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A Review on Present Status, Potentials and Threats of Freshwater Fish Biodiversity of Nadia District, West Bengal, India

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ABSTRACT

Ichthyofaunal diversity of river primarily represents the fish faunal diversity and their abundance of freshwater ecosystem. Fish fauna play the main role in the stability of river and wetland ecosystem. Rivers are the good sources of natural feed for the fishes. Nadia district is situated between River Hooghly and Bangladesh border with three major river, canal and wetlands in West Bengal. The water bodies of the district show moderate fish diversity. But the water body of the district is becoming increasingly scared along with the uncontrolled growth of population and developmental needs. Since, reduction in biodiversity of freshwater fish species has led to a more scientific approach to fisheries management. The fish fauna is also under threat in the district Nadia. In the present review study total 112 fish species are found with 12 orders and 34 families. Here, Order Perciformes shows the highest diversity in families but the order Cypriniformes shows the highest diversity in species.

KEYWORDS: Fish Fauna, Biodiversity, Nadia District, Freshwater Fish

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INTRODUCTION

River plays an important role in preservation of water and Biodiversity. Biodiversity is very essential for stability and protection and also for maintains the quality of environment. River is rich with diversified fish fauna which plays a major role in the stability of river ecosystem. Among all the vertebrates, fish is half in numbers. Total 32447 species of fishes have been recorded in the world[1]. A large variety of fishes is also found in the Indian waters. The state is endowed with huge aquatic resources like -rivers, ponds/tanks, reservoir, beel, baurs and brackish water fishery and also by several wetlands. The state contains 7.5% of water resource of India[1]. In West Bengal there are 190 fresh water fish species which is nearly 23% of the Indian fresh water fishes[1]. As per Dey (2017)[2] West Bengal has rich with freshwater fish genetic resources near about 28.34% to the freshwater fish diversity of India. Aquaculture practices play a significant role in developed and developing countries for earnings and occupation throughout the world [3]. Ichthyofauna is also a natural resource of the rivers of Nadia. There are several rivers, lakes, ponds in Nadia district and these are rich, diversified and characterized by many rare, endemic and exotic fish species. In the present communication, an attempt has been made to provide the current pattern of freshwater fish biodiversity of Nadia district. This review also shows the threats to fish diversity and to make recommendations for Ichthyofaunal diversity conservation and management. Lack of information about the variety of present fish species will affect the ecosystem as well as socio-economic condition of the district. So survey is always needed for proper production and effective exploitation of fishes[4]. Survey of fish fauna will also help in the making of decision for conservation and management of fish germplasm, protection and preservation of endangered species.

GEOGRAPHICAL POSITION, AREA AND THE RIVERS OF NADIA DISTRICT

Nadia is a district of Presidency division of West Bengal. District Nadia is situated to the east of West Bengal. The position of Nadia district is 22°53” and 24°11” N latitude and 88°09” and 88°48”E longitude. The total area of this district is approximately 3927 sq km. Jalangi and Churni is the main inside river of Nadia district. The River Jalangi is a tributary of the river Padma of Bangladesh; 24°17′58″N 88°26′45″E. It flows from the north east side of Nadia district and discharges into the river Ganges at Nabadwip. The another main river of Nadia is Churni, a tributary of river Padma, originating from munshiiganj of Kustia district 23°08′N 88°30′E. It is a distributory of Mathabhanga River. It flows from the eastern side of Nadia and discharges into River Hooghly at Chakdaha. The River Ganges i.e. the Bhagirathi-Hooghly River flows through the western border of

the Nadia district. The river Ganges is the main river of south part of West Bengal. There are also many degraded river or canal like Anjana, beels etc. in the Nadia district. The position of Nadia district and its rivers are showed in the figure 1.

