

## ASSESSMENT OF PRESENT STATUS OF FISH DIVERSITY IN SOMA NADI JALMOHAL OF SUNAMGANJ IN BANGLADESH

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### Abstract

The study was conducted to identify the present status of fish diversity in Soma Nadi *Jalmohal* of Sunamganj for a period of 11 months from June 2013 to April 2014. The study was done by questionnaire interviews (QI) of fishers, focus group discussions (FGD), key informant interviews (KII) and secondary data collection. A total of 56 species of fishes including prawn species belonging to 21 families were recorded from the *jalmohal* where Cyprinidae was the most dominant family contributing 16 species. The present availability status of fish species was remarked in three categories and obtained as 26 commonly available (47%), 18 moderately available (32%) and 12 rarely available species (21%). Among 56 available species, 8 species of carps, 12 species of catfishes, 9 species of barbs and minnows, 4 species of snakeheads, 4 species of eels, 10 species of perches, 3 species of loaches and other miscellaneous 6 species including 3 species of prawns were listed. The highest diversified group was catfishes (21.43%). Of 54 threatened fish species listed by IUCN (2000), only 20 species were found during the study period where 7 species were commonly available, 9 species were moderately available and 4 species were rarely available in the study area. The results of the study is implying that fish diversity of the *jalmohal* have been declining gradually due to some manmade and natural causes such as dewatering, sedimentation, overfishing, use of illegal fishing gears, catching of brood fishes etc. Community based fisheries management, use of appropriate fishing gears, sanctuary establishment and management, implementation of fish laws and regulations, fingerling stocking and dredging of *beels* and canals can play a great role in conserving fish diversity.

**Keywords:** Fish diversity, *jalmohal*, fishermen, questionnaire interviews, FGD

### Introduction

Aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater, tidal and marine regions of the world and their interactions (Hendrik and Martens, 2005). It consists of phytoplankton, zooplankton, aquatic plants, insects, fishes, birds, mammals and other organisms living in or on water. The biodiversity has enormous economic and aesthetic value and is largely responsible for maintaining and supporting overall environmental health (Hossain, 2012). Fish diversity of any waterbody represents the fish faunal diversity and their abundance. Bangladesh is enriched with its aquatic biodiversity containing 260 species of indigenous freshwater finfish belonging to 55 families (placing Bangladesh third in the world in terms of fish species per land area), 150 species of water fowls, 50 species of reptiles, 24 species of mammals, 19 species of amphibians and 63 species of palaemonids and prawns (Ali, 1991; World Bank, 1991). IUCN (2000) recorded 54 threatened freshwater fish species in Bangladesh where 12 critically endangered, 28 endangered and 14 vulnerable.

*Haor* region covers about 25% of the North-Eastern part of Bangladesh. *Haor* is a mosaic of wetland habitats including rivers, streams and irrigation canals, large area of seasonally flooded cultivated plains and combination of hundreds of inter-connected *beels* (Hussain and Salam, 2007). There are altogether 411 *haors* comprising an area of about 8000 km<sup>2</sup> dispersed in the districts of Sunamganj, Sylhet, Moulvibazar, Hobiganj, Netrakona, Kishoreganj and

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Brahmanbaria (Hossain, 2014). The *haor* region comprises a wide variety of finfish including 143 indigenous and 12 exotic species along with several species of freshwater prawns (BHWDB, 2012). For easy management of big *haors*, government divided the *haors* into small portions and declared some inter-connected *beels* or other waters named as *jalmohal*. It may be included vast floodplains along with some perennial waters, rivers, streams, lakes, ponds etc. in the deeper portion of the *haor* basin. For this reason, *jalmohal* is resourceful and plays a vital role to supply huge amount of natural fish during pre-monsoon, monsoon, post-monsoon and dry periods. It provides spawning, nursing, feeding grounds for numerous fish species.

Soma Nadi *Jalmohal* is located in the Derai upazila under Sunamganj district which lies between 24°39' and 24°53' North latitudes and in between 91°10' and 91°28' East longitudes. It covers eight villages namely Anwarpur, Dattagram, Pangaon, Gajinoghor, Sutargaon, Dhulpushi, Dhalkutub and Dolua under two unions named Rajnagar and Bhatipara. Total area of the *jalmohal* is about 78.14 ha and average water depth varies from 1.01 m in winter to 3m in monsoon. There are 9 small, medium and large inter-connected *beels* such as Soma Nadi, Fainda, Pitla, Dhewkhali, Dhumkuri, Shapla, Purulia, Dheyanchhuri and Gunar *beels*. Approximately 1720 households are living in this area whose livelihoods, culture and daily activities are related and adapted to the *jalmohal*. Some fishers are dependent on fishing for about six to eight months of the year but some others catch fish round the year.

