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DIVERSITY OF FISH SPECIES IN SOUTH-EASTERN COAST OF BANGLADESH

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Abstract

As one of the major components of the blue economy and food security, coastal fisheries resources are vital for the sustainable economic development, livelihood security, management and conservation. However, concurrent comprehensive study on assessing abundance and composition of faunal diversity from coastal and marine waters are scant. A yearlong field inventory was conducted with the aim to assess the present status of available fish and shellfish taxa from marine and estuarine waters of South-Eastern coast explicitly Chittagong and Cox's Bazar districts of Bangladesh. Both qualitative and quantitative data concerning the current perspectives of fishery resources to assessing the existing realities of species compositions were accounted. The collected taxa (specimens) were identified based on expert knowledge sharing, secondary document consultation and internationally practised appropriate methods. A total of 64 taxa including 54 finfish species under 27 families and 10 shellfish species under 2 families were recorded from the study area. On the basis of family-wise contribution Sciaenidae showed the highest percentage (11%) represented by 6 species, followed by Gobiidae (9%) and Scombridae (9%) both represented by 5 species, whereas Engnaulidae and Cynoglossidae scored (7%) with 4 species. For shellfish (shrimp) species Pennidae exhibited (80%) contribution represented by 8 species followed by Hippolytidae (20%) represented by 2 species. The specimens were then preserved in the laboratory as the first step towards setup of a Fish Museum in the Faculty of Fisheries, Sylhet Agricultural University (SAU) which may facilitate laboratory education for effective leaning and helpful to respected stakeholders including scientist, researchers, students and managers as well.

Keywords: Blue economy, biological diversity, conservation, fish museum, laboratory education.

Introduction

Bangladesh is endowed with opulent and extensive inland and marine water resources where fisheries sector has an important and potential contribution in the agro-based economic development, poverty reduction and employment generation, supplying of animal protein and a source of foreign currency (Shamsuzzaman *et al*., 2017; FRSS, 2015; DoF, 2013). Recently, Bangladesh government has emphasized on the promotion of the blue growth after settling the permanent maritime boundary with the neighbouring countries explicitly India and Myanmar. Apart from other resources, Bangladesh coastal region is very rich in fish and shellfish species biodiversity considered amongst the most vital components of the blue economy of the country. Being important components of the blue economy, conservation of biological diversity of marine and coastal fishery living resources are vital for the livelihood security, resource utilization, management and sustainable economic development of the country. Shamsuddoha and Islam (2017) reported a total of 442 taxa from marine finfish and 36 shellfish species from marine and estuarine waters of Bangladesh. About 38 species of shrimps (DoF, 2013) have been recorded from the marine water of Bangladesh. However, the availability of different species of marine fishes has been reported to show a decreasing trend in abundance from the last few decades (Islam *et al.*, 2017). Degradation of ecosystems causes ultimate destruction to the structure and function of marine biota (Stoddard *et al.*, 2006). Studies indicate that the coastal and marine ecosystems are in a state of vulnerability due to both natural and multidimensional human induced anthropogenic threats for including negative impact of climate change, sea level rise, pollution, habitat destruction, over exploitation, destructive fishing gear, poor enforcement of law and regulations, negligible awareness, inadequate research on population dynamics and stock assessment, management shortcomings, ever increasing population pressure etc. (Islam *et al*., 2018; Islam and Shamsuddoha, 2018; Shamsuzzaman *et al.*, 2016; Islam and Chuenpagdee, 2013; Alam *et al.*, 2013; Ahmed and Troell, 2010; Allison *et al.*, 2009). From the ecological point of view, fish is very important not only because of its economic value but also because of sensitivity to ecological changes and represents a wide range of tolerance at community level (Pielou, 1966). So, species assemblages of fishery species, assortment and preservation have widely

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been used as biological indicators to estimate and evaluate the level of degradation and health of the ecosystem (Vijaylaxmi *et al.*, 2010).

It further illustrates the biodiversity of species which increases awareness for adoption of a new paradigm for biodiversity protection and ecosystem management. Increasing public appreciation, education and awareness and public involvement concerning the importance of biological diversity promote the environmental conservation and sustainable development (UNEP, 2010; Howe, 2009). United Nations Environment Programme (UNEP) prioritize public awareness as essential to ensure the success of many actions promoting the conservation and sustainable use of biodiversity that is also one of the main instruments available to achieve the goal of the Convention on Biological Diversity. Although holding utmost importance as a vital component of the blue economy, comprehensive research on the assessment of species availability, current species diversity status of coastal and marine living resources (finfish and shellfish) and their subsequent preservation are scant. Therefore, assessing the present status of fish and shellfish species availability, their subsequent collection and preservation in the laboratory (museum), may facilitate the education for effective learning and help to enhance public awareness about the conservation necessities of biological diversity of the coastal and marine ecosystems of Bangladesh.

