD—Data Deficient | NE—Not Evaluated | F—Freshwater | B—Brackish | M—Marine).

	Order/ Family	English name	Scientific name	Red List status	Present study	Previous literature	Habitat
1	Orectolobiformes Hemiscylliidae	Grey Bamboo Shark	<i>Chiloscyllium griseum</i>	NT	✓		M,B
2	Carcharhiniformes Carcharhinidae	Dog Shark	<i>Scoliodon laticaudus</i>	NT	✓		M,B
3		Shark	<i>Glypis glyphis</i>	EN		Bernacsek 2001a	M,F,B
4		Scoliodon Walbeehmii	<i>Rhizoprionodon acutus</i>	NE	✓		M,F,B
5		Blacktip Reef Shark	<i>Carcharhinus melanopterus</i>	NT		Bernacsek 2001a	M,B
6		Scalloped Hammerhead Shark	<i>Sphyraena lewini</i>	EN	✓		M,B
7	Carcharhiniformes Sphyrnidae	Hammerhead Shark	<i>Eusphyra blochii</i>	EN		Bernacsek 2001a	M,B
8		Hardnose Smoothhound	<i>Mustelus mosis</i>	DD	✓		M
9	Torpediniformes Narkidae	Brown Spotted Numbfish	<i>Narcine brunnea</i>	NE	✓		M
10	Torpediniformes Narcinidae	Electric Ray	<i>Narcine timlei</i>	DD		Bernacsek 2001a	M
11		Spottail Sleeper Ray	<i>Narke dipterygia</i>	DD	✓		M
12	Rajiformes Rhinobatidae	Gulter Fish	<i>Rhynchobatus djiddensis</i>	VU		Bernacsek 2001a	M,B
13		Sharpnose Gutterfish, Shovelnose	<i>Glaucostegus granulatus</i>	VU	✓		M
14	Myliobatiformes Dasyatidae	Scaly Whipray	<i>Brevitrygon imbricata</i>	DD	✓		M,F,B
15		Dwarf Whipray	<i>Brevitrygon walga</i>	NT	✓		M
16		Stingray	<i>Himantura undulata</i>	VU		Bernacsek 2001a	M
17		Leopard Stingray, Reticulate Whipray, Honeycomb Stingray	<i>Himantura uarnak</i>	VU	✓		M,B
18		Cowtail Stingray	<i>Pastinachus sephen</i>	NE		Bernacsek 2001a	M,F,B
19		Bleeker's Whipray	<i>Pateobatis uarnacooides</i>	VU		Bernacsek 2001a	M
20		White Spotted Stingray	<i>Maculabatis gerrardi</i>	VU		Bernacsek 2001a	M,B
21		Cowtail Stingray	<i>Pastinachus sephen</i>	NT		Bernacsek 2001a	M,F,B
22		Sharp Snout Stingray	<i>Tetronarcet zugei</i>	NT	✓		M,B
23	Myliobatiformes Gymnuridae	Longtail Butterfly Ray, Butterfly Ray	<i>Gymnura poecilura</i>	NT	✓		M
24	Elopiformes Elopidae	Tenpounder,Tarpon	<i>Elops machnata</i>	LC		Bernacsek 2001a	M,B
25	Elopiformes Megalopidae	Indo-Pacific Tarpon	<i>Megalops cyprinoides</i>	DD	✓		M,F,B
26	Anguilliformes Muraenidae	Red Sea White-Spotted Moray	<i>Gymnothorax punctatus</i>	NE	✓		M
27		Moray Eel	<i>Gymnothorax tile</i>	NE	✓		M,F,B
28		Moray Eel	<i>Gymnothorax sp.</i>	NE	✓		M,B
29		Slender Giant Moray	<i>Strophidon sathete</i>	NE	✓		M,B
30	Anguilliformes Muraenesocidae	Yellow Pike Conger	<i>Congresox talabonoides</i>	NE		Huda et al. 2003	M,B
31		Eel	<i>Congresox talabonoides</i>	NE		Bernacsek 2001a	M,B
32		Daggetooth Pike Conger	<i>Muraenesox cinereus</i>	NE		Bernacsek 2001a	M,F,B
33	Anguilliformes Ophichthidae	Boro Snake Eel	<i>Pisodonophis boro</i>	LC	✓		M,F,B

	Order/ Family	English name	Scientific name	Red List status	Present study	Previous literature	Habitat
34	Anguilliformes Anguillidae	Purple Spaghetti Eel	<i>Moringua raitaborua</i>	NE	✓		F,B
35		Giant Mottled Eel	<i>Aquilla bengalensis</i>	NT	✓		M,F,B
36	Clupeiformes Clupeidae	Chacunda Gizzard Shad, Shortnose Gizard Shad	<i>Anodontostoma chacunda</i>	NE	✓		M,F,B
37		Indian River Shad	<i>Gudusia chapra</i>	LC	✓		F,B
38		Kelee Shad	<i>Hilsa kelee</i>	NE	✓		M,F,B
39		Bloch's Gizzard Shad, Longfinned Gizzard Shad	<i>Nematalosa nasus</i>	LC	✓		M,F,B
40		White Sardine	<i>Escualosa thoracata</i>	NE	✓		M,F,B
41		Gold Stripe Sardine	<i>Sardinella gibbosa</i>	NE		Bernacsek 2001a	M
42		Sardine	<i>Sardinella fimbriata</i>	NE	✓		M,B
43		Indian Oil Sardine	<i>Sardinella longiceps</i>	NE	✓		M
44		Blacktip Sardinella	<i>Sardinella melanura</i>	NE	✓		M
45		River Shad, Hilsa Shad	<i>Tenualosa ilisha</i>	LC	✓		M,F,B
46		Toli Shad, Shad	<i>Tenualosa toli</i>	NE	✓		M,F,B
47	Clupeiformes Engraulidae	Goldspotted Grenadier Anchovy	<i>Coilia dussumieri</i>	NE	✓		M,F,B
48		Neglected Grenadier Anchovy	<i>Coilia neglecta</i>	LC	✓		M,B
49		Ramcarat Grenadier Anchovy	<i>Coilia ramcarati</i>	NE	✓		M,B
50		Gangetic Hairfin Anchovy	<i>Setipinna phasa</i>	NE		Bernacsek 2001a	F,B
51		Scaly Hairfin Anchovy	<i>Setipinna taty</i>	NE	✓		M,B
52		Indian Anchovy	<i>Stolephorus indicus</i>	NE	✓		M,B
53		Common Hairfin Anchovy	<i>Setipinna tenuifilis</i>	NE	✓		M,B
54		Spined Anchovy	<i>Stolephorus tri</i>	NE	✓		M,B
55		Anchovy	<i>Thryssa dussumieri</i>	LC		Bernacsek 2001a	M,B
56		Hamilton's Thryssa	<i>Thryssa hamiltonii</i>	NE	✓		M,B
57		Oblique Jaw Thryssa, Gangetic Anchovy	<i>Thryssa purava</i>	NE	✓		M,B
58	Clupeiformes Chirocentridae	Wolf Herring	<i>Chirocentrus nudus</i>	LC		Bernacsek 2001a	M
59		Dorab Wolf-Herring	<i>Chirocentrus dorab</i>	NE	✓		M,B
60	Clupeiformes Dussumieriidae	Rainbow Sardine	<i>Dussumieri acuta</i>	LC		Bernacsek 2001a	M,F,B
61	Clupeiformes Pristigasteridae	Smooth Back Herring	<i>Raconda russeliana</i>	NE		Bernacsek 2001a	M,B
62		Indian Pellona Herring	<i>Pellona ditchela</i>	LC		Bernacsek 2001a	M,F,B
63		Indian Ilisha	<i>Ilisha melastoma</i>	LC		Bernacsek 2001a	M,B
64		Bigeye Herring	<i>Ilisha megaloptera</i>	LC		Bernacsek 2001a	M,F,B
65		Coromandal Ilisha	<i>Ilisha filigera</i>	DD		Huda & Haque 2003	M,F,B
66		Long Finned Herring	<i>Opisthoterous tardoore</i>	NE	✓		M,B
67	Cypriniformes Cobitidae	Guntea Loach	<i>Lepidocephalichthys guntea</i>	LC	✓		F,B
68	Cypriniformes Cyprinidae	Swamp Barb	<i>Puntius chola</i>	LC	✓		F
69		Barb	<i>Puntius terio</i>	LC		Bernacsek 2001a	F
70		Gangetic Scissortail Rasbora	<i>Rasbora rasbora</i>	LC	✓		F,B

