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A Study On Plankton Diversity Along With Conservation Status Of Jhagra Beel, Dhubri, Assam, India

Dr. Chandralekha Deka[1*], Dr. Bhabesh Nath[2*], Bishal Das[3]

[1*]*Assistant Professor, Department of Zoology, PDUAM, Amjonga,Goalpara*
[2*]*Assistant Professor, Department of Zoology, B N College, Dhubri*
[3]*Student Department of Zoology, B N College, Dhubri*

***Corresponding Author:** Dr. Bhabesh Nath*
******Assistant Professor, Department of Zoology, B N College, Dhubri*

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Abstract

The study aimed to understand the diversity of plankton and conservation status of Jogra beel, located in the Dhubri district of Assam. The research spanned one year, from April, 2017 to May, 2018. Plankton samples were collected in the morning, between 6:00 AM and 8:00 AM, by passing 100 liters of water through standard plankton net with a mesh size of 70 microns (μ). We used Past software to analyze the collected samples. The study revealed a high diversity of phytoplankton, including Chlorophycae, Cyanophycae, Flagellates, Euglenophycae, Bacilariophycae, and Dianoflagelates. Additionally, zooplankton, consisting of protozoans, Rotifers, Copepoda, and Cladocera, were also present. The diversity analysis, which included Margalef's D index, Shannon-Weiner index, and Simpson's index of diversity, indicated that the monsoon season had the highest diversity compared to other seasons. Furthermore, phytoplanktons were most dominant during the premonsoon season. Despite the rich diversity of plankton populations, the beel is facing multiple threats, including pollution, encroachment, overexploitation and improper disposal of medical waste. To address these challenges, it is essential to rigorously enforce protection laws and raise awareness among local communities. Additionally, promoting alternative livelihoods, such as developing the site into an ecotourism destination, could contribute to the preservation of Jhagra Beel.

Keywords: Anthropogenic factors, Diversity, Jhagra Beel, livelihood, ecotourism.

INTRODUCTION

Plankton constitutes a vibrant and intricate microcosm within aquatic ecosystems, comprising both phytoplankton and zooplankton. Phytoplankton, the plant-like component, typically drifts freely, exhibiting minimal resistance to water currents. It exists in a suspended state, with limited or no capacity for self-propulsion. Beyond its fundamental role in primary production, phytoplankton serves as a critical nutrient source for herbivorous organisms and serves as an invaluable biological gauge of water quality.

Zooplanktons are heterotrophic organisms that subsist on phytoplankton, recycling essential nutrients through their metabolic processes. These creatures function as conduits, channelling energy to higher trophic levels within aquatic ecosystems (Tripathi et al., 2006). Zooplanktons occupy a pivotal position in the intricate web of energy transfer, facilitating the flow of resources from primary producers to carnivorous species (Singh et al., 2013). Consequently, the significance of phytoplankton, with its ability to convert light energy into chemical energy through primary production, is matched by the crucial role of zooplankton in bolstering consumer levels and overall fish production within aquatic habitats.

Assam, a region known for its rich wetland ecosystems, boasts a total of 3,513 wetlands, encompassing an expansive area of approximately 1,01,231.8 hectares (ha) ARSAC, 1997. Remarkably, these wetlands constitute roughly 50% of the national wetland coverage and possess the potential to yield an impressive 1000 kilograms of fish per hectare per year, provided there is a moderate level of management in place (Clare S. and Cyrille de K., 1999). These wetlands collectively represent nearly 4% of the entire floodplain area in Assam and account for approximately 1.3% of the state's total land area (ARSAC, 1997).

However, despite the significant number of wetlands in Assam, it's essential to note that out of the 3,513 wetlands; only 1,392 are officially categorized as floodplain wetlands. Among these, 423 are registered, indicating that they have received formal recognition and oversight, while the remaining 969 wetlands remain unregistered. The management and jurisdiction of these unregistered wetlands are divided between governmental control, with 505 of them falling under government ownership, and private ownership, with 464 of them privately owned (CIFRI, 2000).

Jhagra Beel is a water body located near Dhubri town, officially recognized by the State Government. It covers an area of 153 bighas and falls under the jurisdiction of the Dhubri revenue circle. While various researchers have studied freshwater bodies in different regions, including limnology and plankton diversity (Goswami 1985; Goswami and Goswami, 2001; Sharma 2004, 2012, 2015; Bhuyan et. al., 2009), there is limited information available about the plankton diversity in Jhagra Beel. Therefore, our current study aims to evaluate the plankton diversity in Jhagra Beel and assess the conservation status of this water body.