Materials and Methods

Site profile of the study area: The study was conducted in Cox's Bazar and Chittagong districts of the south-eastern coast of Bangladesh (Fig. 1). The coastal zone of Bangladesh well known for providing a huge contribution to the blue economy and nowadays catching policy and research attention for the sustainable development and utilization of the vast ocean resources. As fisheries resources are one of the most important parts of the blue economy around the world, therefore its sustainable utilization would lead to realization of greater revenue in a manner which contributes to eradicating poverty, leads to sustained economic growth, enhances social inclusion, improves human welfare, creates opportunities for employment and decent work for all while maintaining healthy functioning of the Oceans ecosystem (DoF, 2013). The South-Eastern (Chittagong and Cox's Bazar) coast is especially important for artisanal fisheries, fish landing centre, fishing activities, marine shrimp hatchery, shrimp farming, fishery, fish drying, salt production, agriculture, and other natural resources.

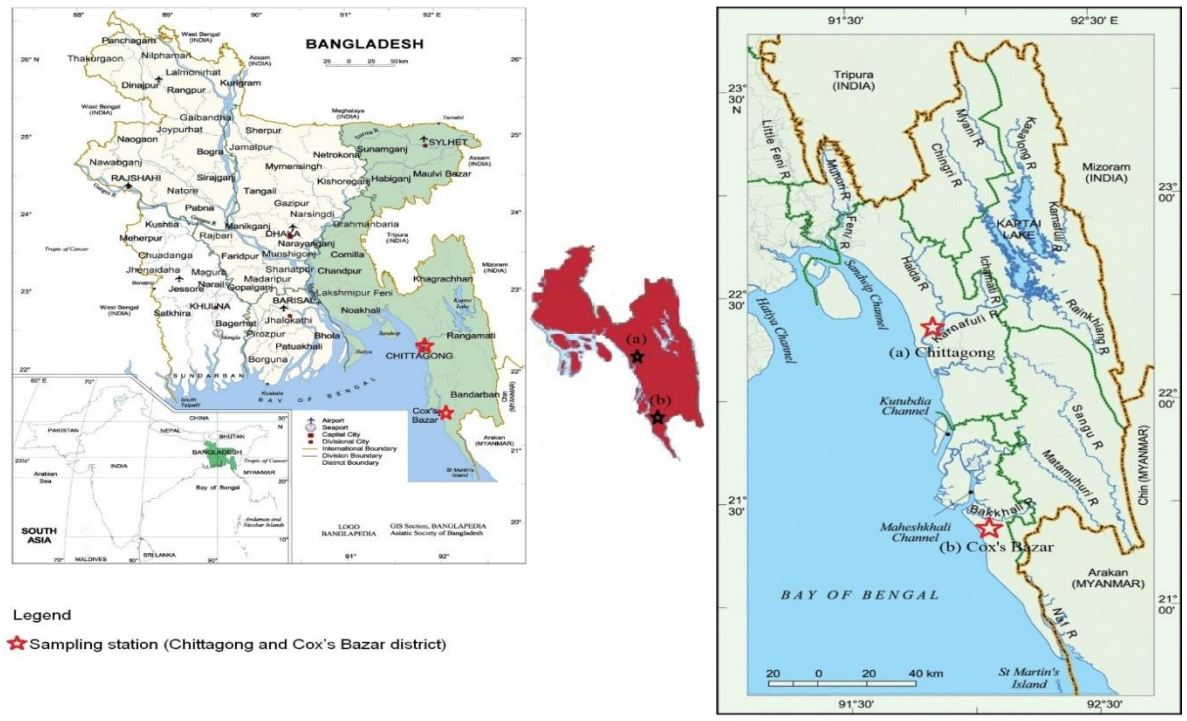

Fig. 1. Geographical location of the study area in the South-Eastern coast of Bangladesh namely (a) Chittagong and (b) Cox's Bazar districts (Adapted from Banglapedia, 2015)

Collection, identification and preservation of specimen: Data (both qualitative and quantitative) on the availability of marine fishery taxa and specimens mainly fin-fish and shellfishes were collected through a series of field survey during two main seasons explicitly monsoon and winter from the various fish markets and landing centers of Chittagong and

Cox's Bazar districts. All of the collected data were scrutinized and species observed in the study area were listed, photographed and immediately preserved in ice then transported to the Laboratory by using icebox. The taxa were then identified based on expert knowledge sharing and secondary document consultation according to Froese and Pauly (2017), Rahman *et al.* (2009), Ahmed *et al.* (2008), Siddiqui *et al.* (2007), Huda *et al.* (2003) etc. Identification of the taxa was fine-tuned by cross-checking with the Catalogue of Life 2017 Annual Checklist (Roskov *et al.*, 2017) and World Register of Marine Species (WoRMS Editorial Board, 2017). In addition, IUCN global status and trends of each available taxa were provided, by using data from the IUCN Red List of Threatened Species (IUCN, 2017). All the specimens were subjected to a preservation process, for instance, fixed with 5-10% buffered formaldehyde solution to prevent the damage or destruction of the ossified structures of the sample over time. Then the specimens were preserved with 70% ethyl alcohol (ethanol) or 70% methylated ethanol and in some cases stored in 37% formaldehyde following Chakraborty *et al.* (2006) and standard procedures (Fig.2). Secondary data were collected from several networks, including Google Scholar, Scopus, Science direct, published articles etc.