	Order/ Family	English name	Scientific name	Red List status	Present study	Previous literature	Habitat
71	<b>Siluriformes</b> <b>Plotosidae</b>	Canine Catfish Eel	<i>Plotosus canius</i>	NE	✓		M,F,B
72		Striped Ell Tail Catfish	<i>Plotosus lineatus</i>	NE		Bernacsek 2001a	M,B
73	<b>Siluriformes</b> <b>Schilbeidae</b>	Gagra	<i>Clarias garua</i>	LC	✓		F,B
74	<b>Siluriformes</b> <b>Ailiidae</b>	Gangetic Ailia	<i>Ailia coila</i>	NT	✓		F,B
75		Silond Catfish, Silondia Vacha	<i>Silonia silondia</i>	LC	✓		F,B
76	<b>Siluriformes</b> <b>Pangasiidae</b>	Fatty Catfish	<i>Pangasius pangasius</i>	LC		Bernacsek 2001a	F,B
77	<b>Siluriformes</b> <b>Bagridae</b>	Tengara Catfish	<i>Mystus tengara</i>	LC	✓		F,B
78		Catfish	<i>Mystus bleekeri</i>	LC		Bernacsek 2001a	F,B
79		Long-Whiskered Catfish	<i>Mystus gulio</i>	LC		Bernacsek 2001a	F,B
80	<b>Siluriformes</b> <b>Clariidae</b>	Walking Catfish	<i>Clarias batrachus</i>	LC		Huda et al. 2003	F,B
81	<b>Siluriformes</b> <b>Sisoridae</b>	Gangetic Goonch, Devil Catfish	<i>Bagarius bagarius</i>	LC	✓		F,B
82	<b>Siluriformes</b> <b>Ariidae</b>	Gagora Catfish	<i>Arius gagora</i>	NT	✓		M,F,B
83		Spotted Catfish, Sea Catfish	<i>Arius maculatus</i>	NE	✓		M,F,B
84		Yellow Sea Catfish, Marine Catfish	<i>Arius venosus</i>	NE	✓		M,B
85		Threadfin Sea Catfish	<i>Arius arius</i>	LC	✓		M,B
86		Blacktip Sea Catfish	<i>Plicofollis dussumieri</i>	LC		Bernacsek 2001a	M,F,B
87		Flatmouth Sea Catfish	<i>Plicofollis platystomus</i>	LC		Bernacsek 2001a	M,B
88		Dusky Catfish, Sona Sea Catfish	<i>Sciades sona</i>	NE	✓		M,B
89		Engraved Catfish	<i>Nemapteryx nenga</i>	NE	✓		M,B
90		Engraved Catfish	<i>Nemapteryx caelata</i>	NE		Huda & Haque 2003	M,B
91		Giant Sea Catfish	<i>Netuma thalassina</i>	NE		Bernacsek 2001a	M,F,B
92		Bronze Catfish	<i>Netuma bilineata</i>	NE	✓		M,F,B
93	<b>Siluriformes</b> <b>Heteropneustidae</b>	Stinging catfish	<i>Heteropneustes fossilis</i>	LC	✓		F,B
94	<b>Aulopiformes</b> <b>Synodontidae</b>	Bombay Duck	<i>Harpodon nehereus</i>	NE	✓		M,B
95		Greater Lizard Fish	<i>Saurida tumbil</i>	LC	✓		M
96	<b>Gadiformes</b> <b>Bregmacerotidae</b>	Unicorn Cod	<i>Bregmaceros mcclellandi</i>	NE	✓		M,B
97	<b>Lophiiformes</b> <b>Antennariidae</b>	Shaggy Angler, Zebra Frogfish	<i>Antennarius hispidus</i>	NE	✓		M
98	<b>Beloniformes</b> <b>Belonidae</b>	Banded Needle Fish, Square Tail Alligator Gar	<i>Strongylura leiura</i>	NE	✓		M,B
99		Spottail Needle Fish	<i>Strongylura strongylura</i>	NE		Bernacsek 2001a	M,B
100		Needle Fish	<i>Tylosurus crocodilus</i>	NE		Bernacsek 2001a	M,B
101		Silver Needle Fish	<i>Xenentodon canila</i>	LC	✓		M,F,B
102	<b>Beloniformes</b> <b>Hemiramphidae</b>	Congaturi Halfbeak	<i>Hyporhamphus limbatus</i>	LC		Bernacsek 2001a	M,F,B
103		Georges Halfbeak, Longbilled Halfbeak	<i>Rhynchorhamphus georgii</i>	NE	✓		M,F,B
104	<b>Beloniformes</b> <b>Zenarchopteridae</b>	Buffon's Halfbeak, Buffon's Garfish	<i>Zenarchopterus buffonis</i>	NE	✓		M,B
105		Ectuntio Halfbeak	<i>Zenarchopterus ectuntio</i>	NE	✓		F,B