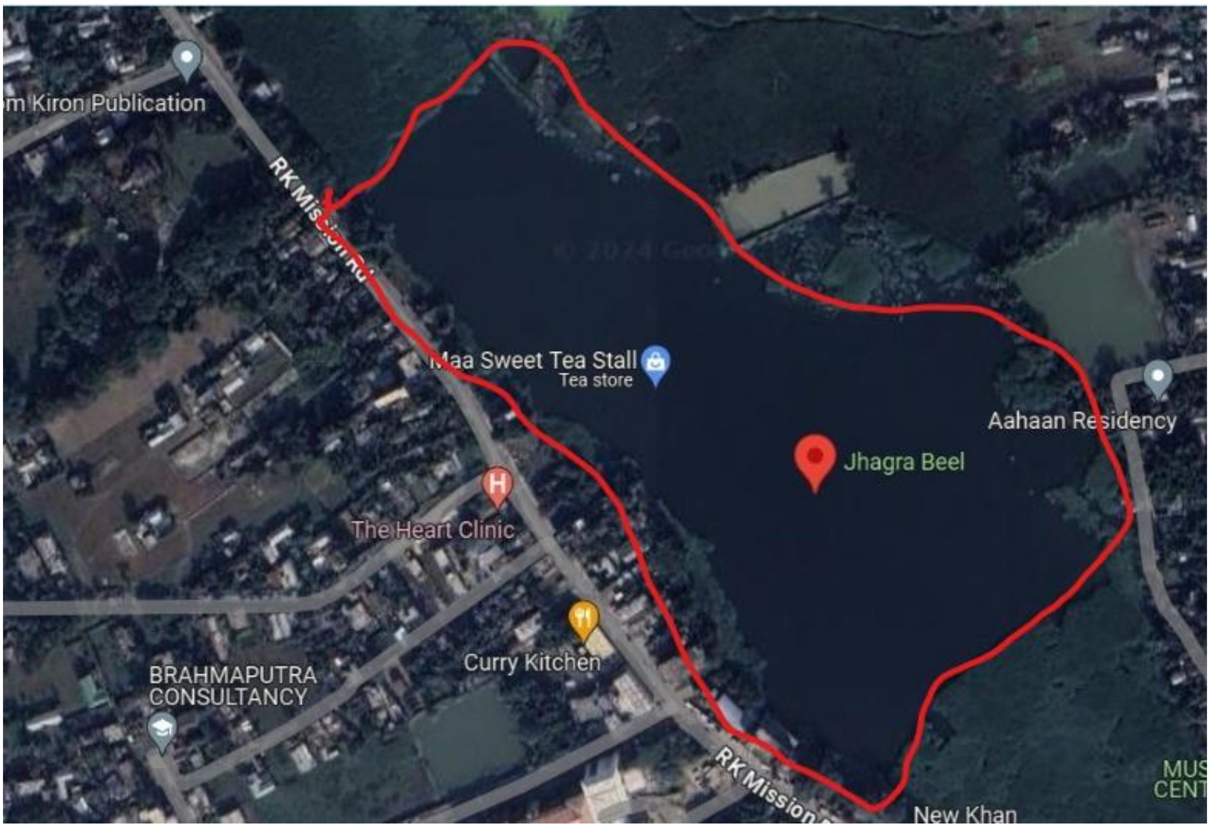

Fig 1: Jhagra Beel

Method and methodology

Plankton Sampling:

The present study was conducted between April 2017 and May 2018.The sampling was done during the mornings, specifically from 6:00 AM to 8:00 AM and we gathered plankton samples by filtering 100 liters of water through a specialized silk net with a mesh size of 70 microns. After collection we transferred the concentrated plankton biomass obtained from the sampled water into 30ml plastic bottles. These samples were then preserved using a solution containing 5% formalin. Subsequently, in the laboratory, we identified the various species of plankton utilizing standard identification methods provided by Needham & Needham (1962), Battish (1992), and Sudha (2012).
In order to assess the diversity of plankton, we employed a range of metrics including species evenness, the Margalef D index, the Shannon-Weiner index, and Simpson's index. Furthermore, we computed 95% confidence intervals utilizing the bootstrap method. For conducting these analyses, we utilized the Past software, specifically designed for plankton species analysis by Park et al. (2008).

RESULTS AND DISCUSSION

In our study, we found that Bacillariophycae had the highest number of phytoplankton species, totalling 17 species. In contrast, Dianophycae had the lowest diversity, with only one species identified.

The analysis of data revealed that the diversity of phytoplankton across different seasons, the retreating monsoon season had the highest diversity. This means that there were more different species of phytoplankton present during this season compared to the premonsoon, winter, and monsoon seasons.