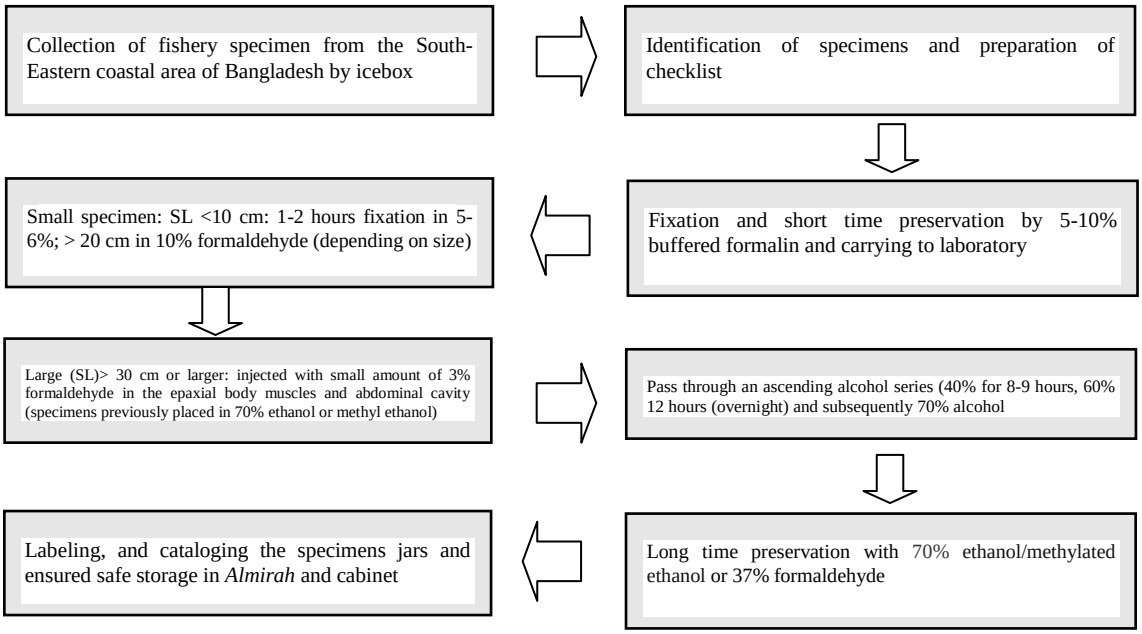

Fig.2. Flow diagram of methodology illustrating different stages starting from the collection, preservation, cataloguing and storing the specimens in the laboratory of the SAU

Technical consideration during preservation, cataloging and placement of specimens (glass jar) in the laboratory: As placing the fish specimens directly into 70% ethanol could create too fast shrinking resulting in shrivels and the same time the alcohol may be diluted by the body liquids. So, for efficient long-term storage, prior to transfer in ethanol (especially small fishes) the specimens were passed through an ascending alcohol series (40% for 8-9 hours, 60% 12 hours (overnight) and subsequently into 70% to prevent the faster exchange of body liquid with the ethanol. The precautionary and safety regulations and measures were taken into consideration and specimens were handled with gloves and holding the clamp in plastic tray carefully to avoid direct contact and be safe from the instant toxic and long-run carcinogenic effect of formalin. There were some technical differences between the preservation methods of large and small fish specimen.

For instance small specimen with standard length (SL) <10 cm, 1-2 hours of fixation in 5-6%; > 20 cm SL in 10% formaldehyde (depending on size) was done whereas large fishes e.g. >30 cm (SL) were injected with small amount of 3% formaldehyde in the epaxial body muscles and abdominal cavity of the specimens (previously placed in 70% ethanol or methyl ethanol) for ensuring the process of preservation (especially of the stomach content). Specimens were then catalogued according to their classification, identifying characteristics like body shape, colour, number of the spine, scale pattern, geographical distribution etc. Finally, all specimens were labelled, placed in different sized glass jar according to the size of taxa and placed carefully in the rack, *Almira and* cabinet to ensure safe storage (Fig. 3 and 4).

