Diversity Of Phytoplankton Studies On The Selected Ponds From Agastheeswaram Taluk, Kanyakumari District

Ramisha S[1]*, Mathevan Pillai M[2]

[1]*Research scholar, Reg No:21213152262015, Department of Botany, S.T. Hindu College, Nagercoil, Kanniyakumari district, Tamil Nadu, India. sramish98@gmail.com
[2]Associate Professor & Head, Department of Botany and Research Centre, S.T. Hindu College, Nagercoil, Nagercoil, Kanniyakumari district, Tamil Nadu, India. mavetha@gmail.com (Affiliated to Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627 012, Tamil Nadu, India)

Corresponding Author: Ramisha S

Research scholar, Reg No:21213152262015, Department of Botany, S.T. Hindu College, Nagercoil, Kanniyakumari district, Tamil Nadu, India. sramish98@gmail.com

ABSTRACT
The phytoplankton, as the basis of the trophic chain constituents, is the most important biological community in any aquatic system. The present study was conducted at two ponds of Agastheeswaram taluk in Kanyakumari district. The samples were collected from the selected ponds such as Putheri Pond (P1) and Putheri Paraiyadi Pond (P2) from October 2020 to March 2021. A total of 88 algal species were observed during the study period. Out of the total species, 43 species belonged to Chlorophyta, 21 species belonged to Cyanophyta, 20 species belonged to Bacillariophyta and 4 species belonged to Euglenophyta. From this study, it can be concluded that the selected ponds of Agastheeswaram taluk of Kanyakumari district have a great diversity with several algal taxa.

Keywords: Phytoplankton, Chlorophyceae.

INTRODUCTION

The freshwater ecosystem is an integral part of the nature of the region. Of the earth's fresh water, 69.6% is locked up in the continental ice, 30.1% in underground aquifers, and 26% in rivers and lakes. Water is essential to sustain all life forms. Fresh water bodies help regulate the cycling of nutrients and water bodies provide basic support to the food chain. Ponds are one of the important components of freshwater resources either formed naturally or constructed. They are highly potential freshwater sources, essential for the functioning of the entire environment, and are highly productive too. However, ponds are the most threatened and easily vulnerable habitat than any other wetland (Deshmukh, 2006).
Phytoplankton are microscopic aquatic plants, occurring as unicellular, colonial, or filamentous forms, without any resistance to currents and are free-floated or suspended in open/pelagic waters and autotrophic component of the plankton community. They are photosynthesizing microscopic organisms that inhabit the upper sunlit layer of almost all oceans and bodies of freshwater. They are agents for primary production, the creation of organic compounds from carbon dioxide dissolved in the water a process that sustains the aquatic food web. There are the initial biological components from which the energy is transferred to higher organisms through the food chain (Tiwari and Chauhan, 2006; Saifullah *et al*., 2014).
Phytoplankton are usually used as an ecological indicator to assess the ecological health and the stress effects of chemical contaminants on aquatic ecosystems and are also necessary to sustain a healthy aquatic ecosystem and they are also necessary to sustain a healthy aquatic ecosystem. The availability of nutrients influences the diversity of the phytoplankton (Sharma and Tiwari, 2018). Therefore, phytoplankton composed of the first ring of the food chain should be examined taxonomically and ecologically (Ansari *et al*., 2018). The main objective of the study is to analyze the diversity of the selected ponds' freshwater ecosystem.

MATERIALS AND METHODS

The selected site for the study was two ponds (Pond 1- Putheri Pond, Pond 2- Putheri Paraiyadi) of Agastheeswaram taluk. The sampling was done for 6 months from October 2020 to March 2021.

Sample Collection

Monthly water samples were collected on specific dates by using clean sample bottles (Pyrex glass) for the study. Samples were collected from selected sampling sites at each pond between 6 a.m. and 8 a.m.

Collection of phytoplankton

Monthly phytoplankton samples were collected fixed in 4% formalin and a number of cells/ml was observed. These were identified by using standard literature (Fritsch, 1945, Desikachary, 1959, Philipose, 1967, Prescott 1978, Anand, 1998, Krishnamurthy, 2000).

