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Fish biodiversity and their present conservation status in the Meghna River of Bangladesh

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Abstract
This study was conducted between January 2016 and December 2016 with a view to assessing the biodiversity of fishes in the River Meghna and their conservation status both in Bangladesh and global aspects. A total of 107 fish species belonging to 13 orders and 36 families were documented. Perciformes was found to be the most dominant order consisting 32% of the total fish population. Cyprinidae was found to be the richest family (16%). Twenty common groups were recorded in the studied areas. Estuary-River was found to be the biggest habitat for the maximum number of fishes (43%). Twenty one threatened fish species (20%) were recorded from the River Meghna in which 11 species (10.28%) were found as Vulnerable (VU), 8 species (7.48%) as Endangered (EN) and 2 species (2%) as Critically Endangered (CR). Steps should be taken to conserve threatened fish species of Meghna River from the risk of extinction.

Keywords: Meghna River, fish biodiversity, conservation, threatened species, Bangladesh

1. Introduction
Bangladesh is a country of hundreds of rivers and well enriched with fish biodiversity. A total of 265 freshwater fish species are reported in Bangladesh [1].The reported fresh water fish species are not limited to freshwater only, 62 species occupy the estuary, and many fish species migrate from the Bay of Bengal to tidal rivers [1]. The most important rivers of Bangladesh is the River Meghna [2]. Bangladesh has an area of 35000 square kilometer in Meghna basin [3]. The upper and the lower Meghna are two distinct parts of the river in which the former one is comparatively a small river from Kuliarchar to Shatnol and the later one below Shatnol is one of the largest rivers in the world due to its wide estuary mouth [2].
The River Meghna is enriched with fish biodiversity. Lots of fisherman are involved in fish harvesting and depended on this river for their livelihood. Fisherman with different fishing boats and fishing gears capture huge number of various fish species in the river every day except during the certain banning periods of fishing. This river is renowned for Hilsa fishing and also serves as a nursery ground for them [24].
Indiscriminate killing, overexploitation, destructive fishing gear and methods, pollution and lack of proper management initiatives causes the fish biodiversity of Meghna River to be in great danger. Many of the fishes become vulnerable, endangered, or critically endangered.
Few research works have been conducted on the Meghna River fish biodiversity. But there is no complete list of existing fish species with updated conservation status. For this reason, it is very difficult to understand the present status of fishes in the River Meghna. In-depth research work is much needed with updated list of fish species to take necessary management initiatives to conserve the biodiversity of fishes in the River Meghna.
Unprecedented species extinctions at global and regional levels have been uncovered through recent studies on biodiversity loss and its implications for ecosystem services [5].
The specific objectives of the present study were to (i) assess the fish biodiversity including threatened fishes in the River Meghna and (ii) suggest recommendations to improve present conservation status of threatened fishes in Bangladesh considering the global threats as well.

2. Materials and Methods

2.1 Study sites

A total 16 sampling stations of Chandpur district were selected for the present study. The GPS reading of those sampling stations were taken by using GPS meter.

Table 1: Sampling stations with corresponding GPS coordinates.

Sampling Station No.	Name of sampling stations	Latitude	Longitude
1.	Lalpur Machghat, Bishnupur	23^0 17' 56.1" N	90^0 39' 26.4" E
2.	Anando Bazar Machghat, Tarpurchandi	23^0 14.874' N	$90^0$39.714' E
3.	Boro Station Landing Center, Chandpur	23^0 13.812' N	$90^0$38.552' E
4.	Dokanghor Machghat, Ibrahimpur, Sakhua	23^0 12' 11.3" N	90^0 38' 35.5" E
5.	Bohoria Machghat, Laxmipur, Bohoria	23^0 11' 11.1" N	90^0 38' 37.4" E
6.	Horina Machghat, Hanar Char, Uttor Gobindia	23^0 09' 52.5" N	90^0 38' 33.5" E
7.	Akhoner hat Machghat, Hanarchar, Daskhin Gobindia	23^0 08' 26.7" N	$90^0$38' 51.5" E
8.	Katakhali Machghat, Lamchori, Uttor Algi	23^0 06.412' N	90^0 38.715' E
9.	Telir More/Kalikhola Machghat, Daskhin Algi	23^0 05.313' N	90^0 38.955' E
10.	Haim Char Machghat, Uttar Char Bhairobi	23^0 04.212' N	90^0 39.147' E
11.	Katakhal Machghat, Jaliar Char, Chorbhairobi	23^0 01' 02.1" N	90^0 39' 35.9" E
12.	Nasir Molla & Babul Pedar Machghat, Moddhyar Char	23^0 04' 43.5" N	$90^0$36' 20.5" E
13.	Habi Gazir Kandi Machghat, Molla Kandi, Haimchar	23^0 02' 36.9" N	90^0 36' 30.6" E
14.	Babu Bazar Machghat, Malopara, Shatnol	23^0 27' 47.9" N	$90^0$35' 32.2" E
15.	Ekhlaspur Machghat, Paschim Ekhlaspur	23^0 22' 36.0" N	90^0 36' 18.8" E
16.	Amirabad Machghat, Ramonathganj, Farazikandi	23^0 20' 16.0" N	90^0 38' 21.6" E