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106	<b>Beloniformes</b> <b>Exocoetidae</b>	Tropical Two-Winged Flying Fish	<i>Exocoetus volitans</i>	LC	✓		M
107	<b>Syngnathiformes</b> <b>Fistulariidae</b>	Red Cornetfish, Flute-Mouth	<i>Fistularia petimba</i>	LC	✓		M,B
108	<b>Syngnathiformes</b> <b>Syngnathidae</b>	Sea Horse, Smooth Seahorse	<i>Hippocampus kuda</i>	VU	✓		M,B
109	<b>Synbranchiformes</b> <b>Synbranchidae</b>	Cuchia, Gangetic Mud Eel	<i>Monopterus cuchia</i>	LC	✓		F,B
110	<b>Synbranchiformes</b> <b>Mastacembelidae</b>	Lesser Spiny Eel	<i>Macrognathus aculeatus</i>	NE	✓		F,B
111		Striped Spiny Eel	<i>Macrognathus pанcalus</i>	LC	✓		F,B
112	<b>Scorpaeniformes</b> <b>Scorpaenidae</b>	Plaintail Turkeyfish, Russell'S Firefish	<i>Pterois russelii</i>	NE	✓		M,B
113		Miles Lion Fish	<i>Pterois miles</i>	NE		Bernacsek 2001a	M
114	<b>Scorpaeniformes</b> <b>Synanceiidae</b>	Grey Stingfish	<i>Minous monodactylus</i>	NE	✓		M
115		Painted Stringer	<i>Minous pictus</i>	NE	✓		M
116	<b>Scorpaeniformes</b> <b>Platycephalidae</b>	Rough Flathead	<i>Grammoplites scaber</i>	NE	✓		M,B
117		Flathead	<i>Cociella punctata</i>	LC		Bernacsek 2001a	M
118		Spiny Flathead	<i>Kumococius rodericensis</i>	NE	✓		M
119		Spotted Flathead	<i>Cociella crocodilus</i>	NE		Bernacsek 2001a	M,B
120		Thorny Flathead	<i>Rogadius asper</i>	LC		Bernacsek 2001a	M
121		Flathead	<i>Rogadius pristiger</i>	LC		Bernacsek 2001a	M
122		Bartail Flathead	<i>Platycephalus indicus</i>	NE	✓		M,B
123	<b>Perciformes</b> <b>Epinephelidae</b>	Cloudy Grouper, Cloudy Rock Cod	<i>Epinephelus erythrinus</i>	VU	✓		M,B
124		Orangespotted Grouper	<i>Epinephelus coioides</i>	NT	✓		M,B
125		Blacktip Grouper	<i>Epinephelus fasciatus</i>	LC		Bernacsek 2001a	M,B
126		Grouper	<i>Epinephelus tauvina</i>	DD		Bernacsek 2001a	M
127		Vermillion Grouper	<i>Cephalopholis miniata</i>	LC		Bernacsek 2001a	M
128		Gaint Gruper	<i>Epinephelus lanceolatus</i>	VU	✓		M,B
129	<b>Perciformes</b> <b>Terapontidae</b>	Terapon Perch, Three-striped Tiger Fish	<i>Terapon jarbua</i>	LC	✓		M,F,B
130		Big Eye	<i>Terapon theraps</i>	LC	✓		M,F,B
131	<b>Perciformes</b> <b>Priacanthidae</b>	Moontail Bulls Eye	<i>Priacanthus hamrur</i>	LC	✓		M
132		Purple Spotted Big Eye	<i>Priacanthus tayenus</i>	LC			M
133	<b>Perciformes</b> <b>Apogonidae</b>	Broad-banded Cardinalfish	<i>Ostorhinchus fasciatus</i>	NE	✓		M
134		Three Striped Cardinalfish	<i>Apogon septemstriatus</i>	NE	✓		M
135	<b>Perciformes</b> <b>Sillaginidae</b>	Gangetic Sillago	<i>Sillaginopsis panjus</i>	NE	✓		M,F,B
136		Silver Sillago	<i>Sillago sihama</i>	LC	✓		M,B
137	<b>Perciformes</b> <b>Channidae</b>	Asiatic Snakehead	<i>Channa orientalis</i>	NE		Bernacsek 2001a	F,B
138		Striped Snakehead	<i>Channa striata</i>	NE		Bernacsek 2001a	F,B
139		Spotted Snakehead	<i>Channa punctata</i>	LC		Bernacsek 2001a	F,B
140	<b>Perciformes</b> <b>Rachycentridae</b>	Cobia, Black King Fish	<i>Rachycentron canadum</i>	LC	✓		M,B
141	<b>Perciformes</b> <b>Echeneidae</b>	Common Remora	<i>Remora remora</i>	LC	✓		M

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142	Perciformes Carangidae	Razorbelly Scad	<i>Alepes kleinii</i>	LC	✓		M
143		Shrimped Scad	<i>Alepes djedaba</i>	LC		Bernacsek 2001a	M
144		Black-Fin Scad	<i>Alepes melanoptera</i>	LC	✓		M,B
145		Threadfin Trevally	<i>Alectis indica</i>	LC		Huda & Haque 2003	M,B
146		Threadfin Trevally	<i>Alectis ciliaris</i>	LC		Bernacsek 2001a	M
147		Black-Fin Jack	<i>Atropus atropos</i>	LC	✓		M
148		Oxeye Scad	<i>Selar boops</i>	LC		Bernacsek 2001a	M
149		Bigeye Scad	<i>Selar crumenophthalmus</i>	NE		Bernacsek 2001a	M
150		Longfin Trevally	<i>Carangoides armatus</i>	NE	✓		M,B
151		Bigeye Trevally	<i>Caranx sexfasciatus</i>	LC	✓		M,B
152		Bumpnose Trevally	<i>Carangoides hedlandensis</i>	NE	✓		M
153		Trevally	<i>Carangoides malabaricus</i>	LC		Bernacsek 2001a	M
154		Giant Trevally, Giant Kingfish	<i>Caranx ignobilis</i>	LC	✓		M,B
155		Red Tailed Mackerel Scad	<i>Decapterus kurroides</i>	NT	✓		M
156		Torpedo Scad	<i>Megalaspis cordyla</i>	LC	✓		M,B
157		Black Promfet	<i>Parastromateus niger</i>	NE	✓		M,B
158		Double Spotted Queenfish	<i>Scomberoides commersonianus</i>	LC	✓		M,B
159		Queen Fish	<i>Scomberoides tol</i>	NE	✓		M,B
160		Black Banded Trevally	<i>Seriolina nigrofasciata</i>	LC	✓		M,B
161		Longrakered Trevally	<i>Ulua mentalis</i>	LC	✓		M
162	Perciformes Menidae	Moon Fish	<i>Mene maculata</i>	NE	✓		M,B
163	Perciformes Leiognathidae	Orangetin Ponyfish	<i>Photopectoralis bindus</i>	NE	✓		M,B
164		Shortnoso Ponyfish	<i>Leiognathus brevirostris</i>	NE	✓		M,B
165		Striped Ponyfish	<i>Leiognathus fasciatus</i>	LC		Bernacsek 2001a	M,B
166		Common Ponyfish	<i>Leiognathus equulus</i>	NE	✓		M,F,B
167		Deep Pugnose Pony Fish	<i>Secutor ruconius</i>	NE		Bernacsek 2001a	M,F,B
168		Pugnose Pony Fish	<i>Secutor insidiator</i>	NE	✓		M,B
169		Tooth Pony	<i>Gazza minuta</i>	NE	✓		M,B
170	Perciformes Lactariidae	False Trevally	<i>Lactarius lactarius</i>	NE		Bernacsek 2001a	M,B
171	Perciformes Lutjanidae	John'S Snapper, Red Snapper	<i>Lutjanus johnii</i>	LC	✓		M,B
172		Malabar Red Snapper	<i>Lutjanus malabaricus</i>	NE		Huda & Haque 2003	M,B
173		Pinjalo Snapper	<i>Pinjalo pinjalo</i>	LC		Bernacsek 2001a	M
174		Blood Snapper	<i>Lutjanus sanguineus</i>	NE		Bernacsek 2001a	M
175	Perciformes Uranoscopidae	Stargazer	<i>Astroscopus guttatus</i>	LC		Bernacsek 2001a	M
176		Dollfus' Stargazer	<i>Uranoscopus guttatus</i>	NE		Huda & Haque 2003	M
177		Stargazer	<i>Ichthyscopus inermis</i>	NE		Bernacsek 2001a	M
178		Stargazer	<i>Ichthyscopus lebeck</i>	NE		Bernacsek 2001a	M
179	Perciformes Datnioididae	Four Barred Tigerfish	<i>Datnioides polota</i>	NE	✓		F,B