The *jalmohal* was famous for its rich reserve of fish diversity. Many species of fishes and prawns were available in the *beels* under the *jalmohal*. But fish diversity of the *jalmohal* is decreasing day by day due to overfishing, use of illegal fishing gears, catching of brood fishes and fish fries, fencing for fishing purpose and other types of manmade and natural causes. At this situation, research work is essential to understand overall situation of the *jalmohal* and thereby keep the proper management steps. Before undertaking any fisheries management tool, the fish diversity in the water must be known (Huda et al. 2009) but there is no published report on its fish diversity and their ecological status. This is why the study was carried out to assess the present status of fish diversity in the Soma Nadi *Jalmohal* with special emphasis on threatened fish species in the study area and to recommend proper management strategies for the conservation of fish diversity in the *jalmohal*.

## Materials and Methods

Soma Nadi *Jalmohal* in Derai upazila of Sunamganj district was selected for the present study because it is one of the largest and most important *jalmohals* in Bangladesh. As part of the research, a survey for a period of eleven (11) months from June 2013 to April 2014 was conducted in the *jalmohal*. The study was based on field survey method where an appropriate questionnaire was prepared and used for collecting data from 4 villages named Anwarpur, Dattagram, Gajinoghor and Dhulpushi surrounding the *jalmohal* (Fig. 1).

During collection of data, both primary and secondary sources were considered to interpret the results. Primary data were collected from 80 randomly selected fishermen through questionnaire interviews (QI) and focus group discussions (FGD) where Upazila Fisheries Officer (UFO), union parishad chairman & members, leaders of the fisher community, fish market leaders, fish traders, fry traders and community people were also present. The secondary information were collected from Dakshin Sunamganj upazila fisheries office, district fisheries office of Sunamganj, projects of WorldFish in Sunamganj, books, journals and theses.

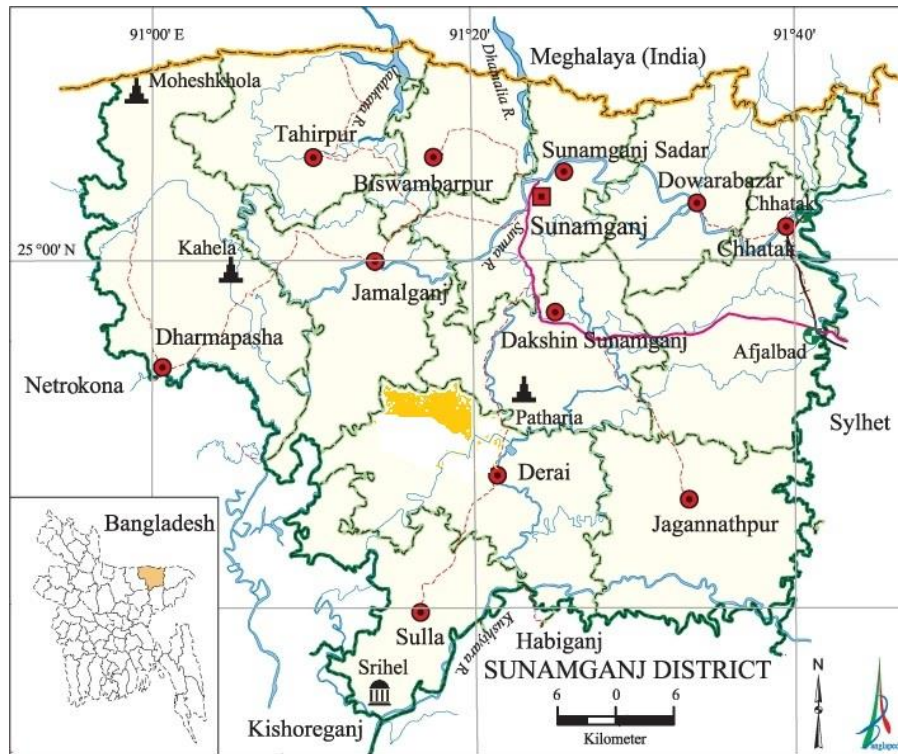
After collecting the data through FGD and questionnaire interviews, it was cross-checked through interviews of Upazila Fisheries Officer (UFO), District Fisheries Officer (DFO), school teachers, local leaders and NGO workers in the study area. Finally data were analyzed using Microsoft office excels 2010.

