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Plankton diversity in Kadaila pond of Mangawan tehsil of district Rewa (M.P.)

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Abstract

Plankton play a significant role in the food chain and the cycling of organic materials in the aquatic ecosystem, therefore their significance is well understood. A significant barrier to a better understanding of the dynamics of plankton in freshwater bodies is our lack of knowledge of these organisms. In the present investigation, total 29 species of phytoplankton and 26 species of zooplankton were also recorded. Bimodal pattern of seasonal variation of plankton was observed with a primary peak in the month of June and secondary peak in December. It was determined that the physical, chemical, and biological parameters were favourable for agricultural and fish culture.

Keywords: Plankton, diversity, density, Kadaila pond

Introduction

Plankton is small, mostly microscopic and extremely diverse form of organisms that play a crucial role in aquatic ecosystems. They occur in all natural lotic and lentic waterbodies as well as in artificial impoundments like ponds, tanks, reservoirs, irrigation canals etc. Welch divided the plankton into two major groups, namely phytoplankton and zooplankton. The biological productivity of any aquatic waterbody is generally determined by the quantitative and qualitative estimation of plankton, which forms the natural food of aquatic animals including fishes.

The primary contributor to the generation of organic matter in aquatic ecosystems, plankton is typically found at the base of the aquatic food chain. Most frequently, the interaction of water's physical, chemical, and biological qualities results in the creation of phytoplankton, and these properties also shape their assemblage (composition, distribution, variety, and abundance).

In order to implement sustainable management practices, it is crucial to consider the population density and diversity of plankton in a water body, as these factors differ between aquatic systems and locations. A significant barrier to a better understanding of the dynamics of plankton in freshwater bodies is our lack of knowledge of these organisms. For the implementation of environmental impact assessment (EPA)-style sustainable environmental management practices, the density and diversity of plankton in a water body are of utmost importance. Almost all fish depend on them as their primary source of nutrition while they are still in the larval stage.

Some plankton species provide accurate data on the level of water pollution. These are hence referred to as good water quality indicators. Controlling the physico-chemical and biological conditions of the water can be accomplished with the help of these investigations and monitoring. Plankton plays a crucial role in tropical reservoir ecosystems because it helps scientists predict the yield of future fish. Wetlands are significantly impacted by the scope of socioeconomic activities, urbanization, industrialization, and hydropower production. These operations have an impact on aquatic biodiversity and water quality.

Numerous works on plankton diversity and limnological studies have already been reported from different parts of India including Ansari and Prakash (2000) [1]; Prakash *et al.* (2002, 2015a, 2015b and 2015c) [9, 10, 11, 12]; Ranjan and Prakash (2020) [13]; Verma *et al.* (2016a, 2016b) [20, 21], Verma (2019) [17] and Sugumaran *et al.* (2020) [16] but a quality research is still awaited from the study area.

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So, the present study was an attempt for reporting plankton diversity and density of Kadaila Pond of Mangawan Tehsil of district Rewa (M.P.).

Material and Methods

Plankton samples from Kadaila Pond were collected fortnightly with plankton net of bolting no. 25 with a mesh size 25 μ attached with a collection tube at the base of net throughout the year, between 9.00 and 10.00 am. The 50 liter of surface water was sieved through the plankton net and sample was collected inside the collection tube. The sample was transferred to plastic bottle and preserved. Plankton productivity was measured by using Sedge Wick Rafter plankton counting cell and quantities are expressed here as units per liter of the Taal water. The diversity of plankton was studied under light microscope with magnification 10X initially and followed by 40X. Plankton were identified with the help of a book entitled "A guide to the study of fresh water biology" written by Needham and Needham (1962)^[5], Sharma and Sharma^[14] (2008) and other standard literature.

Results and Discussion

In the present study, 29 species of phytoplankton belonging to four class, Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae. Out of 29 species, 11 species, *Ankistrodesmus* sp., *Chlamydomonas* sp., *Crucigenia* sp., *Cosmarium* sp., *Chlorella* sp., *Oedogonium* sp., *Pediastrum* sp., *Spirogyra* sp., *Scenedesmus* sp., *Ulothrix* sp. and *Volvox* sp. Belonged to Chlorophyceae; 09 species, *Aphanothecac* sp., *Arthrospira* sp., *Anabaena* sp., *Gloeocapsa* sp., *Lyngbya* sp., *Microcystis* sp., *Nostoc* sp., *Oscillatoria* sp. and *Spirulina* sp. to Cyanophyceae; 07 species, *Cymbella* sp., *Cydotella* sp., *Eragillaria* sp., *Melosira* sp., *Navicula* sp., *Nitzschia* sp. and *Synedra* sp. to Bacillariophyceae and 02 species, *Euglena* sp. & *Phacus* sp. to Euglenophyceae. Presence of these species was also reported in fresh water bodies (Prakash, 2001a, Prakash *et al.*, 2002 and Sinha *et al.*, 2002)^[6, 9, 15].

