RESEARCH PAPER | Zoology | Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

Study on the Effects of Pollution on Ichthyofaunal Diversity of Selected Fresh Water Beels in Nadia District, West Bengal.

KEYWORDS: fish diversity, freshwater water bodies, pollution, Nadia district .

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ABSTRACT *In Nadia district , most of the fresh water water bodies are used for pisiculture all over the year and also perennial in nature. These water bodies harbor a rich floral and faunal diversities. In the present study, extensive field were made of 8 major beels in Nadia district of west Bengal . We identified presently 46 species belonging 7 orders from freshwater body of different perennial pond/beels. The physico-chemical parameter were evaluated. The agricultural effluents like organo-phosphate, pesticides, heavy metals, oil and effluents of different industries like plastic industries dye industries and fertilizers contaminate in pond water. As a result, fish diversity become threatened due to the anthropogenic activities. Thus, the water bodies in this area are under stress condition and small indigenous fish severely affected.. Thus, it also affects the livelihood of the fisher folks and local people. So, eco-friendly management and conservation strategies should be adopt for sustainable fish culture .*

INTRODUCTION

Lakes or ponds provide subsistence and livelihood for people through irrigation and agriculture, fish culture and fisher domestic use and water transport. These water bodies are the major life supporting systems facing ecological degradation today due to irrational human interference and unsustainable developments. The demographic pressure or the anthropogenic disturbances on our water resources and its ecosystems will irrevocably damage and destroy the rich biodiversity supported by it. Developments are necessary, but it shouldn't be at the cost of damage to the environment and should take place along the rational and sustainable lines .Environmental conservation should be at the base of all developments. It is necessary to ensure that the use of water from these habitats should be within sustainable limits without any environmental stress ,so that it doesn't affect either the fish biodiversity or the fish productivity. West Bengal comprises diversified ichthyofauna in various habitats.The major lakes/beels of district Nadia are shallow type ,freshwater lakes, perennial in nature and use for indigenous fish culture. The present work has been undertaken, to understand the seasonal fluctuation in water quality, fish-fauna and to suggest measures for the improvement of the fish production to uplift the economic condition of the fishermen.

STUDY AREA:

District Nadia is situated to the east of the state of the West Bengal, India. The district is positioned between $22^0 53''$ and $24^0 11''$ N latitude and $88^0 09''$ and $88^0 48''$E longitude. The total area of this district is approximately3927 sq.km. we selected 8 major beels in the district.

OBJECTIVES

To document fish species richness and geographical distribution of different species from different important water bodies (rivers, canals, beel/daho, big tanks etc.).To document the occurrences and preference in and to various aquatic habitats of different fish species.To assess the present and past status of those species , basically through interaction with fisher-folks. Above all, to suggest conservation strategies for the fish habitats and fish species for the districts to be adopted.

MATERIALS AND METHODS:

Selection of beels: Eight major beels were selected for investigation during the period September 2013 to August 2014.

Collection of samples: Samples were collected every fifteen days interval during the study period at 9 am to 11 am. Samples were preserved in BOD sampler bottle and immediately transferred to the laboratory for investigation.

Water quality analysis: Some water quality parameters like temperature, pH, and dissolved Oxygen were measured on the spot. Temperature of water was measured with the help of mercury thermometer in centigrade scales; pH of water was measured with the help of Hanna device (HANNA-PHEP). BOD was measured according to Trivedi and Goal (1984). Rest of the parameters were measured according to standard methods described by APHA (2005).

Identification of fishes: Fishes were collected from the beels with the help of fisher men from each sampling zones by using various crafts and gears and local people. Besides these, local fish market visit and collect information from regarding occurrence and abundance of different fish species in different aquatic habitats in that locality and changes of that over the past. Common fishes are identified on the spot and living fishes were released to the environments. Those fishes which were difficult to identify brought to the laboratory, preserved in formalin, labeled with date of collection and location. Identification of fishes were done with the help of different books.

Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

RESULT AND DISCUSSION :

Table 1.: The major sources of pollution were identified during the survey listed .

