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Study of the Phytoplankton Diversity of Five Study Stations in Amravati Region and Impact of Seasonal Variation

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Abstract: ***Water constitutes one of the most essential resources on Earth, essential for the life. Its role in promoting human health and well-being is substantial. Plankton are microscopic organisms that either float freely on the water surface or are transported by water currents. The present study was conducted to assess the biological constituents of some water bodies in Amravati region, Maharashtra with particular focus on phytoplankton communities.For study five study stations were selected including Wadali lake, Chatri lake, Ghatkhed lake, Rajura lake and Bhor lake. The study revealed the population diversity of phytoplanktons at the respective study stations and impact of seasonal variation. Phytoplankton community analysis revealed dominance of Chlorophyceae, followed by Cyanophyceae and Bacillariophyceae.***
Keywords: Plankton, Amravati, Wadali, Chatri, diversity, phytoplankton.

I. INTRODUCTION

Ecological investigations of aquatic systems—including rivers, lakes, wetlands, and oceans—examine the health, structural characteristics, and functional dynamics of these ecosystems by analyzing their physical, chemical, and biological components (Ramya et al., 2022; Sharma, 2026). Such assessments are essential for maintaining sustainable water quality and preserving ecosystem integrity. These studies typically focus on processes such as nutrient cycling, biodiversity patterns, and anthropogenic influences, including pollution and habitat degradation (Li et al., 2026). Given the deteriorating state of numerous natural ecosystems, such as forests, oceans, and lakes, the concept of ecosystem health has increasingly become a focal point within ecological environmental research. Lakes, in particular, are not only vital sources of freshwater but also play a significant role in global ecological processes. Beyond their contribution to water quality enhancement, lakes help mitigate environmental contamination and support the overall ecological environment (Paul et al., 2019).

Plankton, comprising microscopic organisms that either float freely on the water surface or are transported by currents, inhabit diverse aquatic environments. These organisms can be autotrophic (plant-like) or heterotrophic (animal-like) and constitute fundamental components of marine ecosystems, forming the base of the aquatic food web. Plankton are generally divided into two principal categories: phytoplankton, which are photosynthetic, and zooplankton, which are heterotrophic (Jakhar, 2013).

Phytoplankton are microscopic, photosynthetic organisms found in aquatic habitats that produce organic matter through sunlight-driven photosynthesis (Roy and Chattopadhyay, 2007). As primary producers, they occupy the foundational trophic level in aquatic food chains and are critical to the structure and functioning of aquatic food webs (Batten et al., 2019). Most phytoplankton are phototrophic, utilizing solar energy to convert carbon dioxide into organic compounds while releasing oxygen (Jakhar, 2013). Consequently, they thrive in inorganic media enriched with essential nutrients such as carbon dioxide, nitrogen, sulfur, and phosphorus. Phytoplankton are further categorized into three major groups: Cyanobacteria, diatoms, and dinoflagellates. The present study deals with the evaluation of the phytoplankton diversity of some water bodies of Amravati region.

II. MATERIALS AND METHODS

The study was conducted in Amravati region, Maharashtraduring the study period of 2023-2024. The five water bodies including Wadali lake (S1), Chatri lake (S2), Ghatkhed lake (S3), Rajura lake (S4) and Bhor lake (S4) were selected for the study and designated as Station 1 (S1), Station 2 (S2), Station 3 (S3), Station 4 (S4), and Station 5 (S5) respectively.

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Collection of Phytoplankton:

The plankton samples were collected through fine plankton net for which water sample were collected and filtered by repeating several times. The water samples were mixed and collected in phials by adding 4% formalin and brought to the laboratory for analysis.

Statistical Analysis

- Standard deviation

  Standard deviation (SD) was used to measure the dispersion of individual observations from the mean value, indicating the degree of variability within the dataset.

$$\sigma = \sqrt{\frac{\sum(x_i - \bar{x})^2}{N}}$$

  Where:

- σ= standard deviation
- x_i= individual observations
- $\bar{x}$= mean of observations
- N= total number of observations
- Variance

  Variance was computed to quantify the spread of data points around the mean and is the square of the standard deviation.

$$\sigma^2 = \frac{\sum(x_i - \bar{x})^2}{N}$$

  Where:

  σ^2= variance

- One-way ANNOVA

  One-way ANOVA was used to determine whether there were statistically significant differences among the means of multiple groups (e.g., sampling locations or seasons).

$$F = \frac{\text{Between-group variance}}{\text{Within-group variance}}$$

  The significance level was set at $p < 0.05$**.**

III. RESULTS AND DISCUSSION

The phytoplankton diversity observed during the study period included algal diversity belonging to Chlorophyceae, Bacillariophyceae and Cynophyceae (**Table 1**).

