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Fisheries Resources in Rajshahi and Khulna Division, Bangladesh

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Abstract
Fisheries resource of Rajshahi and Khulna Divisions of Bangladesh was assessed and a taxonomic account of biodiversity has been presented. The taxonomic account of fish biodiversity of the study area comprises 160 species, 97 genera, 44 families, 12 orders. There were 130 species of fishes found in Rajshahi division and 126 species in Khulna division. Ninety six species are common in both divisions. The endemic species of Rajshahi division is 34 and Khulna division is 30 species. The fish fauna listed from Study area only one class Osteichthyes. It belong to the orders of clupeiformes, cypriniformes, siluriformes, angulliformes, symbranchiformes, beloniformes, cyprinodontiformes, perciformes, channiformes, tetraodontiformes, mugiliformes and mastacembeliformes.

Keywords: fisheries resource, Rajshahi and Khulna divisions, species distribution, taxonomic account of fishes, culturable and non- culturabe fish species

Introduction
Biodiversity, the genetic library maintained by natural ecosystems, is the basic biotic resource that sustains all human life-support systems (Kim, 1993) [15]. The major causative factors for decline in aquatic biodiversity are: degradation and loss of habitat, over exploitation, spread of exotics, pollution, and climate change. Conservation of biodiversity rests on resource management, that is, sustainable management of stocks and preservation of the habitat. In Bangladesh, fisheries is one of the major subsectors of agriculture, which play a dominant role in nutrition, employment, earning foreign currency and other areas of economy. Fish production from the open water has declined due to many factors such as water quality degradation by pollution, environmental modification, fish diseases, and high fishing pressure (Ali, 1991) [2]. Most of the fish and small aquatic animals cannot survive these pesticides in concentration greater than 1 ppb (Task Force Report, 1991). The great impact of these on fisheries has been described extensively by Ali (1991) [2]. The present attempt is to make a list of fish fauna of the study area with reference to their abundance, synonyms, local names, distinguishing characters, seasonal availability, and breeding season.

Materials and Methods
The study was conducted during July 2007 to June 2010. Fishes were also collected from different landing centers of Rajshahi and Khulna Divisions. The information needed for this study was collected from multiple sources. Firstly, an extensive literature reviews were made in the area of fisheries resources. Secondly, the primary data for the study were collected through survey method from the fishermen, fish traders, Government and Non-Government Organizataion (NGO) personnel and experienced persons related to fisheries research and education (N=250). The classification scheme has been followed mostly after Berg (1940). Help regarding the classifications and nomenclature were taken from the work of Hamilton (1822), Day (1878), Talwar and Jhingran (1991) [24] and Bhuiyan *et al*. (1992) [5], Islam and Hossain (1983) [5]. Rules regarding the nomenclature of fishes have mostly been followed as set forward in the International code of Zoological Nomenclature.

Results
The samples were collected from July 2007 to June 2010 and 160 species, 97 genera, 44 families, 12 orders of fishes were recorded (Table 1). There were 130 species of fishes found in Rajshahi division and 126 species in Khulna division. The district-wise no. of fish species are presented in Fig. 1 and 2 for Rajshahi and Khulna divisions. Ninety six species are common in both divisions (Table 1). All those fish species have economic value, but about 41 species under 27 genera are very economically important. A total of 18 different culturable fish species present in the study area and most of the non-culturable indigenous fishes are commercially important (Plate 1). Total number of fish species recorded in different Beels, Haors and Gher are presented in Table 2. A check list of fish species of Rajshahi and Khulna Division with local name, food habit, seasonal availability, breeding season and economic importance have been presented in Table 2. The fish fauna listed from Study area only one class Osteichthyes. It belong to the orders of clupeiformes, cypriniformes, siluriformes, angulliformes, symbranchiformes, beloniformes, cyprinodontiformes, perciformes, channiformes, tetraodontiformes, mugiliformes and mastacembeliformes (Plate 1).