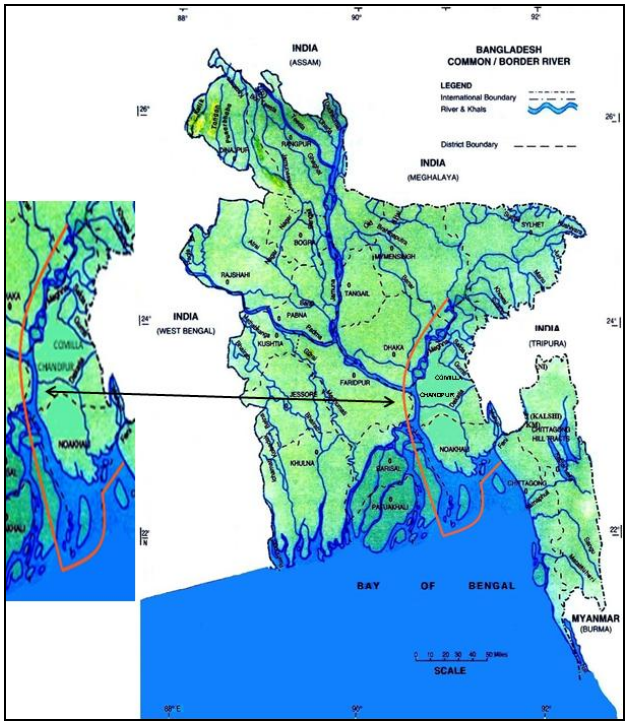

Fig 1: Map of Meghna River showing study sites.

2.2 Study period

The study was conducted for a year during January 2016 to December 2016.

2.3 Data collection framework

The data and information was collected personally by field visit observation from the sampling sites. Information about fish species were collected through interview of boat owners of commercial fishing vessels, retailers, fish traders, local people, fishermen, riverside settlers and other key informants from the sampling areas. Focus group discussion was also done in fish landing centers, fish bazar, and fisher's village of those selected sampling sites. Visits were made at least once a week during the study period.

2.4 Fish specimen collection and identification

Samples of different fish species were collected from the fisherman's catch landed at different fish landing centers of the selected sampling stations and from fish bazar as well. A digital camera was used to capture the photos of different fish species. The collected fish samples were identified by analyzing their morphometric and meristic characteristics following [1, 6, 7].

The valid scientific names of the identified fish species were ensured by checking catalogue of life [8].

2.5 Determination of conservation status

The global conservation was determined following the database of [9] whereas the local conservation status was based on [10].

2.6 Data analysis

Collected data was analyzed by computer software Microsoft Excel 2010.

3. Results

A total 107 species under 13 orders and 36 families were recorded from the 16 sampling stations. List of existing fish species with their taxonomic position (order and family name), scientific name, local name, common group, habitat and their conservation status in Bangladesh and global aspects are presented in Table 1:

Table 1: List of fish species collected from the River Meghna

Order	Family	Scientific Name	Local Name	Group Name	Habitat	IUCN Conservation Status (BD)	IUCN Conservation Status (GB)
Pleuronectiformes	Soleidae	*Brachirus pan*	Kathalpata	Soles	E-R	-	LC
	Cynoglossidae	*Cynoglossus lingua*	Kukurjeeb	Soles	E-R	LC	NE
Syngnathiformes	Syngnathidae	*Microphis cuncalus*	Kumirer khil	Pipefishes	R-E	VU	LC
Anguiliformes	Moringuidae	*Moringua raitaborua*	Rata boura	Eels	E-R	NT	NE
	Ophichthidae	*Pisodonophis boro*	Bamosh	Eels	E-R	LC	LC
Synbranchiformes	Synbranchidae	*Monopterus cuchia*	Kuchia	Eels	R-E	VU	LC
	Mastacembelidae	*Mastacebelus armatus*	Baim	Eels	R-E	EN	LC
		Macrognathus aculeatus	Tara baim	Eels	R-E	NT	NE
Beloniformes	Belonidae	*Xenentodon cancila*	Kakila	Gars	R-E	LC	LC
	Hemirhamphidae	*Hyporhampus limbatus*	Ekthuita	Gars	E-R	LC	LC
Channiformes	Channidae	*Channa punctatus*	Taki	Snakeheads	E-R	LC	NE
Cypriniformes	Cyprinidae	*Salmostoma acinaces*	Chela	Barbs & Minnows	R	LC	LC
		Esomus danricus	Darkina	Barbs & Minnows	R-E	LC	LC
		Megarasbora elanga	Along	Barbs & Minnows	R	EN	LC
		Barilius bendelisis	Joiya	Barbs & Minnows	R	EN	LC
		Devario devario	Banspata	Barbs & Minnows	R	LC	LC
		Amblypharyngodonmola	Mola	Barbs & Minnows	R	LC	LC
		Chela cachius	Chep chela	Barbs & Minnows	R-B	VU	LC
		Puntius sarana	Sarpunti	Barbs & Minnows	R-E	NT	LC
		Puntius ticto	Tit punti	Barbs & Minnows	R	VU	LC
		Puntius phutunio	Phutani punti	Barbs & Minnows	R	LC	LC
		Puntius sophore	Bhadi punti	Barbs & Minnows	R	LC	LC
		Labeo calbasu	Kalibaus	Carps	R	LC	LC
		Labeo rohita	Rui	Carps	R-E	LC	LC
		Labeo bata	Bata	Carps	R	LC	LC
		Gibelion catla	Catla	Carps	R-E	LC	LC
		Cirrhinus mrigala	Mrigal	Carps	R-E	NT	LC
		Cirrhinus reba	Raek	Carps	R	NT	LC
Siluriformes	Siluridae	*Wallago attu*	Boal	Catfishes	R-E	VU	NT
		Ompok pabda	Modhupabda	Catfishes	R	EN	NT
		Ompok pabo	Pabda	Catfishes	R	CR	NT
	Schilbeidae	*Silonia silondia*	Shilong	Catfishes	R-E	LC	LC
		Ailia coila	Kajuli	Catfishes	R-E	LC	NT
		Neotropius atherinoides	Batasi	Catfishes	R-E	LC	LC
		Eutropiichthys vacha	Bacha	Catfishes	R-E	LC	LC
		Eutropiichthys murius	Muribacha	Catfishes	R	LC	LC
		Clupisoma garua	Ghaura	Catfishes	R-E	EN	LC
	Pangasidae	*Pangasius pangasius*	Pangas	Catfishes	R-E	EN	LC
	Bagridae	*Rita rita*	Rita	Catfishes	R-E	EN	LC
		Sperata aor	Air	Catfishes	R-E	VU	LC
		Sperata seenghala	Guizza air	Catfishes	R-E	VU	LC
		Mystus bleekeri	Gulsha tengra	Catfishes	R	LC	LC
		Mystus gulio	Nuna tengra	Catfishes	E-R	NT	LC
		Mystus vittatus	Tengra	Catfishes	R-E	LC	LC
		Hemibagrus menoda	Ghagla	Catfishes	R	NT	LC
	Sisoridae	*Nangra nangra*	Gang tengra	Catfishes	R	LC	LC
		Nangra ornata	Gang tengra	Catfishes	R	DD	DD
		Gagata gagata	Ghora kata	Catfishes	R-E	LC	LC
		Gagata cenia	Gang tengra	Catfishes	R-E	LC	LC

