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A Qualitative and Quantitative Analysis of Zooplanktons and Phytoplanktons in the Pedhi River, Amravati District

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Abstract:

The current study, conducted in Amravati's Pedhi River, District Amravati, aimed to investigate the qualitative and quantitative analysis of zooplankton and phytoplankton. The study spanned three months, from January to February and March of 2023. During the study, 12 zooplankton species and 10 phytoplankton species were identified. Among the zooplankton species, four belonged to protozoa, four to rotifers, and four to crustacea. As for phytoplankton, four species were classified under Bacillariophyceae, four under Chlorophyceae, and two under Myxophyceae. Monthly fluctuations in the abundance of zooplankton and phytoplankton were observed in the study. The highest counts for both zooplankton and phytoplankton were recorded in March, surpassing the counts observed in January and February.

Keywords: Analysis, Qualitative, Quantative, Pedhi, Amravati

Introduction:

Limnology is the specialized field that delves into the study of inland freshwater bodies, with a particular focus on lakes, ponds, and rivers. This comprehensive investigation encompasses the biological, physical, chemical, and hydrological aspects of these water bodies. Plankton, a vital component of aquatic ecosystems, comprises microscopic organisms suspended in water. This category includes small plants known as phytoplanktons, small animals referred to as zooplanktons and bacteria. Planktons are ubiquitous, occurring in both natural water bodies and artificial impoundments such as ponds, tanks, reservoirs, and irrigation channels.

Numerous researchers have undertaken qualitative and quantitative analyses of zooplankton in various regions of Maharashtra. Joshi P (2011) analyzed the zooplanktons of Pedhi River in Buldhana district. Tijare R V (2020) conducted both qualitative and quantitative studies of phytoplankton in the Wainganga River, Markandadeo, District Gadchiroli. Khune CJ et al. (2020) reported on the status of phytoplankton in relation to the physico-chemical characteristics of Siregaon Lake, District Gondia. Gharpure V and Bhatkulkar M (2015) conducted an analysis of zooplanktons, considering seasonal variations in the Vena River of District Nagpur. Khan Rafiullah M and Pathan T D (2016) studied the zooplankton

diversity in Triveni Lake at Amravati District. Kabra P D et al. (2016) focused on the quantitative analysis of zooplanktons in the freshwater ecosystem of Washim town, District Washim. Chavhan J et al. (2021) conducted both qualitative and quantitative studies of zooplankton and phytoplankton in the Rajura lake, District Amravati. The present study focuses on the qualitative and quantitative analysis of zooplankton and phytoplankton in the Pedhi River of Amravati, District Amravati

Material & Methods:

A study on the qualitative and quantitative analysis of zooplankton and phytoplankton was conducted at Pedhi River, located 13 km west of Amravati city in District Amravati, Maharashtra. The sampling took place over three months—January, February, and March. During the study, various biotic factors, including pH, temperature, free CO₂, dissolved oxygen, chlorides, total alkalinity, total hardness, etc., were recorded and analyzed. Water samples were collected three times a month in the morning using plankton nets with a specific mesh size made of blotting cloth. To process the water samples, Lugol's solution was added, and the samples were concentrated using the centrifugation method. The concentrated samples were then preserved in a 4% formalin solution. The isolation and transfer of plankton were carried out using micropipettes. To enhance visibility for

analysis, the plankton material was washed two or three times in distilled water or saline solution. Subsequently, staining was performed by adding a few drops of aqueous eosin stain (1gm eosin in 100ml of distilled water) for a duration of 10 minutes. After staining, the plankton material was washed twice with distilled water. The washed material was observed under a microscope at high magnification to facilitate the quantitative estimation of both zooplankton and phytoplankton.

Result & Discussion:

In the present study, monthly fluctuations and variations were observed in the numbers and species of zooplankton and phytoplankton in the water of Pedhi River. The abundance of these organisms was found to be influenced by the physio-chemical parameters of the water. The recorded temperature ranged from 23°C to 26°C, with the maximum temperature observed in March. The water pH was alkaline, ranging from 8.2 to 8.6. The levels of dissolved oxygen and free CO₂ varied from 6.1 to 6.3 mg/l and 19.3 to 19.8 mg/l, respectively. The water hardness ranged from 162 to 164 mg/l, indicating that Pedhi River water is hard (Table 1).