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180	Perciformes Gerreidae	Whiptail Silverbiddy	<i>Gerres filamentosus</i>	LC	✓		M,F,B
181		Silverbiddy	<i>Gerres sp.</i>	NE	✓		M,B
182	Perciformes Haemulidae	Silver Grunt	<i>Pomadasys argenteus</i>	LC	✓		M,F,B
183		Blotched Grunt	<i>Pomadasys maculatus</i>	LC	✓		M,B
184	Perciformes Sparidae	Ongspine Seabream	<i>Argyrops spinifer</i>	NE		Bernacsek 2001a	M
185		Yellow Seabream	<i>Acanthopagrus latus</i>	DD		Bernacsek 2001a	M,F,B
186		River Bream	<i>Acanthopagrus berda</i>	LC	✓		M,F,B
187	Perciformes Nemipteridae	Double Whip Threadin Bream	<i>Nemipterus nematophorus</i>	NE		Bernacsek 2001a	M
188		Pink Perch	<i>Nemipterus japonicus</i>	NE	✓		M
189	Perciformes Sciaenidae	Goatee Croaker	<i>Dendrophysa russelii</i>	NE	✓		M,F,B
190		Croaker	<i>Chrysochir aureus</i>	NE		Bernacsek 2001a	M,B
191		Blackmouth Croaker	<i>Atrobucca nibe</i>	NE		Bernacsek 2001a	M
192		Sharpnose Hammer Croaker	<i>Johnius borneensis</i>	NE	✓		M,F,B
193		Silver Croaker	<i>Pennahia argentata</i>	NE	✓		M
194		Large-Eye Croaker	<i>Johnius plagiostoma</i>	NE	✓		M,F,B
195		Coitor, Crocker	<i>Johnius coitor</i>	LC	✓		M,F,B
196		Large Fined Croaker	<i>Johnius macropterus</i>	NE	✓		M,F,B
197		Black Croaker	<i>Johnius dussumieri</i>	NE		Bernacsek 2001a	M
198		Gangetic Bola, Croaker	<i>Johnius gangeticus</i>	NE		Bernacsek 2001a	M,B
199		Kathala Croaker	<i>Kathala axillaris</i>	NE	✓		F,B
200		Cuja Croaker	<i>Macrospinosa cuja</i>	NE	✓		M
201		Pama Croaker	<i>Otolithes parna</i>	NE		Bernacsek 2001a	M,F,B
202		Lesser Tiger Toothed Croaker	<i>Otolithes cuvieri</i>	NE		Bernacsek 2001a	M
203		Tiger Toothed Croaker	<i>Otolithes ruber</i>	NE	✓		M
204		Pama Croaker	<i>Otolithoides pama</i>	NE	✓		M,B
205		Bronze Croaker	<i>Otolithoides biauritus</i>	NE	✓		M,B
206		Panna Croaker	<i>Panna microdon</i>	NE	✓		M,F,B
207		Donkey Croaker	<i>Pennahia anea</i>	NE	✓		M,B
208		Spindle Croaker	<i>Pseudotolithus elongatus</i>	LC		Bernacsek 2001a	M
209		Spotted Croakor	<i>Protonibea diacanthus</i>	NE	✓		M,F,B
210		Blotched Tiger-Toothed Croaker	<i>Pterotolithus maculatus</i>	LC	✓		M,B
211	Perciformes Polynemidae	Fourfinger Threadfin	<i>Eleutheronema tetradactylum</i>	NE	✓		M,B
212		Indian Threadfin	<i>Leptomelanosoma indicum</i>	NE	✓		M,F,B
213		Blackspot Threadfin	<i>Polydactylus sextarius</i>	NE	✓		M,F,B
214		Golden Threadfin	<i>Polydactylus sexfilis</i>	NE		Bernacsek 2001a	M,B
215		Paradise Threadfin	<i>Polynemus paradiseus</i>	NE	✓		M,F,B
216	Perciformes Mullidae	Red Sea Goatfish	<i>Parupeneus forsskali</i>	NE	✓		M,F,B
217		Goatfish	<i>Parupeneus heptacanthus</i>	LC		Bernacsek 2001a	M,B
218		Goldband Goatfish	<i>Upeneus moluccensis</i>	LC	✓		M,B
219		Sulphur Goatfish	<i>Upeneus sulphureus</i>	LC	✓		M,B
220		Finstripe Goatfish	<i>Upeneus taeniopterus</i>	LC	✓		M,B

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221	Perciformes Toxotidae	Largescale Archerfish	<i>Toxotes chatareus</i>	NE	✓		M,B
222		Banded Archerfish	<i>Toxotes jaculatrix</i>	LC		Bernacsek 2001a	F,B
223	Perciformes Drepanidae	Spotted Sickle Fish	<i>Drepane punctata</i>	NE		Bernacsek 2001a	F,B
224		Spadefish	<i>Ephippus orbis</i>	NE		Bernacsek 2001a	M,F,B
225		Banded Drepane	<i>Drepane longimana</i>	NE	✓		M,B
226	Perciformes Mugilidae	Longarm Mullet	<i>Osteomugil cunesius</i>	NE	✓		M,B
227		Striped Mullet	<i>Mugil cephalus</i>	LC	✓		M,F,B
228		Greenback Mullet	<i>Planiliza subviridis</i>	NE	✓		M,F,B
229		Corsula Mullet	<i>Rhinomugil corsula</i>	LC	✓		M,F,B
230		Mullet	<i>Valamugil speigleri</i>	NE		Bernacsek 2001a	F,B
231		Yellowtail Mullet	<i>Sicamugil cascasia</i>	LC	✓		M,F,B
232		Goldspot Mullet	<i>Liza parsia</i>	NE		Bernacsek 2001a	F
233		Tade Grey Mullet	<i>Chelon planiceps</i>	NE		Bernacsek 2001a	M,F,B
234		Goldspot Mullet	<i>Chelon parsia</i>	NE	✓		M,F,B
235	Perciformes Uranoscopidae	Stargazer	<i>Uranoscopus guttatus</i>	NE		Huda & Haque 2003	M,F,B
236		Stargazer	<i>Ichthyscopus lebeck</i>	NE		Huda & Haque 2003	M
237		Two Spined Yellowtail Stargazer	<i>Uranoscopus cognatus</i>	NE	✓		M
238	Perciformes Eleotridae	Duckbill Sleeper	<i>Butis butis</i>	LC	✓		M
239		Black Spot Sleeper Goby	<i>Butis humeralis</i>	NE	✓		M,F,B
240		Sleeper Goby	<i>Butis melanostigma</i>	NE		Huda & Haque 2003	M,F,B
241		Dusky Sleeper	<i>Eleotris fusca</i>	LC	✓		M,F,B
242	Perciformes Gobiidae	Mudskipper	<i>Boleophthalmus boddarti</i>	LC	✓		M,F,B
243		Tank Goby	<i>Glossogobius giuris</i>	NE	✓		M,F,B
244		Goby	<i>Apocryptes bato</i>	NE		Bernacsek 2001a	M,F,B
245		Bearded Worm Goby	<i>Taenioides cirratus</i>	DD		Rahman 1989	M,F,B
246		Bumblebee Goby	<i>Brachygobius nunus</i>	NE		Bernacsek 2001a	M,F,B
247		Goby	<i>Zappa confluentus</i>	NE		Bernacsek 2001a	F,B
248		Goby	<i>Pogonogoibius planiformes</i>	NE		Huda & Haque 2003	M,F,B
249		Mudskipper	<i>Periophthalmodon schlosseri</i>	NE		Bernacsek 2001a	M,B
250		Mudskipper	<i>Periophthalmus barbarus</i>	LC		Bernacsek 2001a	M,F,B
251		Rubicundus Eelgoby	<i>Odontamblyopus rubicundus</i>	NE	✓		M,F,B
252		Pointed-Tailed Goby	<i>Pseudapocryptes elongatus</i>	LC	✓		M,F,B
253		Walking Goby	<i>Scartelaos histophorus</i>	NE	✓		F,B
254		Knight Goby	<i>Stigmatogobius sadanundio</i>	NE	✓		M,B
255		Eel Goby	<i>Taenioides buchanani</i>	NE		Bernacsek 2001a	F,B
256		Burrowing Goby	<i>Trypauchen vagina</i>	NE	✓		M,B
257	Perciformes Callionymidae	Arrow Dragonet	<i>Callionymus sagitta</i>	NE	✓		M,B
258	Perciformes Ephippidae	Spadefish	<i>Ephippus orbis</i>	NE	✓		M

