



## Cyanophycean diversity of kayamkulam lake around NTPC, karthikapally, Alappuzha district, Kerala, India

Soumya Das K<sup>1</sup>, Shaji C<sup>2\*</sup>

<sup>1</sup> Department of Botany Sree Narayana College, Kollam, Kerala, India

<sup>2</sup> University Institute of Technology, University of Kerala, Regional Centre Paravur, Kerala, India

### Abstract

The present investigation was carried out for a period of one year from October, 2018 to September, 2019 to study the Cyanophycean diversity of Kayamkulam lake of Alappuzha district of Kerala, India. During the study period, a total of 26 species belonging to 12 genera were recorded from the lake. The maximum density of Cyanophycean members occurred in months of May and June (late Pre-monsoon). They started increasing in March and attained maximum number in June, and decreased during rainy months. Their number again increased in September and this peak was persisted till the end of November. The results are discussed in the text.

**Keywords:** Phytoplankton, bio-indicators, cyanophyceae and kayamkulam lake

### Introduction

Phytoplanktons are predominantly autotrophic, and are primary producers of organic matter in aquatic bodies. They indicate the biological wealth of a water body and constitute a vital link in food chain (Boyd, 1973) [3]. They can be used as bio- indicators of water quality since they reflect even the small changes taking place in their surrounding environment by changing their species composition, biomass, community structure and productivity. Phytoplankton account for half of the oxygen production, despite amounting to only about 1% of the global plant biomass. According to Lepisto *et al.* (2004) [10] the distribution patterns of phytoplankton were strongly correlated with environmental factors. In tropical and Mediterranean climates dominance of certain algal species indicates eutrophication. Basically eutrophication is a natural and very slowly process, however problems of eutrophication arise as a direct result of the production of algal blooms that can be toxic or cause serious changes in the ecology of water bodies. Hence it is essential to understand the natural variation in phytoplankton community of the lake ecosystem.

Cyanophyceae, commonly known as blue-green algae, which can grow at any place and in any environment where moisture and sun light are available. However, specific algae grow in specific environment and therefore their distributional pattern, periodicity and qualitative and quantitative occurrence differ widely (Subramaniyan *et al.*, 2012) [16]. The Cyanophycean diversity of surface waters of various aquatic bodies have been studied by a number of investigators (Vijayakumar *et al.*, 2005 [6]; Debashri and Joydeb, 2014 [4]; Ghule and Halwe, 2019) [17]. A perusal of literature survey revealed that the Cyanophycean diversity of Kayamkulam lake has not received the attention of biologist except Mary John (1958) [11]; Amina *et al.* (2012) [1] and Ranjana and Amina (2018) [13]. Hence the present

study was undertaken to explore the Cyanophycean diversity of the lake.

### Materials and methods

The present study was carried out in the Kayamkulam lake of Alappuzha district of Kerala, lying in the west coast of India between latitude 9° 7' and 9° 16' north and longitude 76° 20' and 76° 29' east. The lake is 14.5 Km long stretching between the Vembanad of Alleppy District in the north and Ashtamudi of Kollam district in the South and the width varies from 1 to 1.5 Km. The sampling sites were selected on the basis of their importance. The first sampling site (SI) is at Karthikapally. Second sampling site (S II) is at the effluent discharge point from NTPC and it is 4.5 Km away from the first site. Third sampling site (S III) is at Kanakakunnu and there is domestic waste discharge in this area.

Algal samples were collected at an interval of one month for a period of one year from October 2018 to September 2019 between 9.30 to 10.30 am. Plankton was analysed both quantitatively and qualitatively. For studying quantitatively, algae were sediment by adding Lugol's solution. Homogenized samples were mounted on a Haemocytometer for counting unicellular and filamentous forms. For qualitative studies, algae were preserved in 4% commercial formaldehyde. Photomicrographs of almost all possible taxa were taken by using Nikon eclipse Ni Trinocular research microscope with image analyzer. The algal taxa of different groups were identified with the help of taxonomic descriptions given in Standard monographs (Desikachary, 1959 [5], Iyengar and Desikachary, 1981 [8], Prasad and Srivastava, 1992) [12] and research publications.

### Results and discussion

The list of Cyanophycean members recorded from the three selected sites of Kayamkulam Lake is shown in Table 1.

