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# Assessment of Fish diversity in Bahadurpur beel, Madaripur, Bangladesh

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**Abstract**
A study was carried out to study the fish diversity of Bahadurpur beel located at Madaripur sadar upazila under Madaripur district in Bangladesh from July to December 2018. During the study period, a total of 34 species under 24 genera, 16 families, and 7 orders were recorded. The dominant order and family were cypriniformes and cyprinidae, which comprised 32.35% and 29.41% of total recorded fish, respectively. Regarding the relative abundance of fish, very common, common, and rear fish was 29.41%, 52.94%, and 17.64%, respectively. On the other hand, 8 (24.24%) species were recorded as threatened fish. Among them, 5 (62.5%) and 3 (37.5%) were endangered and vulnerable, respectively. No critically endangered species were recorded during the study period. A maximum abundance of fish was observed in November. Various types of nets, traps, wounding gears, hooks, and lines were used as the most common fishing gears to harvest the fish in Bahadurpur beel.

**Keywords:** Fish diversity, abundance, Bahadurpur beel

## Introduction
Bangladesh has a total inland open water area of 3907488 ha, from which 27.79% of the total annual fish production of the country comes (DoF) [1]. One of the essential components of the inland water area of Bangladesh is beel which originated from the Bengali word and looked like a small saucer-like depression with a relatively large surface area and static water body that contains surface run-off water through an internal drainage channel (Banglapedia) [2]. Most of the beel is fed by surface runoff water, but some larger ones are fed by floodwater through the wet season from the adjacent river (Ahmed *et al.*) [3]. Consequently, many finfishes and shellfishes enter the inundated areas of the beel from the connecting rivers and canals to feed and grow during the wet seasons (Akteruzzaman *et al.*) [4]. The ecosystem of beel is exceptionally complex, with wide sequential and spatial variations of numerous key parameters. (Sugunan *et al.*) [5]. On the other hand, Beel is considered a supporting agent for many fishermen's livelihood (IUCN) [6]. According to Hughes *et al.* [7], large portions of rural households are engaged in part-time fish capture from the floodplain or beels. Bahadurpur beel is one of the important beel in Madaripur sadar upazila. It is a medium-sized beel, necessary for the villagers of Bahadurpur, Kamlapur, Chauhaddi, and kalagachia villages. It is endowed with rich floral and faunal diversity. The water source of the beel is from the sub-branch of the Kumar River and rainfall. During monsoon season, about 70% hydro phase of the beel has chocked aquatic grasses, water lily, and water hyacinth. Besides there, the beel is rich in diversified fish species. Many of the fishermen surrounding this beel depend entirely on their livelihood on this beel. Some studies have been made to evaluate the fish diversity in various regions of Bangladesh by [8] in Uthrail Beel, [9] in Saldu beel, [10] in Chalan beel, [11] in Shakla beel, [12] in Chalan beel, [13] in Halti Beel, [14] in Dogger Beel, [15] in Ichanoi Beel, [16] in Balla beel, [17] in Kumari beel, [18] in Baikka beel, and [19] in wetlands of Chhatak. But unfortunately, there are no published scientific works on the diversity of fish in Bahadurpur beel under the Madaripur district. However, it is very much obligatory with the updated list of fish species to take any appropriate fisheries management policy to conserve the fish biodiversity (Huda *et al.*) [20]. So, considering the above things, present research was conducted to assess the fish diversity and their abundance in the Bahadurpur beel under Madaripur sadar upazila of Madaripur district in Bangladesh.

## Materials and Methods

### Study area

The present study was carried out at Bahadurpur beel located in Madaripur sadar upazila of Madaripur district between 23º8'7.52º north latitudes and 90º6'8.53º east longitudes (Fig. 1). This beel was a semi-closed perennial irregular-shaped water body connected with the sub-branch of the Kumar River with an average depth of about 4.5 to 6 meters in the rainy season.


**Fig 1:** Map of Madaripur sadar upazila showing the study area.

### Study period

The study was conducted for 06 months, from July to December 2018. Frequent field visits (at least twice a month) were made during this time to collect the necessary information. The data collection program was done at different fishing spots of the beel, fishermen's houses, and fish landing centers adjacent to the beel regarding the types and characteristics of the fishing gears used and species diversity.