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259	Perciformes Ambassidae	Elongate Glassy Perchlet	<i>Chanda nama</i>	LC	✓		M
260		Himalayan Glassy Perchlet	<i>Parambassis baculus</i>	LC		Bernacsek 2001a	F,B
261		Glassy Fish	<i>Parambassis ranga</i>	LC	✓		F
262	Perciformes Scatophagidae	Spotted Scat, Spotted Butterfish	<i>Scatophagus argus</i>	LC	✓		F,B
263	Perciformes Siganidae	Streaked Rabbitfish	<i>Siganus javus</i>	LC		Huda & Haque 2003	M,F,B
264		White-Spotted Spinefoot	<i>Siganus canaliculatus</i>	LC	✓		M,B
265	Perciformes Sphyraenidae	Bigeye Barracuda	<i>Sphyraena forsteri</i>	NE	✓		M,B
266		Barracuda	<i>Sphyraena barracuda</i>	LC		Bernacsek 2001a	M
267		Yellowstripe Barracuda	<i>Sphyraena chrysotaenia</i>	NE	✓		M
268		Banded Or Indian Barracuda	<i>Sphyraena jello</i>	NE	✓		M,B
269	Perciformes Trichiuridae	Smallhead Ribbon Fish	<i>Eupleurogrammus muticus</i>	NE	✓		M,B
270		Large Head Ribbon Fish	<i>Trichiurus lepturus</i>	NE		Bernacsek 2001a	M,B
271		Savalani Ribbon Fish	<i>Lepturacanthus savala</i>	NE	✓		M,B
272	Perciformes Scombridae	Mackerel Tuna	<i>Euthynnus affinis</i>	LC	✓		M,B
273		Island Mackerel	<i>Rastrelliger faugnii</i>	DD	✓		M
274		Indian Mackerel	<i>Rastrelliger kanagurta</i>	LC	✓		M
275		Indian Mackerel	<i>Rastrelliger brachysoma</i>	DD		Bernacsek 2001a	M
276		Striped Bonito	<i>Sarda orientalis</i>	LC		Bernacsek 2001a	M,B
277		Buulet Tuna	<i>Auxis rochei</i>	NE		Huda & Haque 2003	M
278		Seer Fish	<i>Scomberomorus lineolatus</i>	LC		Bernacsek 2001a	M,B
279		Barred Mackerel	<i>Scomberomorus commerson</i>	NT	✓		M
280		Indo-Pacific King Mackerel	<i>Scomberomorus guttatus</i>	DD	✓		M
281	Perciformes Stromateidae	Silver Pomfret	<i>Pampus argenteus</i>	NE	✓		M,B
282		Chinese Pomfret	<i>Pampus chinensis</i>	NE	✓		M
283	Perciformes Lethrinidae	Ornate Emperor	<i>Lethrinus ornatus</i>	LC		Bernacsek 2001a	M,B
284	Perciformes Lobotidae	Tripletail	<i>Lobotes surinamensis</i>	LC		Bernacsek 2001a	M
285	Perciformes Kurtidae	Indian Lamphead	<i>Kurtus indicus</i>	NE		Bernacsek 2001a	M,B
286	Perciformes Latidae	Barramundi	<i>Lates calcarifer</i>	NE	✓		M,F,B
287	Perciformes Anabantidae	Climbing perch	<i>Anabas testudineus</i>	DD	✓		F,B
288	Pleuronectiformes Soleidae	Javanese Flounder	<i>Pseudorhombus javanicus</i>	NE	✓		M,F,B
289		Commerson`S Sole	<i>Synaptura commersonii</i>	NE	✓		M
290		Zebra Sole	<i>Zebrias altipinnis</i>	NE		Bernacsek 2001a	M,B
291		Oriental Sole	<i>Brachirus orientalis</i>	NE	✓		M,F,B
292		Sole	<i>Brachirus pan</i>	LC		Bernacsek 2001a	M,F,B
293	Pleuronectiformes Paralichthyidae	Malayflounder	<i>Pseudorhombus malayanus</i>	NE		Bernacsek 2001a	M,B
294		Large Tooth Flounder	<i>Pseudorhombus arsius</i>	NE		Bernacsek 2001a	M
295		Deep Flounder	<i>Pseudorhombus elevatus</i>	NE		Bernacsek 2001a	M,B

	Order/ Family	English name	Scientific name	Red List status	Present study	Previous literature	Habitat
296	Pleuronectiformes Psettodidae	Indian Hailbut	<i>Psettodes erumei</i>	NE		Huda & Haque 2003	M
297		Halibut	<i>Psettodes belcheri</i>	DD		Bernacsek 2001a	M
298	Pleuronectiformes Cynoglossidae	Fourlined Tonguesole	<i>Cynoglossus bilineatus</i>	NE		Bernacsek 2001a	M,B
299		Gangetic Tonguesole	<i>Cynoglossus cynoglossus</i>	NE		Bernacsek 2001a	M,B
300		Long Tonguesole	<i>Cynoglossus kopsii</i>	NE		Bernacsek 2001a	M
301		Tongusole	<i>Syphurus trifasciatus</i>	NE		Bernacsek 2001a	M
302		Tongusole	<i>Paraplagusia bilineata</i>	NE		Bernacsek 2001a	M
303		Double Lined Tonguesole	<i>Cynoglossus lingua</i>	NE		Bernacsek 2001a	M,F,B
304		Speckled Tonguesole	<i>Cynoglossus puncticeps</i>	NE		Bernacsek 2001a	M,F,B
305		Largescale Tonguesole	<i>Cynoglossus arel</i>	NE	✓		M,B
306	Pristiformes Pristidae	Saw Shark	<i>Anoxypristes cuspidata</i>	EN		Huda & Haque 2003	M,F,B
307		Large Tooth Saw Fish	<i>Pristis microdon</i>	NE		Bernacsek 2001a	M,F,B
308	Tetraodontiformes Triacanthidae	Short-Nosed Tripod Fish	<i>Triacanthus biaculeatus</i>	NE	✓		M,F,B
309		Tripod Fish	<i>Pseudotriacanthus strigilifer</i>	NE		Bernacsek 2001a	M
310	Tetraodontiformes Balistidae	Triggerfish	<i>Abalistes stellaris</i>	NE		Bernacsek 2001a	M
311	Tetraodontiformes Ostraciidae	Yellow Box Fish	<i>Ostracion cubicus</i>	NE	✓		M
312	Tetraodontiformes Tetraodontidae	Gangetic Pufferfish	<i>Chelonodontops patoca</i>	LC	✓		M,F,B
313		Bengal Reticulated Puffer	<i>Chelonodontops bengalensis</i>	NE	✓		M,B
314		Puffer Fish	<i>Arothron stellatus</i>	LC		Bernacsek 2001a	M,B
315		Puffer Fish	<i>Leiodon cutcutia</i>	NE		Bernacsek 2001a	F,B
316		Puffer Fish	<i>Carinotetraodon travancoricus</i>	VU		Bernacsek 2001a	F
317		Diamond-Back Puffer	<i>Lagocephalus guentheri</i>	LC	✓		M
318		Green Pufferfish	<i>Lagocephalus lunaris</i>	LC	✓		M
319		Lattice Blaasop	<i>Takifugu oblongus</i>	LC	✓		M,B
320		Green Pufferfish	<i>Dichotomyctere fluviatilis</i>	LC	✓		F,B
321	Tetraodontiformes Diodontidae	Spotted Porcupine Fish	<i>Diodon hystrix</i>	LC	✓		M
322	Batrachoidiformes Batrachoididae	Grunting Toadfish	<i>Allenbatrachus grunniens</i>	NE	✓		M,B

Head flat above. Caudal fin slightly emarginated. Lateral line absent. Scales ctenoid.

