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Present status (Biodiversity and Conservation) of fish at Chalan *Beel* in Bangladesh

[*1] Md. Ashikur Rahman, [2] Shirin Akter, [3] Md. Istiaque Haidar, [4] Mohammad Wahidur Rahman Majumder

[1] Scientific Officer, Bangladesh Fisheries Research Institute, Riverine Station, Chandpur, Bangladesh
[2] Department of Fisheries Technology, Faculty of Fisheries Bangladesh Agricultural University, Mymensingh, Bangladesh
[3] Scientific Officer, Bangladesh Fisheries Research Institute, Riverine Station, Chandpur, Bangladesh
[4] Assistant Director, Fisheries Training Institute, Department of Fisheries, Chandpur, Bangladesh

Abstract
The study was undertaken to represent the biodiversity and the present conservation status of fishes at Chalan Beel in Bangladesh. Data were collected on the basis of surveying from local farmers, local fishers and fish retailers of local markets from June, 2014 to December, 2016. Fishes from twenty-three families under eight different order were documented. The richest order and family were cypriniformes and cyprinidae which consisting 35 and 32 percent respectively. Twelve common groups were enlisted in study area. The number of threatened species were 18 (27%) among which the number of Vulnerable, Endangered and Critically Endangered were 8 (12%), 8 (12%) and 2 (3%) respectively. Effective steps should be taken to conserve the threatened species of *Chalan Beel* from the further extinction.

Keywords: Chalan Beel, Fish Biodiversity, Conservation, Threatened

1. Introduction
Bangladesh is a densely populated country of 1,47,570 km^2 with population of 160 million people [1]. It is blessed with a vast extensive water resources in the form of ponds, natural depressions (haors and *beels*), lakes, canals, rivers and estuaries covering an area of 4.56 million ha and 2,640 sq nautical miles area in Bay of Bengal [2]. The country is composed of the great combined delta and flood plains criss-crossed by numerous rivers and their tributaries. Bangladesh has about 46,99,345 ha of inland open water area and 7,74,055 ha of inland closed waterbed [2]. Chalan *beel* is one of the largest, most important watersheds in North Central Bangladesh and it is the main sources of inland open water fishes and its production about 6,788 MT [4]. Chalan *beel* consists of a series of depressions, interconnected by numerous channels. The Chalan *beel* is a confluence for numerous smaller water ways and, in turn, is drained by channels that flow south, finally discharging into the Padma and Brahmaputra. The beel was a back-swamp before being greatly expanded by the inclusion of abandoned courses of the Karatoa and Atrai Rivers (the latter being former tributaries of the Jamuna River). Formation of the Chalan *beel* is historically linked to the demise of two key feeder and drainage channels; namely, the Atrai and Baral Rivers. The Atrai (locally known as the Gur), was the principal feeder channel draining the districts of Dinajpur and northern Rajshahi. The Baral River is another important feeder channel that drained water from the Padma River (the Ganges) to the beel through its tributaries (Nandakuja and Godai Rivers). The Baral River ultimately drained the beel into the Jamuna River Rivers [4].
Chalan beel also constitutes one of the largest, most important watersheds in North Central Bangladesh. Chalan Beel is an extensive lowland area in the lower Atrai basin, and spreads across Singra and Gurudaspur upazilas on Natore District, Chatmohar, Bhangura and Faridpur upazilas of Pabna District, and Ullahpara, Raiganj and Tarash upazilas of Sirajganj District. It consists of a series of beels connected to one another by various channels to form a continuous water body during the rainy season. Although the beel area expands into a vast water body with dense aquatic vegetation and remains flooded during the monsoon months, it dries out in the winter months, leaving only patches of water in the central parts of this zone.[3] Chalan *beel* is fast silting up. In the past it covered an area of about 1,085 km² but was reduced to 368 km² in 1909, of which only 85 km² remained underwater throughout the year. It has since shrunk to only 26 km² [5].
Chalan *beel* is enriched with fish biodiversity but now a days it has been decreased for several reasons such as Indiscriminate killing of fishes, over exploitation, use of destructive fishing gear, lack of proper management, use of agricultural insecticides and pesticides and so on. There were few works on the conservation status and fish diversity of Chalan *beel*. 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 Chalan *beel*. 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 Chalan *beel*. The specific objectives of the present study were to (i) assess the fish biodiversity including threatened fishes in Chalan *beel* 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 area
The study spots were selected in such a way that these spots cover all the major areas of Chalan *beel*, include different fishing spots of the *beel*, various fish landing centers and fish markets adjacent to *Chalan beel*. Thirteen upazila markets of five districts covering the study area. Data were collected from local fishers and local market on monthly basis from July, 2014 to December, 2016.

