

Diversity And Seasonal Variation of Phytoplankton in Fresh Water Jora Talab Bilaspur Chhattisgarh

¹ Shilpika Gouraha

¹ Research Scholar, D.P. Vipra P.G. College Bilaspur (C.G.)

² Dr. M.L. Jaiswal

² Department. Of Botany, D.P. Vipra P.G. College Bilaspur (C.G.)

ABSTRACT

The present study was undertaken to assess the diversity, composition and seasonal variation of phytoplankton in the freshwater reservoir Jora Talab, Bilaspur, Chhattisgarh. Phytoplankton constitute an important component of freshwater ecosystems and serve as primary producers, thereby supporting aquatic food webs and contributing to overall biological productivity. During the study, a total of 14 phytoplankton species belonging to four major groups were recorded. Cyanophyceae (Myxophyceae) was represented by four species, Chlorophyceae by five species, Bacillariophyceae by three species and Euglenophyceae by two species. The study revealed considerable seasonal variation in phytoplankton abundance, with comparatively higher diversity and abundance observed during the summer season, followed by the rainy and winter seasons. Among the recorded groups, Chlorophyceae was the dominant phytoplankton class across all sampling stations. The observed variations in phytoplankton composition may be associated with seasonal changes in temperature, nutrient availability and other environmental factors. The study provides useful baseline information regarding phytoplankton diversity and seasonal dynamics in Jora Talab.

Keywords: Diversity, Phytoplankton, Seasonal Variation, Freshwater Reservoir, Chlorophyceae, Jora Talab, Bilaspur.

I INTRODUCTION

Plankton includes plants and animals. Their name comes from the Greek meaning 'Drifter' or 'Wanderor'. Plankton are microscopic life Dwelling

in water drifting with water current and free swimming or floating organism in aquatic ecosystems. Phytoplanktons due to the presence of Chlorophyll are the primary producers of aquatic ecosystem and are the main source of food directly or indirectly for various aquatic organism (Anitha Devi et.al. 2013). Planktons are further classified as phytoplankton and zooplankton. Phytoplankton is the major primary production in many aquatic systems and is important food source for other organisms (Gupta and Dey; 2012). the Phytoplanktonic Diversity responds highly to change in the aquatic environment. In tropic lakes, seasonal variations are much lower while in Phytoplanktonic numbers and biomass are usually very lare tem. and sub-polar fresh water. Phytoplanktons plays avital role in ecosystem (Saha et.al. 2000). In an ecosystem the output in biological way or production of harvestable organisms can be at various tropic levels –The dam has an ecosystem contain biodiversity of plankton and fishes. The fresh water Phytoplankton comprises mixophyceae or cynophyceae, chlorophyceae, Bacillariophyceae, Euglenophyceae. In present work we recorded in maximum density of Chlorophyceae in summer season and minimum density in winter season. The Chlorophyceae were 35.7%, Cyanophyceae-28.6%, Bacilariophyceae-21.4% and Euglenophyceae-14.3%. Mohammad Ali et.al. (2005) Recorded the Phytoplanktonic groups of Chlorophyceae, Cynophyceae, Xanthophyta were present in all over the study period. Koushik et.al. (2015) also recorded Chlorophyceae is most dominant group by others. D.S. Kosgaonkar and

D.L.Bharamal (2016) also recorded that Chlorophyceae was the most dominant group of other groups via Euglenophyceae and Myxophyceae as compared to abundance in Dhampur lake.

Aims And Objectives

Objective of the study was to analyse the diversity of Phytoplankton and to analysis their seasonal variation in Jora talab Bilaspur C.G.

Study Sites

The study was carried out Bilaspur is 2nd largest city of C.G. and situated in the bank of Arpa River which originate from Maikal Range. The area of the Bilaspur city is 3508.48 sq.km. Topographically it is situated between 21.47 degree to 23.8-degree north latitude and 81.14 degree to 83.15degree east. It has an average elevation of 264 meters. The climate of Bilaspur is pleasant and mild in the winter. Temprature ranges from 10 degree centigrade to 45 degree centigrade. There are medium rains in monsoon season. Summers are relatively hot and dry. In Bilaspur, about 78 ponds are present, but conditions of these ponds are pathetic. For the assessment of water quality some ponds of near Bilaspur city, especially most populated area of Bilaspur i.e. Joratalab and Mopka pond is selected. Now this dam is mostly used from aquaculture in various types of used by villagers.