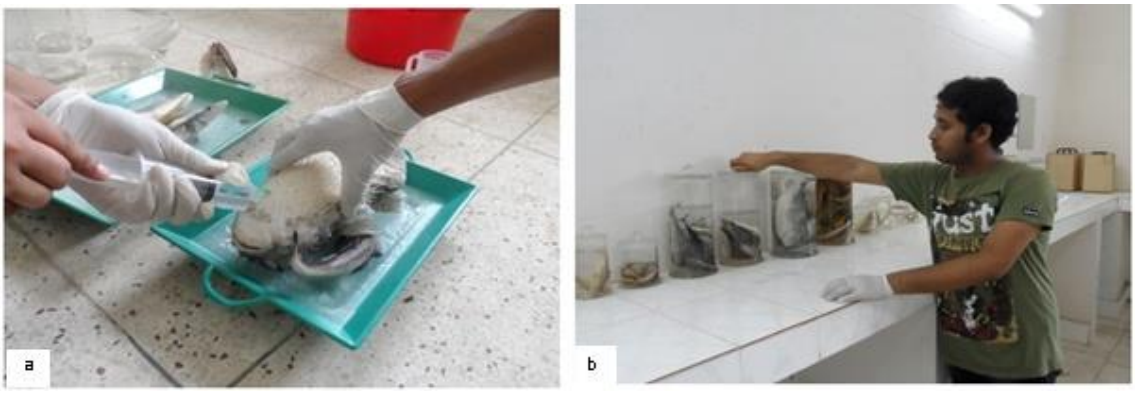

Fig.3. (a) Injection of 3% formaldehyde in the epaxial body muscles and abdominal cavity of the larger specimens (SL)> 30 cm or larger previously placed the fish in 70% ethanol (or methyl ethanol) (b) placement of specimens (glass jars) in the CMF laboratory, SAU

Fig. 4. (a) Fish specimen jars with *Auxisthaz ard* and (b) *Lepturacanthussavala* (c) wooden Almira loaded with specimen jars in the CMF Lab, Faculty of Fisheries, SAU

Data Analysis: The collected data on species composition and availability were encoded, put in the computer and were analyzed by using MS Excel.

Results and Discussion

A total of 64 taxa (54 finfish and 10 shellfish species) were recorded from the study areas (Tables 1-2 and Fig. 5) Among the noted taxa, 27 finfish families were present of which 17 were represented by single species, 2 by two species, 3 by three species, 2 by four species, 2 by five species and 1 by six species (Table 1 and Fig. 5). The richest family in terms of the number of species was Sciaenidae (11%) represented by 6 species, Gobiidae (9%) and Scombridae (9%) represented by 5 species, Engnaulidae and Cynoglossidae (7%) with 4 species, Clupeidae, Polynemidae and Stromateidae (6%) represented by 3 species while the fifth place was Lutjanidae and Sillaginidae occupied by 2 species per each (Table 1 and Fig. 5). The latter come to the families ofCarangidae, Carcharhinidae, Dasyatidae, Drepanidae, Dussumieriidae, Latidae, Muraenesocidae, Ophichthidae, Pangasiidae, Platycephalidae, Sphyrnidae, Synbranchidae, Synodontidae, Tachysuridae, Terapontidae, Tetraodontidae, Trichiuridae (2%) represented by 1 species (Table 1 and Fig. 5). Also, 2 families of shellfish were recorded from study site Hippolytidae (20%) represented by 2 species and Pennidae (80%) represented by 8 species (Table 2). Although all of the 64 taxa were present in both study sites, however seasonal variation in terms of species availability was noticed. In both study sites, most species were more abundant during the winter season in comparison to the monsoon (Tables 1 and 2). The higher availability during winter may be associated with the common phenomena of Bangladesh climatic scenario when sea become calmer with the minimum extreme cyclonic episode. Most of the fishing activities are used to occupy throughout the winter season. The species abundance in the present study was inline with Islam *et al.* (1993), Islam and

Haque (2004), Khan *et al.* (1997), Rashed-Un-Nabi and Ullah (2012). Islam and Hossain (2017) reported a total 49 commercially available finfish taxa in the fish markets adjacent to the Sundarbans, Bangladesh, which also support the finding of the present study.