Samples of fish were collected at random from the different station of the rivers throughout year 2016 to 2017. Fishes were captured by gill net (variable mesh size), scoop net, drag net and cast net (5 mm x 5 mm mesh size). The collected samples were preserved in 5-10% formalin as per the size and brought to the laboratory for identification following standard taxonomic procedure[5,6] and listed according to their families and order. Identification was made up to species level.

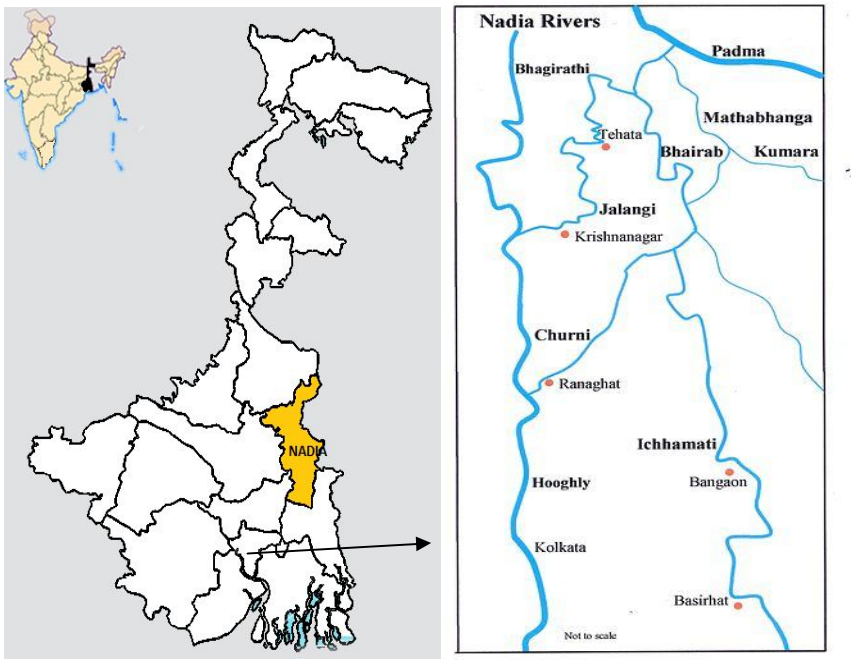

Figure 1: Geographical position of Nadia district, West Bengal, India and study area- main three rivers of the district (https://en.wikipedia.org/wiki/File:Nadia_Rivers.jpg)

TYPES OF THE FISHES

There are mainly two types of fishes according to origin, naturally occurring indigenous fishes and exotic fishes which are introduced from other places.

Indigenous fish species

Indigenous fishes are a critical component of healthy aquatic ecosystems as they form an important part of the aquatic food web and fulfill several important ecological functions. The presence of indigenous fish is one of the signs of a healthy riverine ecosystem, making indigenous fish good bio-indicators of healthy rivers.

Exotic fish species

Exotic fish species are those that are not native or endemic to the particular place. They are brought and introduced to a new place and named as exotic fishes. Exotic fish species are imported from a different country having different agro climatic conditions. Exotic fish species have made socio-economic benefits to each country. There are several introduced and transplanted fish species in West Bengal. Maximum exotic fish has been introduced legally. But some exotic fishes are from unauthorized introduction. About 288 exotic fish varieties are adopted and cultured throughout West Bengal[1]. Most of these adopted fish species are also cultured in Nadia district.

USES OF THE FISHES

Fish has a great ecological as well as economical value. In West Bengal 174 indigenous fishes are used as food fish along with some exotic fish species are also used as food[1]. It is estimated that 6% of the world's annual animal protein is supplied from fresh water fish species[7]. There also some fishes which are attractive and peaceful in nature called ornamental fishes. These fishes can be kept as a pet in closed small spaces such as aquarium or garden pool for beauty and fun. Ornamental fishes are the one of the most popular pet in the world[8]. There are total 70 indigenous ornamental fish species are recorded in West Bengal and some of them are found in Nadia district also[9].

