

# Assessment of Phytoplankton Diversity in Downstream Region of Meenachil River, Kerala, During the Pre-monsoon and Monsoon Season

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## ABSTRACT

The present study aimed to assess the Phytoplankton diversity in the downstream of Meenachil River, Kerala, during pre-monsoon and monsoon seasons. A total of 39 species belonging to five taxonomic divisions were identified, namely Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae. The results revealed that Chlorophyceae was the dominant group, followed by Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae. The season-wise distribution of phytoplankton showed a higher abundance in the pre-monsoon season compared to the monsoon season. This study provides valuable insights into the phytoplankton diversity of Meenachil River, Kerala, and highlights the significance of monitoring seasonal changes in phytoplankton abundance for effective water resource management. The findings of this study can be useful for further research on water quality monitoring and management in rivers.

**Keywords:** Phytoplankton, Meenachil River, premonsoon, monsoon

## INTRODUCTION

Plankton, which constitutes a highly complex and diverse component of ecosystems, includes various types. Among them, Phytoplankton are recognized for their exceptional ability to act as bioindicators as they promptly respond to alterations in environmental conditions. (Prabha & Dua, 2018). Phytoplankton are not limited to marine environments, and can also be found in freshwater systems such as rivers and serving as the foundation of food webs and playing a crucial role in the global carbon cycle. (Zinat et al., 2021). They are recognized for enhancing the stability and efficiency of resources within freshwater and brackish ecosystems (Ptacnik et al., 2008). Seasonal variations and the specific geographic location and water depth can significantly impact the diversity of phytoplankton (Das et al., 2022).

The Meenachil River, which flows through the Indian state of Kerala, is an important river known for its ecological significance and rich biodiversity. This river is 78 kilometers long and has a catchment area of 1272 sq.km. It originates from the Western Ghats and passes through Poonjar, Teekoy, Erattupetta, Palai, Ettumanoor and Kottayam before eventually meeting the Vembanad Lake. Meenachil river and its tributaries provide habitats for a diverse range of aquatic and terrestrial species, including fish, crustaceans, mollusks, reptiles, amphibians, and birds. Studies on phytoplankton diversity are abundant across India. However, information on the phytoplankton diversity in the Meenachil river is limited, with only one study conducted on its algal diversity. (Smitha Sebastian, 2016). This research paper focuses on

the diversity of phytoplankton in the midstream of the Meenachil River during the pre-monsoon and monsoon seasons. The study aims to provide a comprehensive analysis of the phytoplankton community in the midstream of river, which can help in understanding the ecological status of the area and formulating strategies for its conservation and management.

## MATERIALS AND METHODS

Water samples used for the analysis were collected bimonthly from different downstream zones of the Meenachil river, comprising Nagampadam, Thazhathagadi, Kanjirm jetty and Illickal during February 2021 to December 2021. The collection of plankton was performed using standard methods outlined in APHA (1995) with a plankton net made of bolting silk (No: 25, Mesh size 40µm) used to filter 40 L of water. The collected plankton was concentrated to 100 ml and preserved on the spot by adding 2 drops of 4% formalin and lugols iodine and they were left undisturbed to allow the phytoplankton to settle. The sediment was then thoroughly examined under an optical microscope for taxonomic analysis. The systematic identification of the phytoplankton, up to the species level, was conducted using the standard keys of Desikachary (1959), Edmondson (1959), Whitford and Schumacher (1973), Prescott (1982), Palmer (1980), and Anand (1998).

## RESULT AND DISCUSSION

Phytoplankton are important indicators of water quality and ecosystem health in aquatic environments. The distribution of plankton varies significantly based on factors such as seasonal changes, water quality, and nutrient concentrations, as they are highly susceptible to environmental changes (Neethu *et al.*, 2014). During the present study 39 species of phytoplankton belonging to 37 genera coming under five taxonomic divisions namely Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae and Xanthophyceae were identified from the Meenachil River, Kerala. (Table 1.) Out of the 39 species recorded, 18 species belong to Chlorophyceae, 11 to Bacillariophyceae, 7 to Cyanophyceae, 2 to Euglenophyceae and 1 to Xanthophyceae. Chlorophyceae was the major group comprised 18 taxa belonging to 17 genera followed by Bacillariophyceae represented by 11 taxa belonging to 10 genera, Cyanophyceae represented by 7 taxa belonging to 7 genera, Euglenophyceae was represented by 2 taxa each belonging to 2 genera and Xanthophyceae represented by 1 taxa belonging to 1 genera.