		Gagata youssoufi	Gang tengra	Catfishes	R-E	NT	NE
		Gogangra viridescens	Gang tengra	Catfishes	R-E	LC	LC
		Gogangra laevis	Gang tengra	Catfishes	R-E	DD	DD
		Bagarius Bagarius	Baghair	Catfishes	R-E	CR	NT
		Bagarius yarrelli	Baghair	Catfishes	R-E	DD	NT
		Hara jerdoni	Kutakanti	Catfishes	R	LC	LC
	Ariidae	*Osteogeneiosus militaris*	Apuia	Catfishes	E-R	LC	NE
		Batrachocephalus mino	Katabukha	Catfishes	E-R	NE	NE
		Arius gagora	Gagla	Catfishes	E-R	NE	NE
	Plotosidae	*Plotosus canius*	Kainmagur	Catfishes	E-R	NT	NE
Clupeiformes	Clupeidae	*Tenualosa ilisha*	Ilish	Clupeids	E-R	LC	LC
		Gudusia chapra	Chapila	Clupeids	R	VU	LC
		Goniolosa manmina	Gonichapila	Clupeids	R	LC	LC
		Corica soborna	Kachki	Clupeids	R-E	LC	LC
	Pristigasteridae	*Ilisha megaloptera*	Chaukka	Clupeids	E-R	LC	NE
	Engraulidae	*Coilia dussumieri*	Olua	Anchovies	E-R	LC	NE
		Coilia ramcarati	Meghaolua	Anchovies	E-R	LC	NE
		Setipinna phasa	Phasa	Anchovies	E-R	LC	LC
		Setipinna taty	Teliphasa	Anchovies	E-R	LC	NE
Elopiformes	Megalopidae	*Megalopes cyprinoides*	-	Tarpons	E-R	NE	DD
Osteoglossiformes	Notopteridae	*Notopterus notopterus*	Foli	Feather backs	R-E	VU	LC
		Chitala chitala	Chitol	Feather backs	R-E	EN	NT
Perciformes	Polynemidae	*Polynemou sparadiseus*	Tapasi	Threadfins	E-R	LC	NE
		Eleutheronematetradactylum	Tailla	Threadfins	E-R	NE	NE
	Mugilidae	*Rhinomugil corsula*	Khorsula	Mullets	E-R	LC	LC
		Mugil cephalus	Bhangan bata	Mullets	E-R	LC	LC
		Liza subviridis	Bata	Mullets	E-R	LC	NE
	Anabantidae	*Anabas testudineus*	Koi	Perches	R	LC	DD
	Osphronemidae	*Trichogaster lalius*	Lal kholisa	Perches	R	LC	LC
		Ctenops nobilis	Neftani	Perches	R-E	LC	NT
	Centropomidae	*Lates calcarifer*	Koral	Perches	E-R	NE	NE
	Ambassidae	*Chanda nama*	Nama Chanda	Perches	R-E	LC	LC
		Parambassis ranga	Ranga chanda	Perches	R-E	LC	LC
		Pseudambassis baculis	Chanda	Perches	R-E	NT	LC
	Nandidae	*Nandus nandus*	Vheda	Perches	R-E	NT	LC
		Nandus meni	Meni	Perches	R	NE	NE
	Gobiidae	*Pseudapocryptes elongatus*	Chewa	Mudskippers	E-R	LC	LC
		Apocryptes bato	Chiring	Mudskippers	E-R	LC	NE
		Parapocryptes batoides	Dali chewa	Mudskippers	E-R	LC	NE
		Periophthalmus koelreuteri	Dahuk	Mudskippers	E-R	LC	NE
		Eugnathogobius oligactis	-	Mudskippers	E-R	VU	LC
		Awaous guamensis	Baila	Mudskippers	E-R	LC	LC
		Awaous grammepomus	Bele	Mudskippers	E-R	VU	LC
		Brachygobius nunus	Nuna baila	Mudskippers	E-R	LC	NE
		Glossogobius giuris	Bele	Mudskippers	E-R	LC	LC
		Gobiopterus chuno	Chuna bele	Mudskippers	E-R	LC	DD
		Trypauchen vagina	Shada chewa	Mudskippers	E-R	LC	NE
		Odontamblyopus rubicundus	Lal chewa	Mudskippers	E-R	LC	NE
		Taenioides cirratus	Chewa	Mudskippers	E-R	LC	DD
	Sciaenidae	*Otolithoides pama*	Poa	Croakers	E-R	LC	NE
		Macrospinosa cuja	Kuizzapoa	Croakers	E-R	NT	NE
		Johnius coitor	Koitor poa	Croakers	E-R	LC	LC
	Leiognathidae	*Secutor ruconius*	Tek chanda	Pony fishes	E-R	NE	NE
	Eleotridae	*Eleotris lutea*	Kuli	Sleepers	E-R	DD	NE
		Eleotris fusca	Budh bailla	Sleepers	E-R	LC	LC
		Butis butis	Kuli	Sleepers	E-R	LC	LC
	Silaginidae	*Sillaginopsis panijus*	Tulardandi	Flatheads	E-R	LC	NE
Scorpaeniformes	Platycephalidae	*Platycephalus indicus*	Chotabele	Flatheads	E-R	LC	DD

*Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), *River (R), River- Estuary (R-E), Estuary- River (E-R), River-Brackish (R-B),*BD=Bangladesh, GB=Global.

Table 2: Threatened fish species of Meghna River.

Sl. No.	Order	Family	Scientific name	Local name	Common group	Habitat	IUCN Conservation Status (BD)
1.	Syngnathiformes	Syngnathidae	*Microphis cuncalus*	Kumirerkhil	Pipefishes	R-E	VU
2.		Synbranchidae	*Monopterus cuchia*	Kuchia	Eels		
3.	Cypriniformes	Cyprinidae	*Chela cachius*	Chep chela	Carps	R-B	
4.			*Puntius ticto*	Tit punti		R	
5.	Siluriformes	Siluridae	*Wallago attu*	Boal	Catfishes	R-E	
6.		Bagride	*Sperata aor*	Air			
7.			*Sperata seenghala*	Guizza air			
8.	Clupeiformes	Clupeidae	*Gudusia chapra*	Chapila	Clupeids	R	
9.	Osteoglossiformes	Notopteridae	*Notopterus notopterus*	Foli	Feather backs	R-E	
10.	Perciformes	Gobiidae	*Eugnathogobius oligactis*	-	Mudskippers	E-R	
11.	Osteoglossiformes	Notopteridae	*Awaous grammepomus*	Bele			
12.	Osteoglossiformes	Notopteridae	*Chitala chitala*	Chitol	Feather backs	R-E	EN
13.	Synbranchiformes	Mastacembelidae	*Mastacembelus armatus*	Baim	Eels		
14.	Cypriniformes	Cyprinidae	*Megarasbora elanga*	Along	Barbs & Minnows	R	
15.			*Barilius bendelisis*	Joiya			
16.	Siluriformes	Siluridae	*Ompok pabda*	Modhupabda	Catfishes		
17.		Schilbeidae	*Clupisoma garua*	Ghaura		R-E	
18.		Pangasidae	*Pangasius pangasius*	Pangas			
19.		Bagridae	*Rita rita*	Rita			
20.	Siluriformes	Siluridae	*Ompok pabo*	Pabda	Catfishes	R	CR
21.		Sisoridae	*Bagarius Bagarius*	Baghair		R-E	

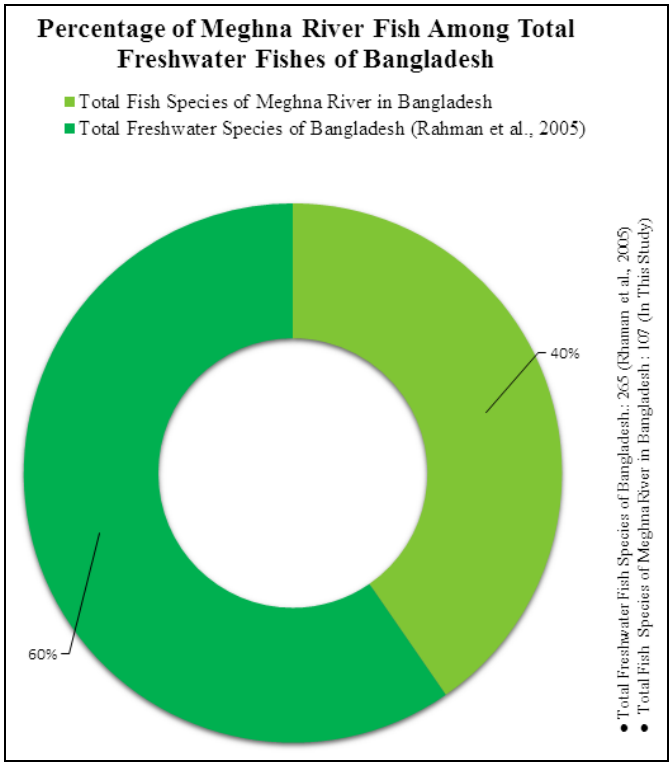

Fig 2: Percentage of Meghna River fish among total freshwater fishes of Bangladesh