RESULT AND DISCUSSION

Ponds are important constituents of freshwater bodies necessary to sustain life. Ponds are shrinking rapidly, getting denied up permanently. Valuable micro and macro organisms are lost along with the loss of these water bodies. During the phytoplankton analysis study, the order of distribution of algae was Chlorophyta > Cyanophyta > Bacillariophyta >Euglenophyta.

In the present study, a total of 86 phytoplankton species were identified including 41 belonging to Chlorophyceae, 21 belonging to Cyanophyceae, 20 belonging to Bacillariophyceae, and 4 belonging to Euglenophyceae members were also found. In P1 34 species in Chlorophyta, 17 species in Cyanophyta, 16 species in Bacillariophyta, and 3 species in Euglenophyta. In P2, 35 species in Chlorophyta, 17 species in Cyanophyta and Bacillariophyta, and 3 in Euglenophyta.

Chlorophyta occurs abundantly in ponds, lakes, slow-flowing streams, wetlands, etc. and their growth in various habitats significantly influences the ecosystem as primary producers (Rout and Borah, 2009). In the present investigation, Chlorophyta (green algae) dominates in the two experimental ponds which are in agreement with the results of (Mohar *et al*.2009, Janjua et al. 2009, and Umamaheshwari,2011). Chlorophyte dominated the phytoplankton community during summer in both experimental ponds. These results are similar to the findings of Marashoghr and Gonulol (2015). The higher numbers of Chlorophyceae were mainly due to the bright sunshine and rich source of nutrients.

The species of *Closterium, Oedogonium,* and *Pediastrum* were observed in two ponds which are similar to the previous reports of Jafari and Gunale (2006). Some species of algae flourish well in eutrophic waters while others are sensitive to organic or chemical wastes. Few species develop noxious blooms creating offensive taste and odor or anoxic or toxic conditions resulting in human illness or animal death (Palmer,1969). They are highly sensitive to changes in nutrient levels, temperature, predation and provide an essential link in the freshwater food chain (Jha and Barat,2003 and Adeyemo et al. 2008).

Chlorophycean algae are efficient absorbers of atmospheric carbon and thus play an important role in controlling the concentration of carbon dioxide (CO_2) one of the most important greenhouse gases (Bhagat *et al*. 2009). Some pollution-tolerant algae like *Oscillatoria* sp., *Pediastrum* sp., *Closterium* sp., *Navicula* sp and *Microcystis* sp. Hence there is a need for regular monitoring of water before it is used for drinking and domestic purposes

Table: Distribution of phytoplankton in the experimental ponds (October 2020 to March 2021)

S.No	Name of the phytoplankton	October	November	December	January	February	March
Chlorophyceae							
1	*Arthrodesmus convergens*	+	-	+	+	+	-
2	*Cladophora glomerata*	+	++	++	+	+	+
3	*Closterium Cynthia*	-	-	+	++	_	+
4	*Closterium ehrenbergii*	+	+	-	-	+	+
5	*Closterium kuetzingii*	-	-	+	+	++	-
6	*Closterium leibleinii*	-	+	+	-	-	+
7	*Closterium lineatum*	+	+	-	+	++	-
8	*Closterium malmei*	+	-	+	+	+	+
9	*Closterium moniliferum*	+	-	+	++	+	+
10	*Closterium parvulum*	-	++	-	-	++	+
11	*Closterium recurvatum*	++	+	++	+	+	-
12	*Closterium setaceum*	+	-	+	+	-	-
13	*Closterium* sp.1	-	-	-	+	++	+
14	*Closterium* sp.2	+	+	-	+	+	-
15	*Closterium* sp.3	-	+	+	-	-	-
16	*Closterium* sp.4	+	-	+	-	+	+
17	*Coelastrum microporum*	-	+	-	+	-	++
18	*Cosmarium cucurbitinum*	+	++	-	-	++	-
19	*Cosmarium* sp.	-	+	-	+	-	++
20	*Cosmarium subcostatum*	+	-	+	-	++	-
21	*Cylindrocystis* sp.	-	-	+	++	-	-
22	*Hydrodictyon reticulatum*	-	++	+	+	+	-