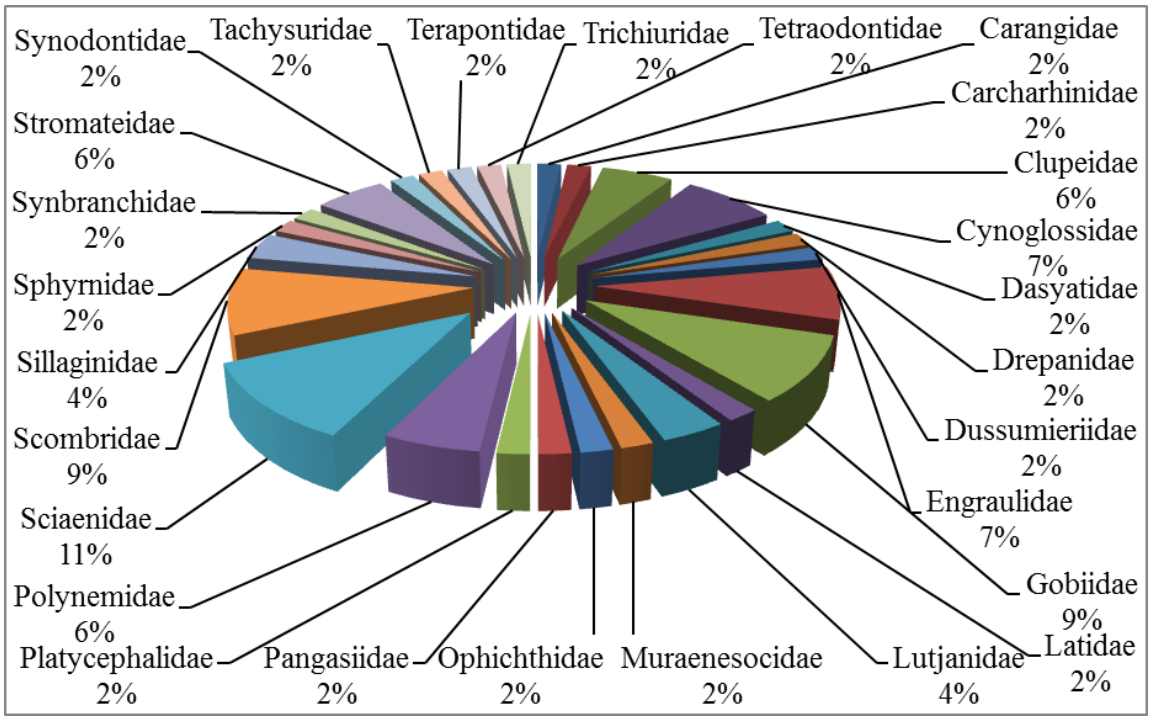

Fig. 5. Family-wise species composition and availability of marine finfish taxa in the South-Eastern coast of Bangladesh

Ahsan *et al*. (2014) reported a total 55 and Barman *et al.* (2016) found 41 marine finfish species from the fish markets of Patuakhali district and Karnafully river estuary respectively, which also coincide with the present findings as the scenarios are more or less similar along the coastline of Bangladesh. Chowdhury and Iqubal (2007) recorded a total 31 major marine commercial species including 21 marine finfish and 9 prawns and shrimp, and 1 crab species of in the fish landing centers of Dhaka City in Bangladesh which is much smaller than the present findings (64 taxa) as only the species with high commercial values were transported to the Dhaka city form the coastal belt for marketing. Over a survey of two consecutive years, Hoq *et al*. (2006) recorded 15 species of shellfishes belonging to 6 families and 37 species of finfish belonging to 27 families from the 5 rivers of the Sundarbans mangrove located in the south-western coast of Bangladesh. Ali *et al.* (2004) recorded 23 brackish water and 39 marine fishery species in the major landing centre of Khulna district where *Lates calcarifer*, *Pelamys chiliensis*, *Trichiurus haumela*, *Katengus typus*, *Penaeus monodon* and *Scylla serrate* were the most abundant species respectively. Gain *et al*. (2015) identified 95 finfish taxa belonging to 14 orders and 45 families where Perciformes (38 taxa) and Gobiidae (14 species) were the most dominant order and family respectively alsocoincide with the present findings. Alam *et al.* (2013) recorded a total 63 taxa belonging to 51 genera pertaining to 24 families and 9 orders from Haldariver, Chittagong. Despite this, fish fauna in this river is dominated by the family of Cyprinidae (30.16% represented by 19 species) followed by Gobiidae (9.52% represented by 6 species) and Schibeidae (7.94% with 5 species), then Bagridae and Channidae (6.35% with 4 species each), Siluridae (4.76% with 3 species) however, are broadly coincide with the present findings.

Though, there were 475 finfish and 38 shrimp species available in the marine and coastal waters of Bangladesh (DoF, 2012, 2013; IUCN, 2000; Hossain, 1971). Lower count of different species 54 finfish and 10 shellfish taxa obtained might be associated with the limited number of short and periodic sampling effort explicitly during two seasons (monsoon and winter) rather continuous year-round monitoring of the study sites. Moreover, limiting the study area coverage only to tiny part of South-east coast (mostly in the major landing centres and fish markets of Cox's Bazar and Chittagong) rather than considering the whole coastline (710 km^2), could be responsible. The number of available species composition could be more if continuous sampling effort would employed throughout the year with extending study sites covering the entire coastal belt of Bangladesh (including central and south-west coast). Hossain (1971) considered every species and the study were conducted on board sea expedition by means of ship or vessel in the whole Bay of Bengal (BOB) for a continuous period of three years that was beyond the capacity of the present study.

Discarding the low-value fishes widely considered as by-catch might be the other cause associated with the lower count in the current study. A portion of the catch by the fishers comprising many of marine taxa of less commercial importance was referred to as non-target or by-catch, thus, discarded at the sea or sometimes sold to fishing villages for drying. In fish markets, fishers used to bring those fishery species that have high market demand and values as well. Most of the trash fishes (with low market price) are usually discarded by the fishers during fishing; however, these comprise a wide variety of species mostly not found in the fish markets (Hossain, 2017). Most of the fishermen gave the more or less similar information, thereby mislaid as the species were recorded only from the landing centre. Therefore, present findings could be considered to be as contemporary scenarios of the current species composition from the marine and coastal waters of the South-Eastern coast of Bangladesh.

