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A Review on Phytoplankton and Zooplankton Studies of Lentic Water Bodies of India

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Abstract: ***Plankton plays a crucial role in aquatic ecosystems, serving as both primary producers and indicators of water quality. Phytoplankton, forming the base of the food chain, supports zooplankton, fish, and other aquatic organisms, while zooplankton, as primary consumers, respond to environmental changes such as nutrient loading and pollution. Various studies across India have explored plankton diversity in lentic water bodies, revealing the impact of physicochemical parameters on their distribution. Research highlights the correlation between pH, nutrient levels, and plankton diversity, with specific species acting as pollution indicators. Seasonal variations influence plankton populations, with higher diversity often observed in less disturbed areas. This study provides insights into the ecological significance of plankton, emphasizing their role in assessing and maintaining water quality in freshwater systems.***

Keywords: Phytoplankton, Zooplankton, Lentic, Ponds, Lakes

1. Introduction

Plankters have great value as food and play an important role in disposal of sewage and natural purifiers of water and are important ecological parameter in water quality assessment. Planktonic communities are influenced by various physico - chemical parameters that determine their abundance, occurrence and seasonal variations. Phytoplankton plays an essential role as a primary producer in fresh water ecosystem because they form a bulk of food for zooplankton, fishes and other aquatic organisms. The dense surface blooms of blue green algae are indicative of potential productivity in aquatic system. Zooplanktons are primary consumers that play an important role in food chain in aquatic ecosystem. Zooplanktons respond to nutrient loading, acidification and sediment input etc. and their distribution and diversity in aquatic ecosystems depend mainly on the physicochemical parameters of water [1]. Present study reveals phytoplankton and zooplankton in lentic water bodies of India.

2. Review of Literature

Several investigations have been made on plankton diversity in India on the lentic bodies [2] - [4]

Rotifers globally have been considered as pollution indicator organisms in the aquatic environment [5]. Senthilkumar and Sivakumar investigated Veeranam Lake, Tamil Nadu for various abiotic factors and observed pH range to be between 7.9 - 8.4 (alkaline). They directly correlated value of pH with productivity and revealed pH as one of the major pollution indicator [6].

Rajagopal *et al.* evaluated species composition of water bodies can be altered by pollution [7]. Datta analyzed zooplankton diversity in relation to physico - chemical parameters of two wetlands of Jalpaiguri, West Bengal and inferred rotifers to be the richest group whereas *Brachionus* enjoyed numerical superiority over *Lecane*. Zooplankton diversity was found to be significantly positively correlated with total suspended solids, submerged macrophytes and negatively correlated with BOD and free CO2 of water [8].

Dhembare found members of rotifers to be dominant component amongst zooplankton and studied fluctuations in physico - chemical parameters that led to variation in diversity of zooplanktons [9]. Joshi observed zooplanktons were good indicators of water quality detecting if there is any change in water quality [10]. Tyor and Chawla studied phytoplankton diversity in Sukhna Lake, Chandigarh and found maximum phytoplankton and species diversity during summer season in area where there was no anthropogenic activity and found minimum diversity in area with maximum disturbance [11]. Giripunje *et al.* studied phytoplankton ecology in freshwater bodies of India and concluded phytoplankton ecology as an indicator for the evaluation of impacts of various physico - chemical factors [12].

Khan and Shah calculated phytoplankton diversity in Upper Lake, Bhopal, India and found that plankton diversity consist of total of 90 phytoplankton species representing to members of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae and Dinophyceae [13]. Baba and Pandit assessed phytoplankton diversity and population dynamics at Saderkot in Wular Lake, Kashmir and identified 70 phytoplankton taxa and also observed that lake was subjected to pollution due to addition of fertilizers from agricultural lands and domestic sewage from the human habitation, as a result, progressive enrichment of water with nutrients takes place which leads to mass production of

algae, which in turn resulted in the increased productivity and other undesirable biotic changes [14].

Murulidhar and Murthy conducted study on ecology and distribution of diatoms in four lakes i. e. Teeta Lake, Colony Lake, B. G. Halli and Gulur Lake in Tumkur, Karnatka and recorded 48 species of diatoms and observed significant positive correlation with air temperature, water temperature, sulphate, nitrate and silica [15]. Bee *et al.* studied plankton diversity of Ambattur Lake, Tamilnadu and reported a total of 22 species of planktons consisting of phytoplankton and zooplankton. They observed *Centropyxis spinosa*, *Arcella discoides*, *Euglypha acanthaphora* to be dominant among protozoa and *Lecane curvicornis* among rotifers [16].

