Int. J. Environ. Res., 2(3): 255-260, Summer 2008
ISSN: 1735-6865

Fish Diversity in Freshwater Perennial Water Bodies in East Midnapore District of West Bengal, India

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Received 10 Sep. 2007; Revised 25 Dec. 2007; Accepted 15 Jan. 2008

ABSTRACT: Present survey synthesized information on fish biodiversity in the perennial freshwater body of Ramnagar, East Midnapore district of West Bengal, India. We documented 45 fish species under 29 genera, 18 families and 8 orders during the periods from1990 to 1995, whereas, 34 species from 21 genera and 12 families under 7 orders were recorded presently from freshwater body of different perennial pond. This present database of ichthyofauna clearly indicated that 11 fish species, 8 genera, 6 families and 1 order have lost from this investigated area. Basically, this agricultural based area associated with profuse application of various chemicals, poisons and drugs in agricultural field that largely pollute perennial water body and ultimately exerting growing pressure on living aquatic resources and driven significant fish biodiversity decline. However, over fishing, chemicals, agricultural runoff and other forms of pollution are most important factors which should be restricted for the conservation of freshwater fish biodiversity. Therefore, it may be concluded that preparation of zone wise database of these information and their implementation through Government and various Non-Government Organizations would be the key tools for conservation of freshwater fish biodiversity.

Key words: Biodiversity, Fish, Freshwater, East Midnapore district of West Bengal

INTRODUCTION

India is endowed with vast freshwater consisting 45,000 Km. of rivers, 26,334 Km. of canals, ponds and tanks 2.36 million hectares and 2.05 million hectares of reservoirs, which present like harbor a rich and diversified fish fauna characterized by many rare and endemic fish species. About 21,730 species of fishes have been recorded in the world; of which, about 11.7% are found in Indian waters. Out of the 2546 species so far listed, 73 (3.32%) belong to the cold freshwater regime, 544 (24.73%) to the warm freshwater domain, 143 (6.50%) to the brackish water and 1440 (65.45%) to the marine ecosystem. The freshwaters of India have been viewed from a single perspective: that of economic production. They are to be sources of irrigation or urban-industrial water supply or of hydro power; they are to receive sewage and industrial waste; they may produce edible fish. In this strictly utilitarian framework, there is no space to conserve the rich heritage of freshwater ichthyofauna diversity of the country. Due to irrational fishing practices, environmental aberrations like reduction in water volume, increased sedimentation, water abstraction, and pollution over the years this diversity is on a decline and few species have been lost from the freshwater ecosystem of India and some are belonging under endemic, endangered and threatened category. A recent series of reviews (Dudgeon, 1999, 2000a, b, c, d, 2002a, b) has underscored the alarming condition of the region's rivers, which has been apparent for over a decade (Dudgeon, 1992). Their waters are grossly polluted, and dams and impoundments influence their natural discharge to such an extent that the lower Ganges and the Indus virtually cease to flow during the dry season (Postel and Richter, 2003). In the present context, freshwater fish biodiversity

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loss is an alarming threat and its conservation is only the solution of the problem. Though, West Bengal comprises diversified ichthyofauna in various habitats but freshwater fishes are a poorly studied group. There is no proper documentation since information regarding distribution, population dynamics and threats is incomplete, and most of the information available is from a few well-studied locations only. Therefore, it is important to prepare a zone wise database for listing the fish diversity in our country. Moreover, a data base on fish biodiversity is also essential as a decision making tool for conservation and management of fish germplasm, protection and preservation of endangered species and mitigation of anthropogenic activities so as to fulfill India's obligations under conventions on biological diversity with special reference to Articles 6 and 8 of UNEP (1992). In the present paper an attempt is made to prepare a consolidated list of freshwater fish species, to determine the cause of fish diversity loss and to suggest a various management plans relevant to the conservation of fish diversity of this perennial freshwater body.

MATERIALS & METHODS

Ten perennial ponds located in the Ramnagar, East Midnapore (Latitude 21.8°N and Longitude 87.8°E), West Bengal, India was selected for present survey (Fig. 1).

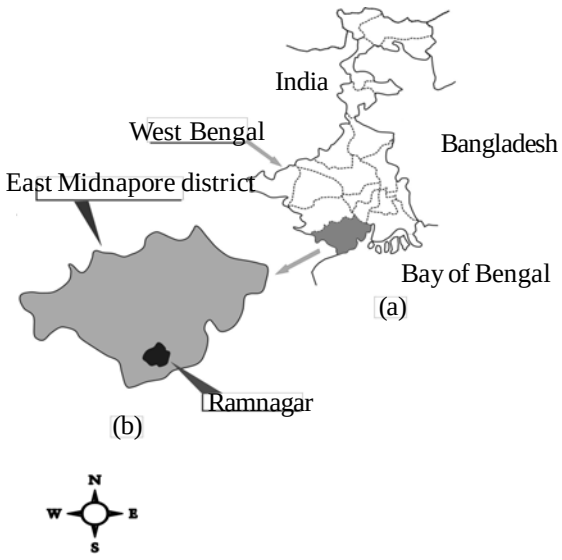

Fig.1. The location of East Midnapore district in the state of west Bengal, India

