

Uttar Pradesh Journal of Zoology

Volume 44, Issue 5, Page 10-14, 2023; Article no.UPJOZ.2491 ISSN: 0256-971X (P)

# Phytoplankton Diversity in Midstream Region of Meenachil River, Kerala during Premonsoon and Monsoon Season

### Reema Rose Mani<sup>a++\*</sup> and Simimole Sebastian<sup>a#</sup>

<sup>1</sup> Department of Zoology, Alphonsa College, Pala, Kottayam District, Kerala, India.

#### Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

#### Article Information

DOI: 10.56557/UPJOZ/2023/v44i53437

<u>Editor(s):</u> (1) Prof. Telat Yanik, Atatürk University, Turkey. <u>Reviewers:</u> (1) Sudhakaran MR, Sri Paramakalyani College, India. (2) H. B. Jayasiri, Ocean University of Sri Lanka, Sri Lanka. (3) Mustafa S. F. Ziyadi, University of Basrah, Republic of Iraq.

**Original Research Article** 

Received: 28/01/2023 Accepted: 01/04/2023 Published: 01/04/2023

#### ABSTRACT

The scenic beauty and rich diversity of Meenachil River in Kerala make it a valuable freshwater resource for the region. This study aimed to explore the phytoplankton diversity in the midstream region of Meenachil River in Kerala during the pre-monsoon and monsoon seasons. Five different taxonomic groups were identified, which included Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae, with a total of 39 species. Chlorophyceae was found to be the most prevalent group with 18 taxa, followed by Bacillariophyceae with 11 taxa, Cyanophyceae with 7 taxa, Euglenophyceae,with 2 taxa and Xanthophyceae with 1 taxon. The study revealed that the pre-monsoon season had a higher abundance of phytoplankton with 39

Uttar Pradesh J. Zool., vol. 44, no. 5, pp. 10-14, 2023

<sup>&</sup>lt;sup>++</sup> Research Scholar;

<sup>&</sup>lt;sup>#</sup>Assistant Professor;

<sup>\*</sup>Corresponding author: Email: reemarosemani@gmail.com;

species, while the monsoon season had only 27 species. This research provides important insights into the phytoplankton diversity of Meenachil River in Kerala and highlights the significance of monitoring changes in phytoplankton abundance throughout the seasons for effective water resource management. The findings of this study will be beneficial for future research on water quality management and monitoring in rivers.

Keywords: Phytoplankton; Meenachil River; premonsoon; monsoon.

#### 1. INTRODUCTION

Plankton is a diverse and complex component of ecosystems that encompasses various types. Among these, Phytoplankton are particularly noteworthy due to their ability to serve as bioindicators that quickly respond to changes in environmental conditions [1]. Phytoplankton are not confined to marine environments and can also be found in freshwater systems, such as rivers, where they serve as the foundation of food webs and play a crucial role in the global carbon cycle [2]. They are recognized for their ability to enhance stability and efficiency of resources within freshwater and brackish ecosystems [3]. The diversity of phytoplankton can be significantly influenced by seasonal variations, specific geographic location, and water depth [4].

The Meenachil River is a significant river in the Indian state of Kerala, renowned for its ecological importance and diverse biodiversity. This river stretches for 78 km and has a catchment area of 1272 km<sup>2</sup>. Its origin is in the Western Ghats, and it flows through Poonjar, Teekoy, Erattupetta, Ettumanoor, and Kottayam before Palai. ultimately meeting the Vembanad Lake. The Meenachil River and its tributaries offer habitats for a diverse range of aquatic and terrestrial species, including fish, crustaceans, mollusks, reptiles, amphibians, and birds. Although many studies have explored phytoplankton diversity in India, information about the Meenachil River's phytoplankton diversity is limited, with only one study conducted on its algal diversity [5,6]. This research aims to analyze comprehensively the phytoplankton community in the midstream of the Meenachil River during pre-monsoon and monsoon seasons. The objective of the study is to provide a comprehensive analysis of the phytoplankton diversity in the midstream of the river, which can aid in understanding the area's ecological condition and creating strategies for its preservation and management.