FISHES OF NADIA DISTRICT

The water bodies of Nadia district contain indigenous and exotic fishes. Different authors made surveys on the several spot of different rivers, lakes, and canals of the district. During this study some fishes was collected from different spots and the order, family, scientific name, common or local name, human uses and the IUCN status were also compiled. We found 112 fresh water fish species belonging to 12 orders, 34 families and 77 genera from the water bodies of the Nadia district. The family cyprinidae of the order cypriniformes is the most diverse family which includes 36 species of 24 genera. According to IUCN Red List conservation status of the fish fauna of Nadia district suggest that there are 2 species under endangered category, 4 species are under vulnerable category, 13 species are under near threatened category, 85 species are least concern category, 2 species are under data deficient category and 6 species are under not evaluated category (Table 1, 2; figure 2).

Table No 1: Freshwater Fishes of Nadia district, West Bengal, India

Order and family	Sl. No.	Scientific name	Common name	Human uses	IUCN status	Reference /Source
Order: Anguiliformes						
Family: Anguilidae	1	*Anguilla bengalensis* (Gray, 1831)	Ban	F	NT	Basu et al. 2012
Family: Ophichthidae	2	*Monopterus cuchia* (Hamilton, 1822)	Kuchia	F	LC	Chakrabarty et al. 2006[10]
	3	*Pisodonophis boro* (Hamilton, 1822)	Kucho	F	LC	From Field Survey
Order-Beloniformes						
Family: Belonidae	4	*Xenentodon cancila* (Hamilton, 1822)	Kakia/ Kakre	O,F	LC	Basu et al. 2012
Order: Clupeiformes						
Family: Clupeidae	5	*Coricaso borna* (Hamilton, 1822)	Khorko	F	LC	Panigrahi et al. 2014
	6	*Gonialosa manmina (*Hamilton, 1822)	Khoira	F	LC	From Field Survey
	7	*Gudusia chapra* (Hamilton, 1822)	Khaira	F	EN	Chakrabarty et al. 2006
	8	*Gudusia variegata* (Day, 1870)	Khoira	F	LC	From Field Survey
	9	*Tenualosa toil* (Valenciennes, 1847)	Chandan Fish	F	NE	From Field Survey
	10	*Tenualosa ilisha* (Hamilton, 1822)	Ilish	F	LC	From Field Survey
Order: Cypriniformes						From Field Survey
Family: Balitoridae	11	*Aborichthys elongatus (*Hora,1921)	Gutum	O,F	LC	From Field Survey
Family: Cobitidae	12	*Acanthocobitis botia* (Hamilton,1822)	Natwa	O	LC	From Field Survey
	13	*Balitora brucei*(Gray, 1830)	Balitora	O	NT	From Field Survey
	14	*Schistura beavani* (Günther, 1868)	Creek loach	O	LC	From Field Survey
	15	*Schistura savona* (Hamilton, 1822)	Khorka	O	LC	From Field Survey
	16	*Botia dario* (Hamilton, 1822)	Betrongi	O, F	LC	Ghosh and Biswas 2017[11]
Family: Cobitidae	17	*Botia lohachata (*Chaudhuri, 1912)	Lohachata, bou	O	EN	From Field Survey
	18	*Canthophrys gongota* (Hamilton, 1822)	Ghor poia	O	VU	From Field Survey

