Studies On The Phytoplankton Diversity Of Selected Ponds In Palukal Panchayat, Kanniyakumari District

Juwairiya Nasreen J[1*] and Mathevan Pillai M[2]

[1*]Research Scholar, Reg No: 21113152262014, Department of Botany, S.T. Hindu College, Nagercoil, Kanniyakumari district, Tamil Nadu, India. juwairiyagj@gmail.com ORCID ID: 0009-0004-1276-4857
[2]Associate Professor & Head, Department of Botany and Research Centre, S.T. Hindu College, Nagercoil, Kanniyakumari district, Tamil Nadu, India. mavetha@gmail.com
(Affiliated to Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli - 627 012, Tamil Nadu, India).

***Corresponding Author:** Juwairiya Nasreen J
[*]Research Scholar, Reg No: 21113152262014, Department of Botany, S.T. Hindu College, Nagercoil, Kanniyakumari district, Tamil Nadu, India. juwairiyagj@gmail.com

ABSTRACT
Ponds are fresh water ecosystems that are highly diverse. Phytoplankton are the photoautotrophic pioneer of aquatic systems. The present study was conducted to analyse the diversity of ponds at Palukal Panchayat. The study was conducted from the period of July 2022 to December 2022. The study revealed the presence of 80 phytoplankton comprising 12 species of blue-green algae, 50 species of green algae, 14 species of diatoms and 4 species of euglenophytes. The study reported the presence of pollution indicator organisms such as *Microcystis, Chlorella, Oscillatoria, Spirogyra,* and *Navicula.* Hence monitoring should be done regularly to protect the environment.

Keywords: Phytoplankton, Chlorophyceae, Pollution indicator.

INTRODUCTION

The region's freshwater environment is an essential component of its natural landscape. One type of freshwater environment that may be created artificially or naturally is a pond. Ponds are essential to human existence as sources of water. Ponds, however, may have been man-made for a variety of uses, or they might have been natural water sources that were used by humans for a variety of reasons in different eras (Rajagopal *et al*., 2010). Ponds are part of an ecosystem that is home to a diverse range of species, from higher to lower plants. Nearly all bodies of water have phytoplankton, which are small, photoautotrophic, chlorophyll-containing organisms that live in the upper sunlight layer. They stand for the earliest members of the aquatic food chain as well as the tiny algae colonies seen in water bodies.

The term "phytoplankton" refers to organisms that are unicellular, filamentous, and free-floating. They constitute the foundational links in the food chain of all aquatic organisms and are almost ubiquitous in all natural water bodies, including diatoms, blue-green algae, and green algae (Mishra *et al*., 2001). Plankton comes in various forms and is a very intricate and diversified part of the ecosystem. Phytoplankton is well acknowledged for its remarkable capacity to function as bioindicators due to its ability to rapidly react to changes in environmental circumstances (Prabha & Dua, 2018). In addition to being found in coastal ecosystems, phytoplankton is also present in freshwater systems like rivers, where it functions as the base of food webs and is essential to the global carbon cycle (Zinat *et al*., 2021). The diversity of phytoplankton can be greatly impacted by seasonal fluctuations, specific geographic location, and water depth (Das *et al*., 2022). To evaluate the quality of the water, phytoplankton was employed. An essential part of an ecosystem, plankton reacts quickly to changes in the environment. They differ in size and represent the water's quality (Ali *et al*., 2003). Green algae are the greatest type of phytoplankton to address the rising issue of protein malnutrition among children in developing nations. Furthermore, phytoplankton is a marker for the aquatic ecosystem's tropic condition.

To better understand the ecological state of the region and develop management and conservation plans, the research intends to give a thorough investigation of the phytoplankton population in the ponds owned by the Palukal panchayat.

