Investigation on species composition in Chalan beel of Bangladesh

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Abstract
The experiment was carried out to investigate the species composition of fish and prawn in Ruhul beel and Bamonji beel under Chalan beel of Pabna district of Bangladesh. Data were collected from selected sanctuary sites, focus group discussion, personal and group contract as well as Government and Non-Government organizations with prepared and pretested questionnaire. A total of 38 fish species belonging to 24 Genus, 17 families and 8 orders (7 fish, 1 prawn) were recorded during the study period at Ruhul beel and Bamonji beel. The largest order recorded for both beels according to species frequency were Cypriniformes and Perciformes which contributed 36.84% (14 species) and 35.14% (12 species) for Ruhul beel and Bamonji beel followed by Perciformes and Cypriniformes which contributed 34.21% (13 species) and 32.43% (12 species) for Ruhul beel and Bamonji beel, respectively. The third largest species was Siluriformes for both beels contributed 10.53% (4 species) and 10.81% (4 species) to Ruhul beel and Bamonji beel, respectively followed by Channiformes which contributed 7.89% (3 species) and 8.11% (3 species) to Ruhul beel and Bamonji beel, respectively. The prevalence of other 4 orders was Beloniformes, Cyprinodontiformes, Decapoda and Tetraodontiformes both were contributed 2.63% (only 1 species) to Ruhul beel and 2.70% (only one species) Bamonji beel.

Keywords: Species composition, Chalan beel

1. Introduction
Chalan beel is a productive water body which extends over four adjacent districts of Bangladesh viz; Rajshahi, Pabna, Sirajganj and Natore. The major part of the beel covers an extensive area of Raiganj Upazila of Sirajganj district and Chamtobar and Bhangura Upazila of Pabna district. The fish production could be increased up to 45,000 MT through improving basic management practices (e.g. proper execution of fish act; establishment of fish sanctuaries; maintaining minimum water depth in dry season (Karim, 2003) [1]). The greatest breadth of the beel is about 13 km from Tarash at the northeast to Narayanpur, near the north bank of the Gumani. Its greatest length is about 24 km from Singra to Kachikata on the Gumani (Banglapedia, 2013) [2]. The species composition was observed in Chalan beel area which is comprised by a series of small depression of which each depression were a separate small beel (Sayeed, 2010) [3]. Fish enter to the Chalan beel by up-stream migration from the Jamuna River through the Baral and Gumani Rivers when inundation commences in the pre-monsoon period. The Chalan beel then serves as an excellent feeding, spawning and nursing ground for many important indigenous fish species (Ahmed and Singh, 1991) [4]. From the findings of Hossain et al. (2008) [5] it was recorded that, about 9818 individuals, representing 114 species from 29 families. The most abundant fish species groups were punti (Puntius sophore and Puntius ticto), followed by chanda (Chanda nana and Parambassis ranga). The third most abundant species was tengra (Mystus vittatus) in the Gumani River and chapila (Gudasia chapra) in the Baral and Katangar Rivers. A decreasing trend was observed in the variability of five species in the Gumani River (Amblypharyngodon mola; Clupisoma garua; Chela cachius; G. giuris; A. coila), live in the Baral River (Punti, Chanda, Botia dario, C. garua, G. giuris), and six in the Katangar River (Chanda; Chela Cachius; Mystus Vittatus; B. Dario; C. Garua; G. Giuris). Many valuable indigenous fish species which were once available in large volumes are currently under threat and severely depleted from the Chalan beel area.
2. Materials and Methods

2.1 Data Collection
The primary data was collected from selected sanctuary site and control site using various methods like baseline survey by transaction, focus group discussion, social mapping, wealth ranking, mobility mapping, personal and group contract with prepared and pretested questionnaire etc. The secondary data was collected from Department of Fisheries (DoF), Bangladesh Fisheries Research Institute (BFRI), Rajshahi University (RU), Dhaka University (DU) and Bangladesh Agricultural University (BAU) library, using internet and the selective fish landing centers in the study area.