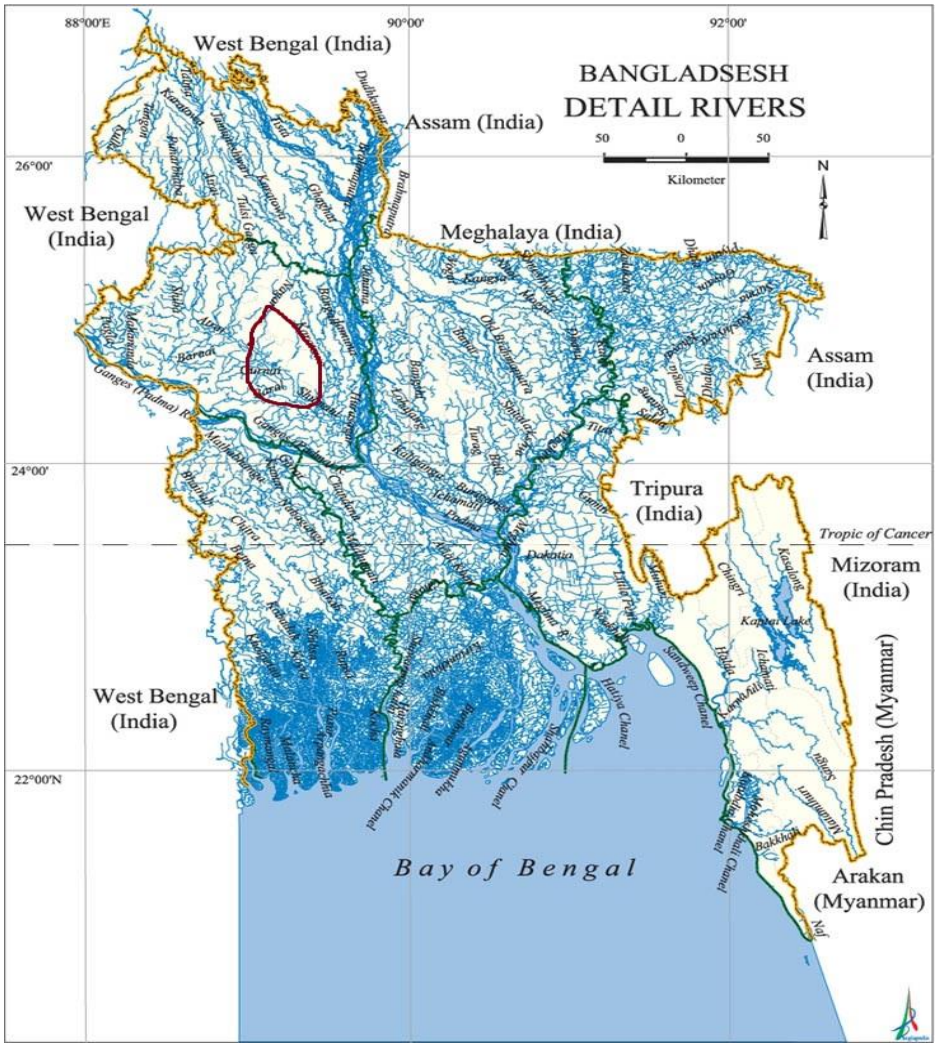


Fig 1: Map of study area

Table 1: Sampling area (Markets) with corresponding GPS

District	Upazila	Market Name	GPS point
Natore	Sadar	Dharail Bazar	24°24'33.3"N 89°04'17.0"E
	Shingra	Bus Stand Fish Market	24°29'58.0"N 89°08'35.5"E
	Gurudashpur	Chanchkair Bazar	24°22'23.4"N 89°14'50.1"E
	Boraigram	Lakhsmikhol Haat	24°18'44.5"N 89°10'03.3"E
Pabna	Chatmohar	Puraton Bazar	24°13'54.7"N 89°17'14.8"E
	Bhangura	Astomonisha hat	24°15'30.6"N 89°21'06.0"E
	Faridpur	Dighulia Bazar	24°10'30.9"N 89°29'30.0"E
Sirajganj	Tarash	Mohishluti Bazar	24°22'24.5"N 89°22'56.2"E
	Shahjadpur	Baghabari River Port Market	24°07'55.8"N 89°35'21.9"E
	Ullapara	Hatikumrul	24°25'06.2"N 89°33'05.6"E
	Raigonj	Bhuiyagati Bazar	24°29'35.3"N 89°30'31.6"E
Naogaon	Atrai	Ahsangong Bazar	24°36'50.1"N 88°58'31.3"E
Bogra	Nandigram	Ranbaga Bazar	24°35'34.6"N 89°14'13.7"E

2.2 Design of a questionnaire

For data collection from local fishers and local markets a questionnaire was prepared in accordance with the objectives set for the study. Before preparing the questionnaire, a draft questionnaire was developed and then pre-tested in the study area.

2.3 Questionnaire interview:

Sixty-five local fishermen were interviewed on the boat and house and thirty-nine fish retailer were interviewed at local fish market. Five fishers and three fish retailers were selected from each upazila.

2.4 Fish sample collection and identification:

Fish samples were collected monthly basis from sampling area. Collected samples from each sampling area were preserved separately in 10% formalin for identification. Fishes were identified from order to species following [6].

2.5 Determination of Conserving Status:
The local conservation status was determined by based on [7] and Global status by [8].

2.6 Data Analysis
Data was analyzed by Microsoft Excel 2013.

3. Results and Discussion
A total 66 species under 08 orders and 23 families were recorded from the sampling area. List of existing fish species with their taxonomic position (order and family name), scientific name, local name, common group and their conservation status in Bangladesh and global aspects are presented in Table 2.

Table 2: List of fish species collected from Chalan Beel.

Order	Family	Scientific Name	Local Name	English Name	Group Name	IUCN Conservation Status	
						BD	GB
Osteoglossiformes	Notopteridae	*Notopterus notopterus* (Pallas)	Foli	Bronze featherback	Featherback	VU	LC
		Notopterus chitala (Hamilton)	Chital	Clown knifefish	Featherback	EN	NT
Clupieformes	Clupidae	*Gudusia chapra* (Hamilton)	Chapila	River shads	Shad	VU	LC