Serial no.	Sources of pollution	Nature of pollutants
01	Municipal wastes of Nadia district	Solid
02	Domestic waste	Soap, detergent, washing of cattle, cow dung, washing of fertilizer bag and pesticides container.
03	Pharmaceuticals and other industries	Chemicals
04	Agricultural wastes	Pesticides and fertilizer runoff
05	Ashes from Burning Ghats	Ashes
06	Wastes from rituals	Organic wastes and Chemicals
07	Jute retting	Organic wastes
08	Bricks fields	Fly ash
09	Silt	Clay

Table 2: Seasonal changes (mean±SD) water quality parameters (average) in the beels in Nadia district

Water quality parameters	Premonsoon Upper limit-lower limit (mean±SD)	Monsoon	Post monsoon
water temperature(^{0}C)	29.9-34.1 (32±1.5)	32.7-33.9 (33.3±0.5)	24.8-29.9 (27.35±1.8)
pH	7.83-8.32 (8.07±0.22)	7.10-7.80 (7.45±0.26)	7.72-8.10 (7.91±0.15)
DO(mg/l)	2.74-4.58 (3.66±0.8)	2.88-4.60 (3.74±0.6)	5.15-5.92 (5.53±0.3)
BOD(mg/l)	1.75-3.48 (2.61±0.5)	1.98-3.27 (2.62±0.5)	3.71-4.87 (4.28±0.5)
Total alkalinity(mg/l)	30.87-47.06 (38.96±6.17)	34.68-52.64 (43.66±6.48)	27.10-34.21 (30.65±2.09)
Total hardness (mg/l)	108.65-127.45 (118.05±6.4)	100.94-122.87 (111.90±7.9)	95.28-104.59 (99.45±3.0)
Nitrate (mg/l)	0.75-1.18 (0.95±0.1)	1.20-1.75 (1.47±0.2)	0.82-1.29 (1.05±0.1)
Phosphate(mg/l)	020-0.58 (0.39±0.1)	0.54-0.69 (0.59±0.03)	0.34-0.40 (0.37±0.05)

Abiotic and biotic factors have an important role in supporting fish diversity and fish culture in lake ecosystems. The relationship between abiotic factors and living organisms in fish culture ponds is far from being unidirectional because fish population will dramatically affect the trophic status of other organisms and alter the water conditions in various ways. Physico-chemical parameters like pH, temperature, dissolved oxygen; ammonia-nitrogen, phosphorus and chlorides have a greater influence on survivability of the fishes. The average range of physico-chemical parameters of the wetlands during different seasons are shown in the Table 2. Changes in physico-chemical conditions of water can also cause mass mortalities of fish eggs and larvae apart from causing various abnormalities in the fish stocks.

Sharma and Gupta (1994) had reported that fish growth has better at temperature range 14.5-38.6 ^{0}C. Fishes have their tolerable limits for pH fluctuation beyond which they cannot survive (Alikunhi, 1957). Some Fluctuation of Dissolved Oxygen affects on the photosynthetic activity which preventing of microbial decomposition which will provide a suitable environment for fish culture.

The temperature is the most vital among all parameters which has a great role in growth, reproduction and distributions of animals. The temperatures were recorded 32^{0}C, 33.3^{0}C, in pre-monsoon and monsoon time respectively in the wetlands, besides that due winter season i.e.; post monsoon period it becomes lower 27^{0}C around. The range of temperature 20^0-35^0 c is ideal for fish production and rearing. pH range is7.1-7.8 throughout the year during our investigation. Dissolved Oxygen (DO) is the most significant parameter which is essential for survive the animals. DO concentration is les 2.77 in premonsoon period . ideal freshwater bodies DO contain in 5mg/lt is recommended for carp culture. DO is high in range post monsoon period.in 5.15.mg/lt. The Biological Oxygen Demand(BOD) value showed from 2.61mg/l to 4.28mg/l . Total alkalinity 40-240mg/l is ideal for fish culture in lakes. where as lowest value30mg/l showed in post monsoon period. Total hardness in range of 60 ppm is essential for

Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

fish production. There are decreasing trend of hardness in the lakes from premonsoon to monsoon to post monsoon i.e, 118.05mg/l ,111.90mg/l, 99.45 mg/l respectively. Nitrates are the prime index of immediate fertility of water. The values of nitrates ranged between 0.95 mg/l and 1.47 mg/l throughout the year in the study. Nitrates value very low in summer months and remain high in rainy season. Phosphates is major nutrients in waterbody. It ranges between o.37 mg/l to 0.59 mg/l throughout the year in our study. The total phosphates in natural water varies from less than 1mg/m^3 to a high value as in a few closed saline lakes(Jhingran,1991). Increase value of phosphate in lakes or ponds causes eutrofication.