	19	*Lepidocephalichthys guntea* (Hamilton, 1822)	Guntey	O	LC	From Field Survey
	20	*Lepidocephalichthys manipurensis* (Arunkumar,2000)	Gutum	O	LC	From Field Survey
Family: Cyprinidae	21	*Amblypharyngodon microlepis* (Bleeker,1853)	Mourala	O	LC	From Field Survey
	22	*Amblypharyngodon mola* (Hamilton, 1822)	Mourala	O,F	LC	Mukherjee et al. 2015[12]
	23	*Barilius barna* (Hamilton, 1822)	Ghol	F	LC	From Field Survey
	24	*Barilius bendelisis* (Hamilton, 1807)	Joia	F	LC	From Field Survey
	25	*Barilius tileo* (Hamilton, 1822)	Boroli	F	LC	From Field Survey
	26	*Cabdio morar* (Hamilton, 1822)	Baspata	O, F	LC	From Field Survey
	27	*Carassius auratus* (Linnaeus, 1758)	Gold fish	O,F	LC	From Field Survey
	28	*Chela cachius* (Hamilton, 1822)	Chela	O,F	LC	Dasgupta et al. 2014[13]
	29	*Chela laubuca* (Hamilton, 1822)	Chela	O,F	LC	Basu et al. 2012
	30	*Chagunius chagunio* (Hamilton, 1822)	Chaguni	O,F	LC	Basu et al. 2012
	31	*Cirrhinus mrigala*(Hamilton, 1822)	Mrigel	F	LC	Mukherjee et al. 2015
	32	*Crossocheilus latius* (Hamilton, 1822)	Kala bata	F	LC	From Field Survey
	33	*Ctenopharyngodon idellus* (Valenciennes, 1844)	Grass carp	F	NE	Bhakta et al. 2007[14]
	34	*Cyprinus carpio* (Linnaeus, 1758)	Common carp	F	LC	Bhakta et al. 2007
	35	*Danio devario* (Hamilton, 1822)	Techokha	O	LC	Basu et al. 2012
	36	*Danio rerio* (Hamilton, 1822)	Techokha	O	NT	Mukherjee et al. 2015
	37	*Devario aequipinnatus* (McClelland, 1839)	Chebli	O	LC	From Field Survey
	38	*Esomus danricus* (Hamilton, 1822)	Flying barb	O	LC	Basu et al. 2012
	39	*Garra gotyla gotyla* (Gray, 1830)	Klagachhi	F	VU	From Field Survey
	40	*Garra mullya* (Sykes, 1839)	Mottu	O,F	LC	From Field Survey
	41	*Catla catla* (Hamilton, 1822)	Catla	F	NE	Mukherjee et al. 2015
Family: Cyprinidae	42	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver carp	F	NT	Bhakta et al. 2007

	43	*Hypophthalmicthys mobilis* (Richardson, 1845)	Big-head carp	F	DD	Mukherjee et al. 2015
	44	*Labeo bata* (Hamilton, 1822)	Bata	F	LC	Mukherjee et al. 2015
	45	*Labeo calbasu* (Hamilton, 1822)	Kalbose	F	LC	Mukherjee et al. 2015
	46	*Labeo rohita* (Hamilton, 1822	Rui	F	NT	Mukherjee et al. 2015
	47	*Oreichthys cosuatis* (Hamilton, 1822)	Punti	O,F	LC	From Field Survey
	48	*Pethia conchonius* (Hamilton, 1822)	Kanchan punti	O,F	VU	Basu et al. 2012
	49	*Puntius phutunio* (Hamilton, 1822)	Punti	O,F	LC	Basu et al. 2012
	50	*Puntius sarana sarana* (Hamilton,1822)	Saral punti	O,F	LC	Basu et al. 2012
	51	*Puntius sophore* (Hamilton, 1822)	Punti	O,F	LC	Basu et al. 2012
	52	*Puntius stigma* (Valenciennes, 1844)	Punti	O,F	VU	Mukherjee et al. 2015
	53	*Puntius terio* (Hamilton, 1822)	Teripunti	O,F	LC	Basu et al. 2012
	54	*Puntius ticto* (Hamilton, 1822)	Titapunti	O,F	LC	Basu et al. 2012
	55	*Salmophasia bacaila* (Hamilton, 1822)	Chela	F	LC	Mukherjee et al. 2015
	56	*Salmophasia sardinella* (Valenciennes, 1844)	Jhola	F	LC	Mukherjee et al. 2015
	57	*Systomus sarana* (Hamilton, 1822)	Swarna punti	O,F	LC	Ghosh and Biswas 2015[15]
Family: Psilorhynchidae	58	*Psilorhynchus sucatio* (Hamilton, 1822)	Balitota	O	LC	From Field Survey
	59	*Aplocheilus panchax* (Hamilton, 1822)	Blue panchax	O	LC	Basu et al. 2012
Order: Cyprinodontiformes						
Family: Aplocheilidae	60	*Aplocheilus panchax* (Hamilton, 1822)	Kanpona	F	LC	Basu et al. 2012
Family: Poeciliidae	61	*Poecilia reticulata* Peters, 1859	Guppy	O	LC	From Field Survey
Order: Mugiliformes						
Family: Mugilidae	62	*Rhinomugil corsula* (Hamilton, 1822)	Khorsula	O,F	LC	Chakrabarty et al. 2006
Order: Osteoglossiformes						
Family: Notopteridae	63	*Notopterus chitala* (Hamilton, 1822)	Chital	O,F	NT	Basu et al. 2012
	64	*Notopterus notopterus* (Pallas, 1769)	Folui	O,F	NE	Basu et al. 2012