MATERIALS AND METHODS

The selected site for the study was four ponds of Palukal Panchayat of Kanniyakumari district (P_1- Mannamkonamkulam, P_2- Payikulam, P_3- Ambalakulam, and P_4- Mullasherykulam). The sampling was done for a period of six months from July 2022 -December 2022. From the study area, monthly water samples were collected, centrifuged and preserved using 4% formalin. It was then observed under the microscope and photographs were taken. They are identified using standard literature (Fritsch, 1945; Desikachary, 1959; Round, 1971; Anand, 1998; Krishnamurthy, 2000).

RESULTS AND DISCUSSION

The first trophic level in the food chain is occupied by phytoplankton. The variety of phytoplankton is intimately correlated with the productivity of an aquatic environment. In aquatic ecosystems, phytoplankton are crucial markers of ecosystem health and water quality. Due to their high susceptibility to change, plankton distribution fluctuates greatly depending on variables such as seasonal variations, water quality, and nutrient concentrations (Neethu *et al*., 2014).

Four categories were identified by the study: Euglenophyceae, Bacillariophyceae, Cyanophyceae, and Chlorophyceae. In the experimental ponds, 80 phytoplankton species and 32 genera were found. Of these, 8 genera with 12 species of blue-green algae, 13 genera with 50 species of green algae, 8 genera with 14 species of diatoms, and 3 genera with 4 species of euglenophytes. Chlorophyceae was the most prevalent group in all ponds throughout the research period, followed by Bacillariophyceae, Cyanophyceae, and Euglenophyceae. The research of Kumar and Oomen (2011) was comparable to the present result. The dominance of Chlorophyceae was also reported by Das *et al*. 2018. The study shows that in all experimental plants, Chlorophycean members predominate in the summer. This outcome was consistent with the findings of Marashoghr and Gonulol (2015). Three species of *Fragilaria* were identified in this investigation. According to Bajpai and Ajarker (1997), the pond's oligotrophic character was suggested by the prevalence of *Fragilaria* species.

Even at low densities, the presence of *Microcystis, Chlorella, Oscillatoria, Spirogyra,* and *Navicula* suggested that there was some organic contamination in the ponds (Shekar *et al*., 2008). *Oscillatoria, Microcystis, Closterium, Phacus,* and *Euglena* have all been found in different stabilization ponds and contaminated habitats, according to the current study. A similar outcome was seen by Morro *et al*. (2012).

Table : Distribution of Phytoplankton in experimental ponds (July 2022 -December-2022)

S. No	Name of the Phytoplankton	P_1	P_2	P_3	P_4
	Bacillariophyta				
1.	*Achnanthes minutissima*	+	-	-	-
2.	*Caloneis gracilis*	++	-	++	-
3.	**Fragilaria construens*	+	-	+	+
4.	**Fragilaria* sp.	+	+	+	+
5.	**Fragilaria virescens*	-	+	-	+
6.	*Gomphonema truncatum*	+	-	+	-
7.	*Gyrosigma* sp.	++	+	+	+
8.	*Licmophora* sp.	+	++	-	++
9.	**Navicula cuspidata*	++	+	+	++
10.	**Navicula fritschii*	-	+++	++	-
11.	**Navicula laterostrata*	-	+++	+	+
12.	**Navicula papula*	++	+	+	+
13.	**Navicula veneta*	+++	-	++	+
14.	*Pinnularia gibba*	-	++	+++	+
	Chlorophyta				
15.	**Closterium recurvum*	+	+	+	+
16.	**Closterium acerosum*	+	+	+	+
17.	**Closterium peracerosum*	++	++	-	-
18.	**Closterium libelulla*	+	+	-	+
19.	**Closterium* sp.	++	-	+++	++
20.	**Closterium kuetzingii*	+	+	++	++
21.	**Closterium croasdale*	-	++	+	-
22.	**Closterium parvulam*	+	+	+	-
23.	**Closterium pritchardianum*	-	-	-	+
24.	**Closterium decorum*	-	+	+	-
25.	**Closterium* sp.	+	+	+	+
26.	**Closterium* sp.	++	-	-	+
27.	**Closterium moniliferum*	-	+	+	-
28.	**Closterium* sp.	++	+	+	+
29.	**Closterium acutum*	-	-	++	-
30.	**Closterium calosporum*	+	+	-	-
31.	**Closterium* sp.	++	+	-	-
32.	**Closterium cynthia*	+	+	-	-
33.	**Closterium dianae var. minus*	-	+	+	-
34.	**Closterium* sp.	-	+	-	++
35.	**Closterium* sp.	++	+	-	-
36.	**Closterium tumidum*	+	-	-	-
37.	**Closterium ehrenbergii*	-	+	-	-
38.	**Closterium* sp.	+	-	-	+