The Chlorophyceae diversity observed at all the study sites during the study consisted of *Ankistrodesmus, Chara, Chlorella, Clostridium, Cosmarium, Merismopodia, Mesotaenium, Mougeotia, Oedogonium, Pediastrum, Phacus, Scenedesums, Spirogyra, Tetradron,* and *Ultothyrx.* The plankton diversity of Bacillariophyceae observed during the study at the study sites showed *Amphora, Cyclotella, Cymbella, Epithemia, Gomphonema, Navicula, Nitzschia, Rhophalodia,* and *Synedra.* The phytoplanktonsof Cyanophycea diversity observed during the study consisted*Anabaena, Chrocoocus, Lyngoya, Microcystis, Nostoc, Oscillatoria, Phormedium,* and *Syuenchocystis.*

Table 1: List of Total Algae (Phytoplanktons) diversity

Chlorophyceae diversity	S1	S2	S3	S4	S5
Ankistrodesmus	+	-	+	+	-
Chara	-	+	-	+	-
Chlorella	+	-	+	-	+
Clostridium	+	+	+	+	+
Cosmarium	+	+	+	+	+

Merismopodia	+	+	+	+	+
Mesotaenium	+	-	-	-	+
Oedogonium	+	+	+	+	+
Pediastrum	+	+	-	+	-
Phacus	+	-	+	-	+
Scenedesums	+	+	+	+	+
Spirogyra	+	+	+	+	+
Tetraedron	+	+	+	+	+
Ulothrix	+	-	-	+	-
Bacillariophyceae diversity					
Amphora	+	+	+	+	+
Cyclotella	+	+	+	+	-
Cymbella	-	+	+	-	+
Epithemia	-	+	-	+	+
Gomphonema	+	+	+	+	+
Navicula	+	+	+	+	+
Nitzschia	+	+	+	+	+
Rhophalodia	-	+	-	-	+
Synedra	-	+	+	-	-
Cyanophyceae diversity					
Anabaena	+	+	+	+	+
Chrococcus	+	+	+	+	+
Lyngbya	+	-	+	-	+
Microcystis	+	+	+	+	+
Nostoc	+	+	+	+	+
Oscillatoria	+	+	+	+	+
Phormedium	+	+	+	+	+
Synechocystis	+	+	+	+	+

IV. IMPACT OF SEASONAL VARIATION

The impact of seasonal variation on the phytoplankton diversity of the water bodies was evaluated during the study and it observed that the standard deviation and variance analysis showed highest variability in Chlorophyceae due to strong seasonal fluctuations while moderate variability was observed in Cyanophyceae and Bacillariophyceae (**Table 1.2**). The one-way ANNOVA of the phytoplanktons did not show any significant difference. The seasonal variation was high in summer, moderate in winter and low in monsoon. The F value was recorded to be $F_{2,6} = 1.48$, $p > 0.05$ resembling no significant statistical variation. It can be concluded that environmental factors largely govern the diversity of phytoplanktons (**Table 1.3**).

Table 1.2: Standard deviation and variance

Group	Mean	SD	Variance
Chlorophyceae	308.67	75.54	5706.0
Cyanophyceae	229.67	54.12	2930.0
Bacillariophyceae	245.33	59.37	3525.0

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Table 1.3: One-way ANNOVA

Source	SS	df	MS	F
Between Groups	9,622	2	4,811	1.48
Within (Error)	19,512	6	3,252	
Total	29,134	8		

V. CONCLUSION

The present study gives a brief overview of the plankton diversity of the five selected water bodies of Amravati region.

REFERENCES

[1] Ramya, M., Sanniyasi Elumalai, ArthanariUmamaheswari, (2022). Study of physicochemical and statistical analysis of water quality parameters in Veeranam Lake, Cuddalore district, Tamil Nadu, India. Materials Today: Proceedings, Volume 49, Part 7, Pages 2934-2942.

[2] Sharma, P. (2026). Evaluation of the physico-chemical properties of water in Rasin Dam, Banda district, Uttar Pradesh, India. International Journal of Advanced Academic Studies. 8. 121-124.

[3] Li, Y., Fang, H. A study on the characterization methods of ecological water requirements in rivers in the Southern plain Region, China. Sci Rep **16**, 8333 (2026).