Furthermore, the Margalef's D and Simpson's D indices were computed, providing additional support for our findings. These indices revealed that during the retreating monsoon season, there was notably higher diversity and greater species richness compared to other seasons.

Remarkably, while diversity peaked during the retreating monsoon season, the evenness of species distribution reached its zenith during the monsoon season, as detailed in Table-1.

The investigation unveiled that the aquatic environment predominantly harbored protozoans among zooplankton, followed by copepods, rotifers, and cladocera. These organisms exhibited their highest abundance during the retreating monsoon and monsoon seasons. Analysis of their seasonal variations revealed the highest diversity during the retreating monsoon season, indicating a multitude of zooplankton species.

Margalef's D and Simpson's D indices further underscored the prevalence of variety and species richness during the retreating monsoon season. Conversely, during the winter season, although the diversity of zooplankton types was lower, their distribution was more evenly spread, as illustrated in Table-2.

Table-1: Phytoplankton diversity in different seasons recorded during the study period from Jhagra beel (Results in parenthesis were significantly higher than other at 5% level)

Diversity Indices	Premonsoon	Monsoon	Reatreating Monsoon	Winter
Dominance_D	**0.38**	0.24	0.29	0.33
Simpson_1-D	0.61	0.55	**0.88**	0.66
Shannon_H	1.36	1.07	**2.64**	1.05
Evenness_e^H/S	0.58	**0.90**	0.70	0.64
Margalef	0.96	0.98	**1.99**	0.89

Table-2: Zooplankton diversity in different seasons recorded during the study period from Jhagra beel (Results in parenthesis were significantly higher than other at 5% level)

Diversity Indices	Premonsoon	Monsoon	Reatreating Monsoon	Winter
Dominance_D	0.29	0.30	0.31	**0.48**
Simpson_1-D	0.68	0.69	**0.87**	0.65
Shannon_H	1.05	1.47	**2.58**	1.00
Evenness_e^H/S	0.70	0.89	0.87	**0.98**
Margalef	0.69	0.56	**1.27**	0.67

Plankton plays a critical role in shaping the productivity of aquatic ecosystems. Both the abundance and variety of plankton are intimately linked to environmental factors, exerting significant influences on the growth and sustainability of fish populations. Within the complex network of aquatic life, phytoplankton holds a central position, serving as the foundation of the aquatic food chain. The metabolic processes of these tiny organisms are intricately connected to the physicochemical characteristics of the aquatic environment. The presence and abundance of phytoplankton significantly influence various dynamic characteristics of water bodies, including their color, clarity, trophic state, zooplankton population, and fish production, as noted by Horne and Goldman in 1994. The quantity of zooplankton is a key indicator of the fertility of the aquatic environment and its capacity to support fisheries. Zooplankton holds a central role as a primary food source for higher organisms, such as fish. Additionally, changes in water temperature can notably affect zooplankton productivity, highlighting their susceptibility to environmental variations. Specifically, the density of zooplankton is closely connected to the abundance of phytoplankton, which serves as their primary food source.

During the study period, significant seasonal fluctuations in plankton diversity were observed, with the peak numbers of zooplankton occurring during the retreating monsoon season. This finding corroborates earlier research conducted by Jitendra Kumar et al. (2017), Singh et al. (2017), and Karunesh Singh et al. (2019).

The comprehensive results of this study highlight the exceptional diversity of plankton in the Jhagra beel, suggesting its suitability for fish farming. Nevertheless, it's crucial to recognize potential threats to this ecosystem, including overexploitation and water pollution, which could ultimately diminish its productivity. This concern is consistent with the findings of Nath and Deka in 2012.

The Jhagra beel ecosystem confronts significant challenges stemming from both natural phenomena and human interventions. Natural threats include silt accumulation and the decomposition of organic matter in water and sediment triggered by rainfall and sewage runoff. However, the primary concern arises from human activities. As the population surrounding the beel expands, increased human presence leads to detrimental impacts on the natural habitat. These include pollution from improper waste disposal, sewage discharge, pesticide and fertilizer runoff from nearby agricultural areas, and contaminants emitted by brick factories.

The beel is also getting smaller as land is converted into agricultural fields. This could lead to less food for fish, which would hurt fish production and other forms of life in the beel, like plankton.

To protect the beel, we need to take multiple actions. This includes reducing water pollution, managing fish harvesting, and educating people about the importance of the wetland and its biodiversity. Local people must be involved in these efforts, and providing them with alternative ways to make a living is crucial. The development of the beel into an ecotourism destination will help greatly in this regards.