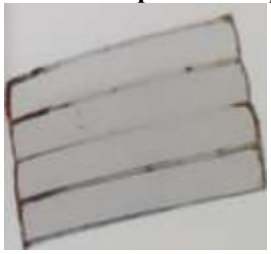
39.	**Closterium leibleinii*	-	+	-	+
40.	**Closterium lineatum*	+	-	+	+
41.	*Coelastrum* sp.	+	+	+	+
42.	*Cosmarium amoenum*	-	++	+	-
43.	*Cosmarium hammeri*	-	+	-	-
44.	*Docidium egregium*	-	+	-	-
45.	*Micrasterias radiosa*	-	-	-	+
46.	*Micrasterias fimbriata*	-	+	+	-
47.	*Mougeotia* sp.	+	-	-	-
48.	*Oedogonium globosum*	-	+	-	-
49.	*Oedogonium intermedium*	+	+	+	+
50.	*Oedogonium* sp.	-	+	-	-
51.	*Oedogonium* sp.	+	-	+	-
52.	*Oedogonium* sp.	-	-	+	+
53.	*Pediastrum duplex*	+	+++	+	+
54.	*Pediastrum ovatum*	+	+	+	++
55.	*Pediastrum tetras*	+	+	+	++
56.	*Pithophora* sp.	-	+	+	-
57.	*Pithophora* sp.	+	-	+++	=+
58.	*Pithophora* sp.	-	-	-	++
59.	*Pithophora* sp.	-	+	+	+
60.	*Scenedesmus denticulatus* var *australis*	-	-	-	+
61.	*Spirogyra crassa*	-	+	-	-
62.	*Spirogyra gratiana*	+	-	-	-
63.	*Ulothrix* sp.	-	-	-	+
64.	*Zygnema* sp.	-	-	+	+
	Cyanophyta				
65.	*Chlorella vulgaris*	+++	+	+	+
66.	*Chroococcus giganteus*	-	+	-	-
67.	*Dactylococcopsis* sp.	++	-	+	-
68.	*Dactylococcopsis* sp.	-	+++	+	+
69.	*Hapalosiphon delicatulus*	+	-	-	-
70.	*Lyngbya* sp.	-	+	+-	
71.	*Microcystis aeruginosa*	++	-	-	-
72.	**Oscillatoria subbrevis*	+	++	+	+
73.	**Oscillatoria nigroviridis*	++	-	-	-
74.	**Oscillatoria* sp.	+	+	+	++
75.	**Oscillatoria tenuis*	++	+	+	+
76.	*Scytonema* sp.	-	-	+	-
	Euglenophyta				
77.	**Euglena gracilis*	-	+	-	+
78.	**Euglena polymorpha*	+	-	-	-
79.	**Phacus anacoelus*	+	-	-	-
80.	*Trachelomonas* sp.	-	+	-	-

+ - Rare, - -Absent, * -Pollution indicators, ++ -Frequent, +++ -Dominant

Plate : Phytoplanktons collected from the experimental ponds

Achnanthes minutissima

Caloneis gracilis



Fragilaria construens

Closterium ehrenbergii


Fragilaria sp.


Gomphonema truncatum


Gyrosigma sp.