Order: Perciformes						
Family: Ambassidae	65	*Chanda ranga* (Hamilton, 1822)	Chanda	O,F	LC	Basu et al. 2012
	66	*Chanda nama* (Hamilton, 1822)	Chanda	O,F	LC	Basu et al. 2012
Family: Anabantidae	67	*Anabas testudineus* (Bloch, 1792)	Koi	F	DD	Mukherjee et al. 2015
Family: Channidae	68	*Channa gachua* (Hamilton, 1822)	Cheng	O,F	LC	Basu et al. 2012
	69	*Channa marulias* (Hamilton, 1822)	Sal	O,F	LC	Basu et al. 2012
	70	*Channa orientalis (*Bloch and Schneider, 1801)	Chang	O,F	NE	Mukherjee et al. 2015
	71	*Channa punctata* (Bloch, 1793)	Lata	O,F	LC	Basu et al. 2012
	72	*Channa striata* (Bloch, 1793)	Sol	O,F	LC	Basu et al. 2012
Family: Badidae	73	*Badis badis* (Hamilton, 1822)	Badis/blue perch	O	LC	Basu et al. 2012
Family: Chichlidae	74	*Oreochromis mossambicus* (Peters, 1852)	Tilapia	F	NT	Bhaktaet al. 2007
	75	*Oreochromis niloticus* (Linnaeus, 1758)	Lilontica	F	NE	Bhaktaet al. 2007
Family: Datniodidae	76	*Datnioides polota* (Hamilton, 1822)	Tiger fish	O,F	LC	Survey data
Family: Gobiidae	77	*Glossogobius giuris* (Hamilton, 1822)	Bele	O,F	LC	Basu et al. 2012
Family: Nandidae	78	*Nandus nandus* (Hamilton, 1822)	Bheda	O,F	LC	Basu et al. 2012
Family: Osphronemidae	79	*Trichogaster fasciata* (Bloch and Schneider, 1801)	kholse	O,F	LC	Basu et al. 2012
	80	*Trichogaster lalius* (Hamilton, 1822)	Lal kholse	O	LC	Mukherjeeet al. 2015
	81	*Colisa chuna* (Hamilton, 1822)	Chuna kholse	O	LC	Basu et al. 2012
Family: Scatophagidae	82	*Scatophagus argus* (Linnaeus, 1766)	Spotted scat	O	LC	Basu et al. 2012
Order: Siluriformes						
Family: Amblycipitidae	83	*Amblyceps mangois* (Hamilton, 1822)	Gang magur	O,F	LC	From Field Survey
Family: Bagridae	84	*Batasio batasio* (Hamilton,1822)	Batasia	O,F	LC	From Field Survey
	85	*Mystus bleekeri* (Day, 1877)	Tengra	O,F	LC	Chakrabarty et al. 2006