## Results and Discussion

### Present status of fish diversity in Soma Nadi *Jalmohal*

During the study period, different fish species were observed in Soma Nadi *Jalmohal*. According to the statement of local fishermen, a total of 56 species of fishes and prawns belonging to 21 families were recorded during the period of investigation from the study area where Cyprinidae was the most dominant family contributing 16 species followed by Anabantidae (4 species), Bagridae (4 species), Channidae (4 species), Siluridae (4 species), Ambassidae (3 species), Cobitidae (3 species), Mastacembelidae (3 species) and Palaemonidae (3 species) (Table 1). Other

contributing families were Belontiidae, Cichlidae, Clariidae, Cyprinodontidae, Gobiidae, Heteropneustidae, Nandidae, Notopteriidae, Pangasidae, Schilbeidae, Sybranchidae and Tetraodontidae each with one species. These available fishes are presented under 8 groups namely carps, catfishes, barbs and minnows, snakeheads, perches, eels, loaches and other miscellaneous species. According to the availability of fish species, their present status was ranked into 3 categories where 26 commonly available (CA), 18 moderately available (MA) and 12 rarely available (RA) species (Table 1).



**Fig. 1.** Location of the study area marked with the golden color in the Sunamganj district map (Banglapedia, 2012).

**Table 1.** Present status of fish diversity in Soma Nadi *Jalmohal* during the study period with IUCN status

Sl. No.	Family	Local name	English name	Scientific name	Present status	IUCN status
<b>Diversity of carps</b>						
1	Cyprinidae	Catla	Indian major carp	<i>Catla catla</i>	MA	NO
2	Cyprinidae	Rohu	Indian major carp	<i>Labeo rohita</i>	CA	NO
3	Cyprinidae	Mrigal	Indian major carp	<i>Cirrhinus cirrhosus</i>	MA	NO
4	Cyprinidae	Carpio	Common carp	<i>Cyprinus carpio</i>	CA	EX
5	Cyprinidae	Goniya	Kuria labeo	<i>Labeo gonius</i>	RA	EN
6	Cyprinidae	Grass carp	Grass carp	<i>Ctenopharyngodon idella</i>	MA	EX
7	Cyprinidae	Kalibaush	Black rohu	<i>Labeo calbasu</i>	CA	EN
8	Cyprinidae	Silver carp	Silver carp	<i>Hypophthalmichthys molitrix</i>	MA	EX
<b>Diversity of catfishes</b>						
9	Bagridae	Golsha	Long whiskered catfish	<i>Mystus cavasius</i>	MA	VU
10	Bagridae	Bujuri	Long bled catfish	<i>Mystus tengra</i>	CA	NO
11	Bagridae	Tengra	Striped dwarf catfish	<i>Mystus vittatus</i>	CA	NO
12	Bagridae	Ayre	Long whiskered catfish	<i>Mystus aor</i>	RA	VU
13	Schilbeidae	Batashi	Indian potasi	<i>Pseudeutropius atherinoides</i>	RA	NO
14	Siluridae	Boal	Freshwater shark	<i>Wallago attu</i>	CA	NO
15	Siluridae	Modhu pabda	Butter catfish	<i>Ompok pabda</i>	CA	EN
16	Siluridae	Kani pabda	Indian butter catfish	<i>Ompok bimaculatus</i>	MA	EN
17	Siluridae	Pabda	Pabo catfish	<i>Ompok pabo</i>	CA	EN
18	Pangasidae	Thai pangus	Sutchi catfish	<i>Pangasius hypophthalmus</i>	RA	EX
19	Clariidae	Magur	Walking catfish	<i>Clarius batrachus</i>	CA	NO