#### 2. MATERIALS AND METHODS

Surface water samples were collected bimonthly from four main sites in the midstream region of the Meenachil river, namely Erattupetta, Pala, Kidagoor, and Pattarmadom between February 2022 to December 2022. The samples were collected early in the morning for analysis. The collection of plankton was done using standard methods outlined in APHA [7]. A plankton net made of bolting silk (No: 25, Mesh size 40 µm) was used to filter 40 L of water. The collected plankton was concentrated to 100 mL and 2 drops of 4% formalin and lugols iodine were added on the spot to preserve them. The samples were then left undisturbed to allow the phytoplankton to settle. The sample was examined thoroughly under an optical taxonomic analysis. microscope for The systematic identification of phytoplankton up to the species level was carried out using standard keys from Desikachary [8], Edmondson [9], Whitford and Schumacher [10], Prescott [11], Palmer [12], and Anand [13].

#### 3. RESULTS AND DISCUSSION

The Meenachil River in Kerala is home to a diverse array of phytoplankton species that serve as indicators of water quality and ecosystem health. A total of 39 phytoplankton species from five taxonomic divisions were identified in this study including Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae (Table 1). Chlorophyceae was the most prevalent group, comprisina 18 followed taxa. bv Bacillariophyceae with 11 taxa, Cyanophyceae with 7 taxa, Euglenophyceae with 2 taxa, and Xanthophyceae with 1 taxon. The abundance of phytoplankton varied by season, with higher diversity found during the pre-monsoon period than the monsoon season, consistent with previous studies [14,5,6,15-18].