### Fish diversity

The diversity of fish of the Bahadurpur beel was carried out through direct observation of fishing during the fishing period, repeated visits to the local fish market, and personal interviews of the persons who were related to fishing. A sampling of catches and their assessment were carried out. The specimens were collected during the daytime directly from the nearby fishermen, identified at the collection place with the help of fishermen and local people, and then brought to the laboratory for confirmation. Photographs were taken as soon as the fish species were found, and some were identified on the spot by books. Some which were difficult to locate were preserved in 10% formaldehyde and brought to the laboratory for identification. The specimens were identified to the species level through the study of some of their taxonomic characters as suggested by Bhuiyan [21], Talwar and Jhingaran [22], Shafi and Quddus [23], Rahman [24], and IUCN Bangladesh [25]. The relative abundance of recorded fish was estimated as very common (71-100%), Common (36-70%), and rare (1-35%), according to Wani and Gupta [26]. National status was determined by following IUCN Bangladesh [25].

## Results and Discussion

### Diversity of fish

All the recorded species during the study period are presented in Table 1. A total of 34 species under 24 genera belong to 7 orders, and 16 families were recorded. Among the recorded 34 species of fish, only one species was exotic, but the rest were indigenous species. Khanom *et al.* [8] reported 28 fish species (2 exotic) under 8 orders and 16 families from the Uthrail beel of Naogaon district, lower than the present observation. But, Saha and Hossain [9] and Karim *et al.* [10]

reported 40 and 38 fish species from Saldu beel of Tangail and Chalan beel of Pabna district of Bangladesh, respectively, which was more or less similar to the present study. However, Ahmed *et al*. [11] recorded 52 fish species in Shakla beel under the Brahmanbaria district of Bangladesh. Galib *et al*. [12] recorded 81 fish species under 59 genera (72 indigenous and 9 exotic) belonging to 12 orders and 27 families from Chalan beel. Imteazzaman and Galib [13] found 63 fish species (55 indigenous and 8 exotic) under 41 genera, 8 orders, and 20 families from the Halti Beel. Siddiq *et al*. [14] identified 58 species belonging to 21families and 9 orders from the Dogger beel. Akhtaruzzaman and Alam [15] reported 62 fish species from Ichanoi Beel. Flura *et al*. [16] recorded 74 species under 21 families from Balla beel, Moulavibazar, Bangladesh. Joadder *et al*. [17] reported 52 species of fish at Kumari beel in the Rajshahi district of Bangladesh. Halim [27] accounted for 59 species belonging to seventeen families under ten different orders from 3 beels located in Atghoria upazilla under the Pabna district of Bangladesh. Flura *et al*. [18] reported 74 fish species belonging to 21 families in Baikka beel of Bangladesh, which was much higher than the present findings. Gradual fish habitat destruction might be the main reason to get lower diversity of fish from the presently studied beel.