Sl. No.	Family	Local name	English name	Scientific name	Present status	IUCN status
20	Heteropneustidae	Shing	Stinging catfish	<i>Heteropneustes fossilis</i>	CA	NO
<b>Diversity of barbs and minnows</b>						
21	Cyprinidae	Chela	Finescale razorbelly minnow	<i>Chela phulo</i>	RA	NO
22	Cyprinidae	Mola	Carplet	<i>Amblypharyngodon mola</i>	MA	NO
23	Cyprinidae	Darkina	Flaying barb	<i>Esomus danricus</i>	MA	DD
24	Cyprinidae	Tit punti	Ticto barb	<i>Puntius ticto</i>	CA	VU
25	Cyprinidae	Teri punti	One spot barb	<i>Puntius terio</i>	CA	NO
26	Cyprinidae	Jat punti	Spot fin swamp barb	<i>Puntius sophore</i>	CA	NO
27	Cyprinidae	Shar punti	Olive barb	<i>Puntius sarana</i>	RA	CR
28	Cyprinidae	Raj punti	Java barb	<i>Puntius gonoiotus</i>	MA	EX
29	Cyprinodontidae	Pach chokha	Top minnow	<i>Aplocheilus panchax</i>	CA	NO
<b>Diversity of snakeheads</b>						
30	Channidae	Taki	Spotted snakehead	<i>Channa punctatus</i>	CA	NO
31	Channidae	Cheng	Asiatic snakehead	<i>Channa orientalis</i>	MA	VU
32	Channidae	Shol	Snakehead murrel	<i>Channa striatus</i>	CA	NO
33	Channidae	Gozar	Giant snakehead	<i>Channa marulius</i>	MA	EN
<b>Diversity of eels</b>						
34	Mastacembelidae	Guchi baim	Striped spiny eel	<i>Macrognathus pancalus</i>	CA	NO
35	Mastacembelidae	Tara baim	One striped spiny eel	<i>Macrognathus aculeatus</i>	CA	VU
36	Mastacembelidae	Baro baim	Two-track Spiny Eel	<i>Mastacembelus armatus</i>	MA	EN
37	Sybranchidae	Cuchia	Gangetic mud eel	<i>Monopterusuchia</i>	MA	VU
<b>Diversity of perches</b>						
38	Anabantidae	Baro khalisha	Striped gourami	<i>Colisa fasciatus</i>	CA	NO
39	Anabantidae	Lal khalisha	Dwarf gourami	<i>Colisa lalia</i>	RA	NO
40	Anabantidae	Chota khalisha	Honey gourami	<i>Colisa chuno</i>	CA	NO
41	Anabantidae	Koi	Climbing perch	<i>Anabas testudineus</i>	CA	NO
42	Ambassidae	Lamba chanda	Elongated glass perchlet	<i>Chanda nama</i>	MA	VU
43	Ambassidae	Lal chanda	Indian glass perchlet	<i>Parambassis lala</i>	RA	EN
44	Ambassidae	Gol chanda	Indian glass fish	<i>Parambassis ranga</i>	CA	VU
45	Cichlidae	Tilapia	Mozambique tilapia	<i>Oreochromis mossambicus</i>	RA	EX
46	Gobiidae	Bele	Bar eyed goby	<i>Glossogobius giuris</i>	MA	NO
47	Nandidae	Meni	Mud perch	<i>Nandus nandus</i>	CA	VU
<b>Diversity of loaches</b>						
48	Cobitidae	Gutum	Guntea loach	<i>Lepidocephalichthys guntea</i>	CA	NO
49	Cobitidae	Bou rani	Bengal loach	<i>Botio dario</i>	MA	EN
50	Cobitidae	Maitta rani	Hora loach	<i>Botia dayi</i>	RA	DD
<b>Diversity of miscellaneous species</b>						
51	Notopteriidae	Foli	Bronze featherback	<i>Notopterus notopterus</i>	MA	VU
52	Tetraodontidae	Potka	Ocellated pufferfish	<i>Tetraodon cutcutia</i>	MA	NO
53	Belontiidae	Kakila	Fresh water gar fish	<i>Xenentodon cancila</i>	RA	NO
54	Palaemonidae	Kalo icha	Monsoon river prawn	<i>Macrobrachium malcolmsonii</i>	CA	NO
55	Palaemonidae	Sada icha	Prawn	<i>Macrobrachium sp.</i>	CA	NO
56	Palaemonidae	Golda	Prawn	<i>Macrobrachium rosenbergii</i>	RA	NO

CA: Commonly available species, MA: Moderately available species, RA: Rarely available species, CR: Critically endangered, EN: Endangered, VU: Vulnerable, NO: Not threatened, DD: Data deficient and EX: Exotic species.

During the period of study, total 56 species of fish fauna from 21 families including prawn species found available in the study area. Among them 8 species of carps, 12 species of catfishes, 9 species of barbs and minnows, 4 species of snakeheads, 4 species of eels, 10 species of perches, 3 species of loaches and other miscellaneous 6 species were found including 3 species of prawns with different level of availability (Table 1). Roy (2010) recorded 47 species of fish fauna including prawn species where there were 7 species of carps, 4 species of snakeheads, 5 species of perches, 3 species of eels, 11 species of catfishes, 6 species of barbs, 2 species of minnows, 2 species of clupeids and 8 species of other miscellaneous fishes including prawns from the Pagnar *haor* in Jamalganj under Sunamganj district. In this study, total number of species was almost same, but the group-wise species diversity was not similar. Nuruzzaman (1997) recorded 141 species of fish from the Tanguar *haor* in Sunamganj district. Mahalder and Mustafa (2013) recorded 126 fish species from 39 families in the Sunamganj *haor* area during 2008 to 2010 that clearly indicate higher fish diversity than the present study. It is revealed that there has been gradual reduction in the fish diversity in the *jalmohal* and adjacent waters.