Seasonwise distribution of phytoplankton showed that maximum abundance was found to be in premonsoon than monsoon season. (Gangware *et al.*, 2012; Simimole Sebastian & Thomas, 2016; Asha *et al.*, 2018; Minuet *et al.*, 2014; Baliarsinghet *et al.*, 2015; Varghese *et al.*, 2022).

During pre-monsoon season, 39 species were observed, comprising 18 species of Chlorophyceae followed by 11 species of bacillariophyceae, 7 species of Cyanophyceae, 2 species of Euglenophyceae and 1 species of xanthophyceae. Meanwhile, in the monsoon season, 27 species were observed, i.e 14 species of Chlorophyceae, each of 5 species of Bacillariophyceae and Cyanophyceae, 2 species of Euglenophyceae and one species of Xanthophyceae. The high concentration of phytoplankton during pre-monsoon periods can be attributed to the increased levels of salinity, temperature, nutrient content, pH, and light intensity (Muraleedharan *et al.*, 2010; Badsiet *et al.*, 2012)

Table 1. Abundance and composition of phytoplankton of Meenachil river

Phytoplankton class	Phytoplankton genera and species	Pre-monsoon	Monsoon
<b>CHLOROPHYCEAE</b>	Coelastrummicroporum	+++	+
	Ankistrodesmusfalcatus	+	+
	Closterium sp.	++	-
	Chlamydomonasglobosa	+	
	Chlorella ellipsoidea	+++	+
	Chlorella vulgaris	+++	+
	Pediastrum duplex	+++	+
	Scenedesmusquadricauda	+++	+
	Pediastrumboryanum	+++	+
	Mougeotia sp.	+++	+
	Cosmarium species	+	-
	Staurastrumsp.	+	+
	Tetraedrontrigonum	+++	+
	Volvox sp.	+++	+
	Arthrodesmus sp.	+	-
Chlorococcumhumicola	+++	+	
<b>BACILLARIOPHYCEAE</b>	Tetrasporalubrica	+++	+
	Spirogyra sp.	+++	+
	Melosiragranulata	++	+
	Naviculasp	++	+
	Amphora ovalis	++	-
	Pinnulariagibba	++	-
	Pinnulariavirdis	+++	-
	Nitzschiavitrea	++	+
	Gyrosigmaacuminatum	+++	+
	Fragilariaratonensis	++	-
	Synedra ulna	+	-
	Cymbellanaviculiformis	+++	+
	Cyclotellastelligera	+++	-
<b>CYANOPHYCEAE</b>	Aphanocapsalitroralis	+++	-
	Synechococcusaeeruginosus	+++	+
	Oscillatoriasubbrevis	++	+
	Gloeocapsa magma	+++	+
	Anabaena spiroides	+	+
	Nostocpruniforme	+++	-
	Lyngbya sp.	++	+
<b>EUGLENOPHYCEAE</b>	Euglena viridis	++	+
	Phacusacuminatus	+	+
<b>XANTHOPHYCEAE</b>	Tribonema sp.	++	+
<b>+++ : abundant; ++ : fairly present; + : rare</b>			

## CONCLUSION

Phytoplankton diversities are natural occurrences, and may occur with regularity depending on seasons and water conditions of the river. The assessment of phytoplankton diversity in the downstream of Meenachil River, Kerala during the pre-monsoon and monsoon season revealed the presence of 39 species of phytoplankton belonging to 37 genera and five taxonomic divisions. Chlorophyceae was the major group, followed by Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae. The season-wise distribution of phytoplankton showed that the maximum abundance was found to be in the pre-monsoon season compared to the monsoon season. This study provides useful insights into the phytoplankton diversity of the Meenachil River, Kerala, and highlights the importance of monitoring the seasonal changes in phytoplankton abundance for better water resource management.

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