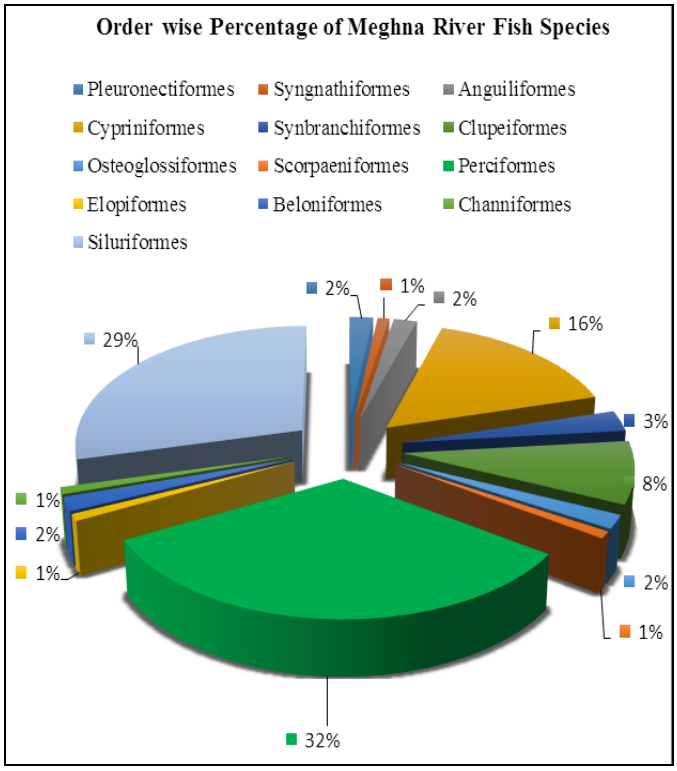

Fig 3: Order wise percentage of Meghna River fish species

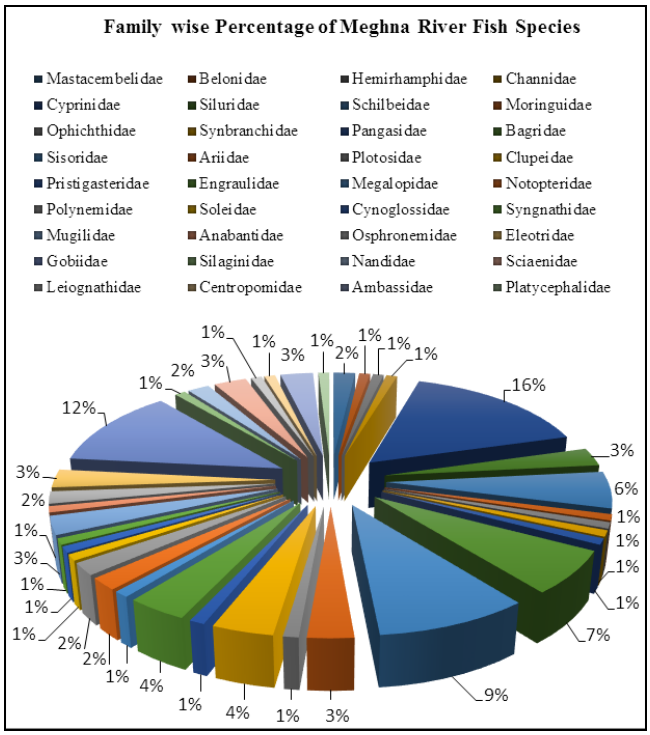

Fig 4: Family wise percentage of Meghna River fish species

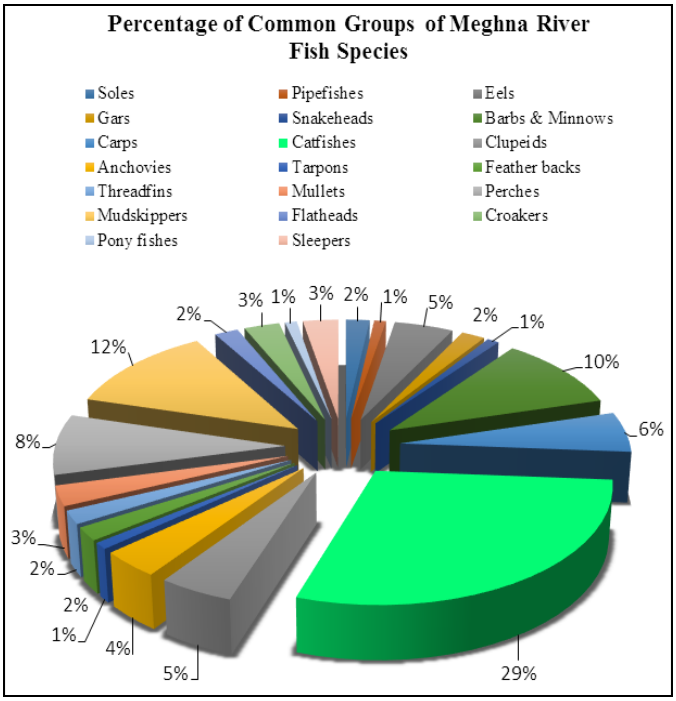

Fig 5: Percentage of common groups of Meghna River fish species