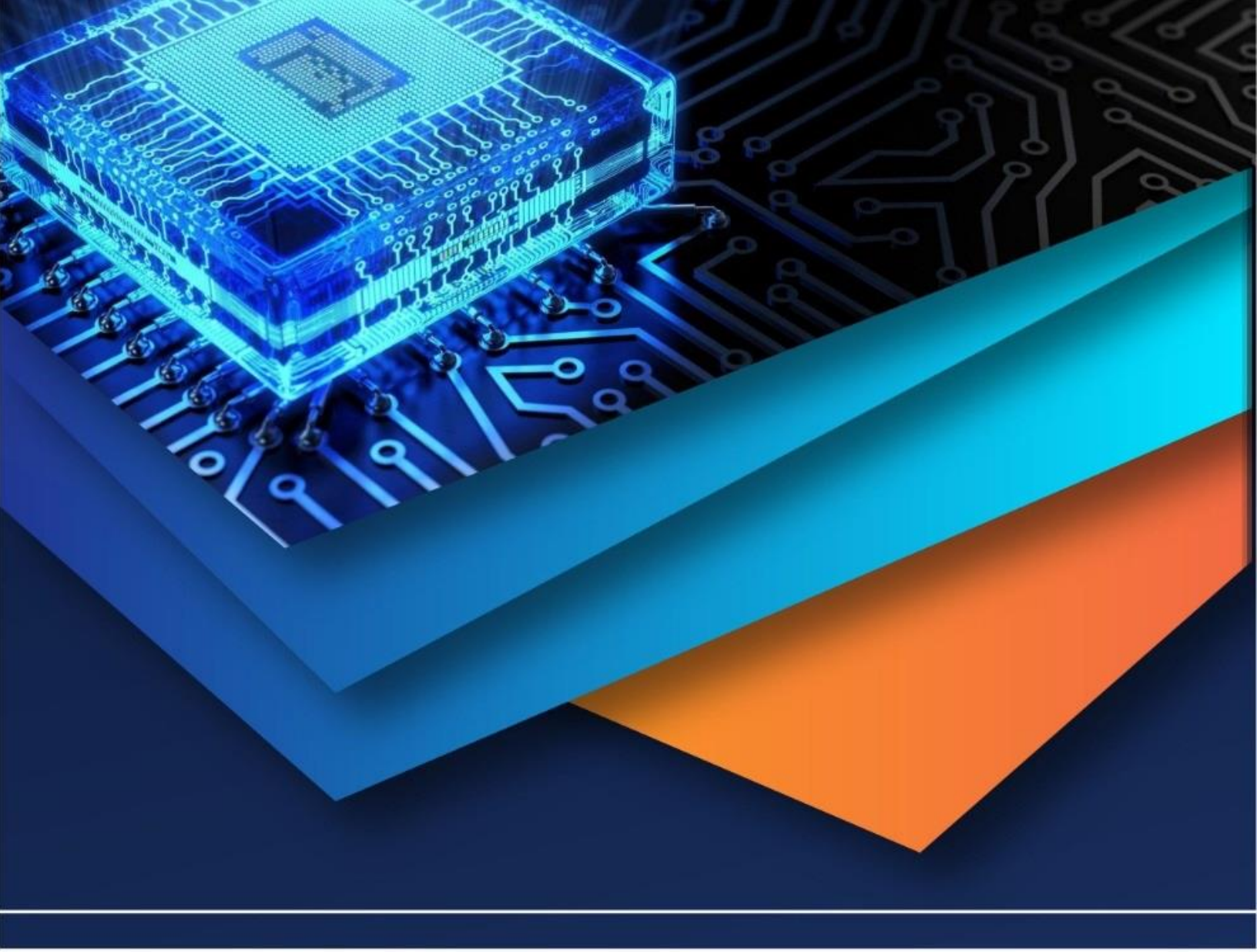
[4] Paul, J. S., Esmil Beliya, Shubhra Tiwari, Nisha Gupta, Dristi Verma and Shailesh Kumar Jadhav (2019) Comparative Studies of Physico-chemical Properties of Water from Various Ponds in Raipur. NewBioWorld A Journal of Alumni Association of Biotechnology, 1(2): 23-27.

[5] Jakhar, P. (2013). Role of Phytoplankton and Zooplankton as Health Indicators of Aquatic Ecosystem: A Review. International Journal of Innovative Research and Studies. 2. 489-500.

[6] Batten Sonia D. , Abu-AlhaijaRana , Chiba Sanae , Edwards Martin , Graham George ,JyothibabuR. , Kitchener John A. ,KoubbiPhilippe , McQuatters-Gollop Abigail , Muxagata Erik ,OstleClare , Richardson Anthony J. , Robinson Karen V. , Takahashi Kunio T. ,Verheye Hans M. , Wilson Willie (2019). A Global Plankton Diversity Monitoring Program. Frontiers in Marine Science. 6. DOI=10.3389/fmars.2019.00321

[7] Roy S., and Chattopadhyay J. (2007). Towards a resolution of “the paradox of the plankton”: a brief overview of the proposed mechanisms. Ecological complexity. 4: 26-33.

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