Table 1. List of preserved marine taxa (fishes) in Fish Museum, collected from the South-Eastern coast literary Chittagong and Cox's Bazar district, Bangladesh along with their seasonal availability, global IUCN (2017) status and trends

Sl.	Family (number of taxa)	Scientificidentity of the specimen	Common English name	Vernacular or Local name	Chittagong[1]		Cox's Bazar[1]		IUCN global Status[2]	IUCN global trends[2]
					Mon soon	Winter	Mon soon	Winter		
1	Latidae (1)	*Lates calcarifer* (Bloch, 1790)	White Sea bass, Asian *sea bass, Barramundi*	Coral, Vetki	C	A	C	A	NE	-
2	Carcharhinidae (1)	*Carcharias dussumieri* (Müller & Henle, 1839)	White cheek shark	Hangur	F	C	A	A	NE	-
3	Clupeidae (2)	*Gonialosa manmina* (Hamilton, 1822)	Ganges river gizzard shad	Chamila	C	A	C	A	LC	Unknown
4	Clupeidae	*Tenualosa ilisha* (Hamilton, 1822)	Hilsa shad, Hilsa	Ilisha	C	A	C	C	LC	Decreasing
5	Pristigasteridae (1)	*Raconda russeliana* (Gray, 1831)	Smooth back herring	Fatra	C	A	C	A	LC	Unknown
6	Cynoglossidae (4)	*Cyanoglossus cyanoglossus* (Hamilton, 1822)	Bengal tongue sole/ tonguefish	Kukurjeeb	F	C	C	A	NE	-
7	Cynoglossidae	*Cyanoglossus lingua* (Hamilton, 1822)	Long tongue sole	Kukurjeeb	F	C	C	A	NE	-
8	Cynoglossidae	*Cyanoglossus arel* (Bloch & Schneider, 1801)	Large scale tongue sole	Kukurjeeb	F	C	F	C	NE	-
9	Cynoglossidae	*Plagusia blochii* (Bleeker, 1851)	Tongue sole	Kukurjeeb	F	C	C	A		-
10	Carangidae (1)	*Atropus atropos* (Bloch & Schneider, 1801)	Cleftbelly trevally	Bangada	F	C	F	A	NE	-
11	Dasyatidae (1)	*Dasyatis zugei* (Müller &Henle, 1841)	Pale-edged Stingray / sharp-nose stingray	Saplapata	F	C	C	A	NE	-
12	Drepanidae (1)	*Drepane longimana* (Bloch & Schneider, 1801)	Sickle fish	Bishtara	C	C	F	A	NE	-
13	Dussumieriidae (1)	*Dussumieri aacuta* (Valenciennes, 1847)	Rainbow sardine/ Common sprat	Goru mash	F	C	C	A	NE	-
14	Engraulidae (4)	*Coilia dussumieri* (Valenciennes, 1848)	Gold spotted grenadier anchovy	Boiragi / Olua	C	A	C	A	NE	-
15	Engraulidae	*Coilia neglecta* (Whitehead, 1967)	Whitehead's /Neglected grenadier anchovy	Boiragi / Olua	F	C	C	A	LC	Unknown
16	Engraulidae	*Setipinna phasa* (Hamilton, 1822)	Scaly hairfin anchovy	Phasa/ Moduphasa	F	C	C	A	LC	Unknown
17	Engraulidae	*Stolephorus indicus* (Van Hasselt, 1823)	Indian/ Hardenberg's anchovy	Sea mola	F	C	C	A	NE	-
18	Gobiidae (5)	*Acentrogobius cyanomos* (Bleeker, 1849)	Gobi	Nunabaila	C	A	C	A	NE	-
19	Gobiidae	*Apocryptes bato* (Hamilton, 1822)	Gobi mudskipper	Baila, Chewabele	F	C	F	C	NE	-