2.2 Species Count
The number of fish species was counted to estimate the species composition as well as diversity of fish population, while the catch weight of fish offered a quantitative indicator of species biomass also related to the species composition, catch composition and fish diversity. The collected samples were sorted to species level (Kulbicki and Wantiez, 1990) [6]. The fishes were identified up to species level followed by (Rahman, 2005) [7]. Fish species composition and catch composition are usually expressed as the catch-per-unit-effort (gm/unit gear/hour).

2.3 Data Analysis
The previously collected data by the local Upazilla Fisheries Office, Project office and Statistics office was used as baseline for the comparison with data collected in 1st year. On the other hand, data of first year was used as baseline to estimate changing trends of species composition, fish diversity of second year. Then data were entry and processing. Necessaary data on present status of biological species of beels were investigated. This term can be used to assessing the degree of exploitation of fishery resources (Degerman et al., 1988) [8].

3. Results
3.1 Frequency Distribution of Fish Species under Different Orders
Frequency distribution of fish species under different Orders has been showed in the Figure 1. A total of 283 fish and prawn individuals from 38 species belonging to 24 Genus, 17 families and 8 orders were recorded during the study period at RB and BB. Frequency of fish species under orders recorded during the study period in RB and BB were estimated minutely. During the study period total 7 orders of fish and one order of prawn were identified from both beels. The largest order recorded for both beels according to species frequency were Cypriniformes and Perciformes which contributed 36.84% (14 species) and 35.14% (12 species) for RB and BB followed by Perciformes and Cypriniformes which contributed 34.21% (13 species) and 32.43% (12 species) for RB and BB, respectively. The third largest species was Siluriformes for both beels contributed 10.53% (4 species) and 10.81% (4 species) to RB and BB, respectively followed by Channiformes which contributed 7.89% (3 species) and 8.11% (3 species) to RB and BB, respectively. The prevalence of other 4 orders was Beloniformes, Cyprinodontiformes, Decapoda and Tetraodontiformes both were contributed 2.63% (only 1 species) to RB and 2.70% (only one species) to BB (Figure 1).

3.2 Frequency Distribution of Species under different Families
Frequency of fish and prawn under different families recorded during the study period in RB and BB were calculated (Figure 3a and Figure 2). Total 16 families of fish and 1 family of prawn were identified in both the beels. Among all the families Cyprinidae 34.21% (13 species) was the largest family for RB and BB which contributed 34.21% (13 species) and 30.56 (11 species), respectively. The second highest families were Ambassidae, Channidae, Mastacembelidae and Osphronemidae for both the beel which contributed 7.89% (3 species) and 8.33% (3 species) in every family for RB and BB, respectively. The lowest dominant family was Tetraodontidae for both the beels which contributed 2.63% (1 species) and 2.78% (1 species) for RB (Figure 3) and BB (Figure 2), respectively. Family-wise species composition for RB by number were consists of Ambassidae 7.89% (3 species), Anabantidae 2.63% (1 species), Bagridae 5.26% (2 species), Belonidae 2.63% (1 species), Channidae 7.89% (3), Cobitidae 2.63 (1 species), Cyprinidae 34.21% (13 species), Cyprinodontidae 2.63% (1 species), Gobiidae 2.63% (1 species), Heteropneustidae 2.63% (1 species), Mastacembelidae 7.89% (3 species), Nandidae 2.63% (1 species), Osphronemidae 7.89% (3 species), Palimnoidei 2.63% (1 species), Pimelodidae 2.63% (1 species), Siluridae 2.63% (1 species), Tetraodontidae 2.63% (1 species). Family-wise species composition in case of BB by number was consists of Ambassidae 8.33% (3 species), Anabantidae 2.78% (1), Bagridae 5.56% (2 species), Belonidae 2.78% (1 species), Channidae 8.33% (3 species), Cobitidae 2.78% (1 species), Cyprinidae 30.56% (11 species), Cyprinodontidae 2.78% (1 species), Gobiidae 2.78% (1 species), Heteropneustidae 2.78% (1 species), Mastacembelidae 8.33% (3 species), Nandidae 2.78% (1 species), Osphronemidae 8.33% (3 species), Palimnoidei 2.78% (1 species), Pimelodidae 2.78% (1 species), Siluridae 2.78% (1 species), Tetraodontidae (2.78% (1 species).
4. Discussion
Species composition was differed with seasons and sites. Among the identified orders from the present study 7 orders of fish and one order of prawn. According to frequency of fish species under orders, the largest orders were Cypriniformes and perciformes in RB and BB. There was a distinct variation in the abundance of fish species by months. Every fish species were not available in all the months. The highest abundance was found in November. The lowest numbers of species was found in the month of January. The dominant species among 38 in RB was M. lamarrei, Chanda sp., Colisa sp., Puntius phutunio, Puntius chola, Esomus danricus and Puntius conchonius whereas in case of BB the dominant species were Chanda sp., M. lamarrei, Puntius phutunio, Colisa sp., Esomus danricus, Channa punctatus, Puntius chola and Xenentodon canchila. At the present study there were 38 species from RB and 37 species from BB under 8 orders, 17 families (16 from fish and one from prawn) and 24 Genus were recorded which was similar to the result of (Galib et al., 2013; Masai et al., 2001; Rahman et al., 2010; Mohsin et. al., 2013; Shafi and Quddus, 1982 and Emmanuel, 2010) [8, 10, 11, 12, 13, 14].

