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EVALUATION OF TROPHIC STATUS IN CERTAIN TROPICAL WETLANDS THROUGH ANALYZING THE CERTAIN PHYSICO-CHEMICAL PARAMETERS AND ITS AFFILIATION WITH ZOOPLANKTON POPULATION

Arun Kumar Namdeo[1]* and Pradeep Shrivastava[2]

[1-2] *Department of Environmental Science and Limnology, Barkatullah University, Bhopal (M.P.)*

E-mail: arunnamdeobioinfo@gmail.com

ABSTRACT

Water a unique element for existence of life. It has various uses since the period of origin of human civilization. In the period of imperial rulers water resources was being used for recreation, water sports and celebration of festival – fair on the bund of tanks. In the 8th and 9th A.D., the Chandela rulers in district Tikamgarh have constructed a large number of tanks for irrigation and recreation but as time passage these tanks got deformed or extinct through various point and non – point sources of pollution. Present study has been carried out to evaluate the primary status of existing tanks or remaining tanks of chandela dynasty through analyzing the certain physico – chemical parameters and its relationship with zooplankton population.

Keywords: *Chandela rulers; Primary status; Tikamgarh; Zooplankton population*

INTRODUCTION

The District Tikamgarh situated on the Bundelkhand plateau of Madhya Pradesh region of India, is rich in lentic aquatic resources except it does not have any big reservoir or dam. There are 960 tanks which were constructed by Chandela kings during the 8th and 9th A.D. in the district, Out of them 127 tanks are in existence and the rest of them got extinct and the remaining live tanks, that support the socio – economic condition in district are facing the threats of extinction from various point and non – point pollution sources and that's why, it becomes necessary to take an action and devise a suitable strategy for their restoration and conservation before their extinction for a better environmental development. Information about present status of wetland may be a key in development of perfect strategy of preservation and restoration.

MATERIALS AND METHODS

A detailed exploratory field surveys and extensive literature review were carried out to find the present status of tropical wetlands in Tikamgarh district and the related problems. This was helpful for selection of water bodies for further investigation. A detailed investigation was done in five water bodies; two from urban area and three from rural area to get an exact picture of Problems.

Water quality of these water bodies was evaluated by monitoring the Physico – chemical and biological characteristics, following APHA

[American Public Health Association, Standard Methods for Water and Waste water Analysis, 1998] and Manual on Water and Waste water Analysis, NEERI, 1988. Samples for zooplankton examined under microscope and identification done using standard key; Pennak, 1989.

RESULTS AND DISCUSSION

The detailed field survey and secondary data from various Government and non – Government organizations reveals that the Socio – economic condition is in quite good state in the vicinity of urban tanks like Mahendra Sagar and Shail Sagar where as in rural areas the Socio – economic scenario is in very bad shape due to the weak infrastructure and poor standard of living. There are 483 (approx.) Fishermen societies, with their family, exploiting the wetlands for fishing and making 25 tonnes annual fish production in district: Tikamgarh also practices Trapa culture and lotus culture to support their livelihood. Livelihood in rural areas depends to a great extent on the wetlands in comparison to urban areas; but the wetlands of both areas are facing the same threats for some extent.

The average water temperature (Table –I) ranged between 17 to 18.5°C confirms the absence of thermocline. The green, greenish – blue and greenish – brown colour of water with fishy odor and H_2S smell (at Shail Sagar) denotes intense pollution in all the tanks with anaerobic condition of the bottom.

pH is considered as an index for suitability of the aquatic environment. Webber and Stumm (1963) have concluded that the pH of the water sources mostly lies within the range of 6.5 to 8.5 and this is the range recommended by the Indian

Table – I .The Average values of Physico – chemical parameters

Parameters	Mahendra Sagar	Shail Sagar	Kumhedi Taal	Barana Taal	Dumduma Taal
Colour	Green	Greenish brown	Greenish blue	Greenish brown	Greenish brown
Odor	Fishy	H_2S smell	Fishy	Fishy	Fishy
Water Temperature (°C)	18.5	18.33	17.5	17.5	17
Transparency(cm)	32.5	41.85	35	30	31.5
Turbidity(NTU)	449.9	848.66	561.1	207.7	167.5
pH	9.9	8.7	8.1	9.45	8.65
Specific Conductivity(µmhos)	671.5	1266.66	837.5	310	250
D.O. (mg/l)	21	11.2	11.4	5.7	10.4
B.O.D.(mg/l)	16.2	10.48	7.8	6.8	9
C.O.D.(mg/l)	23.5	19.66	17	11.1	17.8
Total Alkalinity(mg/l)	54	53	52.5	76	58.5
Calcium Hardness(mg/l)	124.3	188.3	270.55	314.5	38.85
Magnesium Hardness(mg/l)	9.4	115.03	94.45	11.5	41.15
Total Hardness(mg/l)	129	303.33	365	326	80
Nitrate (mg/l)	1.406	1.43	1.398	1.399	1.396
Ortho-Phosphate(mg/l)	1.8	1.358	1.703	1.713	1.696