Discussion
Tsai and Ali (1986) [2] pointed out that the flood control and drainage (FCD), and flood control drainage and irrigation (FCDI) projects became threat to the fish resources during the last 20 years. The same fate has been observed in the study area. The feasibility report on the Barnai Project (1984) had foreseen the negative fate of fisheries sector, after the implementation of the project. Before the Barnai (FCD) Project, the fishermen obtained relatively large size of carps,

Chital, Pangus, Boal, Shol, Gajar etc. and also in considerable quantity (Mortuza *et al*., 2001) [16]. The fishery resources of the Rajshahi area (present districts of Rajshahi, Chapai Nawabganj, Natore and Naogaon) include five species of prawns, *viz.* Macrobrachium malcolmsonii, Macrobrachium dayanum, Macrobrachium dolichodactylus, Macrobrachium lamarrei (Islam 1979, Parween 1979, Rafik 1979, Dutta 1980) [5, 20, 9] and another smaller unidentified one. Except M. dolichodactylus, the other species are available throughout the year in this area, occupying the peak during the monsoon. M. dolichodactylus was reported to be abundant in Rajshahi and Chapai Nawabganj area by Islam (1979) [5]. The production pattern of the said four prawn species in Rajshahi area has been reported by Dutta *et al*. (1997) [8]. Notable works on the systematic of fishes were reported in India by Hora and Mookerjee (1938) [11], Shaw and Shebbeare (1937), Munro (1955), Talwar and Jhingran (1991) [24] and others. In comparison to India, taxonomic works on fishes is very fragmentary and incomplete in Bangladesh. Notable contributions to the systematic of fishes of Bangladesh are those of Ahmad (1953) [1] whose list included 107 species of fishes of East Pakistan. Bhuiyan (1964) [4] recorded 71 species from Dacca district. Quareshi (1965) recorded 133 species in his book "common fresh water fishes of Pakistan" Published from Karachi, most of which occur in Bangladesh. Doha (1973) published a list of 106 species from Mymensingh and Tangail districts. Among other contributions on the taxonomy of the fish fauna of Bangladesh by Bangladeshi authors include Hussain (1970) [12], Shafi and Quddus (1982) [22] (in Bangla) who gave an account of 144 species of fishes from the fresh water of Bangladesh. Rahman (1989) listed 260 species inhabiting the fresh water area of Bangladesh. Many of these are also found in marine and estuarine areas. Bhuiyan *et al.* (1992) [5] listed 133 species inhabiting the fresh water fishes of Rajshahi district. Islam and Hossain (1983) [5] recorded 110 species of the fishes from the river Padma near Rajshahi.

The present study gives a complete list of the fishes found in the study area but still there might be some information missing.

Table 1: Species distribution of Rajshahi and Khulna Division.

Study area	Common sp. (both division)	Endemic for Rajshahi Division	Endemic for Khulna Division	Total sp.
Rajshahi Division	96	34	-	130
Khulna Division	96	-	30	126