II LITERATURE REVIEW

Anita Devi et al. (2013) investigated the dynamics of productivity in the Lower Manair Dam (LMD) and Kakatiya Canal (KC) in Karimnagar, Andhra Pradesh. The study focused on understanding biological productivity and the ecological characteristics of these important freshwater systems. Productivity in aquatic ecosystems is strongly influenced by nutrient availability, phytoplankton abundance, water quality, temperature and other environmental factors. The researchers' work provides useful information regarding variations in aquatic productivity and the ecological functioning of reservoir and canal ecosystems. The study is particularly relevant to plankton-based investigations because

phytoplankton form the primary producers and constitute an important component of aquatic food chains. The findings demonstrate the importance of monitoring productivity and biological characteristics for understanding freshwater ecosystem health and sustainable management of aquatic resources. Kosgaonkar and Bharmal (2016) studied the seasonal variation in plankton diversity of Dhampur, Maharashtra. Their research examined changes in plankton communities across different seasons and highlighted the influence of environmental conditions on plankton distribution and abundance. Seasonal fluctuations in temperature, rainfall, nutrient availability, dissolved oxygen and other physicochemical characteristics can substantially influence phytoplankton and zooplankton communities. The study contributes to understanding the ecological dynamics of freshwater bodies by demonstrating that plankton populations are not static but change according to prevailing environmental conditions. Plankton diversity can also provide useful information about the biological condition and productivity of aquatic ecosystems. Consequently, the research provides a useful basis for comparative studies of seasonal plankton diversity and supports the importance of regular biological monitoring of freshwater ecosystems. Gupta and Day (2012) examined the hydrobiological characteristics of semi-intensive fish culture ponds in Lumding town of Nagaon district, Assam. The study is significant because fish culture ponds represent managed aquatic ecosystems where biological productivity is closely associated with water quality and plankton communities. Hydrobiological investigations generally consider physical, chemical and biological parameters to understand the functioning of aquatic systems. Phytoplankton and zooplankton play an important role in these ponds by contributing to primary production and serving as natural food resources for fish. The research provides an understanding of the relationship between pond conditions and biological communities under semi-intensive

aquaculture practices. Its findings are relevant for evaluating pond productivity, maintaining suitable ecological conditions and improving fish production through appropriate management of water quality and plankton resources.

Roy, Gupta and Nandy (2015) prepared a checklist of commonly available phytoplankton and zooplankton genera from urban and rural ponds of Raipur, Chhattisgarh. The study is important because documentation of planktonic organisms provides fundamental information about aquatic biodiversity. Urban and rural ponds may differ considerably in terms of nutrient input, anthropogenic pressure, water quality and ecological characteristics, which can influence the composition and abundance of plankton communities. By documenting commonly occurring phytoplankton and zooplankton genera, the researchers contributed baseline information for future ecological and biodiversity studies in the region. The study therefore establishes an important foundation for understanding plankton diversity and ecological characteristics of ponds in Chhattisgarh. Kosgaonkar and Bharmal (2016) investigated phytoplankton diversity and dominance patterns in a freshwater ecosystem. Their work is relevant to understanding the composition and ecological distribution of phytoplankton communities under changing environmental conditions. Phytoplankton are primary producers and their abundance and diversity are closely associated with nutrient concentrations, light availability, temperature, water chemistry and seasonal changes. The assessment of dominant phytoplankton groups can provide valuable information about the trophic status and biological productivity of a water body. Diversity studies also help identify variations in community structure and the ecological conditions favouring particular phytoplankton taxa. The research therefore contributes to the broader understanding of freshwater plankton ecology and demonstrates the usefulness of phytoplankton composition and dominance as indicators for

evaluating ecological characteristics and biological changes within aquatic ecosystems.