Standards for drinking water. The average pH values ranged from 8.1 to 9.9 shows alkaline nature of water bodies. Generally, the Specific conductivity in fresh water bodies ranges from 14 µmhos to 600 µmhos and this is considered as a standard for assessing the trophic status of water bodies. The average values of specific conductivity was observed in the range of 250 to 1266.66 µmhos indicates hypo – eutrophic to hyper eutrophic condition of tanks similar results were obtained by Namdeo et.al (2013) during evaluating Seasonally Varying Limnology of a Tropical Irrigation Barna Reservoir. The average value of D.O. ranges between 5.7 to 21 mg/l and the high average value was recorded at Mahendra Sagar tank, the higher value of DO content indicate the great abundance of algal bloom and the high rate of photosynthesis, similar findings were made by Namdeo et. al. (2013) while doing study on Hydrobiology of a Tropical Reservoir with special reference to seasonal flux in certain Physico–chemical parameters.

Figure-1. Percentage contribution of Zooplankton at Mahendra Sagar

Raina et al. (1984) pointed out that Nitrate concentration in excess of 0.3 mg/l may stimulate algal bloom. However, in the present investigation, the average values of Nitrate was found more than 0.3 mg/l, it ranged between 1.96 to 1.43 mg/l. The higher concentration of Nitrate indicates increasing eutrophication in the tropical wetlands of district Tikamgarh.

Reid (1961) showed that the mean Phosphate content of the most water bodies is 0.30 mg/l. In the present study, the higher value of Phosphate content (1.358 – 1.8mg/l) indicates the higher level of eutrophication in all the water bodies.

Figure-2. Percentage Contribution of Zooplankton at Shail Sagar

Figure-3. Percentage contribution of Zooplankton at Kumhedi Taal

Figure-4. Percentage contribution of Zooplankton at Barana Taal

The plankton considered as bioindicators in an aquatic ecosystem. The zooplankton population plays a significant role in determining pollution status of a water body. In present study (Figure A), Rotifers contributed 35% to 41 % followed by Cladocera 21% to 24%, Copepoda 16% to 19%, Protozoa 10% to 19% and Ostracoda 6% to 7%.

Figure-5. Percentage contribution of Zooplankton at Dumduma Taal

The Rotifers was dominant among zooplankton at all the water bodies indicates the eutrophic nature of tropical wetlands as was also reported by Wanganeo and Wanganeo (2006) while studying variation in zooplankton population in to morphologically dissimilar rural lake of Kashmir valley and similarly dominance of Rotifers was reported by Renuga and Ramanibai (2010) when studying zooplankton composition present in Krishnagiri reservoir, Tamilnadu.

Eutrophic Status of Tropical Wetlands in District: Tikamgarh (M.P.), India:

The eutrophic status of a water body can be assessed by various factors including both Physico – chemical and zooplankton population. On the basis of the classification of the lakes into different trophic level given by Wetzel (1975). All the five tanks of the district Tikamgarh are hypo to hyper – eutrophic. The order of eutrophic status based on the Physico – chemical and biological parameters is as follows:

Mahendra Sagar > Shail Sagar > Barana Taal > Kumhedi Taal > Dumduma Taal

Restoration and Management strategies for the Tropical Wetlands in District: Tikamgarh (M.P.), India:

The district Tikamgarh has vast number of lentic aquatic resources that have a great importance for society as well as for environment; but due to anthropogenic activities and lack of management getting degraded and some have got extinct so there is a need to devise a programme for restoring the degraded wetlands before they disappear. Shrivastava et al.(1994) made observations in the management of a tropical wetland ecosystem and suggested that the management strategy should be designed in such a way to avoid any conflict among stakeholders and hence the wetlands should be treated as multiple use resources instead of mono use which may adversely affect its wetlands characteristics. Shrivastava (2001) highlighted the importance of the role of stakeholders in sustainable environmental management of urban lakes and suggested that the participation of stakeholders should be mandatory for sound development of wetland ecosystem.

There is no such activities or programme developed for conservation of the wetland ecosystem that are of the national and international importance; even there is no such regulatory body in the district that can make a conservation programme, implement and regulate in proper way and to be responsible for all of it's working independently, so there is a need to devise a strategy for restoration and management of degraded wetlands and for the same, the following points are suggested for effective implementation :

(A)On account of Technologies:

Catchment Area Treatment, Desilting and Dredging, Prevention of pollution from sewage, Management of shoreline and fringe area, and Water quality management.

(B)On the account of Policies:

Setting up of a Management Committee, People`s Participation, Mass awareness and Education.

CONCLUSION

Present study has showed an obvious inter – dependency of physico-chemical parameters and zooplankton population in determining trophic status of studied tropical wetlands. As it is evident from current study, urban wetlands are more eutrophic than rural areas tanks. It is

believed that the above stated points of strategies, if taken in account by an experienced management authority, can make a sound and sustainable wetland ecosystem.

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