In the present study, 11 groups fish were recorded such as Barbs and Minnows, Carps, Cat fishes, Gars, Gobies, Loaches, Perch, Prawn, Puffer fishes, Snakeheads and Spiny eels. Overall positive changing trends of 33 species for RB and 9 species for BB were observed. From a case study it was known that before establishment of sanctuary the fish diversity and production was gradually decreased day by day whereas it was started to increase after establishing the sanctuary and at the same time the diversity and production was decreased continuously in BB. 11 groups were recorded from RB and BB such as Barbs and Minnows, Carps, Cat fishes, Gars, Gobies, Loaches, Perch, Prawn, Puffer fishes, Snakeheads, Spiny eels which is supported by the findings of Azher (2009) [15] for Dopi beel.

In the present study, total number of species was not increased in both beels upto April. After establishing the sanctuary bigger size carp (such as Rui, Catla, Boal) production was decreased however the SIS production was increased. That might be due to the development of suitable feeding and spawning ground for SIS. In the present study, 20 to 23 species were caught by current jal and 22 to 23 species were caught by lift net (Khora jal) which was supported by the findings of Rahman et al. (1992) [16]. Among the threatened fishes as described by IUCN (2000) [17], 5.26% of endangered and 18.42% vulnerable, 5.26% data deficient and 71.05% not threatened species were found in Chalan beel during the study. The species richness in RB was range from 13 to 38. Overall species richness was higher in
RB during the study period. After establishment of the sanctuary species richness was increased in Ruhul beel. There were 54 threatened species of which only 9 species was found in Ruhul beel. Among the 9 threatened species 8 was showed increasing trend which might be due to the establishment of fish sanctuary and it was more or less similar to (FFP, 2005)\cite{18}. The highest fish diversity was found in the month of November in both the beels which might be due to high abundance of fish, suitable water level and good weather condition for fish and fishing. Considering all the recorded data it was found that the fish diversity was higher in RB than other site in both years. The species was not reappeared in the beels because there has a barrier to connect the beels with the rivers and canals. The abundance and production of fish species were bound to the flooding pattern during the study. Catch composition and species composition was differed with seasons or months. Similar result also reported by Bobori and Salvarina (2010)\cite{19}.

5. Conclusion
There has been virtually conducted the study on the impacts of fish sanctuaries on the biodiversity of fishers. Once upon a time Ruhul beel was highly productive waterbody. However, it is losing its productivity for many natural and manmade reasons. Despite all these problems, Ruhul beel still serves as the natural fish bank for the major portion of the people in this beel area. However, there are a series of small beel under the Chalan beel which is quite different from biodiversity, species composition, vegetation, water depth, hydrography, physico-chemical characteristics and biological conditions. The establishment of fish sanctuary might be the so effective tools to improve and defense the fish biodiversity as well as increasing fish production.

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7. Conflict of interests
The authors declare that there is no conflict of interests regarding the publication of this paper.

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