Total	192/2=96	34	30	160

Table 2: Check list of fish species of Rajshahi and Khulna Division.

Sl. No.	Systematic name	Found	Seasonal availability	Breeding season
1.	*Notopterus notopterus* (Pallas, 1969)	Com	Few, Sep-March	April to July
2.	*Notopterus chitala* (Hamilton, 1822)	Com	Few, Sep-March	April to July
3.	*Setipinna phasa* (Hamilton, 1822)	Com	Few, Aug-Jan	February to Mar
4.	*Setipinna taty* (Valenciennes-1848)	Com	Few, Aug-Jan	April to Sep
5.	*Gadusia chapra* (Hamilton, 1822)	Com	Available, Jul-Feb	March to August
6.	*Gadusia variegate* (Day-1889)	Raj	Jul-Feb	April to Sep.
7.	*Hilsa ilisha* (Hamilton, 1822)	Com	Rare in the rainy season	Jul- Oct, Jan-Mar.
8.	*Hilsa tolil* (valenciennes, 1847)	Raj	Rare in the rainy season	Jul- Oct, Jan-Mar
9.	*Gonialosa manminna* (Hamilton, 1822)	Com	Rare in the rainy season.	Jul- Oct, Jan-Mar
10.	*Corica soborna* (Hamilton, 1822).	Com	Common, Jul-Nov	Jul-Nov
11.	*Anodontostoma chacunda* (Hamilton)	Khu	March-June.	March to June
12.	*Thyssura purava* (Valenciennes)	Khu	February to September.	Feb to Sep
13.	*Megalops cyprinoides*	Khu	August to November.	August to Nov.
14.	*Chela atpar* (Hamilton, 1822)	Com	Common in the rainy season	March to Sep
15.	*Chela laubuca* (Hamilton, 1822)	Raj	Few, July- February	May to Sep
16.	*Chela phulo* (Hamilton, 1822)	Com	Few in the rainy season	April to August.
17.	*Chela bacaila* (Hamilton, 1822)	Com	July to January	April to August
18.	*Chela cachius* (Hamilton, 1822)	Raj	Common, July to Dec.	May to Sep
19.	*Aspidoparia jaya* (Hamilton, 1822)	Raj	Rare in the rainy season.	June to October
20.	*Aspidoparia morar* (Hamilton, 1822)	Raj	Rare in the rainy season	April to October
21.	*Esomus danricus* (Hamilton, 1822)	Com	All the year around	August to Oct
22.	*Oxygaster gora* (Hamilton, 1822)	Com	Available in the rainy season.	May to Sep
23.	*Oxygaster bacaila* (Vanhassel, 1823)	Com	Winter and summer season.	April to August
24.	*Oxygaster phulo* (Hamilton, 1822)	Com	July to November.	March to Oct.
25.	*Rasbora rasbora* (Hamilton, 1822)	Raj	Few, July to January.	April to July.
26.	*Rasbora daniconius* (Hamilton,1822)	Com	Available all the year around	April to July.
27.	*Rasbora elanga* (Hamilton, 1822)	Com	Rare in the rainy season.	April to July.
28.	*Amblypharyngodon mola* (Hamilton, 1822)	Com	Available.	April to Dec.
29.	*Amblypharyngodon microlepis*	Raj	Rare in the rainy season.	April to Dec
30.	*Rohtee cotio* (Hamilton, 1822)	Com	August to December.	April to July.
31.	*Danio devario* (Hamilton, 1822)	Com	Rare in the rainy season.	April to July
32.	*Danio rerio* (Hamilton, 1822)	Com	Rare in the rainy season.	April to July.
33.	*Labeo rohita* (Hamilton, 1822)	Com	Available all the year around.	April to July.
34.	*Labeo gonius* (Hamilton, 1822)	Raj	Rare in the rainy season.	June to August
35.	*Labeo calbasu* (Hamilton, 1822)	Com	All the year round.	May to August
36.	*Labeo bata* (Hamilton, 1822)	Raj	Available throughout the year	May to October.