	86	*Mystus aor* (Hamilton, 1822)	Aar	O,F	LC	Basu et al. 2012
	87	*Mystus cavassius* (Hamilton, 1822)	Tengra	O,F	LC	Basu et al. 2012
	88	*Mystus guilo* (Hamilton, 1822)	Tengra	O	LC	Basu et al. 2012
	89	*Mystus tengara* (Hamilton, 1822)	Tangra	O,F	LC	Basu et al. 2012
	90	*Mystus vittatus* (Bloch, 1794)	tangra	O,F	LC	Chakrabartye t al. 2006
	91	*Rita rita* (Hamilton, 1822)	Rita	O,F	LC	Chakrabarty et al. 2006
Family: Chacidae	92	*Chaca chaca* (Hamilton, 1822)	chaca	O	LC	Basu et al. 2012
Family: Clariidae	93	*Clarias batrachus* (Linnaeus, 1758)	Magur	O,F	LC	Mukherjee et al. 2015
	94	*Clarias gariepinus* (Burchell, 1822)	Thai magur	F	LC	Mukherjee et al. 2015
	95	*Pangasius sutchi* (Fowler 1937)	African Pangus	F	LC	Bhakta et.al 2007
Family: Heteropneustidae	96	*Heteropneustes fossilis* (Bloch, 1794)	Singi	O,F	LC	Mukherjee et.al 2015
Family: Pangasidae	97	*Pangasius pangasius* (Hamilton, 1822)	Pangus	O,F	LC	Field survey
Family: Schilbedidae	98	*Ailia coila* (Hamilton, 1822)	Kajoli	O,F	NT	Chakrabarty et.al 2006
	99	*Eutropiichthys vacha* (Hamilton, 1822)	Bacha	F	LC	Chakrabarty et al. 2006
Family: Siluridae	100	*Ompok pabo* (Hamilton, 1822)	Pabda	O,F	NT	Basu et al. 2012
	101	*Ompok bimaculatus* (Bloch, 1794)	Pabda	O,F	NT	Basu et al. 2012
	102	*Ompok pabda* (Hamilton, 1822)	Pabda	O,F	NT	Mukherjee et al. 2015
	103	*Wallago attu* (Bloch and Schneider, 1801)	Boal	O,F	NT	Basu et al. 2012
Family: Sisoridae	104	*Bagarius bagarius* (Hamilton, 1822)	Garua	F	NT	From Field Survey
	105	*Hara hara* (Hamilton, 1822)	Tinkata	O	LC	Basu et al. 2012
Order: Synbranchiformes						
Family: Mastacembelidae	106	*Mastacembelus armatus* (Lacepède, 1800)	Ban	F	LC	Basu et al. 2012
	107	*Macrognathus aral* (Bloch & Schneider, 1801)	Pankal	F	LC	Basu et al. 2012
	108	*Macrognathus pancalus* (Hamilton, 1822)	Pankal	F	LC	Basu et al. 2012

	109	*Amphipnous cuchia* (Hamilton,1822)	Kuche	O,F	LC	Chakrabarty et al. 2006
Order: Syngnathiformes						
Family: Syngnathidae	110	*Microphis cuncalus* (Hamilton, 1822)	Crocodile tooth pipe fish	O	LC	From Field Survey
Order: Tetradontiformes						
Family: Tetradontidae	111	*Tetraodon cutcutia* (Hamilton, 1822)	Spotted Puffer fish	O	LC	Basu et al. 2012
	112	*Tetraodon fluviatilis* (Hamilton, 1822)	Green Puffer fish	O	LC	Basu et al. 2012

*****[(O=Ornamental fish, F=Food fish) and conservation status IUCN = International Union for Conservation of Nature and Natural, EN= Endangered; VU= Vulnerable; NT= Near Threatened; LC= Least Concern; DD= Data Deficient; NE= not evaluated]