Sl.	Family (number of taxa)	Scientificidentity of the specimen	Common English name	Vernacular or Local name	Chittagong[1]		Cox's Bazar[1]		IUCN global Status[2]	IUCN global trends[2]
					Mon soon	Winter	Mon soon	Winter		
20	Gobiidae	*Boleophthalmus boddarti* (Pallas, 1770)	Blue-spotted Mudskipper, Boddart's goggle-eyed goby	Dahuk	F	A	C	A	NE	-
21	Gobiidae	*Odontamblyopus rubicundus* (Hamilton, 1822)	Red eel goby	Raja chewa	F	C	C	A	NE	-
22	Gobiidae	*Trypauchen vagina* (Bloch & Schneider, 1801)	Burrowing goby	Chewa	C	A	C	A	NE	-
23	Muraenesocidae (1)	*Congresox talabonoides* (Bleeker, 1853)	Indian pike conger	Kamila	F	C	F	C	NE	-
24	Lutjanidae (2)	*Lutjanus erythropterus* (Bloch, 1790)	Crimson snapper	Photo poa	C	A	C	A	NE	-
25	Lutjanidae	*Lutjanus johnii* (Bloch, 1792)	John's snapper	RangaChoukka	C	A	C	A	NE	-
26	Ophichthidae (1)	*Pisodonophis boro* (Hamilton, 1822)	Rice-paddy eel	Kharu	F	C	C	A	LC	Unknown
27	Pangasiidae (1)	*Pangasius pangasius* (Hamilton, 1822)	Pangas catfish	Pungus	F	C	F	C	LC	Decreasing
28	Platycephalidae (1)	*Platycephalus indicus* (Linnaeus, 1758)	Indian flathead	Char bele	C	A	C	A	DD	Unknown
29	Polynemidae (3)	*Eleutheronema tetradactylum* (Shaw, 1804)	Blunt-nosed salmon, giant threadfin	Lakkha	C	C	F	A	NE	-
30	Polynemidae	*Leptomelanosoma indicum* (Shaw, 1804)	Indian threadfin	Lakkha	C	A	C	A	NE	-
31	Polynemidae	*Polynemus paradiseus* (Linnaeus, 1758)	Paradise threadfin	Taposi	C	A	C	A	NE	-
32	Scombridae (5)	*Scomberoides commersonnianus* (Lacepède, 1801)	Talang queen fish		C	A	C	A	NE	Unknown
33	Scombridae	*Scomberoides guttatus* (Bloch & Schneider, 1801)	Indo-Pacific king mackerel	Maittya	C	C	C	A	DD	Unknown
34	Scombridae	*Rastrelliger kanagurta* (Cuvier, 1816)	Indian Mackerel	Champa	C	C	C	A	DD	Unknown
35	Scombridae	*Thunnus albacares* (Bonnaterre, 1788)	Yellow fin tuna, Yellow finned albacore	Surma	C	C	C	C	NT	Decreasing
36	Scombridae	*Auxis thazard* (Lacepede, 1800)	Frigate tuna	Surma	F	C	C	A	LC	Stable
37	Sciaenidae (6)	*Johnius carutta* (Bloch, 1793)	Karut croaker	Poa	C	A	C	A	NE	Unknown
38	Sciaenidae	*Johnius belangerii* (Cuvier, 1830)	Belanger's croaker/ Jewfish	Poa	C	A	C	A	NE	Unknown
39	Sciaenidae	*Johnius dussumieri* (Cuvier, 1830)	Sin croaker	Poa	C	A	C	A	NE	Unknown
40	Sciaenidae	*Johnius macropterus* (Bleeker, 1853)	Big-snout croaker/ Large-	Poa, Large fin poa	C	C	C	A	NE	Unknown

Sl.	Family (number of taxa)	Scientificidentity of the specimen	Common English name	Vernacular or Local name	Chittagong[1]		Cox's Bazar[1]		IUCN global Status[2]	IUCN global trends[2]
					Mon soon	Winter	Mon soon	Winter		
			fined Croaker							
41	Sciaenidae	*Pennahia argentata* (Houttuyn, 1782)	Silver jaw fish	Lalpoa/ Vola fish	C	A	C	A	NE	Unknown
42	Sciaenidae	*Panna microdon* (Bleeker, 1849)	Panna Croaker	Poa, Jewfish	C	A	C	A	NE	Unknown
43	Sillaginidae (2)	*Sillaginopsis panijus* (Hamilton, 1822)	Flathead silago	Hundra, Tulardandi	F	C	C	A	NE	-
44	Sillaginidae	*Sillaginopsis domina* (Hamilton, 1822)	Gangetic Sillago	Tulardanti	F	C	C	A	NE	-
45	Sphyrnidae (1)	*Eusphyra blochii* (Cuvier, 1816)	Hammer headed shark	Haturihangur	F	C	F	C	EN	Decreasing
47	Stromateidae (2)	*Pampus argenteus* (Euphrasen, 1788)	Silver or white pomfret	Folichanda	C	A	C	A	NE	Unknown
48	Stromateidae	*Pampus chinensis*(Euphrasen, 1788)	Chinese silver pomfret	Rupchanda	C	C	C	A	NE	Unknown
49	Synbranchidae (1)	*Monopterus cuchia* (Hamilton, 1822)	Cuchia	Kuchia	F	C	F	C	LC	Unknown
50	Synodontidae (1)	*Harpadon nehereus* (Hamilton, 1822)	Bombay-duck	Loitta	C	A	C	A	NE	Unknown
51	Tachysuridae (1)	*Netuma thalassina* (Rüppell, 1837)	Sea cat fish	Guizza	C	A	C	A	NE	Unknown
52	Terapontidae (1)	*Terapon jarbua* (Forsskål, 1775)	Jarbuaterapon	Gogo/ borguni	F	C	C	A	LC	Unknown
53	Tetraodontidae (1)	*Chelonodon patoca* (Hamilton, 1822)	Milkspotted puffer	Potka	C	A	C	A	NE	Unknown
54	Trichiuridae (1)	*Lepturacanthus savala* (Cuvier, 1829)	Savalaihairtail	Churi	C	A	C	A	NE	Unknown

[1]Species availability status in study sites (Chittagong and Cox's Bazar) during monsoon and winter seasons of the year: Abundant (A) – a lot of or plenty, Common (C) - frequently available, Few (F) – present but not frequently available (modified after Chowdhury and Iqubal, 2007). [2]Global IUCN status of the species and global population trends representing here are according to the IUCN Red List of Threatened Species (IUCN 2017). Categories of IUCN status: Data Deficient (DD), Not Threatened (NO), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR); Bangladesh (BD). Not evaluated (NE): Taxon has not yet been assessed for the IUCN Red List.