37.	*Labeo boga* (Hamilton, 1822)	Raj	Rare in the rainy season.	June to October.
38.	*Cirrhinus reba* (Hamilton, 1822)	Com	July to December.	April to July.
39.	*Cirrhinus mrigala* (Hamilton, 1822)	Com	Available all the year around.	May to July.
40.	*Salmostoma phulo* (Hamilton, 1822)	Raj	Few in the rainy season.	April to Sep
41.	*Salmostoma bacaila* (Hamilton,1822)	Com	Common in the rainy season.	April to August.
42.	*Puntius sarana* (Hamilton, 1822)	Com	All the year round	-
43.	*Puntius chola* (Hamilton)	Com	Available all the year round.	April to July.
44.	*Puntius phutunio* (Hamilton, 1822)	Com	Available in the rainy season.	May to October
45.	*Puntius ticto* (Hamilton, 1822)	Com	Available in July to January	April to July
46.	*Puntius guganio* (Hamilton, 1822)	Raj	Rare in the rainy season	April to July
47.	*Puntius sophore* (Hamilton, 1822)	Com	Available all the year around	April to July.
48.	*Puntius stigma* (Hamilton, 1822)	Com	Not available the year round.	July to August
49.	*Puntius terio* (Hamilton, 1822)	Com	Common all the year round.	July to August
50.	*Puntius gelius* (Hamilton, 1822)	Com	All the year round.	May to July
51.	*Puntius cosuatis* (Hamilton)	Com	Rare in the rainy season	May to October
52.	*Catla catla* (Hamilton)	Com	Available all the year around.	June to August
53.	*Hypophthalmichthyes molitrix*	Com	Available all the year round	Sep-Nov, Feb-Apr
54.	*Aristichthys nobilis* (Hamilton, 1822)	Raj	Available all the year round	Sep-Nov, Feb-Apr
55.	*Cyprinus carpio* (Linnaeus, 1758)	Com	Available all the year round	Sep-Nov, Feb-Apr
56.	*Cyprinus carpio* (Linnaeus, 1758)	Com	Available all the year round	Sep-Nov, Feb-Apr
57.	*Ctenopharyngodon idellus*	Com	Available all the year round	Sep-Nov, Feb-Apr
58.	Botia dayi (Hamilton, 1822)	Raj	Few in the rainy season.	April to July
59.	*Botia dario* (Hamilton, 1822)	Com	Common in the rainy season.	Aug to December.
60.	*Botia birdi* (Chaudhuri, 1909)	Raj	Rare in the rainy season.	May to October
61.	*Botia lohachata* (Chaudhuri, 1909)	Raj	July to January	May to September.
62.	*Lepidocephalus guntia*	Com	All the year round.	April to July.
63.	*Nemachilus botia* (Hamilton, 1822)	Khu	All the year round.	April to July.
64.	*Lepidocephalus berdmorei* (Blyth, 1860).	Raj	Rare, Sep to June.	April to July.
65.	*Acanthophthalmus pangia*	Raj	Rare, October to January.	April to October.
66.	*Plotosus canius* (Hamilton)	Khu	May to December.	May to Dec
67.	*Wallago attu* (Bloch, 1801)	Com	July to February	May to August
68.	*Ompok pabda* (Hamilton, 1822)	Com	Sep to Feb.	May to August
69.	*Ompok pabo* (Hamilton, 1822)	Com	Rare in the rainy season.	June to Aug.
70.	*Ompok bimaculatus* (Bloch, 1794)	Raj	Sep to Feb.	June to August.
71.	*Rita rita* (Hemilton, 1822)	Com	Available in the rainy season.	September to Dec
72.	*Mystus aor* (Hamilton, 1822).	Com	Sep to April.	April to July.
73.	*Mystus seenghala* (Sykes, 1841)	Com	Common, September to March.	April to July.
74.	*Mystus menoda* (Hamilton, 1822)	Com	Common, in July to March.	May to August.
75.	*Mystus cavasius* (Hamilton, 1822)	Com	Available from July to March	April to August.
76.	*Mystus bleekeri* (Day, 1878)	Com	August to February.	August to Feb
77.	*Mystus tengara* (Hamilton, 1822)	Com	Available throughout the year.	April to August
78.	*Mystus gulio* (Hamilton, 1822)	Khu	Available throughout the year	April to August
79.	*Mystus vittatus* (Bloch, 1797)	Com	Available throughout the year.	April to August.
80.	*Mystus armatus* (Day, 1865)	Raj	Available from July to January.	April to August.
81.	*Rama rama* (Hamilton, 1822)	Raj	August to September	April to July
82.	*Chandramara chandramara*	Raj	Rare in the rainy season.	June to October.
83.	*Batasio batasio* (Hamilton, 1822)	Com	Rare in the rainy season.	May to July.
84.	*Batasio tengara* (Hamilton, 1822)	Com	Rare in the rainy season.	May to July.
85.	*Chaca chaca* (Hamilton, 1822)	Com	October to February.	April to October
86.	*Clupisoma garua* (Hamelton, 1822)	Raj	July to January.	May to August.
87.	*Clupisoma murius* (Hamilton, 1822)	Com	July to Feb.	April to August.
88.	*Silonia selondia* (Hamilton, 1822)	Raj	Rare in the rainy season.	May to July.
89.	*Pseudotropeus atherinoides*	Com	Available all the year round	May to July.
90.	*Eutropiichthys vacha* (Hamilton, 1822)	Raj	July to January	April to September
91.	*Eutropiichthys murius* (Hamilton, 1822)	Raj	Aug to January	May to September
92.	*Ailia coila* (Hamilton, 1822)	Com	Aug to January	May to September
93.	*Ailiichthys punctata* (Day, 1878)	Raj	Aug to Feb	April to August.
94.	*Pangasius pangasius* (Hamilton, 1822)	Com	Available all the year round.	March to July.
95.	*Clarias batrachus* (Linnaeus)	Com	September to March.	May to July.
96.	*Clarias gariepinus*	Com	All the year around	May to July.
97.	*Heteropneustes fossilis (Bloch, 1797)*	Com	All the year round	May to July.
98.	*Amblyceps mangois* (Hamilton, 1822)	Raj	Rare in the winter season	May to July.
99.	*Olyra kempi (Mc Clelland, 1842)*	Raj	Rare in the Nov to Feb.	May to July.
100.	*Sisor rhabdophorus*	Raj	Rare in the rainy season	April to August
101.	*Bagarius bagarius* (Hamilton, 1822)	Com	Rare in Aug -Mar.	April to August.
102.	*Gagata gagata* (Hamilton, 1822)	Com	Rare in August to January	April to September
103.	*Gagata viridescens* (Hamilton, 1822)	Com	Rare in August to February.	May to October.
104.	*Gagata cenia* (Hamilton, 1822)	Com	Rare in July to March.	April to October.