**Table 1.** List of recorded fish species from Bahadurpur Beel during the study period.

| SL. | Order | Family | Species | Local name | RA | NS |
|---|---|---|---|---|---|---|
| 01 | Cypriniformes | Cyprinidae | *Puntius sarana* | Sarpunti | +++ | NT |
| 02 | | | *Puntius ticto* | Titpunti | +++ | VU |
| 03 | | | *Amblypharyngodon mola* | Mola | +++ | LC |
| 04 | | | *Barbonemus gonionotus* | Thai sarnapunti | ++ | Ex |
| 05 | | | *Labeo rohita* | Rui | +++ | LC |
| 06 | | | *Labeo calbasu* | Kalibaus | ++ | LC |
| 07 | | | *Cirrhinus reba* | Tatkini | ++ | NT |
| 08 | | | *Cirhinus cirrhosus* | Mirka | ++ | NT |
| 09 | | | *Catla catla* | Katla | +++ | LC |
| 10 | | | *Labeo bata* | Bata | ++ | LC |
| 11 | | Cobitidae | *Lepidocephalichthys guntea* | Gutum | + | LC |
| 12 | Perciformes | Channidae | *Channa punctatus* | Taki | +++ | LC |
| 13 | | | *Channa striatus* | Shol | +++ | LC |
| 14 | | | *Channa marulius* | Gagar | ++ | EN |
| 15 | | | *Channa orientatalis* | Cheng | ++ | LC |
| 16 | | Anabantidae | *Anabas testudineus* | Koi | +++ | LC |
| 17 | | Osphronemidae | *Trichogaster fasciata* | Kholisha | +++ | LC |
| 18 | | | *Trichogaster lalius* | baicha | ++ | LC |
| 19 | | Nandidae | *Nandus nandus* | Veda/meni | +++ | NT |
| 20 | | Ambassidae | *Parambasis ranga* | Tek Chanda | ++ | LC |
| 21 | | Gobidae | *Glossogobius giuris* | Balia | ++ | LC |
| 22 | Tetradontiformes | Tetradontidae | *Tetraodon cutcutia* | Tepa | + | LC |
| 23 | Synbranchiformes | Mastacembelidae | *Macrognathus aculeatus* | Tara baim | ++ | NT |
| 24 | | | *Mastacembelus armatus* | Sal baim | ++ | EN |
| 25 | | | *Macrognathus pancalus* | Guchi baim | ++ | LC |
| 26 | Osteoglossiformes | Notopteridae | *Notopterus notopterus* | Foli | + | VU |
| 27 | | | *Notopterus chitala* | Chital | + | EN |
| 28 | Beloniformes | Belonidae | *Xenentodon cancila* | Kalika | + | LC |
| 29 | Siluriformes | Siluridae | *Ompok pabda* | Pabda | ++ | EN |
| 30 | | | *Wallago attu* | Boal | + | VU |
| 31 | | Chilbeidae | *Clupisoma garua* | Ghaura | ++ | EN |
| 32 | | Heteropneustidae | *Heteropneus fossillis* | Shing | ++ | LC |
| 33 | | Bagridae | *Mystus vittatus* | Kabashi tengra | ++ | LC |
| 34 | | | *Mystus bleekeri* | Gulsha tengra | ++ | LC |

*Exotic= Ex; Critically Endangered=CE; Endangered=EN; Vulnerable=VU; Near Threatened =NT; Least Concern =LC; +++=Very common, ++=Common and +=Rare. NS=National status, Relative abundance=RA.

**Diversity of order**

During the study period, 34 species under 7 orders were recorded. Among the recorded order, Cypriniformes were the dominant order containing 11 species (32.35%) of fish (Fig 2). Whereas, Tetradontiformes and beloniformes contained 1 species (2.94%) of fish. On the other hand, perciformes, synbranchiformes, osteoglossiformes, and siluriformes contained 29.41%, 8.82%, 5.88%, and 17.64% of fish, respectively. More or less similar trends were also reported by Saha and Hossain [9], Khanom *et al.* [8], and Karim *et al.* [10]. However, Galib *et al.* [12] and Akhtaruzzaman and Alam [15] reported 12 and 10 orders from chalan beel and Ichanoi beel, respectively, higher than the present recorded orders.