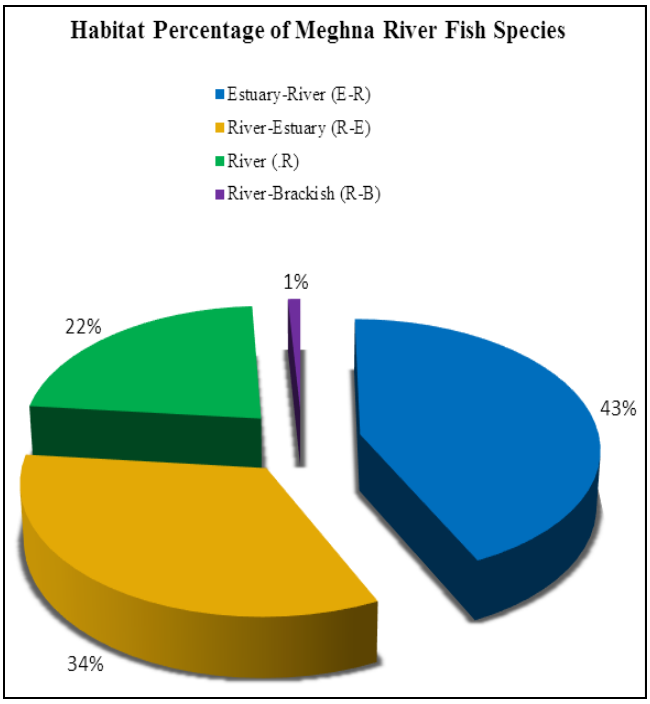

Fig 6: Habitat percentage of Meghna River fish species

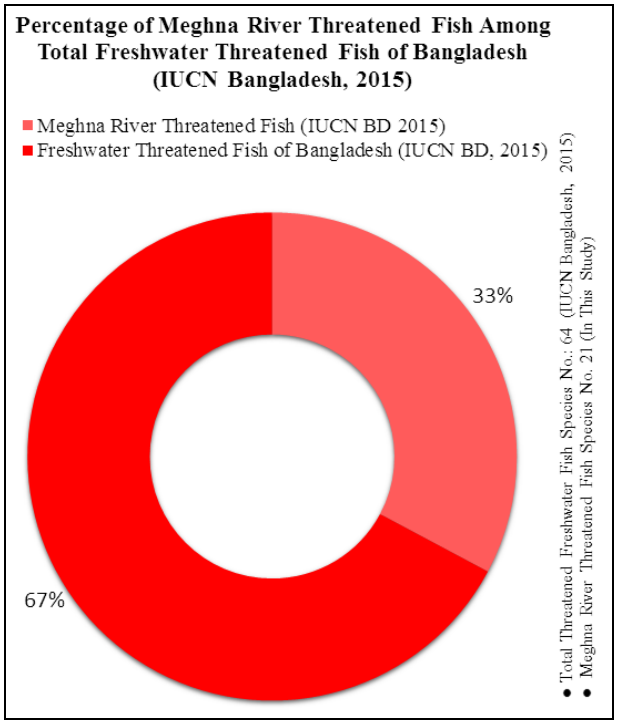

Fig 7: Percentage of Meghna River threatened fish species among total freshwater threatened fish species of Bangladesh (IUCN Bangladesh, 2015)