105.	*Gogata youssoufi* (Rahman, 1989)	Com	Rare in rainy season	May to July.
106.	*Hara jerdoni* (Day, 1879)	Raj	Rare in August to January	May to July.
107.	*Anguilla bengalensis* (Gray, 1834)	Khu	Rare in the rainy season.	April to August.
108.	*Lycodontis tile* (Hamilton)	Khu	May to November.	May to November.
109.	*Monopterus cuchia* (Hamilton, 1822)	Com	December to March.	May to September
110.	*Ophisternon bengalensis*	Khu	March to December	March to December
111.	*Xenentodon cancila* (Hamilton, 1822)	Com	All the year around	July to October
112.	*Hemirhamphus gaimardi*	Com	Rare in the rainy season.	May to July.
113.	*Zenearchopterus ectuntio* (Hamilton)	Khu	April to July	April to August
114.	*Anabas testudineus* (Bloch, 1801)	Com	All the year around	June to July
115.	*Macropodus cupanus*	Khu	Not available all the year	June to July
116.	*Colisa fasciatus* (Bloch, 1801)	Com	Available throughout the year.	June to October
117.	*Colisa sota* (Hamilton, 1822)	Raj	Available July to April.	January to October
118.	*Colisa lalius* (Hamilton, 1822)	Com	June to March.	June to October
119.	*Colisa labiosa* (Day, 1878)	Com	June to October	June to October
120.	*Badis badis* (Bleeker, 1853)	Com	Few, October to March	October to March
121.	*Oreocaromis mossambica* (Peters, 1852)	Com	All the year around	
122.	*Tilapia nilotica* (Linneaus, 1767)	Com	All the year round.	
123.	Nandus nandus (Hamilton, 1822)	Com	Rare in the winter season.	May to September
124.	*Chanda nama* (Hamilton, 1822)	Com	In the month of July to Jan.	March to October
125.	*Chanda ranga* (Hamilton, 1822)	Com	In the rainy season.	April to September
126.	*Lates calcarifer* (Bloch)	Khu	Round the year.	April to September
127.	*Chanda baculis* (Hamilton, 1822)	Com	Available the in rainy season	April to September
128.	*Glossogobius giuris* (Hamilton,1822)	Khu	Available all the year round.	
129.	*Boleophthalmus bodrarti* (Pallas, 1770)	Khu	June to October	June to October.
130.	*Apocrytes bata*	Raj	February to October.	February to Oct
131.	*Stigmatogobius sadanandio*	Khu	June to September.	June to September.
132.	*Taenioides cirratus* (Day, 1873)	Khu	March to August	March to August
133.	*Butis buties* (Hamilton-Buchana)	Khu	November to June.	November to June.
134.	*Prionobutis koilomatodon* (Herre)	Khu	April to November.	April to November
135.	*Thysanophrys indicus* (Linnaeus)	Khu	May to November	May to November.
136.	*Pomadasys argyreus* (Balenciennes, 1833)	Khu	July to November.	July to November
137.	*Macrospinosa cuja*	Raj	August to January.	August to January.
138.	*Toxotes chatareus* (Hamilton, 1822)	Khu	December to May.	December to May.
139.	*Therapon jarbua* (Day)	Khu	July to December	July to December.
140.	*Scatophagus argus* (Day)	Khu	June to November	June to November.
141.	*Polydactylus indicus*	Khu	March to June.	March to June.
142.	*Eleutheronema tetradactylum* (Shaw)	Khu	June to December.	June to December.
143.	*Datnoides polota* (Hamilton)	Khu	October to December	October to Dec
144.	*Aplocheilus panchax* (Ham., 1822)	Raj	Available in July to January.	April to August
145.	*Oryzias melastigma* (McClelland, 1839)	Khu	July to January.	July to January
146.	*Channa striatus* (Bloch, 1794)	Raj	July to March.	April to June
147.	*Channa marulius* (Hamilton, 1822)	Raj	Rare in the July to March	April to June.
148.	*Channa punctatus* (Bloch, 1794)	Raj	Available all the year around.	April to June.
149.	*Channa gachua* (Hamilton, 1822)	Raj	September to March.	April to June
150.	*Channa orientalis* (Schneider, 1801)	Raj	Rare in the winter season	April to June.
151.	*Tetraodon cutcutia* (Hamilton, 1822)	Raj	Common in the rainy season.	June to October.
152.	*Chelonodon patoca* (Hamilton, 1822)	Raj	Rare in the rainy season.	July to October
153.	*Chelonodon fluviatilis* (Hamilton, 1822)	Com	Rare in the rainy season.	Julyto October.
154.	*Rhinomugil corsula* (Hamilton,1822)	Com	Few, all the year around.	April to August.
155.	*Liza parsia* (Hamilton)	Khu	Round the year.	November to Mar
156.	*Liza vaigiensis*	Khu	June to January.	November to Mar
157.	*Mugil cascasia* (Hamilton, 1822)	Com	August to February	April to August
158.	*Macrognathus aculeatus* (Bloch)	Com	Available all the year around.	April to July.
159.	*Mastacembelus pancalus* (Hamilton, 1822)	Com	Available throughout the year.	April to July
160.	*Mastacembelus armatus* (Lacepede, 1803)	Com	Available all the year round.	April to July.