Freshwater fish species inhabiting the perennial ponds were collected to study the qualitative abundance. The specimens were collected using various types of fishing methods such as cast nets (16 mm, 18 mm, 22 mm), gill nets (32 mm, 38 mm, 64 mm, 78 mm, 110 mm), drag nets (4 mm, 15 x 3 meters), scoop nets and other local contrivances. Collected fish samples were preserved in 8% formalin for detailed examination and identification with the help of literature (Talwar and Jhingran, 1991; Sen, 1992; Jayaram, 1981, 1999). Extensive survey was also performed to collect the fish abundance data of previous year from 1990 to 1995 from local persons of the selected area.

Water samples were collected from ten ponds and examined for water pH and dissolved oxygen levels using specific electrode and probe of a Multiline System (F/SET-3, Best-Nr. 400327, WTW Wissenschaftlich-technische Werkstatten 82362 Weilheim, Germany), respectively. The concentration of ammonium-N, orthophosphate and hardness of water sample were analyzed following the standard methods described by APHA (1995). Water and sediment samples were collected from ten ponds and examined to identify the abundance of food (Plankton, Benthos and aquatic vegetation etc.) available for fish in the pond.

RESULTS & DISSCUSION

In the period from 1990 to 1995, the forty-four fish species under 29 genera, 18 families and 8 orders were recorded, whereas, thirty-four species from 21 genera and 12 families under 7 orders were presently collected and identified from freshwater body of different perennial pond of Ramnagar, East Midnapore. Maximum number of species (13 – 16) was found under the order Cypriniformes, whereas order Symbranchiformes comprised minimum number (1) among eight orders. The Scientific, common and local name of the species, together with their systematic position, commercial value and availability were described in Table 1.

This showed that about 10 fish species were ornamental, whereas left over 35 species were food fish and both groups of fishes have potent commercial value. Of the 45 recorded fish species, 7 were belonging to exotic fish and remaining fish species were indigenous group. Among all species listed in the Table 1, 5 were belonging under Indian major carp and 8 were recorded as jeol fish category.

The foods available to fishes in the ponds were populated with planktonic and benthic communities consisting of plants and animals.The phytoplanktonic communities were usually represented by major groups of algae, like green algae, blue-green algae, desmids, diatoms. *Eudorino, Ulothrix, Volvox, Chlorococcum, Pediastrum, Oocystis, Tetrallantos, Sceredesmus, Coelastrum, Oedogonium, Cladophora, Spirogyra, Microcystis, Aphanothece, Merismopedia, Dactylococcopsis, Spirulina, Oscillatoria, Lynabya, Symploca, Nostoc, Aradaera* and *Raphidiopsis* are the major knowngenera of phytoplankton. Protozoans, rotifers, cladocerans, copepods, and ostracods were represented as zooplanktonic communities found in ponds. Various animal larvae, worms and some immature stages of fishes are also found as occasional plankton. Zooplanktonic organisms like - *Cyclops, Cypris, Daphnia, Diaptomus, Microcyclops, Stenocypris, Cyclestheria, Pleuretra, Anuraeossia, Brachionus, Platyias, Keratella, Euchlanis, Dipleuchlanis, Triplechilanis, Macrochaetus, Mytilina, Epiphane, Diplois,* and *Monostyla, Chironomids are* major genera.The benthic food communities available to fish are small water insects, various worms, nematodes etc. Aquatic vContd. Table 1 egetation are also available to some fishes as a food like- Lemna, Pistia, Trapa, Chlorelle, Valisneria, Azolla, Anabaena, Eichonea, Najas, Hydrilla and Wolfia. The water pH ranged from 6.8 to 8.2 in ten ponds. Concentration of dissolved oxygen and hardness of water varied between 6 to 12.3 mg/L and 92 to 206 mg/L during the period of investigation, respectively. The value of ammonium-N and orthophosphate concentration ranged from 0.065 to 0.296 mg/L and 0.052 to 0.130 mg/L, respectively in different ponds.Present extensive survey allowed to gather data and essentially to develop the concepts of the number of previous (from 1990 to 1995) and present fish species inhabiting the perennial freshwater body of the area. Collected data demonstrated that 45 species from 29 genera and 18 families were found fewer than 8 orders during the period from 1990 – 1995 year, whereas 34 species from 21 genera and 12 families fewer than7 orders are recorded presently (Table 1). The present database of ichthyofauna clearly indicated that 11 fish species, 8 genera, 6 families and 1 order have lost from the investigated area during this period (Fig. 2). This 11 species of fish that have most possibly become locally are primarilylarge population size of fishes having high consumption value and subjected to heavyharvesting and affected by various anthropogenic activities such as: unethical over fishing, using of chemicals and poisons, dynamiting and habitat destruction of natural spawning and breeding grounds of the fishes. Human activity is causing the extinction of animal, plant and microbial species at rates that are a thousand times greater than those which would have occurred naturally (Wilson, l988). Basically, this agricultural based study area associated with profuse application of various chemicals, poisons and drugs as fertilizer, pesticides, insecticides, herbicides and antibacterial agents in agricultural field that largely pollute perennial water body and ultimately exerting growing pressure on living aquatic resources (like: planktonic, benthic and vegetative food of fish) present in the different niches of aquatic ecosystem and driven significant biodiversity decline or loss through bioaccumulation and biomagnifications of pollutants.Despite environmental damage caused by losing the ecosystem balance, the fish yield has also been drastically decline due to losing a number of commercially important fish species from this zone. Pimbert (1993) acknowledges that most of the species important for the maintenance of ecological processes are located in human-managed ecosystems such as agricultural and forestry land.