		Corica soborna (Hamilton)	Kechki	Ganges river sprat	Shad	LC	LC
Cypriniformes	Cyprinidae	*Gibelion catla* (Hamilton)	Catla	Catla	IMC	LC	LC
		Cirrhinus cirrhosis (Bloch)	Mrigal, Mirka	Mrigel	IMC	NT	LC
		Labeo calbasu (Hamilton)	Kalibaus, Baus	Orange-fin labeo	IMC	LC	LC
		Labeo rohita (Hamilton)	Rui	Rohu	IMC	LC	LC
		Labeo gonius (Hamilton)	Ghainna, Goni	Boggut labeo	Carp	NT	LC
		Cyprinus carpio var. *specularis* (Linnaeus)	Minar carp	Mirror carp	Exotic Carp	NE	DD
		Cyprinus carpio var. *communis* (Linnaeus)	Comon carp	Common Carp	Exotic Carp	NE	DD
		Hypophthalmichthys molitrix (Hamilton)	Silver	Silver carps	Exotic Carp	LC	LC
		Aristichthys nobilis (Richardson)	Bighed	Bighead carp	Exotic Carp	LC	LC
		Ctenopharyngodon idella (Hamilton)	Grass carp	Grass carp	Exotic Carp	LC	LC
		Amblypharyngodon mola (Hamilton)	Mola	Mola Carplet	Carplet	LC	LC
		Esomus danricus (Hamilton)	Darkina	Flying barb	Barb	LC	LC
		Cirrhinus reba (Hamilton)	Bata, Bhagna	Reba Carp	Barb	NT	LC
		Barbodes sarana (Hamilton)	Sar punti	Olive Barb	Barb	NT	LC
		Puntius chola (Hamilton)	Chala punti	Swamp barb	Barb	LC	LC
		Puntius phutunio (Hamilton)	Phutani punti	Spottedsail barb	Barb	LC	LC
		Puntius conchonius (Hamilton)	Kanchan punti	Rosy Barb	Barb	VU	LC
		Puntius ticto (Hamilton)	Tit punti	Ticto barb	Barb	VU	LC
		Puntius sophore (Hamilton)	Punti, Jatpunti	Spotfin Swamp barb	Barb	LC	LC
		Puntius terio (Hamilton)	Teri punti	One spot barb	Barb	LC	LC
		Barbonymus gonionotus (Bleeker)	Java Puti	Java Barb	Barb	NE	LC
	Cobitidae	*Lepidocephalichthys guntea* (Hamilton)	Gutum	Guntea loach	Loache	LC	LC
		Botia Dario (Hamilton)	Puiya	Bangla Loach	Loache	EN	LC
Beloniformes	Belonidae	*Xenentodon cancila* (Linnaeus)	Kaikka, Kakila	Freshwater Gar	Gar, Pipe Fish	LC	LC
Siluriformes	Siluridae	*Wallago attu* (Bloch)	Boal	Freshwater Shark	Catfish	VU	NT
		Ompok bimaculatus (Bloch)	Boalipabda	Butter catfish	Catfish	CR	NT
		Ompok pabda (Hamilton)	Madhupabda	Pabda Catfish	Catfish	EN	NT
	Schilbeidae	*Ailia coila* (Hamilton)	Kajoli, bashpata	Gangetic ailia	Catfish	LC	NT
		Pseudeutropius atherinoides (Bloch)	Batashi	Indian potasi	Catfish	LC	LC
		Eutropiichthys vacha (Hamilton)	Bacha	Batchwa bacha	Catfish	LC	LC
		Clupisoma garua (Hamilton)	Ghaura	Gaura bachcha	Catfish	EN	LC
	Chacidae	*Chaca chaca* (Hamilton)	Cheka	Squarehead catfish	Catfish	EN	LC
	Pangasidae	*Pangasianodon hypopthalamus* (Sauvage)	Thai Pangush	Suthi Catfish	Catfish	DD	DD
	Heteropneustidae	*Heteropneustus fossilis* (Bloch)	Shing	Sting catfish	Catfish	LC	LC
		Clarias batrachus (Linnaeus)	Magur	Walking catfish	Catfish	LC	LC