Among 56 available fish species, the highest diversified group of fishes was catfishes (21.43%) and the lowest were loaches (5.36%). Among other groups, there were 17.86% perches, 16.07% barbs and minnows, 14.29% carps,

7.14% snakeheads as well as eels, and 10.71% other miscellaneous species (Fig. 2). Catfishes are dominant in many waterbodies because they can survive in low water depth and adverse environmental conditions.

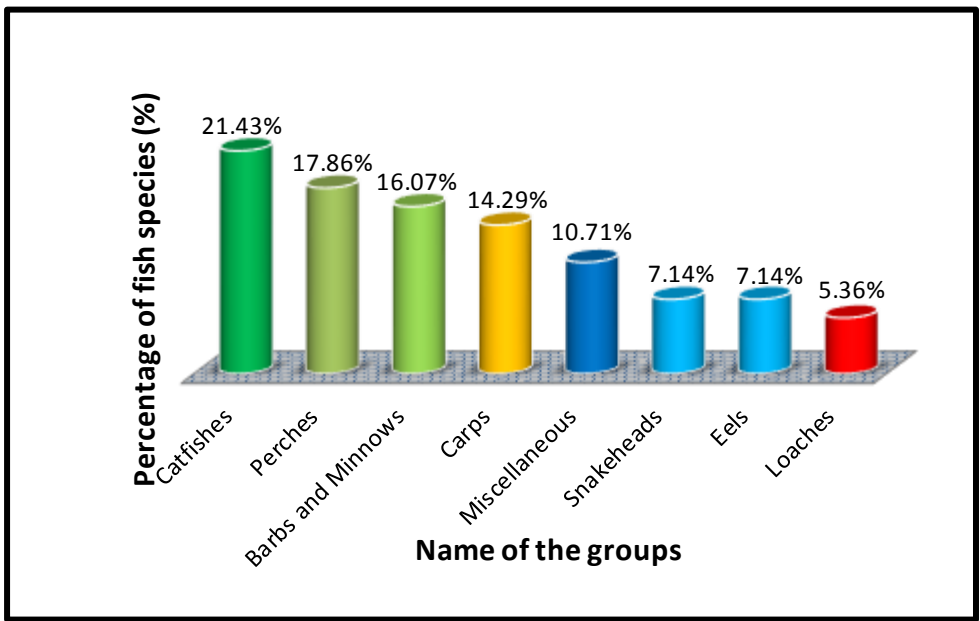


Fig. 2. Different groups of fish recorded during the period of study.