Table 3: identified fishes were listed during investigation period.:

Sl No.	Scientific Name	Common Name/local name	Order	Occurrence
1	*Labeo rohita*	Rohu	Cypriniformes	+++
2	*Labeo bata*	Bata	Cypriniformes	++
3	*Cirrhinus mrigala*	Mrigel	Cypriniformes	++
4	*Catla catla*	Catla	Cypriniformes	+++
5	*Labeo calbasu*	Calbasu	Cypriniformes	++
6	*Puntius sarana sarana*	Saral punti	Cypriniformes	++
7	*Puntius ticto*	Tita punti	Cypriniformes	++
8	*Puntius javanicus*	punti	Cypriniformes	+
9	*Puntius terio*	punti	Cypriniformes	++
10	*Puntius stigma*	Punti	Cypriniformes	+
11	*Hypophthalmicthys molitrix*	Silver carp	Cypriniformes	++
12	*Hypophthalmicthys mobilis*	Big-head carp	Cypriniformes	++
13	*Cyprinus carpio*	Common carp	Cypriniformes	++
14	*Salmostoma bacila*	Chep chela	Cypriniformes	+
15	*Salmostoma sardinella*	Chela	Cypriniformes	++
16	*Barilius bola*	Bhola	Cypriniformes	+
17	*Anabas testudineus*	Koi	Perciformes	++
18	*Heteropneustes fossilis*	Singi	Siluriformes	+++
19	*Clarius batracus*	Magur	Siluriformes	+++
20	*Ompak pabda*	Pabda	Siluriformes	++
21	*Notopterus notpterus*	Folui	Siluriformes	+++
22	*Mystus vittatus*	Tangra	Siluriformes	+++
23	*Mystus tengra*	Tangra	Siluriformes	++
24	*Channa (Ophiocephalus) punctutas*	Lata	Ophiocephaliformes	++
25	*Channa maurilis*	Shal	Ophiocephaliformes	+
26	*Channa orientalis*	Chang	Ophiocephaliformes	++
27	*Channa striatus*	Shol	Ophiocephaliformes	+
28	*Nandus nandus*	Veda	Perciformes	+
29	*Monopterus cuchia*	Ban	Symbranchiformes.	++
30	*Mystus bleckeri*	Tangra	Siluriformes	++
31	*Pseudambassis ranga*	Ranga	Perciformes	++
32.	*Chanda nama*	Chanda	Perciformes	+++
33	*Gumbusia gumbusia*	Techokha	Cypriniformes	+++
34	*Pangasius sutchi*	Pangas	siluriformes	++
35	*Puntius conconius*	Punti	Cypriniformes	++
36	*Oreochromis mossambicus*	Tilapia	Perciformes	+++
37	*Colisa fasciatus*	kholse	Perciformes	++
38	*Gudusia chapra*	Chapa	Clupiformes	++
39	*Amblypharyngnodon mola*	Morala	Cypriniforms	++
40	*Glossogobius giuris*	Bele	Perciformes	++
41	*Chanda ranga*	Chanda	Perciformes	++
42	*Colisa lalia*	Lal kholse	Perciformes	+++
43	*Mastacembelus armatus*	Pankal	Mastacembeliformes	++
44	*Rasbora daniconius*	Morala	Cypriniformes	++
45	*Clarius gariepinus*	Thai magur	Siluriformes	++
46	*Wallago attu*	Boal	Siluriformes	+

Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

Note: +++ Most common,++ common,+ rare

CONCLUSION.:

We documented about 46 fish species out of number of fish species 19– 21 was identified under the order Cypriniformes,and they are dominant in these area. 8-9 species under perciformes were recorded. 7-9 fish species under order siluriformes and 4-5 species under order ophiocephaliformes were found. whereas order Symbranchiformes (*Monopterus cuchia*) and order mastacembeliformes *(Mastacembelus armatus)* and order clupiformes comprised minimum number 1 species of each . It is demonstrated that health of the environment decides the diversity and productivity of the aquatic systems. Therefore, for sustaining the diversity of fish, and for sustainable management of the fish culture, it is important to know the factors controlling the quality of the lake systems. Certain changes in physico-chemical parameters, drainage of pesticides and fertilizers from the surrounding crop fields, heavy siltation during heavy rainfall, high density of fingerling stocking of selected culture fishes, poor management of fish culture and fish diseases were found to exert undesirable impacts on fish diversity and productivity. Rational management methods by creating public awareness has to be followed for sustaining fish diversity and for sustainable fish production and eco-friendly management practice in these lakes for preventing any further natural and rural economic loss. A periodic survey and monitoring of these water bodies is essential to check the water quality and prevent any disturbances to these wetland ecosystems. The documentation of fish species distribution in various habitats will assist in resource allocation between different user communities who depend on fishing as a livelihood strategy.

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