Gopinath and Kumar studied phytoplankton diversity of Vellayani Lake, Kerala and observed Bacillariophyceae to be dominated followed by Chlorophyceae, Cyanophyceae and Euglenophyceae, Chrysophyceae. Furthermore, the pollution indicator phytoplankton like *Closterium*, *Nitzschia*, and *Oscillatoria* were also found in the lake and hence the lake was found to be in the verge of pollution [17]. Mirgane *et al.* carried out study on fluctuations in zooplankton diversity in Katphal Lake, Solapur (M. S.) India and reported total of 20 species represented by 10 species belonging to Rotifera, 5 to Copepoda, 4 to Cladocera and 1 to Ostracoda, whereas zooplanktons were found to be highest in number during summer season, followed by winter and lowest during monsoon season [18].

Korgaonkar and Bharamal studied seasonal variation in plankton diversity of Dhamapur Lake (Malvan) of Sindhudurg District (MS), India and recorded 10 phytoplankton species and 7 zooplankton species. Furthermore, both phytoplanktons and zooplanktons showed highest diversity in winter season [19]. Joseph studied plankton diversity and distribution in artificial pond, Kattakada thaluk, Kerela and observed Cyanophyceae to be the dominant group followed by Chlorophyceae, Bacillariophyceae and Euglenophyceae [20].

Qureshi and Dube conducted study on phytoplankton diversity of Chandrasarovar pond of Jhalwar, Rajasthan and found cyanophyceae to be the dominant group among phytoplankton [21]. Singh *et al.* observed zooplankton diversity in a Raja Bandh pond of Jamtara, Jharkhand and revealed 14 different species of zooplanktons dominated by rotifers, followed by cladocerans, copepods and ostracod [22].

Balamurugan *et al.* studied two ponds, Chinnakodunthurai and Thiruthiyamalai in Tamil nadu and found six species of phytoplankton and eight species of zooplankton and found that both ponds were suitable for growth of planktons [23]. Kumar and Ahmad observed diversity and abundance of zooplankton in pond of Samastipur, Bihar and observed 14 genera belonging to Rotifera (5), Caladocera (4), copepod (3) and Ostracoderm (2) [24].

Pal *et al*. studied pond ecosystem in Prayagraj, U. P and observed 69 species of phytoplanktons and zooplanktons belonging to Bacillariophyta, Chlorophyta, Crytophyta, Cyanobacteria, Euglenozoa, Myozoa and Rotifer [25].

3. Conclusion

Plankton diversity is a vital ecological indicator of water quality, influenced by various environmental factors such as pH, nutrient availability, and human activities. Studies across different lentic water bodies in India highlight the dynamic nature of plankton populations, with seasonal variations playing a crucial role. The presence of certain species as pollution indicators underscores the need for continuous monitoring and conservation efforts to maintain ecological balance. Understanding plankton dynamics can aid in effective water management strategies, ensuring the sustainability of aquatic ecosystems

References

[1] F. Saba, and D. N. Sadhu, “Zooplankton diversity of Garga reservoir of Bokaro, Jharkhand, India”, International Journal of Bioassays, pp.3792 - 3795, 2015.
[2] J. Pandey, U. Pandey, and H. R. Tyagi, “Nutrient status and cyanobacterial diversity of a tropical freshwater Lake”, Journal of Environmental Biology, 21 (2), pp.133 - 138, 2000.
[3] C. B. Meshram, and R. R. Dhande, “Algal diversity with respect to pollution status of Wadali Lake, Amaravati, Maharashtra, India”, Journal of Aquatic Biology, 15, pp.1 - 15, 2000.
[4] A. S. Kumar, G. Tripathi, and P. Ghosh, Status of Freshwater in 21st century: A Review - In Water Pollution: Assessment and Management, Dayause, New Delhi, 2004.
[5] B. B. Kambe, and C. B. Meshram, “A preliminary study of zooplankton diversity of Khatijapur tank near Achalpur, Maharashtra”, Journal of Aquatic Biology, 20 (2), pp.45 - 47, 2005.
[6] R. Senthilkumar, and K. Sivakumar, “Studies on phytoplankton diversity in response to abiotic factors in Veeranam Lake in the Cuddalore District of Tamil Nadu”, Journal of Environmental Biology, 29, pp.747 - 752, 2008.
[7] T. Rajagopal, T. Thangamani, S. P. Sevarkodiyone, M. Sekar, and G. Archunan, “Zooplankton diversity and physico - chemical conditions in three perrennial Ponds of Virudhunagar District, Tamilnadu”, Journal of Environmental Biology, 31, pp.265 - 272, 2010.
[8] T. Datta, “Zooplankton diversity and physico - chemical conditions of two wetlands of Jalpaiguri District, India”, International Journal of Applied Biological and Pharmaceutical Technologies, 2 (3), pp.576 - 583, 2011.
[9] A. J. Dhembare, “Statistical approaches for computing diversity and density of zooplankton with water factors in Mula Dam, Rahuri, Maharashtra, India”, European Journal of Experimental Biology, 1 (2), pp.68 - 76, 2011.
[10] P. S. Joshi, “Studies on zooplanktons of Rajura Lake of Buldhana District, Maharashtra India”, Science Research Reporter, 1 (3), pp.132 - 137, 2011.
[11] A. Tyor, and D. Chawla, “Survey and study of phytoplankton ecology in Sukhna Lake, Chandigarh, (India), International Journal of Applied Biology and Pharmaceutical Technology, 3 (2), pp.229 - 238, 2012.

