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Water Quality Assessment of Lake Water of Patna Bird Sanctuary with Special Reference to Abiotic and Biotic Factors

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Abstract: Study on limnobiotic status of the Patna Bird Sanctuary (PBS) water was made to assess the pot ability of water for all three seasons (winter, summer and rainy) of 2004 to 2005. PBS exhibits high alkalinity with pH ranging from 7.4 to 8.0, alkalinity from 131 to 428 mg/l, Phosphates from 0.02 to 0.11 mg/l and BOD from 18.00 to 44.07 mg/l. The population of zooplanktons varies with the change in climate of the PBS. The maximum population of Rotifers (1178 number/l) and Cladocers (851 number/l) were recorded in the month of May and June, respectively. However, Copepods and Ostracods were attained highest population (946 and 212 number/l, respectively) during the month of December. The observations revealed that the PBS water is inferior and not suitable for drinking purposes. The possible factors for its poor quality have been discussed.

Key words: Physiochemical factors · Seasonal variation · Zooplankton · Patna bird sanctuary

INTRODUCTION

The state government of Uttar Pradesh declared Patna as a full fledged Sanctuary in year 1990 by the special gazette notification (Ref. No. 2432/14-3-49/90 dated 22-12-1990). It tallies name from village Patna of Jalesar Tehsil in Etah district. It spread over an area of 108.86 hectare which is an important place for breeding of the birds [1].

The accidental or infant mortality in aquatic and semi aquatic migratory birds, fish killing and the climination of desirable species as a result of oxygen depletion constitute a serious eutrophication problem in aquatic habitats of Patna Bird Sanctuary (PBS). Our knowledge on limnology of these a lake is quite meager. Therefore, the present investigation has been undertaken to investigate the physiochemical and biological factors of the lake for holding good population of fishes and aquatic as well as semi aquatic migratory bird too.

MATERIALS AND METHODS

Surface water samples were collected in clean polyethylene containers fortnightly from May 2004 to Jan 2005. The collected samples were brought to the laboratory for the estimation of various physiochemical parameters. The procedures were followed as per the suggestions of [2]. Temperature and pH were recorded on the same day at site. The dissolved oxygen was analyzed by using Winkler's modification method. On the other hand, potassium, chloride and phosphate were extracted by flame photometric method, argentometric method and stannous chloride method, respectively. However, the numerical estimation of zooplankton was done by using Sedgewick Rafter Cell.

RESULTS AND DISCUSSION

The physiochemical study of PBS lake water revealed that the temperature varied from 17.10 0.087 to 26.06 0.096°C, pH from 7.46 0.043 to 7.86 0.096, DO from 6.05 5.056 to 482 0.876 mg/l and BOD from 15.2 0.175 to 44.04 0.026 mg/l (Table 1). As far as biotic factors (zooplanktons) were concerned, the maximum population (1178 number/l) of Rotifers was recorded in the month of May. However, the highest population (851 number/l) of Cladocers was found in the month of June. On the other hand, Copepods and Ostracods were attained maximum numbers (946 and 212 number/l, respectively) during the month of December (Table 2). The recorded tropical ranges corroborated with other Indian lakes [2, 3].

The pH depicted alkaline nature varied between 7.46 to 7.83 mg/l. It recorded minimum in the month of January and maximum in the month of June. Alkaline nature of lake water in summer could be attributed to the increase of the photoperiod.

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Table 1: Seasonal variation in abiotic factors of lake water of Patna Birds Sanctuary (2004 - 2005)

	Winter		Summer		Rainy	
Parameters	December	January	May	June	August	September
Water temp. (°C)	17.10 ± 0.087	15.06 ± 0.096	25.10 ±0.148	33.06± 0.096	26.06± 0.096	24.10 ±0.096
pH	7.50 ±0.087	7.46 ±0.043	7.86±0.096	7.83± 0.043	7.50 ±0.087	7.53 ±0.043
DO (mg/l)	6.05 ± 5.056	6.07 ±0.043	380.33±1.332	482 ± 0.876	148.33±0.499	150.33± 0.499
BOD (mg/l)	15.2 ± 0.175	18.04 ± 0.043	39.01± 8.764	44.04 ±0.026	40.72± 0.508	38.02 ± 0.017
Potassium (mg/l)	3.01 ± 8.764	2.9 ± 8.764	1.69±5.056	1.80 ± 5.056	1.06 ± 8.764	1.30 ± 5.056
Chloride (mg/l)	7.06 ± 8.764	10.04 ± 8.764	9.02 ± 8.764	11.01± 8.764	7.05 ± 8.764	8.08 ± 8.764
Alkalinity (mg/l)	132.66±1.822	156.66±0.499	9.02 ± 8.764	11.01± 8.764	7.05 ± 8.764	8.08 ± 8.764
Phosphate (mg/l)	0.04±5.056	0.02±5.056	0.09±5.056	8.08±8.764	0.10±5.056	0.03±5.056