	Bagridae	*Rita rita* (Hamilton)	Rita	Rita	Catfish	EN	LC
		Sperata aor (Hamilton)	Ayre	Gaint-River Catfish	Catfish	VU	LC
		Sperata seenghala (Sykes)	Guizzaayse	Long-whiskered catfish	Catfish	VU	LC
		Mystus bleekeri (Hamilton)	Golsha, Golshateugra	Gangetic mystus	Catfish	LC	LC
		Mystus tengara (Hamilton)	Bhajari-tengra, Ghuittatengra	Bagrid catfish	Catfish	LC	LC
		Mystus vittatus (Bloch)	Tengra	Striped dwarf catfish	Catfish	LC	LC
	Sisoridae	*Bagarius bagharius* (Hamilton)	Baghair	Dwarf goonch	Catfish	CR	NT
		Hara hara (Hamilton)	Hara	Sisorid catfish	Catfish	LC	LC
	Amblycipitidae	*Amblyceps mangois* (Hamilton)	Catfish	Indian torrent catfish	Catfish	LC	LC
Perciformes	Gobiidae	*Glossogobius giuris* (Hamilton)	Baila	Tank goby	Perch	LC	LC
	Anabantidae	*Anabas testudineus* (Bloch)	Koi	Climbing perch	Perch	LC	DD
	Badiidae	*Badis badis* (Hamilton)	Napit koi	Badis	Perch	NT	LC
	Nandiade	*Nandus nandus* (Hamilton)	Meni, Bheda	Gangetic leaffish	Mud perch	NT	LC
	Osphronemidae	*Colisa fasciata* (Bloch and Schneider)	Cholisa	Branded gourami	Gourami	NT	DD
		Colisa Laila (Hamilton)	Lal kholisha	Dwarf gourami	Gourami	NT	DD
		Trichogaster chuna (Schneider)	Chuna	Honey gouram	Gourami	NT	DD
	Cichlidae	*Oreochromis mossambicus* (Peters)	Tilapia	Tilapia	Cichlid	DD	NT
		Oreochromis niloticus (Linnaeus)	Nilotica	Nile tilapia /Nilotica	Cichlid	DD	NE
	Ambassiade	*Chanda nama* (Hamilton)	Chanda	River Glass Perch	Glass perch	LC	LC
Synbranchiformes	Mastacembelidae	*Macrognathus aculatus* (Bloch)	Tara baim	Lesser spiny eel	Spiny Eel	NT	NE
		Mastacembelus armatus (Lacepede)	Baim, Bam, Salbaim	Zig-zag eel	Spiny Eel	EN	LC
		Macrognathus pancalus (Hamilton)	Guchi, Baim, chirka	Barred spiny eel	Spiny Eel	LC	LC
	Synbranchidae	*Monopterus cuchia* (Hamilton)	Chucia	Cuchia	Eel	VU	LC
Channiformes	channidae	*Channa punctata* (Bloch)	Taki	Spotted snakehead	Snakehead	LC	LC
		Channa marulius (Hamilton)	Gozar	Great snakehead	Snakehead	EN	LC
		Channa striatus (Bloch)	Shol	Striped snakehead	Snakehead	LC	DD
		Channa orientalis (Bloch and Schneider)	Cheng	Walking snakehead	Snakehead	LC	DD