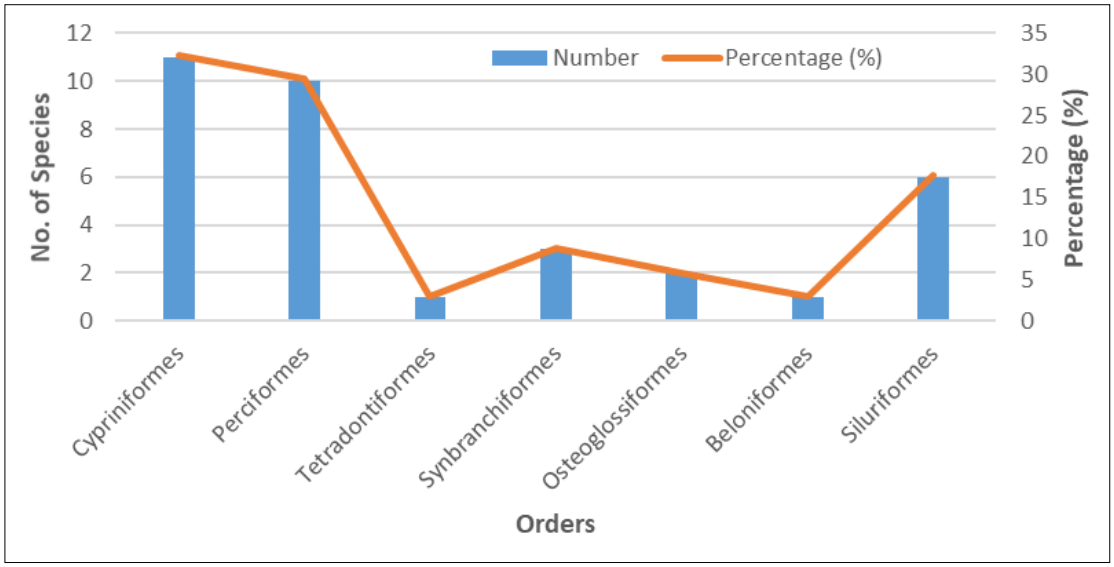


**Fig 2:** Recorded orders with their number and relative percentage in Bahadurpur Beel.

**Diversity of family**

A total of 16 families were recorded during the study period. Recorded families and their respective species' numbers and percentages are presented in Fig 3. A maximum of 29.41% (10 species) of species belonging to the cyprinidae family. However, cobitidae, anabantidae, ambassidae, gobidae, tetradontidae, belonidae, chilbeidae, and heteropneustidae of each contained one species (2.94%). On the other hand, channnidae, osphronemidae, mastacembelidae, notopteridae, siluridae, and bagridae comprised 11.76%, 5.88%, 8.82%, 5.88%, 5.88%, and 5.88% respectively. The present study is also supported by the observation of Khanom *et al.* [8] and Karim *et al.* [10]. However, Sultana *et al.* [19], Akhtaruzzaman and Alam [15], and Galib *et al.* [12] reported 23, 23, and 27 families, respectively, in different beels of Bangladesh, which were higher than the present observation, but all the researchers reported cyprinidae as a dominant family which was supported by the present finding.

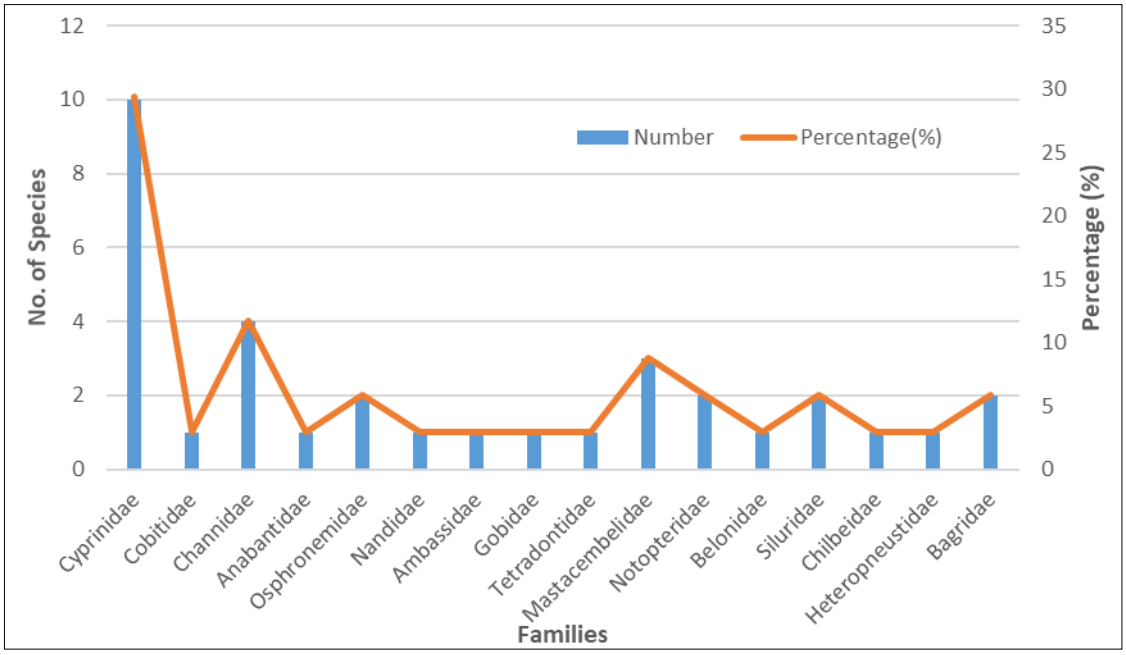


**Fig 3:** Recorded family and their relative number and percentage in Bahadurpur beel.

**Relative abundance**

The relative abundance of recorded fish during the study period is presented in Table 1 and Fig 4. Among the recorded 34 species, very common, common, and rare species were 29.41%, 52.94%, and 17.64%, respectively. Sultana *et al.* [19] reported species availability into four statuses available (44.64%), seasonal (19.64%), rare (16.08%), and very rare (19.64%) from Bhawal beel. Galib *et al.* [12] recorded as common (23%), abundant (17%), rare (9%), and very rare (5%) from Chalan beel. Akhtaruzzaman and Alam [15] found as available (46.77%), seasonal (8.06%), rare (6.45%), and extremely rare (38.71%) from Ichanoi Beel, which were more or less similar to the present observations.