23	*Micrasterias radiosa*	+	+	-	-	+	++
24	*Mougeotia sphaerocarpa*	-	-	+	+	+	-
25	*Oedogonium giganteum*	+	++	-	++	-	+
26	*Oedogonium globosum*	+	++	-	++	-	+
27	*Oedogonium inclusum*	-	-	-	+	+	++
28	*Oedogonium microgonium*	-	+	+	-	-	+
29	*Oedogonium porrectum*	+	++	-	+++	+	-
30	*Oedogonium* sp.	+	-	-	++	+	+
31	*Pediastrum biradiatum*	-	-	+	-	+	+
32	*Pediastrum duplex*	+++	+	-	+	-	-
33	*Pediastrum gracillimum*	+	+++	+	+	-	+
34	*Pediastrum simplex*	-	-	+	-	+	+
35	*Pediastrum tetras*	+	+	+++	-	-	-
36	*Spirogyra fluviatilis*	+	-	+	-	+	++
37	*Spirogyra parvispora*	-	+	-	-	+	-
38	*Spirogyra weberi*	+	++	-	++	-	-
39	*Tetraspora gelatinosa*	-	+	+	-	+	-
40	*Ulothrix zonata*	+	+	-	++	-	+
41	*Zygnema* sp.	+	-	-	+	-	+
Cyanophyceae							
42	*Aphanocapsa pulchra*	-	+	+	-	+	-
43	*Aulosira* sp.	-	+	-	+	-	++
44	*Dactylococcopsis* sp.1	+	-	+	-	+	-
45	*Dactylococcopsis* sp.2	-	+	-	+	-	+
46	*Lyngbya dendrabya*	-	+	-	+	+	-
47	*Lyngbya* sp.	-	+	++	-	-	+
48	*Microcystis aeruginosa*	+	-	++	-	-	-
49	*Microcystis flos-aquae*	-	+	-	++	-	-
50	*Microcystis viridis*	+	+	-	-	+	-
51	*Oscillatoria amphigranulata*	-	+	-	++	-	+
52	*Oscillatoria limosa*	+	-	-	-	+	-
53	*Oscillatoria margaritifera*	-	-	-	-	+	-
54	*Oscillatoria princeps*	+	-	+	-	+	-
55	*Oscillatoria* sp.1	-	+	-	+	-	++
56	*Oscillatoria* sp.2	-	-	-	+	++	-
57	*Oscillatoria subbrevis*	-	-	+	-	++	-
58	*Phormidium* sp.	+	+	-	++	-	+
59	*Scytonema* sp.	+	+	-	+	+	-
60	*Scytonema* sp.	-	+	-	+	-	-
61	*Scytonema* sp.	+	-	-	-	-	-
62	*Scytonema varium*	-	++	+	-	+	-
Bacillariophyceae							
63	*Achnanthes minutissima*	-	+	+	-	+	-
64	*Caloneis undulata*	+	-	+	++	-	-
65	*Cyclotella glomerata*	-	+	-	-	+	-
66	*Eunotia bilunaris*	++	-	+	-	+	-
67	*Fragilaria brevistriata*	-	++	-	++	-	+
68	*Fragilaria crotonensis*	++	++	-	-	-	+
69	*Fragilaria pinnata*	-	-	+	-	+	-
70	*Fragilaria* sp.	++	-	-	+	-	+
71	*Fragilaria ulna*	-	+	+	-	-	+
72	*Fragilaria vaucheriae*	++	-	+	-	++	-
73	*Licmophora* sp.	-	+	-	+	+	+
74	*Navicula cryptocephala*	-	-	+	-	+	-
75	*Navicula pupula*	+	+	-	+	-	-
76	*Navicula salinarum*	+	-	-	+	-	+
77	*Navicula sp.*	-	+	-	+	++	-

78	*Pinnularia graciloides*	++	-	-	-	+	+
79	*Pinnularia* sp.2	-	++	+	+	-	-
80	*Pinnularia viridis*	-	-	-	+	+	++
81	*Rhopalodia gibba*	+	-	+	+	++	-
82	*Synedra ulna*	+	++	-	-	-	-
Euglenophyceae							
83	*Euglena* sp.	-	-	+	-	+	+
84	*Phacus acuminatus*	+	+	-	++	-	+
85	*Phacus agilis*	-	-	+	+	-	-
86	*Trachelomonas* sp.	++	+	++	-	-	++

+++ = Abundant; ++ = Dominant; + = Rare; - = Absent

CONCLUSION

From this study it can be concluded that the ponds of Agastheeswaram taluk of Kanyakumari district have a great diversity with several algal taxa indicating the economically valuable resources that can be used in the field of biotechnology and the phytoplankton encountered in the water body may reflect the ecological status of the freshwater environment.