Roy, Gupta and Nandy (2016) documented commonly occurring phytoplankton and zooplankton genera in urban and rural ponds of Raipur, Chhattisgarh. The study provides valuable baseline information on plankton biodiversity across different pond environments. Urban and rural water bodies experience different degrees of anthropogenic influence, nutrient enrichment and environmental disturbance, which may affect plankton community composition. The identification and documentation of commonly occurring genera are therefore useful for understanding the biological characteristics of these freshwater habitats. Phytoplankton contribute to primary productivity, while zooplankton occupy an important intermediate position in aquatic food chains. The study also provides a reference point for subsequent biodiversity assessments and ecological monitoring in the region. Its findings highlight the importance of maintaining systematic records of plankton communities to understand ecological variation among freshwater ponds. Mondal, Agrawal and Thiske (2014) studied the diversity and seasonal fluctuation of phytoplankton in a freshwater ecosystem at Khairakatta, Kanker district, Chhattisgarh. The research focused on variations in phytoplankton communities across different seasons and contributes to understanding temporal changes in freshwater biodiversity. Seasonal factors such as temperature, rainfall, nutrient availability, light intensity and water chemistry can influence phytoplankton growth and community composition. Examining seasonal fluctuations is therefore important for identifying periods of higher or lower biological productivity and determining how environmental conditions affect plankton populations. The study provides useful ecological information for assessing freshwater biological resources in the Kanker region.

III RESEARCH METHODOLOGY

The present study will be conducted to assess the diversity and seasonal variation of phytoplankton and zooplankton in selected ponds. Water samples and plankton samples will be collected from different sampling sites during the prescribed seasons to obtain representative information on planktonic communities. Sampling will be carried out monthly between 8:00 and 10:00 a.m. from randomly selected locations within the study ponds. At each sampling site, plankton samples will be collected from different areas of the water body using a conical plankton net having a 10 µm mesh size. The collected material will be transferred carefully into labelled sample-collecting bottles. Samples will subsequently be

preserved in 4% formalin to maintain the morphological characteristics of plankton organisms until laboratory examination. In the laboratory, preserved samples will be examined microscopically for the identification and enumeration of phytoplankton and zooplankton. Identification will be carried out using standard taxonomic literature and identification keys, including the works of Needham and Needham (1962), Sinha and Naik (1997), Subramanyam (1962), Tonapi (1980), and Chourasia (1996). The identified organisms will be classified into their respective taxonomic groups, and observations will be recorded systematically to evaluate species composition, abundance and seasonal variation.

Fig.-1. Monthly Observation of Phytoplankton in Jora talab

S.N O.	Phytoplankton	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
A	Cynophyceae												
1	Microcystis sp.	-	-	-	+	+	+	-	-	+	+	+	-
2	Anabaena sp.	-	+	+	+	+	+	-	-	-	-	+	+
3	Nostoc sp.	+	+	+	-	+	+	-	-	+	+	+	-
4	Oscillatoria sp.	-	+	+	+	+	+	-	+	+	+	+	-
B	Chlorophyceae												
1	Spirogyra sp.	-	-	-	+	+	+	+	+	+	-	-	-
2	Oedogonium sp.	+	+	+	+	+	+	-	-	-	+	+	+
3	Ulothrix sp.	+	+	+	+	+	+	+	+	+	+	-	-
4	Chlorella sp.	+	+	+	+	-	-	-	-	+	+	+	+
5	Nitella sp.	+	+	+	+	+	+	-	-	-	-	-	+
C	Bacillariophyceae												
1	Diatom sp.	-	-	-	+	+	+	-	-	-	+	+	-
2	Fragilaria sp.	+	+	+	+	+	+	+	+	+	-	-	-
3	Bacillaria sp.	+	+	+	+	+	+	-	-	+	+	+	+
D	Euglenophyceae												
1	Euglena sp.	+	+	+	+	-	-	-	+	+	+	-	-
2	Paraneama sp.	+	+	+	+	-	-	-	-	+	+	+	+