## DISCUSSION

In Bangladesh, Acharya & Kamal (1994) first made a list of fishes from a portion of the Sundarbans where 53 species of pelagic and 124 species of demersal fishes were included. Afterward, another list of finfishes has been compiled by Bernacsek & Haque (2001) where

the fishes were basically gathered from the baseline study of Chantarasri (1994) under a project of Food and Agriculture Organization (FAO) and this study contained a list of 196 species reported from the Sundarbans of Bangladesh. This baseline survey on the fishes of the Sundarbans reproduced many subsequent reports on fish biodiversity in the 1980s. After that no significant study on fish diversity has been conducted on the Sundarbans region of Bangladesh. Further, no conservation status was assessed by IUCN locally in Bangladesh for Sundarbans'

marine and brackish water fishes. In the present study, we have categorized all of the compiled fishes according to the Global IUCN status, which is given in the Table 1.

About 54.35% species of enlisted fishes belongs to the category of "Not Evaluated" and only 4.04% of fishes are in "Data Deficient" (Figure 3). Around 33.23% of species are categorized as "Least concern", some of which are exploited for commercial purposes such as *Elops machnata* Forsskal, 1775; *Gudusia chapra* Hamilton, 1822; *Coilia* sp., *Thryssa* sp., *Ilisha* sp., *Arius arius* Hamilton, 1822; *Sillago sihama* Forsskal, 1775; *Alepes* sp. Among the fishes of the Sundarbans of Bangladesh enlisted in the present study 4.04% (13 species) of the species are "Near Threatened" and 10 species (3.11%) species are "Vulnerable" viz. *Rhynchobatus djiddensis* Forsskal, 1775, *Glaucostegus granulatus* Cuvier, 1829, *Himantura undulata* Bleeker, 1852, *Himantura uarnak* Gmelin, 1789, *Pateobatis uarnacoides* Bleeker, 1852, *Maculabatis gerrardi* Gray, 1851, *Hippocampus kuda* Bleeker, 1852, *Epinephelus erythrinus* Valenciennes, 1828, *Epinephelus lanceolatus* Bloch, 1790 and *Carinotetraodon travancoricus* Hora & K.K. Nair, 1941. Four (1.24%) species viz. *Glypis glypis* Müller & Henle, 1839, *Sphyra lewini* Griffith & Smith, 1834, *Eusphyra blochii* Cuvier, 1816, and *Anoxypristes cuspidata* Latham, 1794 are listed as "Endangered" based on the global Red List status. Based on our observations, *Himantura uarnak*, *Glypis glypis*, *Sphyra lewini* and *Eusphyra blochii* that are frequently found in the Sundarbans though the Red List mentions these as threatened globally.

Most of the shark, skates, and rays (Elasmobranchs) are usually over-exploited for their fins and skins. Dried fins are used for the shark fin trade and other parts of the shark body are used for other purposes. Sharks are sold through an open bidding system. Before selling, the fishes are graded species-wise and sometimes lengthwise. We recorded a good number of *Chiloscyllium griseum* Muller & Henle, 1838 of the order Orectolobiformes which was previously overlooked in the Elasmobranchs checklist of the Sundarbans. A total of 10 species of rays under the order Myliobatiformes are enlisted here, among them *Brevitrygon imbricata* Bloch & Schneider, 1801 and *Telatrygon zugei* Müller & Henle, 1841 are new reports from the Sundarbans area of Bangladesh.

Eels are usually a less studied group in Bangladesh. *Anguilla bengalensis* Gray, 1831 which is locally named as Bamosh, is a known commercially valuable species. In this present checklist, we list 10 species of the order Anguilliformes. Among them *Gymnothorax punctatus* Bloch & Schneider, 1801, *Gymnothorax tile* Hamilton, 1822, and *Moringua raitaborua* Hamilton, 1822 are newly

reported from the Sundarbans area.

Recent taxonomic studies of the family Leiognathidae (Pony fishes) suggest several changes; however, a total of seven species have been recorded in this family from the Sundarbans. Among them we found four species where *Leiognathus brevirostris* Valenciennes, 1835 was newly recorded in the Sundarbans. Pony fishes are small fishes and commercially not valuable. Those species are usually exploited for dried fish.

Puffer fishes belong to the family Tetraodontidae. A total of 13 species of puffer fish has been listed in this checklist from previous literature and the present study whereas Shamsuzzaman et al. (2015) recorded nine marine puffer fish species from Cox's Bazar located on the eastern coast. Among 13 species of puffer fish reported in the Sundarbans until now, we documented four new records of which three species, viz., *Triacanthus biaculeatus* Bloch, 1786; *Diodon hystrix* Linnaeus, 1758, and *Ostracion cubicus* Linnaeus, 1758 are locally new and the species *Lagocephalus guentheri* Miranda Ribeiro, 1915 is the first record in the country. This study also added a new described species, *Chelonodontops bengalensis* Habib et al., 2018 from the same family.

The Sundarbans is where mainland Bangladesh meets the Bay of Bengal, making the area a globally unique ecological niche. In the Indian part, 34 elasmobranchs under 10 families and 271 bony fishes belonging to 61 families are known from the Sundarbans (Pal et al. 2014). In the present checklist, 36% species have been found as the habitants of both marine and brackish water followed by 26% as exclusively marine, 25% as marine, freshwater & brackish, 11% freshwater and brackish, and 2% exclusively as freshwater fish (Figure 4).

Among the bony fishes a few rare species of fishes are also reported from the Sundarbans of Bangladesh in this updated check list, viz., *Rhizoprionodon acutus*, *Himantura uarnak*, *Gymnura poecilura*, *Epinephelus coioides* Hamilton, 1822, *Glaucostegus granulatus*, *Antennarius hispidus* Bloch & Schneider, 1801, *Bregmaceros mcclellandi* Thompson, 1840, *Ostracion cubicus* Linnaeus, 1758, *Allenbatrachus grunniens* Linnaeus, 1758, and *Chelonodontops bengalensis* (Image 2). After the previous report by Hussain (1969), we report *Antennarius hispidus* from the Bay of Bengal coast of Bangladesh.

To the best of our knowledge, no study has been performed to assess diversity and breeding status of fish exclusively for three protected wildlife sanctuaries in the Sundarbans. In the present study, we have tried to cover the sanctuaries to assess its existing species composition of fishes; however, detailed and year-round study is necessary. One of the major limitations in a year-round

survey is the lack of a vessel suitable to go downstream of rivers and canals during the monsoon season due to the strong current of the heavy downwards water flow.