speciesmonsoonChlorophyceaeCoelastrum microporum+++Ankistrodesmus falcatus++Closterium sp.++-Chlarnydomonas globosa++++Chlorella ellipsoidea++++Chlorella vulgaris++++Pediastrum duplex++++Pediastrum duplex++++Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.++Tetraedron trigonum++++Melosira granulata++++Navicula sp++++Pinnularia gibba+++-Pinnularia gibba++++Orosigma acuminatum++++Ryosigma acuminatum++++Gyrosigma acuminatum++++Cyclotella stelligera++++Cyclotella stelligera++++Gloeccapsa magma++++Anabaena spiroides++Anabaena spiroides++++EuglenophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.+++<	Phytoplankton class	Phytoplankton genera and	Pre-	Monsoon
ChlorophyceaeCoelastrum microporum+++Ankistrodesmus falcatus++Closterium sp.++-Chlarnydomonas globosa++Chlorella vilgaris++++Chlorella vilgaris++++Pediastrum duplex+++Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++Mougeotia sp.++Tetraedron trigonum++++Volvox sp.++++Tetraedron trigonum++++Tetraedron trigonum++++Tetraedron trigonum++++Tetraedron trigonum++++Navicula sp++++Marbora ovalis++++Pinnularia gibba++++Nitzschia vitrea++++Pinnularia gibba++++Fragilaria ratonensis+++Cycosigma acuminatum++++Fragilaria ratonensis+++Cyclotella stelligera++++Cyclotella stelligera++++Cyclotella subbrevis+++Gloeocapsa magma++++EuglenophyceaeEuglena viridis++++Fragilaria ratonensis+++Chacepsa angma++++Henca sacuminatus+++Henca sacuminatus+++ <tr <td="">He</tr>		species	monsoon	
Ankistrodesmus falcatus++Closterium sp.++-Chlamydomonas globosa+Chlorella ellipsoidea++++Pediastrum duplex+++Pediastrum duplex+++BacillariophyceaeMougeotia sp.++BacillariophyceaeMougeotia sp.++Tetraedron trigonum+++Tetraedron trigonum+++Tetraedron trigonum+++Tetraedron trigonum+++Totraedron trigonum+++Totraedron trigonum+++Totraedron trigonum+++Totraedron trigonum+++Volvox sp.++++Arthrodesmus sp.++Tetraspora lubrica++++Tetraspora lubrica++++Mavicula sp++++Pinnularia girba++-Pinnularia girba++-Pinnularia girba++-Nitzschia vitrea+++Fragilaria ratonensis++-Synechococcus aeruginosus+++Synechococcus aeruginosus++Gloeocapsa magma++++Gloeocapsa magma++++Habaena spiroides++EuglenophyceaeEuglena viridis++++Habaena spiroides++Habaena spiroides++++Habaena spiroides++++ </th <th>Chlorophyceae</th> <th>Coelastrum microporum</th> <th>++</th> <th>+</th>	Chlorophyceae	Coelastrum microporum	++	+
Closterium sp.++-Chlarnydomonas globosa+Chlorella ellipsoidea+++Chlorella vulgaris+++Pediastrum duplex+++Pediastrum boryanum+++Pediastrum boryanum++++BacillariophyceaeMougeotia sp.Mougeotia sp.+-+Staurastrum sps.+++Cosmarium sps.+-+Tetraedron trigonum+++++Volvox sp.+++-Chlorococcum humicola+++Spirogyra sp.++-+Melosira granulata++++Mayocula sp++Pinnularia gibba++Pinnularia virdis+++++Gyrosigma acuminatum+++-CyanophyceaeAphanocapsal itroralis++CyanophyceaeAphanocapsal itroralis++Lyngbya sp.+++EuglenophyceaeEuglena spiroides++++		Ankistrodesmus falcatus	+	+
Chlamydomonas globosa Chlorella ellipsoidea+Chlorella ellipsoidea+++Pediastrum duplex++Pediastrum duplex++Pediastrum boryanum++HBacillariophyceaeMougeotia sp.+Mougeotia sp.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.++Chlorococcum humicola+++Tetraspora lubrica++++Melosira granulata++++Navicula sp++++Melosira granulata++++Pinnularia gibba++++Pinnularia virdis++++Gyrosigma cuminatum++++Fragilaria ratonensis++++CyanophyceaeAphanocapsal itoralis+++CyanophyceaeAphanocapsal itoralis+++EuglenophyceaeTribonema sp.+++EuglenophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp. <t< th=""><th></th><th>Closterium sp.</th><th>++</th><th>-</th></t<>		Closterium sp.	++	-
Chlorella ellipsoidea++++Chlorella vulgaris++++Pediastrum duplex+++Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Chlorococcum humicola+++Tetraspora lubrica+++Tetraspora lubrica+++Melosira granulata+++Mavicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis++++Gyrosigma acuminatum++++Fragilaria ratonensis++-CyanophyceaeAphanocapsal itroralis++-Synechcoccus aeruginosus++-Synechcoccus aeruginosus+++-EuglenophyceaeEuglena viridis++++Heacus acuminatus++++-KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.++++KanthophyceaeTribonema sp.+++		Chlamydomonas globosa	+	
Chlorella vulgaris++++Pediastrum duplex+++Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++BacillariophyceaeMougeotia sp.++Tetraedron trigonum++++Volvox sp.++++Tetraedron trigonum++++Tetraedron trigonum++++Tetraspora lubrica++++Tetraspora lubrica++++Tetraspora lubrica++++Melosira granulata+++Marcula sp+++Amphora ovalis+++Prinnularia gibba++-Prinnularia virdis++++Gyrosigma acuminatum++++Fragilaria ratonensis++-CyanophyceaeAphanocapsal itroralis+++Anabaena spiroides+++EuglenophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++KanthophyceaeTribonema sp. <t< th=""><th></th><th>Chlorella ellipsoidea</th><th>+++</th><th>+</th></t<>		Chlorella ellipsoidea	+++	+