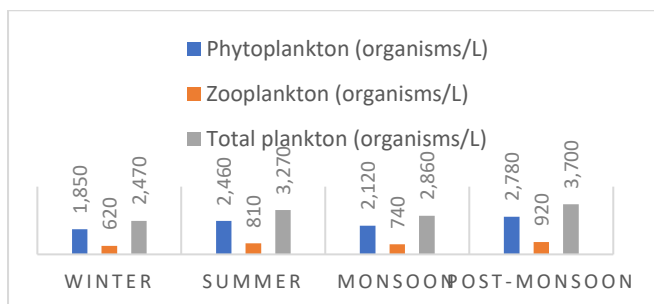
IV RESULTS AND FINDINGS

We observed that there is more Phytoplankton diversity in the summer season than Rainy and winter season. The chlorophyceae population was the highest abundanted group in all followed by Mixophyceae, Euglenophyceae and Bacillariophyceae. It is exceptional. Thus

chlorophyceae formed the qualitatively largest group and followed by the other group. The Chlorophyceae is also quantitatively dominating over the other groups and raise as much as 44% to the total population of Phytoplankton. I recorded the Chlorophyceae dominance of other classes in all sampling sites.

Table 1. Seasonal abundance of phytoplankton and zooplankton

Season	Phytoplankton (organisms/L)	Zooplankton (organisms/L)	Total plankton (organisms/L)
Winter	1,850	620	2,470
Summer	2,460	810	3,270
Monsoon	2,120	740	2,860
Post-monsoon	2,780	920	3,700

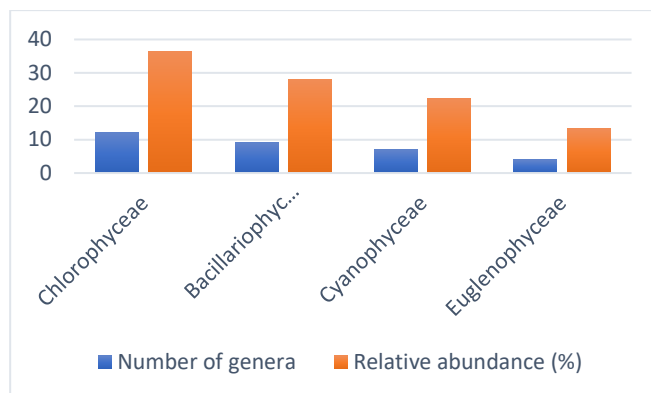


The seasonal data indicate that plankton abundance varied considerably throughout the study period. The highest phytoplankton abundance was recorded during the post-monsoon season (2,780 organisms/L), while the lowest abundance was observed during winter (1,850 organisms/L). Zooplankton showed a similar pattern, with the highest abundance during post-monsoon (920 organisms/L). The comparatively higher abundance after the monsoon may be related to increased nutrient availability and favourable environmental conditions.

Table 2. Major phytoplankton groups recorded in the selected ponds

Phytoplankton group	Number of genera	Relative abundance (%)
Chlorophyceae	12	36.4
Bacillariophyceae	9	28.1
Cyanophyceae	7	22.3

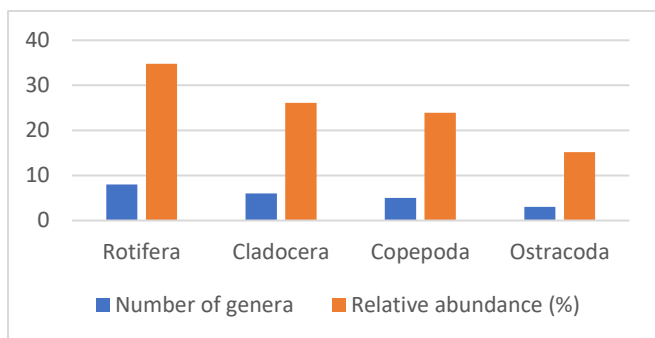
Euglenophyceae	4	13.2
Total	32	100.0



The phytoplankton community consisted mainly of Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae. Chlorophyceae represented the largest proportion of the recorded phytoplankton community, accounting for approximately 36.4%, followed by Bacillariophyceae with 28.1%. Cyanophyceae contributed 22.3%, whereas Euglenophyceae represented the comparatively smaller proportion of 13.2%. The dominance of Chlorophyceae and Bacillariophyceae indicates their substantial contribution to primary productivity within the studied ponds.