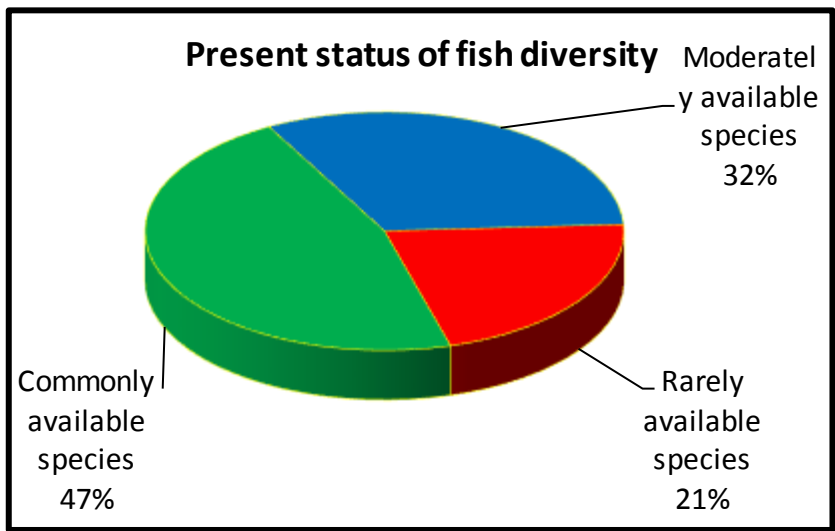


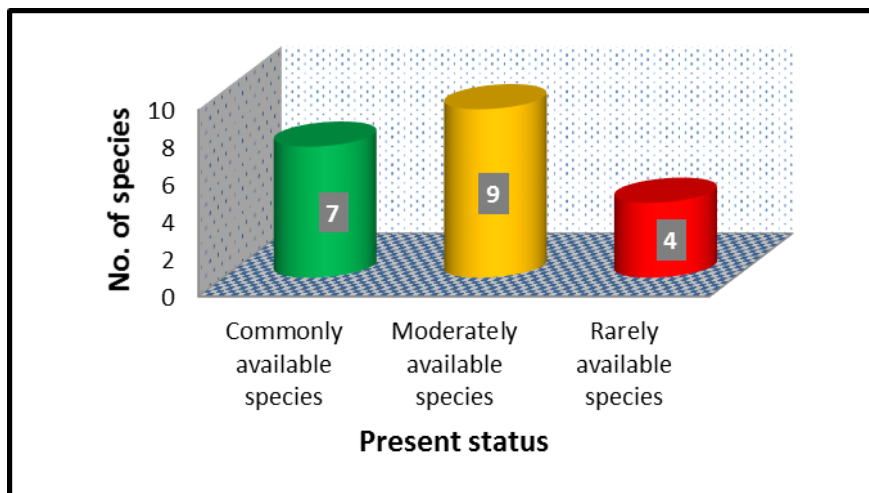
Fig. 3. Present status of fish diversity in Soma Nadi *Jalmohal* during the study period.

In percentage, there were 47% commonly available, 32% moderately available, 21% rarely available species of fishes reported by the respondents (Fig. 3). According to the statement of the fisherman the rare species will be disappeared from the water body with in few years. Fishermen also mentioned that fish diversity of the *jalmohal* was declining gradually due to fishing by dewatering, sedimentation, overfishing, use of illegal fishing gears, catching of brood fishes, cultivation of rice or other field crops by artificially drying wetlands etc.

**Status of threatened fish species found from the *jalmohal***

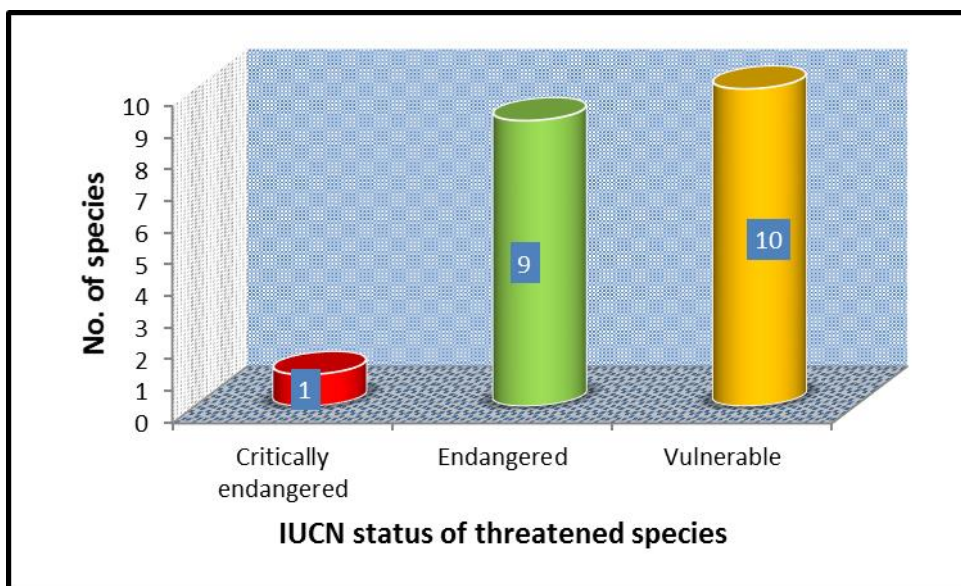
Among 54 threatened fish species listed by IUCN (2000), only 20 species were identified from the Soma Nadi *Jalmohal* by the respondents. Out of them, 7 species were found commonly available, 9 species were moderately

available and 4 species were rarely available in the study area (Fig. 4). According to the present study it is a good sign that 7 species are commonly available in the study area which were declared threatened in 2000 by IUCN, it might be due to good management of the *jalmohal*.



**Fig. 4. Present status of threatened fish species in Soma Nadi Jalmohal.**

The IUCN status of these threatened species was 1 critically endangered (out of 12 species), 9 endangered (out of 28 species) and 10 vulnerable (out of 14 species) (Fig.5).



**Fig. 5. IUCN status of threatened fish species found during the study period.**

Among 12 critically endangered species reported by IUCN (2000), only 1 species (*Puntius sarana*) was detected from Soma Nadi *Jalmohal* and present status was rarely available. This situation clearly indicates that critically endangered species will be disappeared in near future.

Among 28 endangered fish species listed by IUCN (2000), only 9 species were identified from the Soma Nadi *Jalmohal* by the respondents. Among these 9 endangered species, 3 species (*Labeo calbasu*, *Ompok pabda* and *Ompok pabo*) were commonly available, 4 species (*Ompok bimaculatus*, *Channa marulius*, *Mastacembelus armatus* and *Botia dario*) were moderately available and 2 species (*Labeo gonius* and *Parambasis lala*) were rarely available during the study period (Fig. 6). The total number of endangered fish species is very little comparing with total numbers in Bangladesh. The peak time of availability of most of these species was July to November.