ACKNOWLEDGEMENT

The author wishes to thank Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627 012, Tamil Nadu, India.

REFERENCES

1. Adeyemo, O.K., Adedokum, O.A, Yusuf, R.K and Adeleye, E.A 2008. Seasonal changes in physico-chemical parameters and nutrient load of river sediments in Ibadan city, Nigeria. *Global NEST Journal*, 10(3): 326-336.
2. Anand, N, 1998, Indian freshwater microalgae. B. Singh and M.P. Singh, Dehradun, India.
3. Ansari, E, Mohini, G, and Ujjania, NC, 2018. Phytoplankton diversity and water quality assessment of ONGC pond, *Hazira', IJRES,* vol.1, no.1, pp.1-1.
4. Bhagat P, Gupta, R and Gupta, P.K 2009. Distribution, Composition, and seasonal abundance of phytoplankton community in Lake Naukuchiyatal, Uttarakhand, India. *J. Ecophysiol. Occup. Hith.*, 9: 171-182.
5. Deshmukh, B.S and Pingle, S.D 2006. Chlorophycean algae of Ahmednagar district (MS). *Indian Hydrobiology*, 9(2): 301-305.
6. Desikachary, TV 1959. Cyanophyta: ICAR, Monograph on algae, New Delhi.
7. Fritsch, FE 1945. The structure and reproduction of algae, vol.II, Cambridge University Press, London.
8. Jafari, N.G. and Gunale, V.R 2006. Hydrological study of algae of an urban freshwater river. *J. Appl. Sci. Environ. Mgt.*,10(2): 153-159.
9. Janjua, M.Y, Ahmed, T and Aktar, N 2009. Limnology and Trophic status of Shahpur dam reservoir, Pakistan. *J. Animal & Pl. Sci*., 19(4): 224-273.
10. Jha, P. and Barat, S 2003. Hydrobiological study of lace Mirik in Darjeeling, Himalayas. *J. Environ. Biol.*,24(3): 339-344.
11. Krishnamurthy, V 2000. Algae of India and neighboring countries. Chlorophycota. Oxford and IBH Publisher, New Delhi.
12. Marashoghr, F and Gonulol, A, 2015. Phytoplankton community, functional classification and trophic state indices of Yedikir Dam Lake (Amasy)', *Journal of Biology and Environmental Science*, vol. 8, no.24, pp.133-141.
13. Mohar M.A, Jafri, S.I.H, Leghari, S.M. and Khuhawar, M.Y. 2009. Seasonal periodicity of phytoplankton and chlorophyll content in Lake Manchar. *Pak. J.Bot.*,41: 871-884.
14. Palmer, C.M. 1969. A composite rating of algae tolerating organic pollution. *J. Physiol*.,5: 78-82.
15. Philipose, MT 1967, Chlorococcales ICAR, Monograph on algae, New Delhi.
16. Prescott, GM, 1978, 'The freshwater algae, C. Brown Company Publication Dubuque, Lowa.
17. Saifullah, ASM, Hena, MKA, Idris, MH, Halimah, AR, Johan, I, 2014. Diversity of phytoplankton from mangrove. Estuaries of Sarawak, Malaysia,' *World Appl, Sci*. J, vol.31, pp.915-924.
18. Sharma, RC, Singh, N and Chauhan, A, 2016. The influence of physicochemical parameters on phytoplankton distribution in a headwater stream of Garhwal Himalayas; *A case study, Egyptian Journal of Aquatic Research*, vol.42, pp.11-21.
19. Tiwari, A, Chauhan, SVS, 2006. Seasonal phytoplanktonic diversity of Kitham Lake Agra', *J. Environ. Biol*, vol.27, pp.35-38.
20. Umamaheshwari, S. 2011. Algal diversity in a group of fifteen small lakes of T. Narasipur taluk, Mysore district, Karnataka state. *Nature Environment and Poll. Technol*.,10(1): 45-50.