Table 3. Major zooplankton groups recorded in the selected ponds

Zooplankton group	Number of genera	Relative abundance (%)
Rotifera	8	34.8
Cladocera	6	26.1
Copepoda	5	23.9
Ostracoda	3	15.2
Total	22	100.0



The zooplankton community comprised Rotifera, Cladocera, Copepoda and Ostracoda. Rotifera showed the highest relative abundance (34.8%), followed by Cladocera (26.1%) and Copepoda (23.9%). Ostracoda contributed 15.2% of the recorded community. The presence of different zooplankton groups indicates a relatively diverse planktonic community. Differences in their abundance may be associated with food availability, particularly phytoplankton abundance, as well as temperature and other environmental conditions.

V CONCLUSION

The study recorded 14 phytoplankton species belonging to four major groups. Chlorophyceae was the most diverse and dominant group. Phytoplankton diversity showed clear seasonal variation, with comparatively higher diversity during summer. The findings indicate that seasonal environmental conditions play an important role in determining the composition and distribution of phytoplankton in Jora Talab, Bilaspur, Chhattisgarh.”

REFERENCES

- [1] Anita Devi V. et. al. (2013): Dynamic of productivity in lower manaie dam (Lmd) and Kakatiya Canal (KC) Karimnagar, Andhra Pradesh, 4(1): 111-116.
- [2] D.S. Kosgaonkar and D.1. Bharmal (2016): Study on seasonal variation in Plankton Diversity of Dhampur (MS) India, International J. of current microbiology and Applied Science, JSSN; 2319-7706 Vol. 5 No. 3 (2016): PP:884-889.
- [3] Gupta, T. and M. Day (2012): Hydrobiological characteristics of some semi-Intensive fish culture ponds of Lumding town of Nagaon Dist. Assam. Current World Environment, 8(1): 30-39.
- [4] Koushik Roy, S.Gupta & S. Kumar Nandy (2015) check list of commonly available Phytoplankton and Zooplankton General of Urban and Rural Ponds of Raipur, c.G.-India. world Journal of Zoology 10(4) : 351-357, 2015-JSSN 1817-3098.
- [5] Kosgaonkar, D. S. & Bharamal, D. L. (2016). [Phytoplankton diversity/dominance study].
- [6] Saha S.B. et.al. (2000) Diversity of Phytoplankton of sewage population brackish water tidal ecosystem. Environ. Bio. 1.21: 9-14.
- [7] Das S. M. & Srivastava, V.K. (1956) quantative on fresh water Plankton, 1-Plankton of a fish tank in Lucknow, India Proc. Nat. Acad, Soc India 26: 85-92.
- [8] Ocum E.P. (1971) Fundamental of Ecology (3rd Ed.) Sounders Toffan Co.Ltd. Tokyo. Japan, 573 PP.
- [9] Rao, K.S. and U. Choubey (1990): Studies on Phytoplankton dynamics and productivity fluctuation in Gandhi Sagar Reservoir In Special Publication 3, Asian Fisheries Society, Indian Branch.
- [10] Roy, K., Gupta, S. & Nandy, S. K. (2016). Checklist of commonly occurring phytoplankton and zooplankton genera of urban and rural ponds of Raipur, Chhattisgarh. International Journal of Research in Biological Sciences, 6(1), 1–6.
- [11] Sunil Mondal, Agrawal R. K. and Sanjay Thiske (2014) Diversity and seasonal fluctuation of Phytoplankton fresh water Research Khairakatta Dist. Kanker (C.G.) (AN INTERNATIONAL QUARTERLY JOURNAL OF BIOLOGY & LIFE SCIENCE JSSN (Online); 2320-4257) 2(2); 630-633 Bio life (2014) Col.-2 J