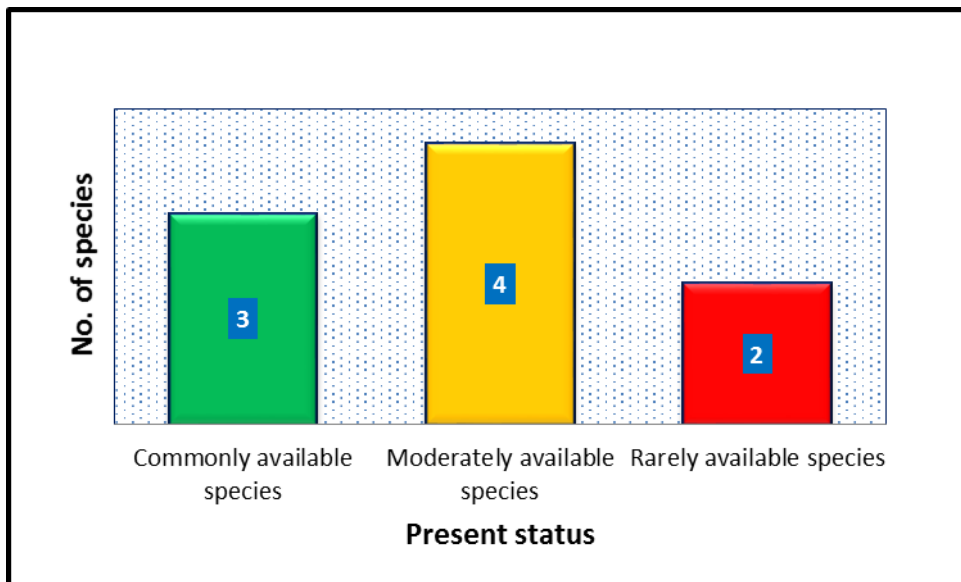


Fig. 6. Present status of endangered fish species in Soma Nadi Jalmohal.

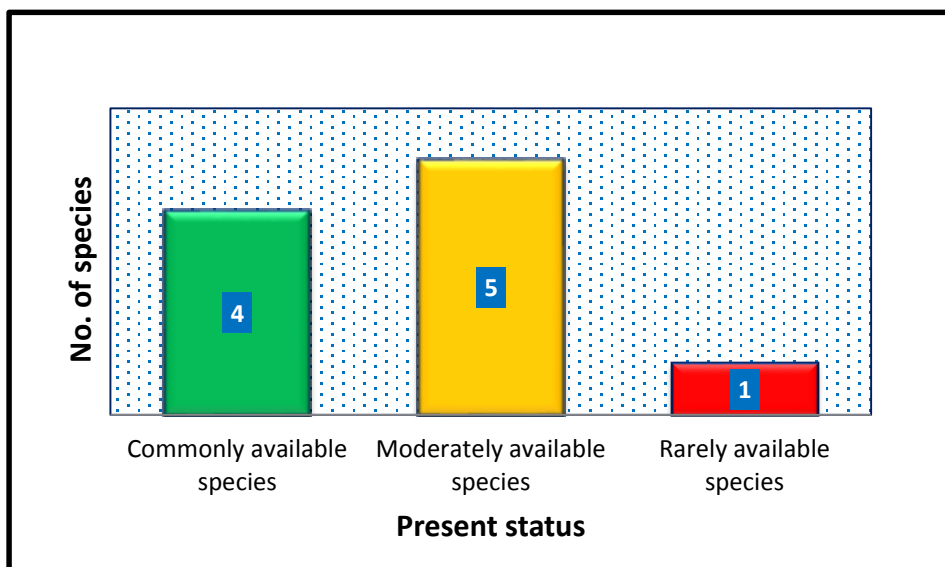


Fig. 7. Present status of vulnerable fish species in Soma Nadi Jalmohal.

Ten vulnerable species were identified from Soma Nadi Jalmohal out of 14 species reported by IUCN). Among these 10 vulnerable species, 4 species (*Puntius ticto*, *Macrornathus aculeatus*, *Parambassis ranga* and *Nandus nandus*) were commonly available, 5 species (*Mystus cavasius*, *Channa orientalis*, *Monopterus cuchia*, *Chanda nama* and *Notopterus notopterus*) were moderately available and 1 species (*Mystus aor*) was rarely available during the study period (Fig. 7). The peak time of availability of most of these species was July to November.