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

Table 3: List of threatened fish species collected from Chalan Beel.

Order	Family	Scientific Name	Local Name	English Name	Group Name	IUCN Conservation Status (BD)
Osteoglossiformes	Notopteridae	*Notopterus notopterus* (Pallas)	Foli	Bronze featherback	Feather back	VU
Clupieformes	Clupidae	*Gudusia chapra* (Hamilton)	Chapila	River shads	Shad	
		Puntius conchonius (Hamilton)	Kanchan punti	Rosy Barb	Barb	
		Puntius ticto (Hamilton)	Tit punti	Ticto barb	Barb	
Siluriformes	Siluridae	*Wallago attu* (Bloch)	Boal	Freshwater Shark	Catfish	
		Sperata aor (Hamilton)	Ayre	Gaint-River Catfish	Catfish	
		Sperata seenghala (Sykes)	Guizzaayse	Long-whiskered catfish	Catfish	
	Synbranchidae	*Monopterus cuchia* (Hamilton)	Chucia	Cuchia	Eel	
Osteoglossiformes	Notopteridae	*Notopterus chitala* (Hamilton)	Chital	Clown knifefish	Feather back	EN
Clupieformes	Cobidiae	*Botia Dario* (Hamilton)	Puiya	Bangla Loach	Loache	
Siluriformes	Siluridae	*Ompok pabda* (Hamilton)	Madhupabda	Pabda Catfish	Catfish	
	Schilbeidae	*Clupisoma garua* (Hamilton)	Ghaura	Gaura bachcha	Catfish	
	Chacidae	*Chaca chaca* (Hamilton)	Cheka	Squarehead catfish	Catfish	

	Bagridae	*Rita rita* (Hamilton)	Rita	Rita	Catfish	
Synbranchiformes	Mastacembelidae	*Mastacembelus armatus* (Lacepede)	Baim, Bam, Salbaim	Zig-zag eel	Spiny Eel	
Channiformes	channidae	*Channa marulius* (Hamilton)	Gozar	Great snakehead	Snakehead	
Siluriformes	Siluridae	*Ompok bimaculatus* (Bloch)	Boalipabda	Butter catfish	Catfish	CR
	Sisoridae	*Bagarius bagharius* (Hamilton)	Baghair	Dwarf goonch	Catfish	

3.1 Percentage composition of Meghna River fish species

The total identified fish species (66) of the Chalan *beel* is 25.78% of the total fresh water fish species (265) recorded by [6]. 3.2 Order wise percentage of Chalan *beel* fish species Cypriniformes was found to be the most dominant order consisting 35% of the total fish population followed by Siluriformes (30%), Perchiformes (15%), Synbranchiformes and Channiformes (6%), Clupeiformes (8%), and Osteoglossiformes and Beloniformes comprised 2% each of the total species.