Table 2. List of preserved shellfishes (shrimp/prawn) in SAU Fish Museum, collected from the South-Eastern coast of Bangladesh along with their seasonal availability, global IUCN (2017) status and trends

Sl.	Family (number of taxa)	Scientific identity of the specimen	Common English name	Vernacular or Local name	Chittagong[1]		Cox's Bazar[1]		IUCN global Status[2]	IUCN global trends[2]
					Mon soon	Winter	Mon soon	Winter		
1	Penaeidae (8)	*Penaeus monodon* (Fabricius, 1798	Giant tiger shrimp	Bagda chingri	A	A	A	A	NE	-
2	Penaeidae	*Penaeus semisulcatus* (De Haan, 1844)	Green tiger prawn	Sada icha	C	C	A	A	NE	-
3	Penaeidae	*Penaeus japonicus* (Spence Bate, 1888)	Shrimp	Bagda chingri	C	C	A	A	NE	-
4	Penaeidae	*Macrobrachium dolichodactylus* (Hilgendorf, 1879	Golda river prawn	Brammhani chingri	A	A	C	C	NE	-
5	Penaeidae	*Macrobrachium mirabile* (Kemp, 1917)	Shortleg prawn	GuraIcha	F	A	F	C	NE	-
6	Penaeidae	*Metapenaeus brevicornis* (H. Milne Edwards, 1837)	Yellow shrimp	Honni chingri	F	C	C	F	NE	-
7	Penaeidae	*Metapenaeus monoceros* (Fabricius, 1798)	Brown Shrimp	Harina Chingri	C	C	A	C	NE	-
8	Penaeidae	*Parapenaeopsiss culptilis* (Heller, 1862)	Rainbow shrimp	Baghatara chingri	F	C	C	F	NE	-
9	Palaemonidae (2)	*Exopalaemon styliferus* (H. Milne Edwards, 1840	Roshna prawn	Siberian icha	C	C	A	C	NE	-
10	Palaemonidae	*Palaemon* (*Nematopalaemon*) *karnafuliensis* (Ali Azam Khan, Fincham & Mahmood, 1980)	Karnafuli shrimp	Karnafuli chingri	C	A	C	F	NE	-

[1]Species availability status in study sites (Chittagong and Cox's Bazar) during monsoon and winter seasons of the year: Abundant (A) – a lot of or plenty, Common (C) - frequently available, Few (F) – present but not frequently available (modified after Chowdhury and Iqubal, 2007). [2]Global IUCN status of the species and global population trends representing here are according to the IUCN Red List of Threatened Species (IUCN 2017). Categories of IUCN status: Data Deficient (DD), Not Threatened (NO), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR); Bangladesh (BD). Not evaluated (NE): Taxon has not yet been assessed for the IUCN Red List.

Recommendations, societal implication to conservation and conclusion

The preserved specimens in the laboratory of the Department of Coastal and Marine Fisheries (CMF), Faculty of Fisheries, Sylhet Agricultural University (SAU), created an opportunity to gain knowledge about the biological diversity of the marine and coastal ecosystems of Bangladesh that are a vital component of the blue economy. Classroom education (what and why) often intersect with well-equipped laboratory (how and why) for effective learning and assume to be raising awareness. As laboratory instruction involves students in hands-on experimentation, manipulation, practice or performance (Phipps *et al.*, 2008; Zaraf shani, 2008; NRC, 2006). This setup may facilitate the laboratory educational activities of Masters and Bachelor study of SAU which essentially requires effective theoretical and practical knowledge/learning about coastal and marine living resources. This fish museum at a glimpse sketches a view of coastal and marine biological diversity and promotes awareness about conservation necessities to relevant stakeholders including scientist, researchers, managers etc. Students, readers or visitors may be satisfied with a complementary idea about the species composition of the commercial fin and shellfishes of the South-eastern coastal region of Bangladesh. However, to make it a well-equipped to the status of scientific knowledge based documented museum, more collection of fishes and other species like mollusc, reptile, seaweed etc., and continuous maintenance are essential.

IUCN global status (IUCN, 2017) of the majority of the identified taxa (37 out of 64) was designated as not evaluated (NE) or not assessed for the IUCN Red List, with global trend stiered as unknown or decreasing, which demand further research for better management, conservation and sustainable utilization of those resources. Nevertheless, the list of fishery taxa presented here with their IUCN global status, trends and updated nomenclature (systematics) by comparing with the global database (Catalogue of Life; WoRMS Editorial Board; IUCN Red List of Threatened Species) could provide valuable insights for the policy makers with the management of marine and coastal ecosystems of Bangladesh. Simultaneously, to assist in combating multidimensional anthropogenic and natural threats, this study submit surgent research and policy attention to conserve these invaluable marine and coastal resources for human well-being by ensuring better utilization while maintaining the ecosystem health as an important component towards the sustainable blue economy of Bangladesh. The government should critically note and implement the opinions of the experts and should support the research facilities in order to get better resource exploitation to keep pace with the increasing demand for fishes in the 21stcentury as well as maintaining sustainable fisheries resources of Bangladesh.

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