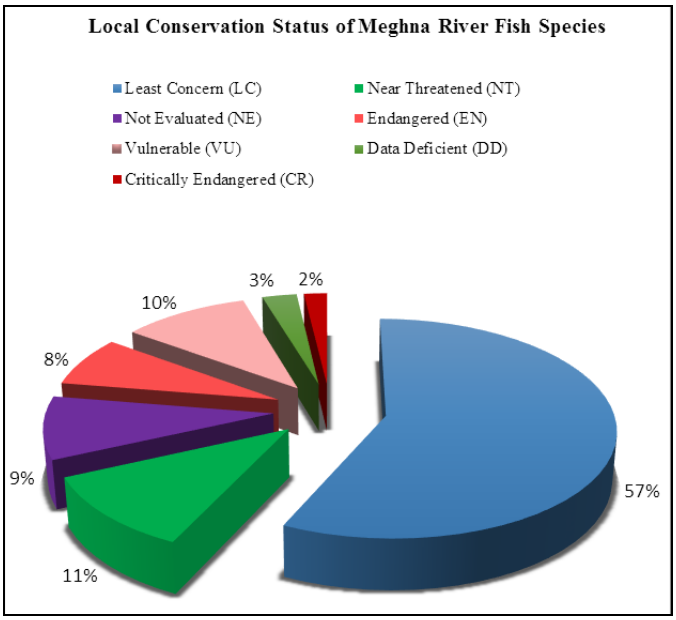

Fig 8: Local conservation status of Meghna River fish species

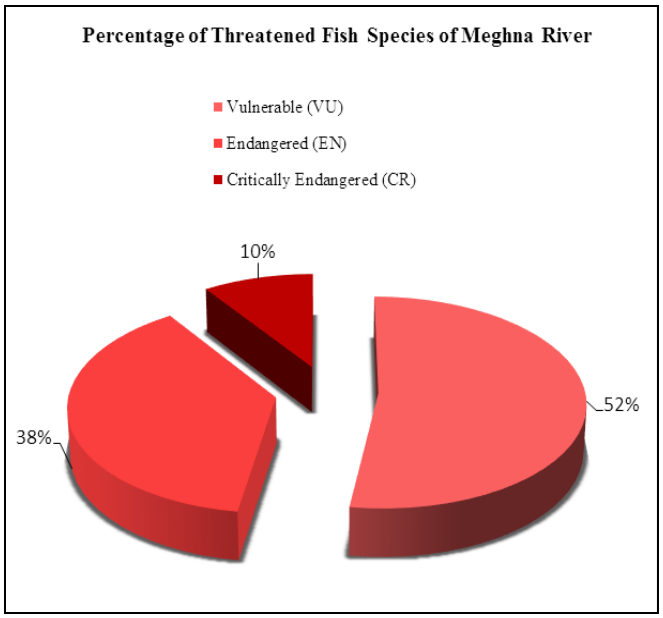

Fig 9: Percentage of threatened fish species of Meghna River

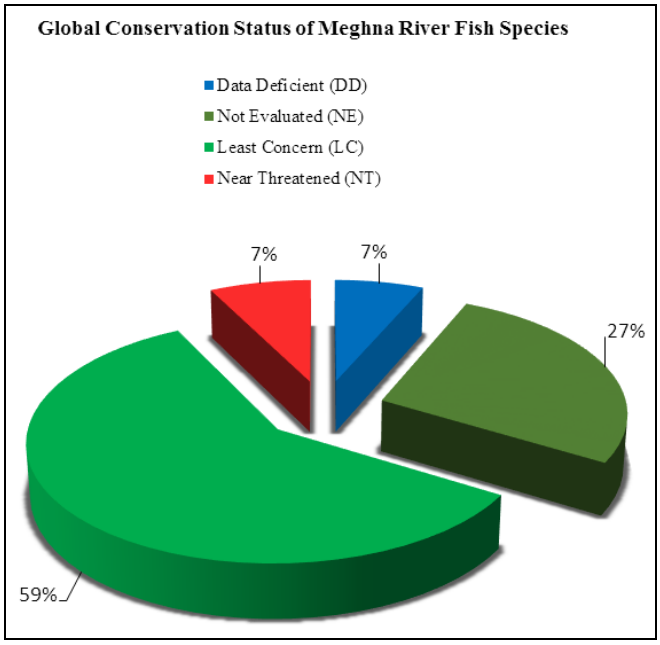

Fig 10: Global conservation status of Meghna River fish species

3.1 Percentage composition of Meghna River fish species

The total identified fish species (107) of the River Meghna is 40% of the total fresh water fish species (265) recorded by [1].

3.2 Order wise percentage of Meghna River fish species

Perciformes was found to be the most dominant order consisting 32% of the total fish population followed by Siluriformes (29%), Cypriniformes (16%), Clupeiformes (8%) and Synbranchiformes (3%). Pleuronectiformes, Anguiliformes, Osteoglossiformes and Beloniformes comprised 2% each of the total species where contribution of Syngnathiformes, Scorpaeniformes, Elopiformes and Channiformes were 1% each.

3.3 Family wise percentage of Meghna River fish species

Cyprinidae was found to be the richest family (16%) followed by Gobiidae (12%), Sisoridae (9%), Bagridae (7%) and Schilbeidae (6%). On the other hand Clupeidae and Engraulidae comprised 4% each whereas percentage of Siluridae, Ariidae, Mugilidae, Eleotridae, Sciaenidae and Ambassidae were 3% each. Mastacembelidae, Notopteridae, Polynemidae, Osphronemidae and Nandidae contributes 2% each of the total whereas the contribution of Belonidae, Hemirhamphidae, Channidae, Moringuidae, Ophichthidae, Synbranchidae, Pangasidae, Plotosidae, Pristigasteridae, Megalopidae, Soleidae, Cynoglossidae, Syngnathidae, Anabantidae, Silaginidae, Leiognathidae, Centropomidae and Platycephalidae were 1% each.

3.4 Different common groups of Meghna River fish species

Twenty (20) common groups were recorded in the present study. Catfishes contributes the highest percentage (29%) followed by Mudskippers (12%), Barbs & Minnows (10%), Perches (8%), Carps (6%), Clupeids (5%), Eels (5%) and Anchovies 4%. Mullets, Croakers and Sleepers contribute 3% each where Soles, Gars, Feather backs, Threadfins and Flatheads shares 2% each. Snakeheads, Tarpons, Pony fishes and Pipefishes represent only 1% each.

3.5 Habitat percentage of Meghna River fish species

The present study reveals that Estuary-River was found to be the biggest habitat for the maximum number of fishes (43%) followed by River-Estuary (34%) and River (22%). River-Brackish water habitat represents only 1% habitat of the total fish population.

3.6 Local conservation status of Meghna River fish species

According to the [10], 64 native freshwater fish species of Bangladesh have been declared as threatened species. Among them 21 fish species were recorded from the River Meghna, which is 33% of total threatened fishes of Bangladesh.

The threatened species of Meghna River was 20% of the total identified species. Out of the 21 fish species, 11 species (10.28%) were found as Vulnerable (VU), 8 species (7.48%) as Endangered (EN) and 2 species (2%) as Critically Endangered (CR).

Local conservation status of Meghna River fish species showed that the highest percentage was recorded as Least Concern (57%) followed by Near Threatened (11%), Vulnerable (10%), Not Evaluated (9%) and Endangered (8%). Only 3% fish species were occupied by Data Deficient category whereas 2% in Critically Endangered category.

Among the threatened fish species, Vulnerable (52%) was found to be most abundant category followed by Endangered (38%) and Critically Endangered (10%) category.

3.7 Global conservation status of Meghna River fish species

According to [9], the highest percentage of fish species was occupied by the Least Concern category (59%) followed by Not Evaluated (27%). Only 7% of the total fish species was found in both the Data Deficient and Near Threatened category.

4. Discussion

Different fish species composition has been reported by several authors for a different section of Bangladesh [4]. Very limited research works have been conducted on the fish biodiversity of Meghna River.

[11] gave an account of 293 fresh water fish species including 13 orders and 61 families. [1] compiled a list of 265 species of freshwater fishes belonging to 154 genera and 55 families from Bangladesh.