**Table 1:** List of Cyanophycean Members Encountered From Lake

SL. No	Algal Taxa	Site I	Site II	Site III
1.	<i>Microcystis aeruginosa</i> Kuetz.	+	-	-
2.	<i>Aphanocapsa littoralis</i> Hansg.	+	+	+
3.	<i>Chroococcus minutus</i> (Kuetz.) Naeg.	+	+	+
4.	<i>C. turgidus</i> (Kuetz.) Naeg. var. <i>thermalis</i> (Kuetz.) Rab.	+	-	+
5.	<i>Merismopedia glauca</i> (Ehren.) Naeg.	+	+	+
6.	<i>Spirulina meneghiniana</i> Zanard Ex Gomont	+	+	+
7.	<i>S. subsalsa</i> Oerstd	+	-	+
8.	<i>Oscillatoria chlorina</i> Kuetz ex Gom.	-	+	+
9.	<i>O. formosa</i> Ag. ex. Gom.	+	+	+
10.	<i>O. limosa</i> Ag. ex. Gom.	+	+	+
11.	<i>O. princeps</i> Voucher ex. Gom.	+	+	+
12.	<i>O. subuliformis</i> Kuetz ex Gomont.	+	-	-
13.	<i>O. tenuis</i> Ag. ex. Gom.	+	+	+
14.	<i>O. vizagapatensis</i> Rao	-	+	+
15.	<i>O. willei</i> Gardner ex. Drouet	+	+	+
16.	<i>Lyngbya aestuarii</i> Liebm. Ex Gomont var. <i>constricta</i> Ghose	-	+	+
17.	<i>L. baculum</i> Gom.	+	-	+
18.	<i>L. confervoides</i> G.Ag. ex. Gomont	+	+	+
19.	<i>L. martensiana</i> Menegh.	-	+	+
20.	<i>L. sordida</i> (Zanard) Gom.	+	-	+
21.	<i>Anabaena constricta</i> Szafor	+	-	+
22.	<i>Anabaena variabilis</i> Kuetz.	+	+	-
23.	<i>Scytonema</i> sp.	-	-	+
24.	<i>Calothrix scytonemicola</i> Tilden.	+	+	+
25.	<i>Gloeocapsa decorticans</i> (A.Br) Richter.	-	-	+
26.	<i>Nodularia harveyana</i> (Tnwaites) Thuret	+	-	+

Cyanophyceae was represented by 26 species belonging to 12 genera viz. *Microcystis* (1 Species), *Aphanocapsa* (1 Species), *Chroococcus* (2 Species), *Merismopedia* (1 Species), *Spirulina* (2 Species), *Oscillatoria* (8 Species), *Lyngbya* (5 Species), *Anabaena* (2 Species) *Scytonema* (1 Species) *Calothrix* (1 Species) *Gloeocapsa* (1 Species) and *Nodularia* (1 Species). The population density of Cyanophyceae at three different sites of Kayamkulam lake during study period are recorded (Fig: 1). At Site I of Kayamkulam lake its population ranged from  $31 \times 10^3$  Org/ml to  $72 \times 10^3$  Org/ml with an average of  $51 \times 10^3$  Org/ml. The percentage contributions of Cyanophyceae to the total phytoplankton were 19 % in the Post-monsoon season, 21 % in the Pre-monsoon season and 18% in the Monsoon season (Fig:2). At Site II, its population ranged from  $29 \times 10^3$  Org/ml to  $61 \times 10^3$  Org/ml with an average of  $45 \times 10^3$  Org/ml. The percentage contributions of Cyanophyceae to the total phytoplankton were 22 % in the Post-monsoon season, 24% in the Pre-monsoon season and 20 % in the Monsoon season (Fig: 3). At Site III, its population ranged from  $35 \times 10^3$  Org/ml to  $66 \times 10^3$  Org/ml with an average of  $50 \times 10^3$  Org/ml. The percentage contributions of Cyanophyceae to the total phytoplankton were 23 % in the Post-monsoon season, 25 % in the Pre-monsoon season and 22 % in the monsoon season (Fig: 4).