REFERENCE

1. Battish SK (1992) Freshwater Zooplankton of India, Oxford an IBH Pub. Co.. New Delhi, pp:233
2. Battish SK (1992) Freshwater zooplankton of India. Oxford and IBH publishing Co. New Delhi.
3. Bhuyan KC, Dutta A and Kalita B (2009) Hydrobiology and fishery status of Sondoba beel, Morigaon, Assam, *Inland Fishery Society of India*, 41(2): 48-53.
4. Dutta A, Chutia P and Das D (1990). Seasonal fluctuation in plankton population of two freshwater ponds.
5. Goswami MM (1985). Limnological investigations of a tectonic lake of Assam, India and their bearing on fish production. *Ph.D. thesis*, Gauhati University, Assam.
6. Goswami MM and Goswami N (2001) studies on productivity indicators in Mori beel of Assam. *Tropical zoology* 2(3): 1-9
7. Horne AJ, Goldman CR. Limnology. Edn 2, McGrawHill, New York, 1994.
8. Nath, B and Deka C (2012). A study on fish diversity, conservation status and anthropogenic stress of chandubi tectonic lake, Assam, India. *Journal of BioInnovation*, 1(6):148-155.
9. Needham JG and Needham PR (1962): A guide to the study of freshwater Biology. Holden-Day Inc. San Francisco pp 108
10. Park SJ, Park BJ and Rhee, SK (2008). Comparative analysis of archaeal 16S rRNA and amoA genes to estimate the abundance and diversity of ammonia-oxidizing archaea in marine sediments. *Extremorphiles.* 12:605. Doi:10.1007/s00792-008-0165-7.
11. Sarma D and Dutta A (2012) Ecological Studies of Two Riverine Wetlands of Goalpara District of Assam, India, *Nature Environment and Pollution Technology*, 11(2): 297-302

12. Sharma BK (2004) Phytoplankton diversity of floodplain lake of the Brahmaputra river basin upper Assam, Journal of Indian fisheries Association 31: 27-35
13. Sharma BK (2012) Phytoplankton communities of a floodplain lake of Brahmaputra river basin of Assam, North-East India, *Indian Journal of Fish*, 59(4): 131-139
14. Sharma BK (2015) Phytoplankton diversity of Deepor beel –a Ramsar site in the floodplain of Brahmaputra river basin of Assam, North-East India, *Indian Journal of Fish*, 59(4): 131-139
15. Singh K, Singh I and Tripathi RB(2013): Seasonal variation of zoobenthos population in relation to physic-chemical characteristics of water of Kohargaddi dam of district Balrampur (U.P.), India. *Flora and Fauna*, 19(1): 107-110.
16. Singh NR, Das SK, Kumar S, Bhakta D, Behera S, Nagessh TS and Mondal A. (2017): Limnology and productivity status in wetlands (Beels) of 24- South Paraganas district, West Bengal. *Journal of Entomology and Zoology Studies*, 5(2):664-668.
17. Sudha S (2012) Studies on plankton diversity in Bilaspur reservoir. *International Journal of Life sciences Biotechnology and Pharmacy research*, 1(4): 69-72
18. Tripathi RB, Sing I and Tewari DD (2006). Quantitative and qualitative study of Zooplankton in Seetadwar lake of Shravasti (U.P.), India in relation to Physico chemical characteristics of Zooplankton. *Flora and Fauna*, 12(2): 257-262.
19. Clare S., Cyrille de K., Wetlands, Water and the Law. Using law to advance wetland conservation and wise use, IUCN, Gland, Switzerland, Cambridge, UK and Bonn, Germany. xvi + 330 (1999)
20. ARSAC., Report of Wetlands of Assam, Assam Remote Sensing Application Centre, Guwahati, Assam, India (1997)
21. CIFRI., Ecology and fisheries in beels of Assam, Bulletin No. 104, Central Inland Fisheries Research Institute, Barrackpore, India, 48 (2000)
22. Chandra G., Management Regimes and Institutional Arrangement in Floodplain Wetlands Fisheries of Assam: An Evaluation, Indian Journal of Extension Education, 47(1 and 2), 27-33 (2011
23. Tripathi, A., Tyagi, A., & Kumar, A. (2006). Zooplankton dynamics in a tropical floodplain lake ecosystem (Ganges-Brahmaputra delta, India). Hydrobiologia, 563(1), 311-324.
24. Singh, S., Swati, S., & Ansari, S. (2013). Zooplankton diversity and their trophic role in three floodplain lakes of central India. Environmental Monitoring and Assessment, 185(3), 2189-2201.