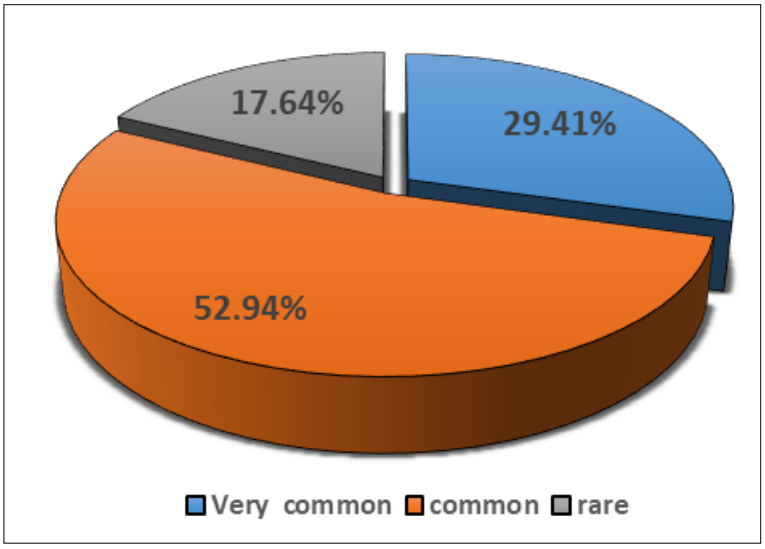


**Fig 4:** Relative abundance of observed fishes in Bahadurpur beel during the study period.

**National status of observed fishes**

Among the recorded 34 species, one species was exotic, and the rest of the 33 species were indigenous species. Among the indigenous species, endangered, vulnerable, near threatened and most minor concerns were 15.15%, 9.09%, 8.19%, 15.15%, 59.01%, and 60.60%, respectively (Table 1 and Fig 5). Again, about one-fourth (24.24%) of recorded fish were treated as a threatened species, which is alarming. Habitat destruction, illegal fishing gear, overfishing, and water pollution made them more vulnerable. There were no critically endangered species recorded during the study period. The present observation was also supported by the Sultana *et al.* [19] and Rahman *et al.* [28] in Bhawal beel and Chalan beel, respectively. Lower threatened fish from the present observation was also reported by Karim *et al.* [10] in Chalan beel. However, higher threatened fish were reported by Galib *et al.* [12] and Imteazzaman and Galib [13] in the case of Chalan beel and Halti beel, respectively.

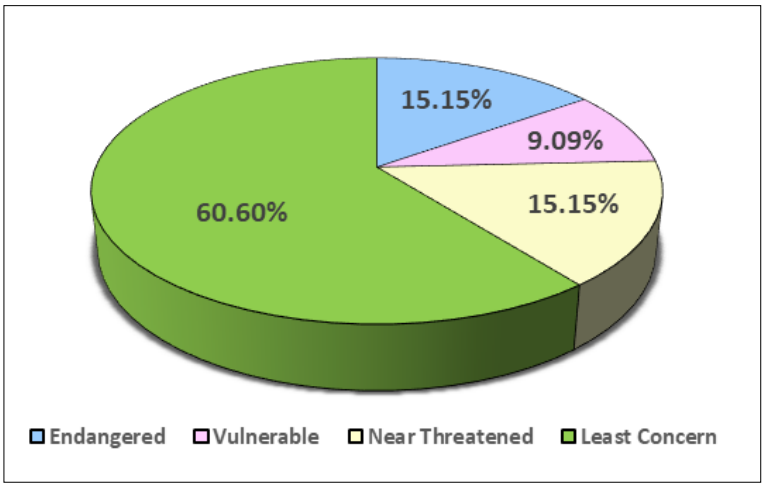


**Fig 5:** National Status of observed fishes in Bahadurpur beel during the study period.

**Monthly variation**

Species diversity also fluctuates from month to month. It was observed that the highest 16 number of species (47.05%) was recorded during November, whereas the lowest number of species, 12 (35.29%), was observed during the month of July (Fig 6). The maximum availability of fish in November might be due to reducing water level, enhancing the fishing activity, and an abundance of fish. These observations coincide with the observation made by Sultana *et al.* [19].