In this study, only 20 species of threatened fishes were recorded which is more than one third of the total fish diversity of the jalmohal (20 out of 56). More than 100 fish species were available in the Hakaluki haor where one third of which was listed as threatened (Choudhury and Faisal, 2005). A total of 107 fish species were found in the Hakaluki haor area (CNRS, 2002); among them 32 species were threatened, of which 12 were vulnerable, 16 were endangered and 4 were critically endangered. All of these findings are similar with the findings of the present study.

Fishermen explained that many available threatened fishes became unavailable in the study area due to some manmade and natural causes. Main reasons for declining threatened fish diversity in the jalmohal were siltation and

sedimentation, overfishing and indiscriminate fishing, use of illegal fishing gears, use of katha fishing method, use of chemical fertilizers and over doses of insecticides and pesticides in agriculture, drought in summer, creation of barrier and making obstacle in natural movement of fishes etc.

### Recommendations for conservation of fish diversity

The Soma Nadi *Jalmohal* is an important wetland in terms of diversity of fish fauna and contribution to fish production. Fish diversity and production of this *jalmohal* have been declining rapidly due to some manmade and natural causes. So, proper management policies should be adopted to protect the fish fauna and to recover sustainable production of the *jalmohal*. The suggestions given by the respondents for conserving fish diversity are as follows:

- Community based fisheries management should be strengthening for the better management of open water fisheries resources;
- The number of fish sanctuaries should be increased and conserve accordingly through community participation;
- Fishing by complete dewatering of *beels* must be stopped;
- Use of illegal fishing gears must be stopped;
- Stocking of fish fry of different species must be done in every year to enhance the fish diversity in the *jalmohal*;
- The number of sluice gate should be increased across the roads and dams to accelerate easy migration of fishes; and
- Public awareness should be increased to stop use of illegal gear, indiscriminate killing of fishes, obey fishing regulations, alternate income generating activities and other issues.

### Acknowledgement

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### References

- Ali M Y. 1991. Towards Sustainable Development of Fisheries Resources of Bangladesh. IUCN and BRAC, Dhaka. 906p.
- Banglapedia. 2012. National Encyclopedia of Bangladesh, Asiatic Society of Bangladesh, Dhaka.
- BHWDB (Bangladesh Haor and Wetland Development Board). 2012. Master Plan of Haor Areas: Volume 1, Summary Report. Ministry of Water Resources, Government of the People's Republic of Bangladesh. 18p.
- Choudhury J K and Faisal A M. 2005. Plant Resources of Haors and Floodplains: an Overview. IUCN-The World Conservation Union. Bangladesh Country Office, Dhaka. 53p.
- CNRS (Center for Natural Resource Studies). 2002. Bio-physical and Socio-economic Characterization of Hakaluki Haor: Steps towards Building Community Consensus on Sustainable Wetland Resource Management. IUCN-Netherlands Small Grants for Wetlands Programme, Dhaka, Bangladesh.
- Hendrik S and Martens K. 2005. Aquatic Biodiversity: the Diversity of Aquatic Ecosystems (Developments in Hydrobiology). Springer Publi.
- Hossain M A R. 2014. An Overview of Fisheries Sector of Bangladesh. Res. Agric., Livest. Fish. 1(1):109-126.
- Hossain M. 2012. Biodiversity of Threatened Fish Species of Choto Jamuna River in Badalgachhi Area Under Naogaon District. MS Thesis. Dept. Fish. Man. BAU, Mymensingh. pp. 30-53.
- Huda A T M N, Shah M S, Hasanuzzaman A F M and Azam M R. 2009. An Investigation on the Ichthyofauna of the Gorai-Modhumati River System. Bangladesh J. Zool. 37(1):11-24.
- Hussain M G and Salam M. 2007. Basic Service Delivery Advocacy: Review Report, Development Wheel (Dew), Dhaka.
- IUCN (International Union for Conservation of Nature). 2000. Red Book of Threatened Fishes of Bangladesh. IUCN-The World Conservation Union, IUCN.
- Mahalder B and Mustafa M G. 2013. Introduction to Fish Species Diversity: Sunamganj Haor Region within CBRMP's Working Area. Community Based Resource Management Project-LGED, Worldfish, Dhaka, Bangladesh. 75p.



- Nuruzzaman A K M. 1997. Inland Fisheries Resources of Bangladesh: its Management and Development Strategies. Paper Presented at the Seminar on Fisheries Resources of Bangladesh at the Department of Zoology, DU. 30p.
- Roy K C. 2010. Fish Biodiversity and the Livelihoods of the Fishing Community in Pagnar *Haor* under Jamalganj Upazila in Sunamganj District. MS Thesis. Dept. Aqua. BAU, Mymensingh. pp. 33-59.
- World Bank. 1991. Bangladesh Environmental Strategy Review. World Bank, Washington DC, USA.