Table 2: Seasonal variations in the biotic factors (zooplankton's unit number/l) in the lake water of Patna Birds Sanctuary (2004 -2005)

	Winter		Summer		Rainy	
Zooplanktons	December	January	May	June	August	September
Rotifera	989.00	884.00	1178.00	745.00	696.00	768.00
Cladocera	0.00	0.00	120.00	851.00	741.00	510.00
Cpepoda	946.00	726.00	348.00	102.00	456.00	526.00
Ostracoda	212.00	0.00	0.00	88.00	82.00	96.00

The dissolved oxygen (DO) concentration fluctuated between 4.08 to 6.07 mg/l. The DO did not show any definite annual pattern but its higher concentration was recorded (482 0.876 mg/l) during winter and early monsoon. It showed an inverse correlation with water temperature which is in conformity with other findings [5]. Biological Oxygen Demand (BOD) was ranged from 15.2 to 44.04 mg/l and the maximum value (44.04 mg/l) was recorded in rainy seasons, indicating contamination of organic wastes. The BOD is inversely correlated with DO, suggesting its consumption during aerobic degradation of organic wastes.

The alkalinity fluctuated between 7.05 and 156.66 mg/l. The potassium was recorded from 1.06 – 3.01 mg/l, contributed to the hardness of water. The first three alkaline earth metals also depicted direct correlation with hardness of water. High concentration of chloride (7.05 to 11.01 mg/l) in the PBS reflects the presence of high amount of organic pollutants [6]. Some workers are pointed out that chloride content also increase with the degree of eutrophication [7]. Phosphate fluctuated between 0.02 and 0.10 mg/l. Its value is high because of continuous disposal of city sewage into the lake.

The zooplanktons were represented by four groups namely Rotifera, Cladocera, Copepoda and Ostracoda (Table 2). Rotifers contributed zooplankton richness in PBS accounting 52.38% followed by copepodes 26.5%. cladocerans 16.45% and ostracodans 4.67%. The rotifers and copepodes were found in the lake throughout the year, whereas cladocerans made their appearance in May, persisted up to November and disappeared in December. However, Ostracodes were remained in small number around the year. The annual range of zooplankton richness in PBS Lake is higher than other lake as reported by others [8-11].

The present study depicted considerable variations in overall community structure within limonitic zooplanktons. Dominance of rotifers in the lake could be attributed to the continuous supply of food material, which in turn indicates eutrophic nature of the lake. The rate of eutrophication is increasingly and the necessary steps should be taken up to check the eutrophication of lake at Patna Bird Sanctuary [12].

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REFERENCES

1. Sharma R. and A. Capoor, 2010. Seasonal Variations in Physical, Chemical and Biological Parameters of Lake Water of Patna Bird Sanctuary in Relation to Fish Productivity. World Appl. Sci. J., 8(1): 129-132.

2. APHA, 1991. Standard methods for examination of water and waste waters. 16th Ed. American Public Health Association, Washington, USA.
3. Shastri, Y. and D.C. Pendse, 2001. Hydrobiological study of Dahikhuta reservoir, J. Environ. Biol., 22: 67-70.
4. Singh, D.N., 2000. Seasonal variation of zooplankton in a tropical lake, Geobios., 27: 92.
5. Bath, K.S. and H. Kaur, 1997. Crustacean population in relation to certain physico-chemical factors at Harike reservoir (Punjab), J. Environ. Ecoi., 15: 954-957.
6. Jha, A.N. and P.K. Verma, 2000. Physico-chemical properties of drinking water in town area of Godda district under Santal Pargana (Bihar), India, Poll. Res., 19: 245-247.
7. Sharma, K.P., P.K. Goel and B. Gopal, 1978. Limnological studies of polluted freshwater Physico-chemical characteristics, Int. J. Ecoi. Environ., 4: 89-105.
8. Kaushik, S. and N. Sharma, 1994. Physico-chemical characteristics and zooplankton population of a perenial tank, Matsya Sarowar, Gwalior, J. Environ. Ecoi., 1: 429-434.
9. Patil, C.S. and B.Y.M. Goudar, 1985. Ecological study of fresh water zooplankton of a subtropical pond, Int. Revue. Ges. Hydrobiol., 70: 259-267.
10. Patil, H.S. and S.M. Karikal, 2001. Zooplankton diversity of Bhutnal water reservoir at Bijapur, Kamataka state. In: Water quality assessment and zooplankton diversity (Ed: B.K. Sharma), pp: 236-249.
11. Zutshi, D.P., B.A. Shukla, M.A. Khan and A. Wanganeo, 1980. Comparative limnology of nine lakes of Jammu and Kashmir Himalayas, Hydrobiologia, 80: 101-112.
12. Sharma R. and A. Capoor, 2009. Study of the Water quality of Lake Water of Patna bird sanctuary, Etah (U.P.). Bionotes, 11(2): 57.