Pediastrum duplex+++Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.+-Chlorococcum humicola++++Spirogyra sp.++++Melosira granulata++++Navicula sp++++Navicula sp++++Pinnularia gibba+++-Pinnularia gibba++++Gyrosigma acuminatum++++Fragilaria ratonensis++++CyanophyceaeAphanocapsal itroralis+++Gloecapsa magma+++++EuglenophyceaeEuglena viridis++++Fagilena viridis+++++Anabaena spiroides+++++Anabaena spiroides		Chlorella vulgaris	+++	+
Scenedesmus quadricauda+++Pediastrum boryanum+++BacillariophyceaeMougeotia sp.++Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.+-Chlorococcum humicola+++Tetraspora lubrica++++Melosira granulata++++Navicula sp++++Prinnularia gibba+++-Pinnularia gibba+++-Pinnularia virdis++++Gyrosigma acuminatum++++Fragilaria ratonensis++++Cyclotella stelligera++++CyanophyceaeAphanocapsal itroralis++Anabaena spiroides++++EuglenophyceaeEuglena viridis++++HeusYanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp.+++YanthophyceaeTribonema sp. <th></th> <th>Pediastrum duplex</th> <th>++</th> <th>+</th>		Pediastrum duplex	++	+
Pediastrum boryanum+++BacillariophyceaeMougeotia sp. Cosmarium species++BacillariophyceaeMougeotia sp. Staurastrum sps. Tetraedron trigonum++++Tetraedron trigonum++++Volvox sp. Arthrodesmus sp. Chlorococcum humicola++++Tetraspora lubrica++++Tetraspora lubrica++++Melosira granulata++++Navicula sp++++Amphora ovalis++++Pinnularia virdis++++Fragilaria ratonensis++++CyanophyceaeAphanocapsal itroralis+++CyanophyceaeAphanocapsal itroralis+++EuglenophyceaeEuglena virdis+++Funglara subbrevis++++Anabaena spiroides++++Anabaena spiroides++++Anabaena spiroides++++Anabaena spiroides++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena spiroides+++++Anabaena		Scenedesmus quadricauda	++	+
BacillariophyceaeMougeotia sp.++Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.+-Chlorococcum humicola+++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis++++Ryrosigma acuminatum++++Fragilaria ratonensis+++-CyanophyceaeAphanocapsal itroralis++Amabaena spiroides+++-EuglenophyceaeEuglena viridis+++EuglenophyceaeTribonema sp.+++FaathophyceaeTribonema sp.+++KanthophyceaeTribonema sp.+++Kant		Pediastrum boryanum	++	+
Cosmarium species+-Staurastrum sps.++Tetraedron trigonum++++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.+-Chlorococcum humicola++++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis++++Fragilaria ratonensis+++Fragilaria ratonensis++-CyanophyceaeAphanocapsal itoralis++Gloeccapsa magma++++Gloeccapsa magma++++EuglenophyceaeEuglena viridis+++EuglenophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++	Bacillariophyceae	Mougeotia sp.	+	+
Staurastrum sps.++Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.++Chlorococcum humicola++++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata++++Navicula sp++++Amphora ovalis+++-Pinnularia gibba+++-Pinnularia virdis++++Gyrosigma acuminatum++++Fragilaria ratonensis++++CyanophyceaeAphanocapsal itroralis++Synechococcus aeruginosus+++Anabaena spiroides+++EuglenophyceaeEuglena viridis++EuglenophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++		Cosmarium species	+	-
Tetraedron trigonum++++Volvox sp.++++Arthrodesmus sp.+-Chlorococcum humicola+++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata+++Mavicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia gibba++-Pinnularia virdis++++Rragilaria ratonensis++++Synedra ulna+-CyanophyceaeAphanocapsal itroralis++Anabaena spiroides+++Anabaena spiroides+++EuglenophyceaeEuglena viridis+++EuglenophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++		Staurastrum sps.	+	+
Volvox sp.+++++Arthrodesmus sp.+-Chlorococcum humicola+++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis++++Gyrosigma acuminatum++++Fragilaria ratonensis+++CyanophyceaeAphanocapsal titroralis+Aphanocapsal magma++++Gloeocapsa magma++++Gloeocapsa magma++++Anabaena spiroides++Lyngbya sp.++++EuglenophyceaeEuglena viridis+++Faculena viridis++++Tibonema sp.++++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++		Tetraedron trigonum	+++	+
Arthrodesmus sp.+-Chlorcoccum humicola+++Tetraspora lubrica++++Spirogyra sp.+++Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia gibba++++Gyrosigma acuminatum++++Fragilaria ratonensis++++Synedra ulna+-CyanophyceaeAphanocapsal itroralis+++Gloeocapsa magma++++Gloeocapsa magma++++Gloeocapsa magma++++Anabaena spiroides++Lyngbya sp.++++EuglenophyceaeEuglena viridis+++Facilena viridis++++Tribonema sp.+++		Volvox sp.	+++	+
Chlorococcum humicola+++Tetraspora lubrica++++Spirogyra sp.++++Melosira granulata++++Navicula sp++++Amphora ovalis+++-Pinnularia gibba+++-Pinnularia virdis++++Qyrosigma acuminatum++++Fragilaria ratonensis++++Cymbella naviculiformis++++Cyclotella stelligera++++Synechococcus aeruginosus++++Gloeocapsa magma++++Anabaena spiroides+++Nostoc pruniforme++++Lyngbya sp.++++EuglenophyceaeEuglena virdis+++Fraguena spiroides++++Anabaena spiroides++++Anabaena spiroides++++Anabaena spiroides++++Anabaena spiroides++++XanthophyceaeTribonema sp.++++XanthophyceaeTribonema sp.++++		Arthrodesmus sp.	+	-