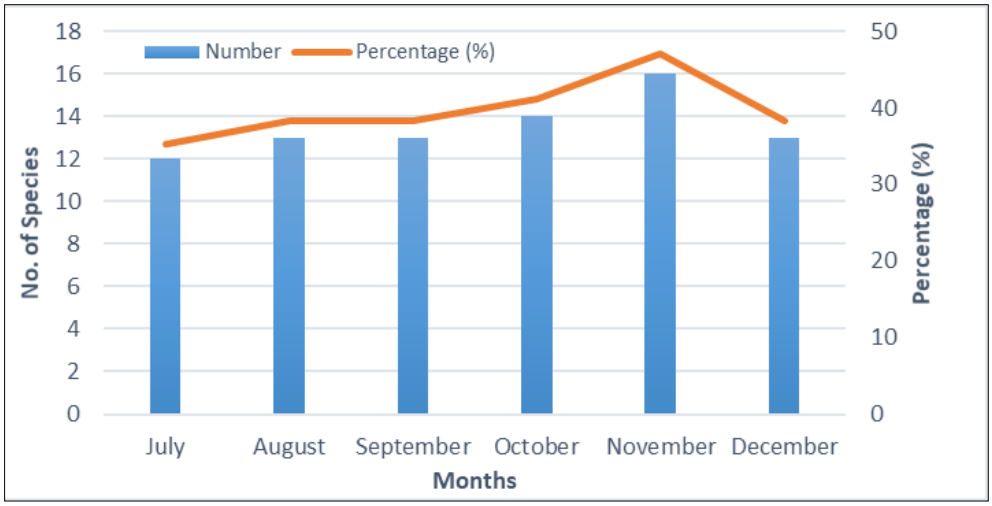


**Fig 6:** Monthly variation of observed fish species in Bahadurpur beel.

**Types of fishing gears**

About 200 fishermen in Bahadurpur Beel performed their fishing either in a group or individually. They catch different kinds of fish by using different types of fishing gear. The fishing gears they used during the study period are presented in Table 2. Fishermen living around the Bahadurpur Beel used all kinds of mentioned fishing gears, but most fishermen use the net and frequently trap to harvest their fish. They mainly used current jal and veshal among the net and trap. Sultana and Islam [29] and Ferdoushi *et al.* [30] reported 28 types of fishing gears in Chalan beel and Ashura beel, respectively.

**Table 2:** Recorded fishing gears in Bahadurpur beel during the study period.

| SL. | Types | Name of fishing gear | Types of fish caught |
|---|---|---|---|
| 01 | Net | Current jal | Small fish (i.e. punti, baicha, koi, kholisha, veda etc.) |
| | | Thela jal | Small fish, specially Molla, Baicha, Chingri etc. |
| | | Ber jal | All types of fish. |
| | | Jhaki jal | All types of fishes |
| 02 | Trap | Veshal | All types of fishes |
| | | Fulkuchi | Baim, Shol, Aair, Taki, Kakra etc. |
| | | Gora | All types of fishes |
| | | Gunchi | Mainly small fish |
| 03 | Wounding gears | Teda | Taki, Koi, Shol, Gajar, Boal, Baim etc. |
| | | Barsha | Especially Koi, Veda etc. |
| 04 | Hook and line | Hooks | Mainly Taki, Koi, Shol, Gajar, Boal, Baim, etc. |

**Conclusion**

Fish diversity of Bahadurpur beel was not satisfactory compared to other beels of Bangladesh. Fish species drastically reduced both qualitatively and quantitatively. Environmental and human activities like the use of banned gear of tiny mesh size fishing nets, overfishing, and indiscriminate use of gears are responsible. Moreover, there is no appropriate beel management policy. The present study revealed that restoration of fish habitat and conservation of fish diversity is great challenges. Many of the fishermen depend their livelihood on this beel. So, government and non-government organizations should come forward to make sustainable management policies that will conserve the fish diversity of the Bahadurpur beel.

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