Kobadak, Kholpetua, Rupsa, Shibsa, Pashur, Baleshwar, Raimangal, Arpangasia, Sakbaria are the main rivers passing through the Sundarbans which constitute about 2,000km<sup>2</sup> of waterways (Khan 2011), in addition to numerous small rivers, canals and creeks. The Sundarbans in Bangladesh has been divided into northeastern freshwater, middle to southern moderately saline and western saline zones (Chaffey et al. 1985). Therefore, it has brackish water as well as fresh water fish available in the labyrinth of water bodies. The government made some regulations and passed acts to protect and maintain sustainable production of fish in the Sundarbans area which are executed and enforced by the Bangladesh Forest Department (BFD). For example, 18 'khals' (canals) in the buffer zone of the Sundarbans have been permanently closed for fishing to ensure natural breeding of fish under Khal Closure Regulation (1989). Further, canals of less than 25 feet width have been banned for fishing throughout the Sundarbans. Entire fish of these small canals can be caught easily using poison and trapping fish setting net from two ends. Fishing is prohibited in three wildlife sanctuaries of Sundarbans by Wildlife Sanctuary Regulations (1999). Close Season Regulation (2000) banned catching of three finfish species, viz., *Pangasius pangasius*, *Plotosus canius*, *Lates calcarifer*, from 1 May to 30 June every year inside the Sundarbans to ensure natural breeding. BFD also implements the banning of Hilsa fishing each year imposed by Bangladesh Government's Department of Fisheries during peak breeding season during a certain time of the month between September and October every year (e.g., 9–30 October in 2019).

Fishers of the Sundarbans use different kinds of harmful nets and gear for catching fish which cause damage to aquatic lives, such as monofilament gill nets (called current Jal) are responsible for the killing of different aquatic animals and small sized fishes. Fine-meshed set bag nets (locally called Behundi Jal), pull and push nets (Thela Jal), fine-mesh mosquito nets (Chingri Pona Jal), long shore nets (Khuti Jal) have been identified as the most destructive among all the fishing gears in the Sundarbans. Catch mortality is very high for these nets. Set bag nets used for collecting shrimp fry in the estuary and rivers of the Sundarbans also catch eggs, spawn, and larvae of all species along with adult fish. It is highly detrimental for declining fish diversity. Local fishers also use pull nets to catch post larvae (PL) of shrimps which also hampers fishery growth. In such cases they dispose unwanted larvae onto land rather than being freed into

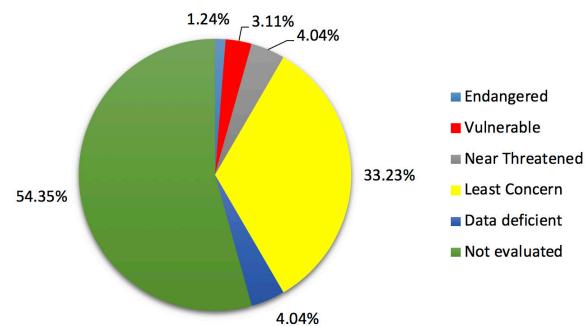


Figure 3. Global IUCN Red List status of the fishes recorded from the Sundarbans, Bangladesh.

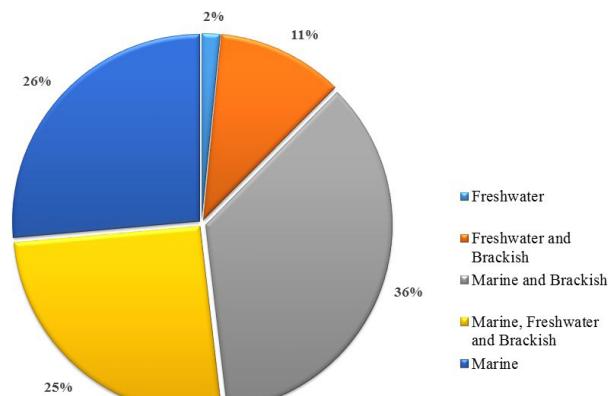


Figure 4. Habitat-wise distribution of listed fishes of the Sundarbans, Bangladesh.

water, resulting in wastage. Thus, these larvae do not get the opportunity to mature into fish. It has been observed that about 99 fin fish and fry of other shrimp species are discarded for collecting a single shrimp post larva (Rashid 2000; Azad et al. 2017). Considering such a detrimental effect, the Government of Bangladesh declared a regulation in 2000 where it was stated that "no person shall catch or cause to be caught fry or post larvae of fish, shrimp and prawns of any kind in any form and in any way in the estuary and coastal waters of Bangladesh" (MoFL 2000). Unfortunately, thousands of people still catch post larvae of fish, shrimps and prawns and market their catch.

Poison fishing is another ecosystem threatening practice of the locals. It is very alarming that some fishermen are illegally using lethal poison to catch fish including crabs and shrimps in the Sundarbans canals. They release poison into the water and collect the dying fish. The poison is so deadly that a few drops of it are sufficient to kill a large amount of fish. It also contaminates the water, planktons, and mangrove tree roots. As toxic water flows into the large rivers from canals, it is not only the fish species that are being destroyed, but the entire

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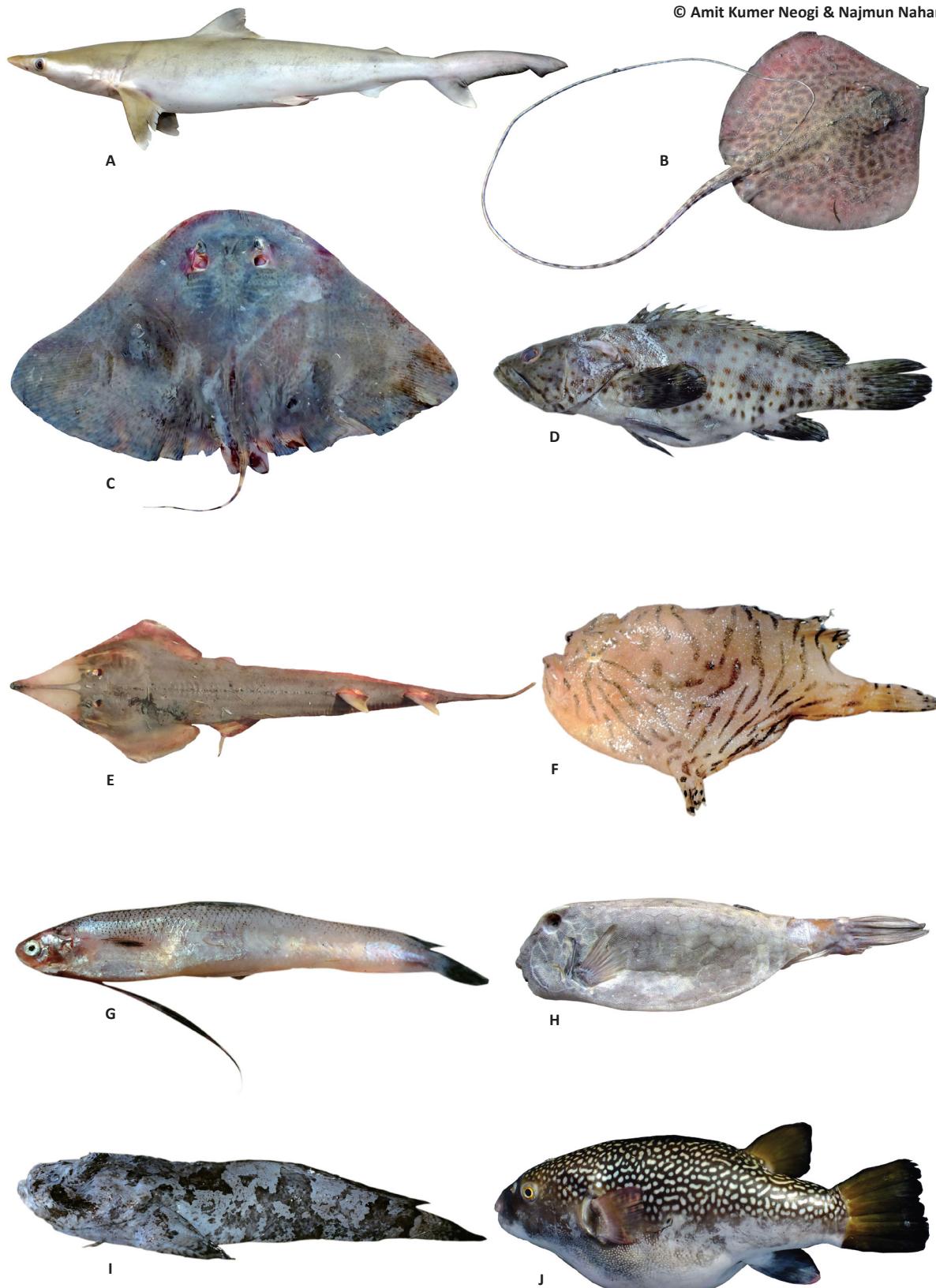