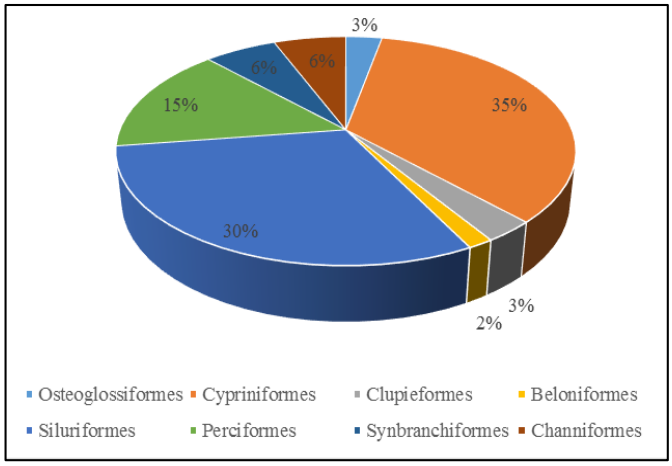
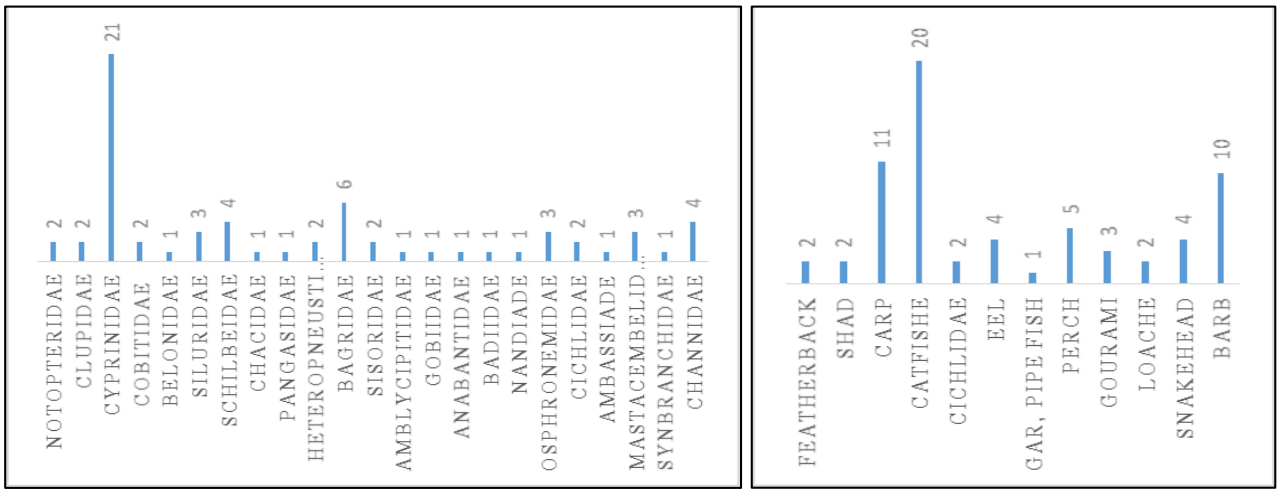


Fig 2: Order wise percentage of fishes in Chalan *beel*

3.3 Family wise percentage of Chalan *beel* fish species

Cyprinidiae was the richest family consisting 32% of the total fish population followed by Bagridae (9%), Schilbeidae, Channidiae (6%) for each and Siluridae, Osphronemidae, Mastacembelidae (5%). On the other hand 3% for Notopteridae, Clupidae, Cobitidae, Heteropneustidae, Sisoridae and Cichlidae each and rest of the families Belonidae, Chacidae, Pangasidae, Amblycipitidae, Gobiidae, Anabantidae, Badiidae, Nadiade, Ambassiade and Synbranchidae contain 2% each. (Fig. 3 a)



(a) (b)