During the study, a total of 48 zooplankton and 43 phytoplankton species were recorded. Among zooplanktons, 12 species were identified, including 4 Protozoans, 4 Rotifers, and 4 Crustaceans. Rotifers were the most species-rich group, with 17 species, followed by Protozoa (16) and Crustacean (15) (Table 2). Khan Rafiullah M and Pathan T D (2016) reported a dominance of Rotifers among zooplankton in Triveni Lake, Amravati. In terms of phytoplankton, 10 species were recorded, with 4 belonging to

Bacillariophyceae, 4 to Chlorophyceae, and 2 to Myxophyceae. Chlorophyceae was the most species-rich group, with 18 species, followed by Bacillariophyceae (16) and Myxophyceae (9) (Table 3). Tijare R V (2020) reported the abundant presence of Chlorophyceae among phytoplankton in Wainganga River, Gadchiroli, and Khune CJ et al., (2020) recorded the abundance of Chlorophyceae among phytoplankton in Siregaon Lake, Gondia.

The study revealed that Chlorophyceae was the most species-rich group among phytoplanktons. Monthly fluctuations were observed, with the maximum number of zooplankton (17) and phytoplankton (16) recorded in March compared to January and February. In the month of March, the abundance and occurrence of zooplankton and phytoplankton were observed to be higher compared to January and February. This increase is attributed to a rise in temperature and the increased availability of light. The elevated temperature has stimulated the activity of organisms in the water. Moreover, in March, the phytoplankton, which serve as the food source for zooplanktons, were also found to be more abundant than in January and February. This heightened abundance of phytoplankton in March is attributed to the greater availability of food resources during this period.

Conclusion

In the present study, the most dominant community among zooplanktons was found to be the rotifers, while among phytoplankton, the Chlorophyceae group was identified as the richest. The abundance of both zooplanktons and phytoplankton in Pedhi River suggests that the lake is productive.

Table.1 Physiochemical analysis of Pedhi River, Amravati

Sr. No	Parameters	Values		
		January	February	March
1.	Dissolved oxygen (mg/l)	6.1	6.3	6.3
2.	Free carbon dioxide(mg/l)	19.8	19.5	19.3
3.	Chlorides (mg/l)	56.4	56.5	56.3
4.	Total alkalinity (mg/l)	143	145	147
5.	Sulphate (mg/l)	33	33	33
6.	Nitrate (mg/l)	0.492	0.487	0.471
7.	Phosphate (mg/l)	0.032	0.033	0.030
8.	Total Hardness (mg/l)	162	164	162
9.	Calcium Hardness (mg/l)	94	94	93
10.	Magnesium Hardness (mg/l)	12	12	12
11.	pH	8.2	8.4	8.6
12.	Temperature (°C)	23	24	26
13.	TDS Mg/L	214	215	217

Table. 2 Recorded Population of Zooplankton of Pedhi River, Amravati

Taxon	Number of species			Grand Total
	January	February	March	

Protozoa				
Vorticella	1	1	2	04
Euglena	1	1	2	04
Paramecium	2	1	1	04
Ceratium	1	2	1	04
Total	05	05	06	16
Crustaceans				
Cyclops	2	1	1	04
Nauplius	1	2	1	04
Daphnia	1	1	2	04
Moina	1	1	1	03
TOTal	05	05	05	15
Rotifers				
Brachionus	2	1	2	05
Asplanchna	1	2	1	04
Filinia	1	0	2	03
Keratella	2	2	1	05
Total	06	04	06	17
Grand Total	16	15	17	48

Table. 3 Recorded Population of Phytoplankton of Pedhi River, Amravati

Taxon	Number of species			Grand Total
	January	February	March	
Chlorophyceae				
Closterium	1	2	1	04
Denticula	2	1	1	04
Spirogyra	1	2	3	06
Chlorella	2	1	1	04
Total	06	06	06	18
Bacillariophyceae				
Asterionella	1	0	2	03
Synedra	1	1	2	04
Amphora	1	2	1	04
Navicula	2	1	2	05
Total	05	04	07	16
Myxophyceae				
Anabaena	2	1	2	05
Nostoc	1	2	1	04
Total	03	03	03	09
Grand Total	14	13	16	43

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