THREATS TO FISH BIODIVERSITY

Making of unscientific dam, Occupancy of river bed by people, withdrawal of water for irrigation, deforestation, urbanization and industrialization has caused drastic changes the river bed and hydrology in terms of natural flow. Out of these, wanton killing, overexploitation of fishery resources and over-fishing due to high economic value has exacerbated the vulnerability of the fish population in different ecosystem of in the district of Nadia like other places of West Bengal. The most comprehensive, effective and evaluating procedure for the conservation status of animal and plant species in the world is IUCN. There are several species in threaten and endangered condition in West Bengal. Here required data is still insufficient and unavailable of many fishes for IUCN red list evaluation. So, proper survey is needed for those fishes.

Table No 2: Freshwater Fish diversity of Nadia district (order, family, genera and species wise)

Sl.No.	Order	Family	Genera	Species
1	Anguiliformes	02	03	03
2	Beloniformes	01	01	01
3	Clupeiformes	01	04	06
4	Cypriniformes	04	38	49
5	Cyprinodontiformes	02	02	02
6	Mugiliformes	01	01	01
7	Osteoglossiformes	01	01	02
8	Perciformes	10	11	18
9	Siluriformes	09	13	23
10	Synbranchiformes	01	01	04
11	Syngnathiformes	01	01	01
12	Tetradontiformes	01	01	02
Total	12	34	77	112

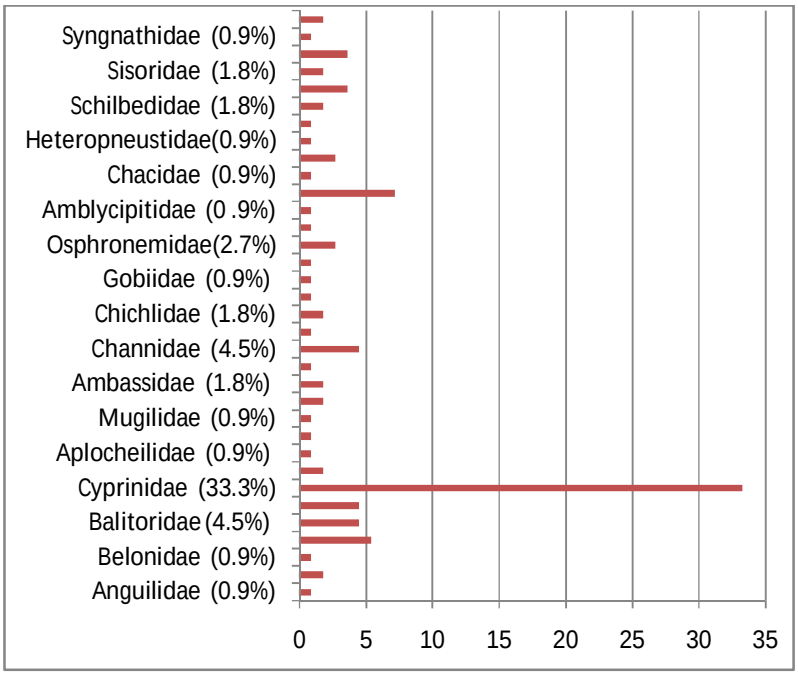

Figure 2: Number of species of different family of freshwater fishes of Nadia district (Horizontal axis indicates number of species in percentage and vertical axis indicates percentages of family)

CONCLUSION

Fish fauna is the one of the most important part of the riverine and wet land ecosystem. Here, a complete list of the freshwater fishes of Nadia district has been given. Most of the documented fishes are ornamental but many food fishes are also there. Fish diversity also indicates a healthy and stable ecosystem. Fisheries have a socio-economic role, so fish diversity plays an important role in local economy. Overpopulation, overexploitation of fish resource, increasing of predatory fish species is the big threat for fish diversity of Nadia district. There should be a proper utilization and conservation of the indigenous and exotic fish species for a healthy food resource and wealthy economy.

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