Zooplankton diversity of Kadaila pond represented by 26 genera belonging to five groups, Protozoa, Rotifera, Copepoda, Cladocera and Ostracoda. Out of 26 species, 05 genera, *Arcella* sp., *Chilodonella* sp., *Diffusia* sp., *Epistylis* sp. and *Paramecium* sp. belonged to Protozoa; 7 genera, *Asplanchna* sp., *Brachionus* sp., *Filinia* sp., *Keratella* sp., *Lecane* sp., *Rosaria* sp. and *Trichocerca* sp. to Rotifera; 05 genera, *Cyclops* sp., *Diaptomus* sp., *Gammarus* sp., *Mesocyclops* sp. and *Nauplius* larvae belong to copepodes; 8 genera, *Alona* sp., *Alonella* sp., *Bosmina* sp., *Ceriodaphnia* sp., *Daphnia* sp., *Monia* sp., *Mono daphnia* sp. and *Sida* sp. and *Cypris* sp. belongs Ostracoda. Presence of 29 species of phytoplankton and 26 species of zooplankton shows that the pond is rich in planktonic diversity. Similar observation was made by Ansari and Prakash (2000)^[1], Prakash (2001b)^[7] and Sinha *et al* (2002)^[15]. The plankton density in the pond shows is highly productive. Increase in plankton density is a good sign for healthy aquatic ecosystem required for the maintenance of biodiversity (Ashok, 2017a and 2017b)^[2, 3], however, excessive anthropogenic activities, electronic wastes and microplastics in general influence aquatic life (Verma and Prakash, 2020; Prakash and Verma, 2022; Verma and Prakash, 2022)^[18, 8, 19]

The density of phytoplankton fluctuated between 531 to 1014 Units (Org)/L and density of zooplankton fluctuated between 529 to 018 Units (Org)/L, respectively. In the present study bimodal pattern of seasonal variation of plankton was

observed, with a primary peak in the month of June and secondary peak in December (Table.1). The maximum average plankton density was found in summer season, moderate in winter season and minimum in monsoon season. It was observed that maximum plankton production occurred during the summer months due to optimum ecological conditions. Similar pattern of plankton distribution were also reported in the fresh water bodies (Khan and Siddiqui, 1974)^[4].

Table 1: Monthly variation in Phytoplankton and Zooplankton Productivity (Unit/L) of Kadaila pond of Mangawan Tehsil of district Rewa (M.P.). During July 2021 to June 2022

Months	Phytoplankton Productivity				Zooplankton Productivity			
	Sites / Stations				Sites / Stations			
	S1	S2	S3	Mean	S1	S2	S3	Mean
July	532	521	539	531	611	601	603	605
Aug	582	572	569	574	571	566	549	562
Sept	614	622	613	616	538	531	528	532
Oct	622	618	621	620	534	522	531	529
Nov	698	679	681	686	612	611	617	613
Dec	941	921	931	931	701	705	708	705
Jan	719	709	712	713	652	661	651	655
Feb	535	526	521	527	657	639	621	639
Mar	621	618	604	614	612	608	604	608
April	715	705	711	710	727	713	704	715
May	793	768	781	781	862	852	854	856
June	1022	1018	1001	1014	921	918	914	918
Min	532	521	539	531	534	522	531	529
Max	1022	1018	1001	1014	921	918	914	918
Seasonal Variations								
Monsoon Season	587	583	585	585	564	555	552	557
Winter Season	723	709	711	714	656	654	649	653
Summer Season	788	777	774	780	781	773	769	774

Conclusion

Plankton play a significant role in the food chain and the cycling of organic materials in the aquatic ecosystem, therefore their significance is well understood. As rotifers are recognized to be the finest diet for fish larvae, the current study shows that Kadaila Pond is rich in density and diversity of both phytoplankton and zooplanktons, indicating that this pond is suited for aquaculture. Rotifers, which are indications of eutrophication in zooplankton, were discovered to be the majority group by the authors. So, it is necessary to control human activity in watershed areas in order to reduce water contamination. In light of the significance of the study, actions should be taken to ensure its conservation and upkeep.

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