[12] M. D. Giripunje, A. B. Fulke, K. Khairnar, P. U. Meshram, and W. N. Paunikar, "A review of phytoplankton ecology in freshwater Lakes of India", Lakes Reservoirs and Ponds, 7 (2) 127 - 141, 2013.
[13] A. A Khan, and T. A. Shah, "Phytoplanktonic biodiversity in Upper Lake of Bhopal, India", International Journal of Science and Research, 4 (6), pp.1748 - 1750, 2013.
[14] A. I. Baba, and A. K. Pandit, "Species composition, diversity and population dynamics of phytoplankton at Saderkot in Wular Lake, Kashmir", Journal of Ecosystem and Ecograph, 4, pp.142, 2014.
[15] V. N. Murulidhar, and V. N. Y. Murthy, "Distribution and ecology of diatom communities in four Lakes using Lange - Bertalot method", International Journal of Current Microbiology and Applied Sciences, 3 (4), pp.539 - 548, 2014.
[16] K. S. Bee, J. Chitra, and E. Malini, "Studies on plankton diversity and water quality of Ambattur Lake, Tamil nadu", International Journal of Pure and Applied Zoology, 3 (1), pp.31 - 36, 2015.
[17] P. Gopinath, and A. Kumar, "Micro algal diversity of the fresh water Lake in Thiruvananthapuram District, Kerala", International Journal of Plant, Animal and Environmental Sciences, 5 (1), pp.288 - 291, 2015.
[18] A. P. Mirgane, A. B. Kamble, A. B. Mamlayya, A. L. Shaikh, and D. S. Nikam, "Study on seasonal fluctuations in zooplankton diversity at Katphal Lake, TalSangola, Dist - Solapur (M. S.) India", Global Journal for Research Analysis, 4 (2), pp.188 - 190, 2015.
[19] D. S. Korgaonkar, and D. L. Bharamal, "Seasonal variation in plankton diversity of Dhamapur Lake (Malvan) of Sindhudurg District (MS), India", International Journal of Current Microbiology and Applied Sciences, 5 (3), pp.884 - 889, 2016.
[20] J. Joseph, "Diversity and distribution of phytoplankton in an artificial pond", International Journal of Advanced Research in Biological Sciences, 4 (5), pp.114 - 122, 2017.
[21] A. Qureshi, and P. Dube, "Studies on phytoplankton diversity of Chandrasarovar pond of Jhalawar (Rajasthan) ", International Journal of Multidisciplinary Research, 8 (1), pp.305 - 310, 2021.
[22] S. Singh, V. Kumari, M. Basant, K. Gupta, and M. Arif, "Study on Zooplankton Diversity in A Fresh Water Pond (Raja Bandh) of Jamtara, Jharkhand, India", International Journal of Advancement in Life Sciences Research, 4 (2), pp.05 - 13, 2021.
[23] S. Balamurugan, R. Sivakami, and R. Palanisamy, "Plankton biodiversity and limnological conditions in freshwater ponds", Journal of Science and Technology, 7 (3), pp.30 - 41, 2022.
[24] R. Kumar, and F. Ahmad, "Study of Zooplankton Abundance and Diversity in a Fresh Water Pond of Samastipur District (Bihar) ", International Journal of Research and Analytical Reviews, 10 (3), pp.326 - 334, 2023.
[25] P. Pal, J. Kumar, and A. C. Dwivedi, "Comparative study on plankton diversity of ponds (culture and non - culture) ecosystem in Prayagraj, Uttar Pradesh: A note", Journal of the Kalash Science, 11 (1), pp.14 - 24, 2023.