CONCLUSION

On the whole, taking into account, fish biodiversity conservation represents another major environmental challenge at the global level, and will continue under threat if there is no strenuous policy action to curb human activity. Few important management plans have been considered from the study for the conservation of fish biodiversity in the freshwater body which should be inserted into the fishery policies of the Government, such as, identification and listing of threatened and endangered fish species of freshwater body, determination of population size and distribution, find out the breeding behavior of threatened fish species which is essential for both *ex situ* and *in situ* conservation of the species, development of techniques of captive breeding and bloodstock maintenance of fishes of potential economic importance.

Table 1. List of fish species reported from the perennial ponds of Ramnagar, East Midnapore District of West Bengal, India

SL. No.	Scientific name	Common name	Local name	Systematic position	Category	Availability	
						1990 - 1995	2006
			A) Ord.: Osteoglossiformes				
1.	*Notopterus chitala*	Chital	Chital	Fam. - Notopteridae	N & F*	+	-
2.	*Notopterus notopterus*	Falui	Fali	Fam. - Notopteridae	N& F*	+	+
			B) Ord.: Cypriniformes				
3.	*Amblypharyngodon mola*	Morala	Chuna	Fam. - Cyprinidae	N,O & F***	+	+
4.	*Catla catla*	Catla	Katla	Fam. - Cyprinidae	N& F**	+	+
5.	*Cirrhina mrigala*	Mrigal	Mrigel	Fam. - Cyprinidae	N& F**	+	+
6.	*Ctenopharyngodon idella*	Grass carp	Grass carp /Gheso rui	Fam. - Cyprinidae	E& F**	+	+
7.	*Cyprinus carpio*	Common carp /Cyprinus	American rui /Cyprinus	Fam. - Cyprinidae	E& F**	+	+
8.	*Esomus danricus*	Dadhikha /Danrika	Thadia	Fam. - Cyprinidae	N,O & F***	+	-
9.	*Hypopthalmicthys molitrix*	Silver carp	Silver carp	Fam. - Cyprinidae	E & F**	+	+
10.	*Hypopthalmicthys nobilis*	Bighead carp	Bighead carp	Fam. - Cyprinidae	E & F**	+	+
11.	*Labeo bata*	Bata	Bata	Fam. - Cyprinidae	N & F**	+	+
12.	*Labeo Calbasu*	Calbasu	Calbaush	Fam. - Cyprinidae	N & F***	+	-
13.	*Labeo rohita*	Rohu	Ruhi	Fam. - Cyprinidae	N & F**	+	+
14.	*Puntius chola*	Punti	Kerrundi	Fam. - Cyprinidae	N O & F**	+	+
15.	*Puntius sarana*	Punti	Swarna punti	Fam. - Cyprinidae	N & F**	+	+
16.	*Puntius ticto*	Punti	Tita punti	Fam. - Cyprinidae	N, O & F**	+	+
17.	*Rasbora daniconius*	Morala	Mourala	Fam. - Cyprinidae	N, O & F***	+	+
18.	*Salmostoma sardinella*	Chela	Jhola	Fam. - Cyprinidae	N & F*	+	-
			C) Ord.: Siluriformes				
19.	*Clarius batrachus*	Magur	Magur	Fam. - Clariidae	N & F***	+	+
20.	*Clarias gariepinus*	Thai magur	Thai magur	Fam. - Clariidae	E & F*	+	+
21.	*Heteropneustes fossilis*	Singi	Singi	Fam. - Heteropneustidae	N & F***	+	+
22.	*Mystus menoda*	Arr tengra	Arr	Fam. - Bagridae	N & F**	+	-