Closterium dianae* var. *Minor


Navicula cuspidata


Navicula fritschii


Navicula laterostrata


Closterium acutum


Navicula veneta


Pinnularia gibba


Closterium pritchardianum


Closterium parvulum


Closterium tumidum


Closterium sp.


Closterium sp.


Pediastrum tetras


Closterium cynthia


Closterium calosporum


Closterium sp.


Pediastrum ovatum


Closterium recurvum


Closterium moniliferum

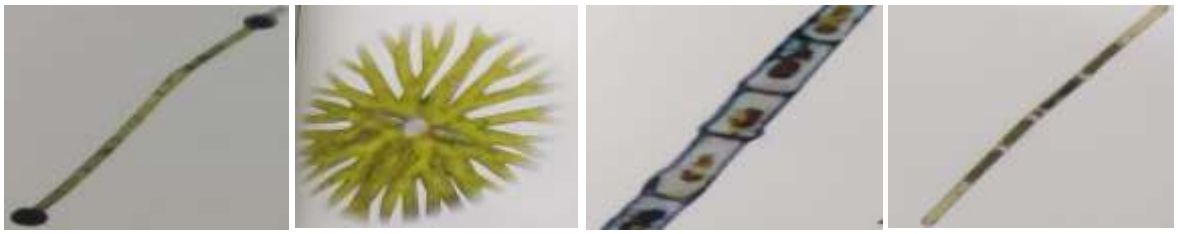

Closterium sp.


Zygnema sp.

Closterium decorum ***Closterium*** sp. ***Closterium*** sp. ***Oscillatoria*** sp.

Closterium lineatum ***Closterium leibleinii*** ***Closterium*** sp. ***Closterium kuetzingii***

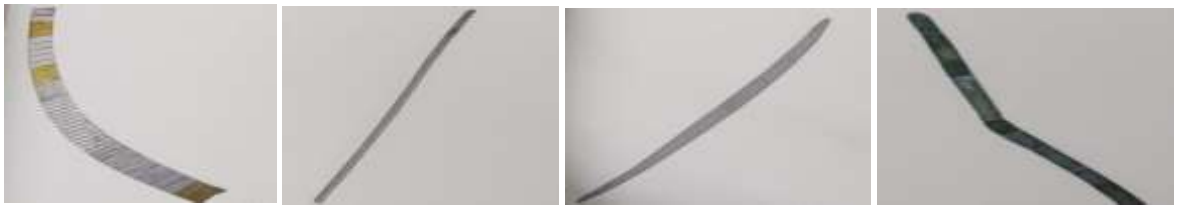
Closterium libelulla ***Closterium paracerosum*** ***Closterium acerosum*** ***Closterium*** sp.



Oedogonium intermedium ***Micrasterias fimbriata*** ***Pithophora*** sp. ***Oedogonium sp***

Oedogonium globosum ***Mouegeotia*** sp. ***Scytonema*** sp. ***Ulothrix*** sp.

Micrasterias radiosa ***Spirogyra crassa*** ***Microcystis aeruginosa*** ***Oedogonium*** sp.



Scytonema sp. ***Oscillatoria nigroviridis*** ***Dactylococcopsis*** sp. ***Pithophora*** sp.

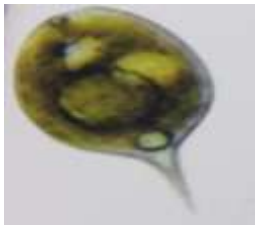

Chlorella vulgaris


Dactylococcopsis sp.


Lyngbya sp.


Oscillatoria subbrevis


Oscillatoria tenuis


Euglena gracilis


Phacus anacoelus


Euglena polymorpha

CONCLUSION

From this study, it can be concluded that the selected four ponds such as Mannamkonamkulam, Payikulam, Ambalakulam and Mullasherykulam of Palukal panchayat in Kanniyakumari have a great diversity. Besides, the freshwater ecosystem of Palukal Panchayat needs more attention for environmental protection.

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