Image 2. Pictures of some rare species recorded during the present study: A—*Rhizoprionodon acutus* Ruppell, 1837 | B—*Himantura uarnak* Gmelin, 1789 | C—*Gymnura poecilura* Shaw, 1804 | D. *Epinephelus coioides* Hamilton, 1822 | E—*Glaucostegus granulatus* Cuvier, 1829 | F—*Antennarius hispidus* Bloch & Schneider, 1801 | G—*Bregmaceros mcclellandi* Thompson, 1840 | H—*Ostracion cubicus* Linnaeus, 1758 | I—*Allenbatrachus grunniens* Linnaeus, 1758 | J—*Chelonodontops bengalensis* Habib, Neogi, Oh, Lee & Kim, 2018.

aquatic ecosystem is also under threat. Such dangerous practices cause a great risk to the flora and fauna of the Sundarbans and may create long-term negative effects on its ecology. This illegal practice needs a close watch to stop it. Increased and regular patrolling inside the forests and, motivation and engaging fishers against this is under way to stop this practice.

Mangrove forest is the breeding and nursery ground of many fish species. In a prohibitive order, the BFD had banned fishing in all of the canals (around 450) in the Sundarbans for the two months of July and August in 2019 for ensuring safe breeding and for conservation. It has been also observed that the intensity of poison fishing is higher in these two months; however, more studies need to be carried out to accurately identify the canals and creeks where breeding of fish occurs and which fish breed especially in the downstream with their specific breeding seasons. Netting of fish was also banned in the beels (e.g., Andaria beel) and chatals of the Sundarbans from February to March in 2019 for smooth breeding as proposed in IRMP (2010). The beels and chatals are lake-like wetlands with static water but chatals are relatively smaller. Further, a chatal gets totally dried out in the late winter but a beel does not. Some chatals are located between Chandpai and Sharankhola range of the Sundarbans. Both of the

wetlands are reservoirs of freshwater. Both waterbodies are the source of many small indigenous freshwater fish species such as *Anabas testudineus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Channa* sp. etc. The actions taken by the Government of Bangladesh to protect the availability and diversity of fish in Sundarbans have been shown in Table 2. This table has been prepared based on UNESCO (2016) along with different acts and regulations made by Bangladesh Government. Besides, to prevent over fishing, the number of boat license certificates (BLC) provided by BFD to allow fishermen for catching fish inside Sundarbans were limited. The maximum number of annual BLC issuance has been 12,000. The first priority in issuing BLC is given to those boat owners who live within 5km area around the Sundarbans. The maximum limit of permits for a month is given for three times and 5–7 days fishing is allowed under one permit (UNESCO 2016).

This article is primarily aimed to compile the information generated by authors and previous workers on the occurrence of total fish species from the past to the present in the core and adjacent marine areas of the Sundarbans, Bangladesh. This checklist should be considered as a working document and several additions of records of fish species for Sundarbans are added with survey work, particularly in the unique aquatic ecosystem.

**Table 2. Current monitor and conservation measures taken by Bangladesh Forest Department.**

Measures taken	Implementation periods (month)											
	J	F	M	A	M	J	J	A	S	O	N	D
Fishing ban in waterbodies of wildlife sanctuaries.												
Fishing ban in specific 18 declared canals in the buffer zone												
Fishing ban canals less than 25 feet wide throughout the Sundarbans												
Fishing ban in all canals												
Fishing ban in beels and chatals												
Complete ban of using monofilament gill net (current jal), set bag net (behundi jal), push net (thela jal), channel stake net (khalpata jal)												
No fishing by poison, insecticide and de-watering												
No fishing by the net with mesh size more than 01 inch or 15 mm (knot to knot at stretch condition).												
Fishing ban three finfish species viz. Pangas ( <i>Pangasius pangasius</i> ), Sea bass ( <i>Lates calcarifer</i> ) and Kain magur ( <i>Plotosus canius</i> )												
Ban on Hilsa ( <i>Tenualosa ilsha</i> ) fishing for 22 days (a total of 4 days before and 17 days after the full moon in October i.e. the month of Ashwin in Bangla calendar)												
Catching of Hilsa ( <i>Tenualosa ilsha</i> ) and Pangus ( <i>Pangasius pangasius</i> ) below 23 cm												
Boal ( <i>Wallago attu</i> ) lower than 12 inch.												
Ban on fishing of the species Shilon ( <i>Silonia silondia</i> ), Vola ( <i>Johnius argentatus</i> ) and Air ( <i>Bagarius bagarius</i> ) lower than 12 inch.												
Ban on fingerling and fish fry collection												

More studies should be conducted on the Sundarbans fishes to known the total scenario of this unique ecological niche. Based on the study further management measures can be taken with the forest department to protect fisheries. Lastly, awareness campaigns need to be carried out on a larger scale for fish conservation.

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**Author details:** KAZI AHSAN HABIB is a Professor and the Chairman of the Department of Fisheries Biology and Genetics at Sher-e-Bangla Agricultural University (SAU) in Bangladesh. The topics of his research focus are marine biodiversity, DNA taxonomy, DNA barcoding and metabarcoding, phylogenetics, population genetics of marine organisms. He received PhD in Marine Biology from Korea Institute of Ocean Science and Technology (KIOST) under the University of Science and Technology (UST), South Korea. Currently he is serving as the Dean of the Faculty of Fisheries, Aquaculture and Marine Science at SAU. AMIT KUMER NEOGI has a broad interest in biology encompassing the fields of animal taxonomy, entomology, genetics, ecology, and conservation biology. He has been graduated from Jagannath University, Dhaka. He was a former senior researcher at Aquatic Bioresource Research Lab., in Sher-e-Bangla Agricultural University (SAU) on fisheries molecular taxonomy. He is now working as a specialist in communicable disease programme at BRAC. NAJMUN NAHAR is working as a research assistant at Aquatic Bioresource Research Lab., in Sher-e-Bangla Agricultural University (SAU). She has completed her BSc in Zoology and MSc (Fisheries) in Zoology from National University. JINA OH graduated from Chungnam National University. She has completed PhD degree from Korea Institute of Ocean Science and Technology (KIOST) under University of Science and Technology (UST), Korea. Her research interests are ichthyoplankton and fish biology. YOUN-HO LEE is the principal research scientist and professor at KIOST. He graduated from Seoul National University and received his PhD in Marine Biology from Scripps Institution of Oceanography. His research interests include dynamics of marine ecosystem and molecular ecology, population genetics, biogeography and evolution of marine organisms such as fish, sea urchin, abalone, and zooplankton. CHOONG-GON KIM is the principal research scientist and professor at KIOST, Korea. He graduated from Kyungpook National University and received his PhD in molecular genetics from Tokyo University. His research interests include genomic biology, biodiversity and genetics. At present he is involved in the research on human healthcare using by marine resources.







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## Article

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