* Raj = Rajshahi Khu= Khulna Com = Common

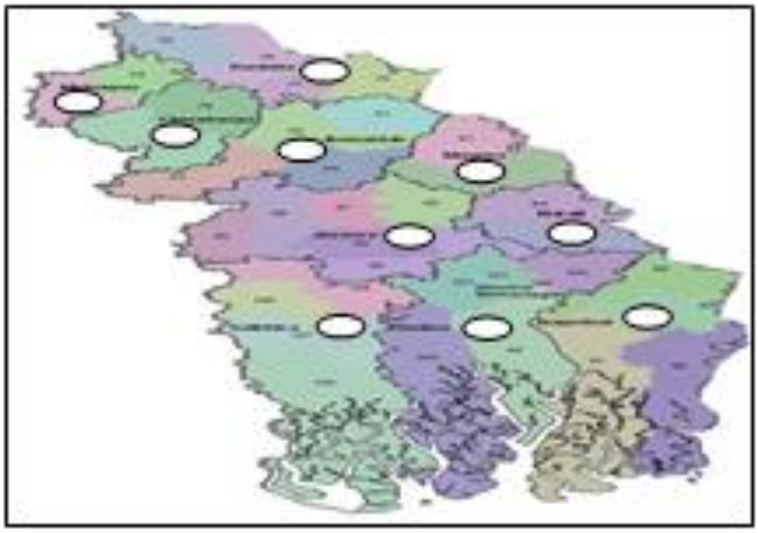

Fig 1: Fish Sp. distribution model of Khulna division

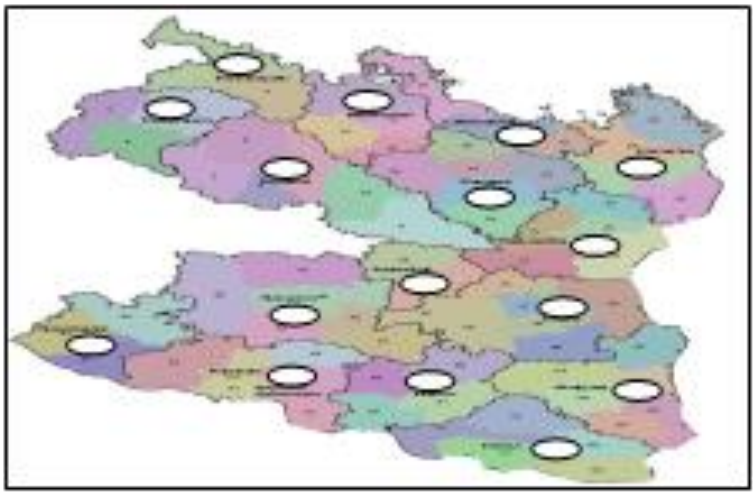

Fig. 2. Fish sp. distribution mode of Rajshahi division

		
Notopterus notopterus	*Notopterus chitala*	*Setipinna phasa*
		
Gagata viridescens	*Gagata cenia*	*Gogata youssoufi*

Plate 1: Some Fish fauna of Rajshahi and Khulna Divisions.

Conclusion

The taxonomic account of fish biodiversity in the present study comprises 160 species, 97 genera, 44 families, 12 orders. There were 130 species of fishes found in Rajshahi division and 126 species in Khulna division. Ninety six species are common in both divisions. The endemic species of Rajshahi division is 34 and Khulna division is 30 species. Systematic studies of the fresh water fish fauna of the study area with reference to ecology and distribution, seasonal availability, feeding habits, breeding season and migration need more research.

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Contribution of the authors:

Nahid Sultana: Collection of primary and secondary data and literatures, statistical analysis, and finalization of the manuscript

Mona Ashis Chowdhury: Collection of secondary data and literatures and draft manuscript writing.

Md. Nowsher Ali: Collection of literatures.

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