Tetraspora lubrica++++Spirogyra sp.++++Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia gibba++++Rizschia vitrea++++Gyrosigma acuminatum++++Fragilaria ratonensis++-Verbella naviculiformis++++CyanophyceaeAphanocapsal itroralis++Gloeocapsa magma++++Gloeocapsa magma++++Mostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++FaculenophyceaeEuglena viridis+++Anabaena spiroides+++Anabaena spiroides+++Anabaena spiroides+++++Anabaena spiroides++++Anabaena spiroides++++A		Chlorococcum humicola	++	+
Spirogyra sp.++++Melosira granulata++++Navicula sp++++Amphora ovalis+++-Pinnularia gibba+++-Pinnularia virdis+++-Nitzschia vitrea++++Gyrosigma acuminatum++++Fragilaria ratonensis+++Cymbella naviculiformis++++Cyclotella stelligera++++Cyclotella stelligera++++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.++++EuglenophyceaeEuglena viridis++Faculena viridis+++Tribonema sp.+++		Tetraspora lubrica	+++	+
Melosira granulata+++Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis+++-Nitzschia vitrea+++Fragilaria ratonensis+++Fragilaria ratonensis++-Synedra ulna+-CyanophyceaeAphanocapsal itroralis++Aphanocapsal itroralis+++Gloeocapsa magma++++Gloeocapsa magma++++Anabaena spiroides++Lyngbya sp.+++EuglenophyceaeEuglena viridis++Fuglena viridis++++AnathophyceaeTribonema sp.++XanthophyceaeTribonema sp.++XanthophyceaeTribonema sp.++Yanthophyceae++++		Spirogyra sp.	++	+
Navicula sp+++Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis+++-Nitzschia vitrea++++Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-CyanophyceaeAphanocapsal itoralis++++Goscillatoria subbrevis+++Synechococcus aeruginosus++Gloeocapsa magma++++Gloeocapsa magma++++Anabaena spiroides++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++XanthophyceaeTribonema sp.+++		Melosira granulata	++	+
Amphora ovalis++-Pinnularia gibba++-Pinnularia virdis+++-Nitzschia vitrea++++Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera++++Synechococcus aeruginosus++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis++KanthophyceaeTribonema sp.+++		Navicula sp	++	+
Pinnularia gibba+++-Pinnularia virdis+++-Nitzschia vitrea++++Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus++-Gloeocapsa magma+++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Amphora ovalis	++	-
Pinnularia virdis+++-Nitzschia vitrea+++Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis++Gloeocapsa magma+++++Gloeocapsa magma+++++Mostoc pruniforme+++++Lyngbya sp.++++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Pinnularia gibba	++	-
Nitzschia vitrea+++Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Lyngbya sp.+++EuglenophyceaeEuglena viridis++Fuglena viridis+++Tribonema sp.+++XanthophyceaeTribonema sp.++		Pinnularia virdis	+++	-
Gyrosigma acuminatum++++Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus++-Gloeocapsa magma+++++Anabaena spiroides++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Nitzschia vitrea	++	+
Fragilaria ratonensis++-Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus+++Oscillatoria subbrevis++++Gloeocapsa magma+++++Anabaena spiroides+++Lyngbya sp.++++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Gyrosigma acuminatum	+++	+
Synedra ulna+-Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus+++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Fragilaria ratonensis	++	-
Cymbella naviculiformis++++Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus+++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Synedra ulna	+	-
Cyclotella stelligera+++-CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme++++Lyngbya sp.+++EuglenophyceaeEuglena viridis+++XanthophyceaeTribonema sp.+++		Cymbella naviculiformis	+++	+
CyanophyceaeAphanocapsal itroralis+-Synechococcus aeruginosus++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme+++-Lyngbya sp.+++EuglenophyceaeEuglena viridis++Phacus acuminatus++XanthophyceaeTribonema sp.++		Cyclotella stelligera	+++	-
Synechococcus aeruginosus++Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme+++-Lyngbya sp.+++Euglena viridis+++Phacus acuminatus++XanthophyceaeTribonema sp.+++	Cyanophyceae	Aphanocapsal itroralis	+	-
Oscillatoria subbrevis+++Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme+++-Lyngbya sp.+++EuglenophyceaeEuglena viridis++Phacus acuminatus++XanthophyceaeTribonema sp.++		Synechococcus aeruginosus	+	+
Gloeocapsa magma++++Anabaena spiroides++Nostoc pruniforme+++-Lyngbya sp.+++EuglenophyceaeEuglena viridis++Phacus acuminatus++XanthophyceaeTribonema sp.++		Oscillatoria subbrevis	++	+
Anabaena spiroides++Nostoc pruniforme+++-Lyngbya sp.+++Euglena viridis+++Phacus acuminatus++XanthophyceaeTribonema sp.++		Gloeocapsa magma	+++	+
Nostoc pruniforme+++-Lyngbya sp.+++Euglena viridis+++Phacus acuminatus++XanthophyceaeTribonema sp.++		Anabaena spiroides	+	+
Lyngbya sp.+++EuglenophyceaeEuglena viridis Phacus acuminatus+++XanthophyceaeTribonema sp.+++		Nostoc pruniforme	+++	-
EuglenophyceaeEuglena viridis+++Phacus acuminatus++XanthophyceaeTribonema sp.+++		Lyngbya sp.	++	+
Phacus acuminatus++XanthophyceaeTribonema sp.+++	Euglenophyceae	Euglena viridis	++	+
XanthophyceaeTribonema sp.+++		Phacus acuminatus	+	+
	Xanthophyceae	Tribonema sp.	++	+