Fig 3: Family and Group wise Fish Species (Nos.) of Chalan *beel*

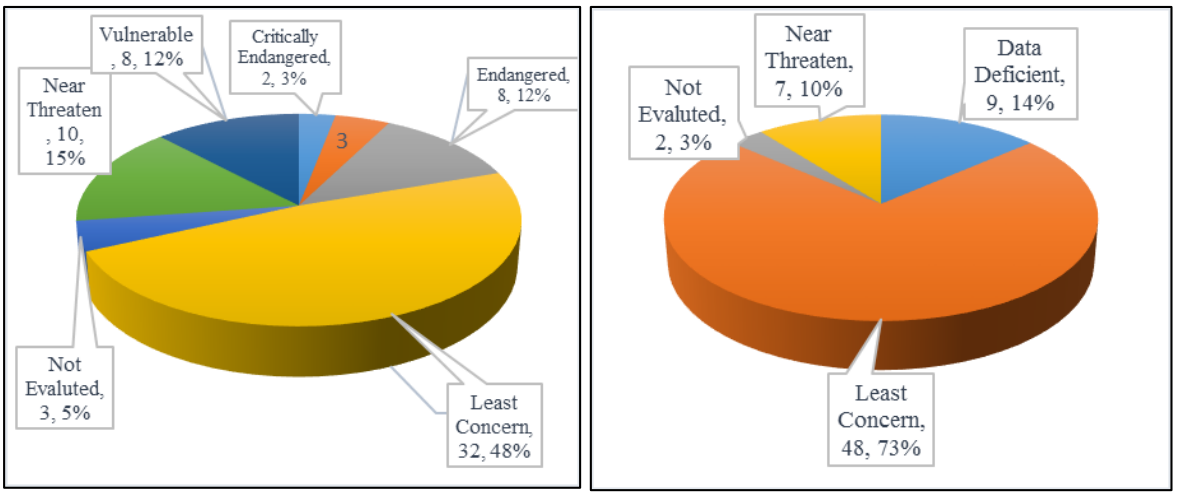
3.4 Different Common groups of fish species in Chalan *beel*

Twelve (12) common groups were recorded in Chalan *beel*. The result shows in fig. 3 (b). A total of 8 exotic fish species were recorded from the *beel*. All of these fish were cultured species and cultured in ponds of the study areas and found in heavy flood period when beel adjacent culture water bodies become over flooded and fishes enter the *beel*.

3.5 Local and Global conservation status fish species

According to the [7], the number of threatened species is 64. Among them fish species were recorded from Chalan *beel*, which is 28.12% of total threatened fishes of Bangladesh. The threatened species of Chalan *beel* was 27.27% of the total identified species. The results were showed in Fig. 4 (a).

For global status [8], the highest percentage of fish species was occupied by the Least Concern category (73%). followed by Data Deficient (14%) Fig. 4 (b).



(a) (b)

Fig 4: IUCN Conservation Status (Percentage)

A number of fish composition has been reported by different authors for different water bodies of Bangladesh. But a few research work have been done on Chalan *beel*.

[9] Gave an account of 293 fresh water fish species including 61 families where [6] compiled a list of 265 species of freshwater fishes belonging to 154 genera and 55 families from Bangladesh. [10] Documented total of 81 fish species including 72 indigenous and 9 exotic species were recorded under 12 fish orders, 27 families and 59 genera where as in the present study we found 8 exotic species. [11] Reported 114 fish species under 29 families from Chalan *beel*. [12] Found 82 SIS fish belonging to 10 orders, 22 families and 46 genera were recorded. The order Cypriniformes (42.68%) was the most dominant order comprising 35 species. The most dominant family of the order Cypiniformes was Cyprinidae (77.14%) comprising 27 species, which is similar to the present study. [13] Recorded a total of 52 fish species in Shakla beel (Brahmanbaria) of Bangladesh.

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 [14]. According to [7], among the threatened fishes (18) found in the Chalan *beel* 8 species (12%) were Vulnerable (VU), 8 species (12%) were Endangered (EN) and 2 species (3%) were Critically Endangered (CR). The present finding is quite similar with the findings of [15] 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%). [16] Found nearly one-third (72%) of the total species were belonging to Least Concern category of Global conservation status.

In the Global conservation aspects, not a single species of the identified fishes was found to be threatened. Whereas, 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 bimaculatus* and *Bagarius bagharius* were considered Critically Endangered (CR) in Bangladesh but it was categorized as Near Threatened (NT) globally.

4. Conclusions and Recommendations

The present study is an overview of present conservation status and fish diversity of Chalan *beel*. Total number of diversity is decreasing day by day. Immediately, some effective steps must be taken to conserve the species from extinction. The following recommendations must be taken into consideration for policy making, implementation and conservation of fish diversity of Chalan *beel*.

- Establishment and maintaining of fish sanctuaries
- Avoid overfishing and indiscriminate fishing of fry or fingerlings
- Ban Destructive fishing gears
- Low use of agricultural insecticides and pesticides
- Rising awareness among fisherman, fish retailers, fish traders and local people.
- Dredging of adjacent rivers

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