[12] documented 53 fish species from the Meghna river estuary, which is almost half of the recorded number of species from the present study. Only 20 species were identified from the catches of different nets reported by [13] from the Meghna River at Ashugonj upazilla, which is one fifth as compared to the present findings. [14] recorded 16 species in the Meghna River at Ramgoti upazilla, which is far less than the present findings. [15] documented 53 species under 9 orders and 26 families from Lohalia River of Patuakhali, which differ to present investigation. [16] found 82 species under 11 orders and 2classes in Padda River near Rajshahi city which is very close to the present study. Almost similar study was conducted by [17] who recorded 95 finfish species contributing to 14 orders, 45 families and 77 genera of the Passur River in Bangladesh. [18] documented 64 species under 11 orders and 30 families during their study in Rupsha River. [19] recorded 63 species belongs to 9 orders, 24 families, 51 genera from the upper Halda River, Chittagong, Bangladesh. [20] reported 63 species constituting 9 orders and 23 families, 41 genera of the River Choto Jamuna. [21] recorded 71 species constituting 10 orders, 26 families and 54 genera in the River Padma. [22] found 69 species belonging to 10 orders, 25 families and 47 genera in the Padma River at Rajshahi district.

Perciformes was found to be the most diversified order followed by Siluriformes and Cypriniformes. [15] also reported similar findings during their study at Lohalia River of Patuakhali. The dominance of these three groups was also found by [18, 20]. In fresh water bodies of Bangladesh, these three groups are the most dominant groups [1].

The most dominant family found in the present study was Cyprinidae. [21, 22, 19] reported the domination of this family in the River Padma of Rajshahi district and Upper Halda River of Chittagong district respectively. [1] showed that this family is dominant in the fresh water fishes of Bangladesh.

The richest group in terms of fish species composition in the River Meghna was Catfish group which is similar to the findings of [23].

Estuary-River was found to be the biggest habitat for the maximum number of fishes that differ with the study of [11] who recorded the highest number of fresh water fish habitat was River.

To evaluate the extinction risk of many species the IUCN adopted Red List categories of animals and plants. The objective of IUCN Red List is to help the international community to try to reduce species extinction through suggesting the importance of conservation issues to the public and policy makers [19].

According to [10], among the threatened fishes (21) found in the Meghna River 11 species (10.28%) were Vulnerable (VU), 8 species (7.48%) were Endangered (EN) and 2 species (2%) were Critically Endangered (CR).

[19] found almost similar result in terms of threatened fish species in the Upper Halda River in which he reported 22 threatened fish species out of 63 identified fish species where 8 species belong to Vulnerable (VU), 11 species belong to Endangered (EN) and 3 species belong to Critically Endangered (CR).

[20] recorded 41.27% threatened fish species in Choto Jamuna River including 15.87% Vulnerable (VU), 15.87% Endangered (EN)and 9.52% Critically Endangered (CR) which is higher than the present study.

[21] identified 28 (39.43%) threatened fish species from the River Padma which include 13% Vulnerable (VU), 18% Endangered (EN) and 8% Critically Endangered (CR) of the total fish species is also different to the present study.

[17, 18] both found 14 threatened fish species in Passur River and Rupsha River respectively.

According to [9] the highest percentage of fish species was occupied by the Least Concern (LC) category (59%) followed by Not Evaluated (NE) category (27%). Only 7% of the total fish species was found in both the Data Deficient (DD) and Near Threatened (NT) category.

The present finding is quite similar with the findings of [17] who found the majority fish species were belonging to Least Concern (LC) and Not Evaluated (NE) categories (43%) followed by Near Threatened (NT) category (3%) and Data Deficient (DD) category(11%).

[21] found nearly one-third (72%) of the total species were belonging to Least Concern category of Global conservation status.

Not a single species of the identified fishes was found threatened in the Global conservation aspects. In fact, those fishes that were recorded as threatened fishes in Bangladesh

were occupied either Least Concern (LC) or Near Threatened (NT) in the Global aspects. As for example, *Ompok pabo* was considered Critically Endangered (CR) in Bangladesh but it was categorized as Near Threatened (NT) globally.

5. Conclusion and Recommendations

The present study mainly focuses on documentation of fish biodiversity in the Meghna River and their present conservation status in Bangladesh. Total number of species recorded during the study period has shown good indication of rich biodiversity in the Meghna River which could be increased in further research. The threatened fish species recorded from the Meghna River indicates the alarming threat to the present conservation status of fishes in Bangladesh.

The followings are recommended for policy making, implementation, and conservation of fish biodiversity in the Meghna River:

- Research should be carried out on the conservation of threatened fishes considering both Bangladesh and Global conservation aspects.
- Banning indiscriminate killing of fish fry and fingerling.
- Banning or controlling destructive fishing gears and crafts.
- Establishing and maintaining fish sanctuaries.
- Identification of migration and breeding period of different fish species.
- Identification and protection of the breeding and nursery grounds.
- Regular dredging should be done for continuous river water flow to facilitate fish migration.
- Breeding technologies of commercially important fish species should be developed.
- Raising awareness among fisherman, fish retailers, fish traders and local people.
- Development of fish landing centers and materialization of fisher's friendly fish trading system.
- Ecofriendly modern fishing technology should be implemented through local fisherman.
- Digital fishing calendar should be published which contain banning period, spawning time and catch restriction, etc.
- National strategies should be formulated for policy making, monitoring and implementation on the Meghna River.

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7. References

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