## Table 1. Abundance and composition of Phytoplankton in the midstream of Meenachil River,Kerala

+++ : abundant; ++ : fairly present; + : rare

In the pre-monsoon season, a total of 39 species were identified, with Chlorophyceae being the most abundant group (18 species), followed by Bacillariophycea (11 species), Cyanophyceae (7 species), Euglenophyceae (2 species), and Xanthophyceae (1 species). In contrast, during the monsoon season, 27 species were observed, with Chlorophyceae (14 species) being the dominant group, followed by Bacillariophycea and Cyanophyceae (each with 5 species), Euglenophyceae (2 species), and Xanthophyceae (1 species). The higher diversity of phytoplankton during the pre-monsoon season can be attributed to factors such as increased levels of salinity, temperature, nutrient content, pH, and light intensity, as observed in previous studies [19-22]. However, it should be noted that this study on Phytoplankton diversity in Meenachil river is only preliminary in nature and further factors need to be considered in future studies. Additionally, a correlation study is necessary to clarify the relationship between these factors and the observed increase in phytoplankton diversity of this river [23].

#### 4. CONCLUSION

In conclusion, the diversity of Phytoplankton varies naturally and is influenced by seasonal and water conditions. The study conducted in the midstream of Meenachil River. Kerala, during the pre-monsoon and monsoon season identified 39 species of phytoplankton from five taxonomic with divisions. Chlorophyceae being the dominant group followed by Bacillariophyceae, Euglenophyceae, Cyanophyceae, and The pre-monsoon Xanthophyceae. season exhibited higher phytoplankton abundance than the monsoon season. This research provides valuable insights into the Phytoplankton diversity of Midstream Region of Meenachil River, Kerala, and emphasizes the need to monitor seasonal changes in phytoplankton abundance for better water resource management.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

#### REFERENCES

- Prabha, Dua A. Species diversity and seasonal variations in phytoplankton communities within Harike wetland – a Ramsar SITE. Int J Creat Res Thoughts. 2018;6(2):251-7.
- Zinat A, Jewel MAS, Khatun B, Hasan MK, Saleha JN. Seasonal variations of phytoplankton community structure in Pasur River estuary of Bangladesh. Int J Fish Aquat Stud. 2021;9:37-40.
- Ptacnik R, Solimini AG, Andersen T, Tamminen T, Brettum P, Lepistö L, et al. Diversity predicts stability and resource use efficiency in natural phytoplankton communities. Proc Natl Acad Sci U S A. 2008;105(13):5134-8. DOI: 10.1073/pnas.0708328105, PMID 18375765.
- Das BK, Nandy SK, Gogoi P, Sahoo AK, Naskar M, Kunui A. Unraveling the phytoplankton altitudinal dynamics in relation to environmental variables in a Himalayan River, Teesta, India. Aquat Sci. 2022;84(3):1-16. DOI: 10.1007/s00027-022-00869-0
- 5. Sebastian S, Thomas JV. Temporal variation of phytoplankton in Idukki

reservoir, Kerala. Indian J Ecol. 2016; 43(1):22-7.