Table 1. List of fish species reported from the perennial ponds of Ramnagar, East Midnapore District of West Bengal, India-Continued

SL. No.	Scientific name	Common name	Local name	Systematic position	Category	Availability 1990 - 1995	Availability 2006
23.	*Mystus tengara*	Tengra	Tengra	Fam. - Bagridae	N & F*	+	+
24.	*Mystus vittatus*	Tengra	Bitengra	Fam. - Bagridae	N & F*	+	+
25.	*Pangasius sutchi*	Pangus /African pangus	pangus	Fam. - Clariidae	E, O & F*	+	+
26.	*Wallago attu*	Boal	Balia	Fam. - Siliridae	N & F***	+	-
			D) Ord.: Channiformes				
27.	*Channa marulius*	Sal	Shal	Fam. - Channidae	N & F**	+	+
28.	*Channa orientalis*	Chang	Chang	Fam. - Channidae	N & F**	+	+
29.	*Channa punctatus*	Lata	Layta	Fam. - Channidae	N & F**	+	+
30.	*Channa striatus*	Shol	Shol	Fam. - Channidae	N & F**	+	+
			E) Ord.: Symbranchiformes				
31.	*Monopterus cuchia*	Ban	Ban	Fam. - Symbranchidae	N & F*	+	-
			F) Ord.: Perciformes				
32.	*Anabas testudineus*	Koi	Koi	Fam. - Anabantidae	N & F***	+	+
33.	*Chanda nama*	Chanda	Chada	Fam. - Chandidae	N, O & F***	+	+
34.	*Chanda ranga*	Chanda	Chada	Fam. - Chandidae	N, O & F***	+	+
35.	*Colisa fasciata*	Colisa	Khalsha	Fam. - Belontidae	N, O & F***	+	+
36.	*Glossogobius giuris*	Beley	Balkira	Fam. - Gobiidae	N & F*	+	-
37.	*Nandus nandus*	Bheda	Veda	Fam. - Nandidae	N & F*	+	-
38.	*Oreochromis mossambicus*	Tilapia	Tilapia	Fam. - Cichlidae	E & F*	+	+
39.	*Oreochromis niloticus*	Nilotica	Nilotica	Fam. - Cichlidae	E & F**	+	+
40.	*Rhinomugil corsula*	Kharsula	Kharsula	Fam. - Mugilidae	N & F*	+	-
			G) Ord.: Mastacembeliformes				
41.	*Mastacembelus aculeatus*	Goichi	Turi/Pakal	Fam. - Mastacembelidae	N & F**	+	+
42.	*Mastacembelus armatus*	Pankal	Turi/Pakal	Fam. - Mastacembelidae	N & F**	+	+

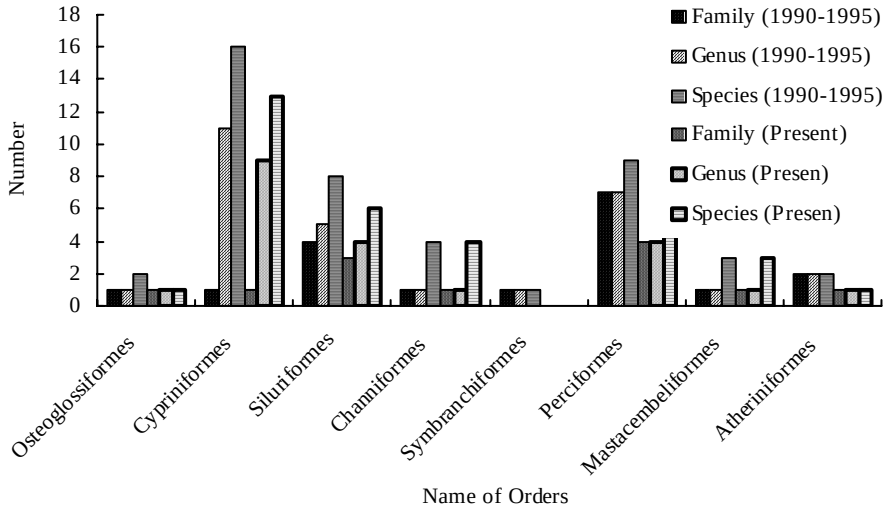

Fig. 2. Ichthyofauna of investigated area under different orders clearly indicating the loss of fish species

Establishment of hatcheries for bloodstock maintenance to *in situ* conservation and aqua ranching as a substitute for their natural recruitment. However, over fishing, chemicals, agricultural runoff and other forms of pollution are most important causes of fish biodiversity loss, which should be restricted for the conservation of freshwater fish biodiversity. From this point of view, it may be concluded that the zone wise database of this information and their implementation through Government and various Non-Government Organizations would be a key tools for conservation of freshwater fish biodiversity.

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