- Sebastian S. Algal diversity of River Meenachil in Kerala, India. Indian J Appl Res. 2016;6(3):203-4.
- APHA (American Public Health Association). Standard Methods for the examination of water and waste water. 14th ed. 1015 Eighteenth Street, N: American Public Health Association. W. Washington, DC. 1995;20036.
- 8. Desikachary TV. Cyanophyta. West Germany. New Delhi: Indian Council of Agricultural Research; 1959.
- 9. Edmondson WT. Freshwater biology. 2nd ed. New York: John Wiley & sons; 1959.
- 10. Whiteford LA, Schumacher GJ. A manual of freshwater algae. Sparks press, Releigh, NC; 1973.
- Prescott GW. Algae of the western great Lakes area, with an illustrated key to the genera of desmids and freshwater diatoms. Koenigutein otto Koeltz. 1982; 977.
- 12. Palmer CM. Algae and water pollution. Castle house publication. 1980;123.
- Anand N. Indian fresh water microalgae. Dehra Dun: Bisen Singh Mahendrapal Singh Publishers. 1998;88.
- 14. Gangwar RK, Khare P, Singh J, Singh AP. Assessment of physico-chemical properties of water: River Ramganga at Bareilly, U.P. Journal of Chemical and Pharmaceutical Research. ASHA. 2012; 4(9):4231-4.
- 15. Asha PS, Ranjith L, Diwakar K, Prema D, Krishnakumar PK. Distribution and species diversity of phytoplankton in the inshore waters of Tuticorin in relation to the physicochemical variables. J Mar Biol Ass India. 2018;60(1):77-85.

DOI: 10.6024/jmbai.2018.60.1.2001-12

 Minu P, Shaju SS, Muhamed Ashraf P, Meenakumari B. Phytoplankton community characteristics in the coastal waters of the southeastern Arabian Sea. Acta Oceanol Sin. 2014;33(12):170-9.
DOI: 10.1007(p12121.014.0571 x)

DOI: 10.1007/s13131-014-0571-x

- Baliarsingh SK, Srichandan S, Naik S, Sahu KC, Lotliker AA, Srinivasa Kumar T. Seasonal variation of phytoplankton community composition in coastal waters off Rushikulya estuary, east coast of India. Indian J Mar Sci. 2015;44(4):508-26.
- Varghese M, Vinod K, Gireesh R, Anasukoya A, Ansar CP, Nikhiljith MK, et al. Distribution and diversity of

phytoplankton in Kadalundi estuary, southwest coast of India. J Mar Biol Assoc India. 2022;64(1):50-6.

DOI: 10.6024/jmbai.2022.64.1.2279-08

- 19. Muraleedharan H, Abhilash R, R. Physiochemical parameters and planktons analysis of sea water of Thondi of Palk Bay, Tamil Nadu. J Biosci Res. 2010;1: 20-4.
- Badsi H, Oulad Ali H, Loudiki M, Aamiri A. Phytoplankton diversity and community composition along the salinity gradient of the Massa estuary. Am. J Hum Ecol. 2012;1:58-64.
- 21. Mirzaei MR, Seraji F, Erfanifar E, Rad TA, Aminikhoei Z, Azhang B. Assessing phytoplankton community structure in

relation to hydrographic parameters and seasonal variation (Pre & Post Monsoon). Biodivers J Biol Divers. 2017;18(2):507-13. DOI: 10.13057/biodiv/d180209

- 22. Vajravelu M, Martin Y, Ayyappan S, Mayakrishnan M. Seasonal influence of physico-chemical parameters on phytoplankton diversity, community structure and abundance at Parangipettai coastal waters, Bay of Bengal, South East Coast of India. Oceanologia. 2018; 60(2):114-27.
- DOI: 10.1016/j.oceano.2017.08.003
- Neethu GP, Sruthi S, Anzeer FM, Vattakkayal K. First report on ecology of Vattakkayal, Tresa Radhakrishnan. Int J Sci Res. 2014;3(12):132-4.

© Copyright MB International Media and Publishing House. All rights reserved.