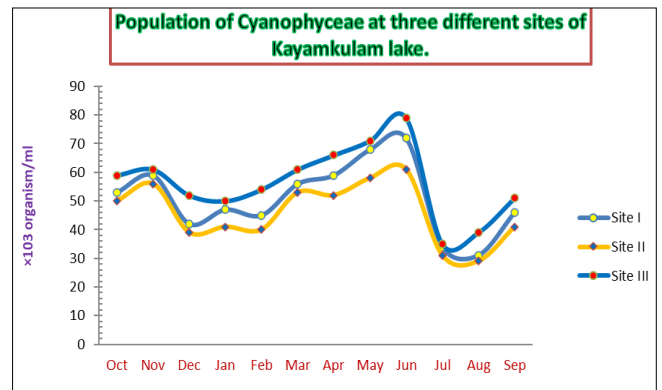


Fig 1

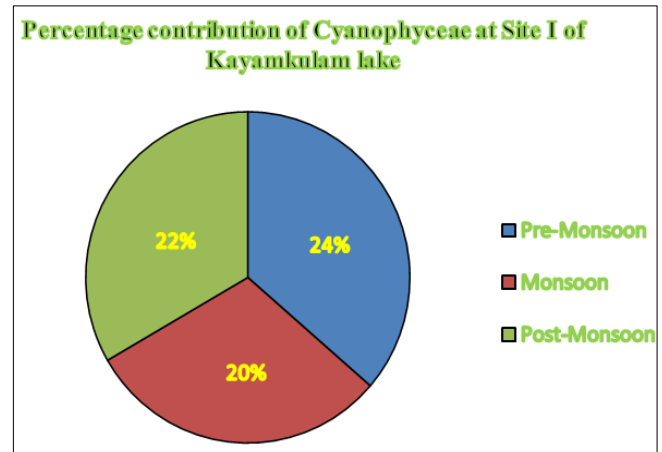


Fig 2

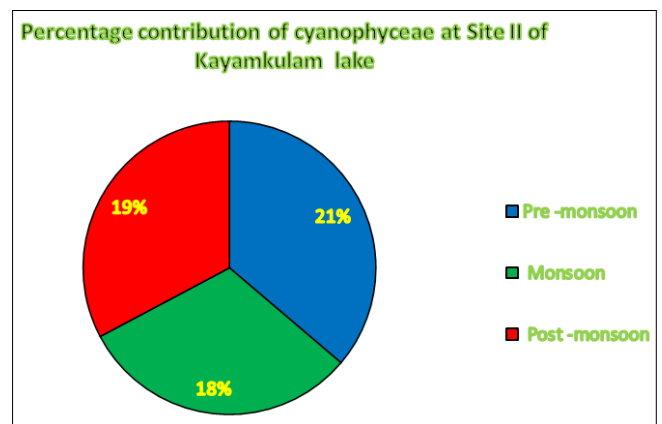


Fig 3

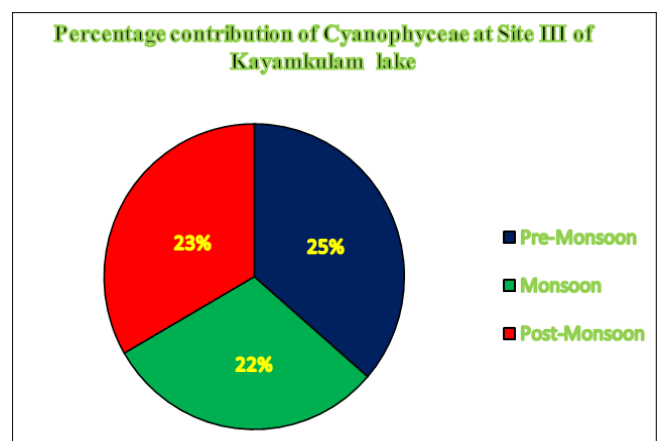


Fig 4

The maximum density of Cyanophycean members occurred in months of May and June (late Pre-monsoon). They started increasing in March and attained maximum number in June, and decreased during rainy months. Their number again increased in September and this peak was persisted till the end of November. These findings could be paralleled with the observations of Thirugnanamoorthy and Selvaraju (2009) <sup>[17]</sup>, Soyly and Gonulo (2010) <sup>[15]</sup> and Sivakumar *et al.* (2012) <sup>[14]</sup>. The late Pre-monsoon periods was characterized by high temperature and intense light. Both these factors stimulated the growth of Cyanophyceae which is in confirmation with the observations of Tiwari and Chauhan (2006) <sup>[18]</sup> and Bhojar and Tamloorkar (2012) <sup>[2]</sup>. At the end of rainy season, the number of genera and species started increasing and they persisted till the end of November. Kotadiya (2013) <sup>[9]</sup>, Ghule Halwe (2019) <sup>[17]</sup> and Geethu and Mamiyil (2021) <sup>[6]</sup> recorded maximum Cyanophyceae in early Post-monsoon period. In the present study during early Pre-monsoon period many of the species disappeared so that they are poorly represented during the months of February and March. During the period of April to June their number again started increasing and maximum number of taxa dominated by species of *Oscillatoria*. Members of this group mainly comprised filamentous forms which in the decreasing order of abundance are *O.willei*, *O. limosa*, *O. principes*, *O. chlorine*, *O. tenuis*, *Lyngbya confervoides*, *L. sordid*, *L. baculam*. The colonial forms like *Microcystis aeuruginosa*, *Chroococcus minutus*, *C. turgidus* and *Merismopedia* were appeared in early Monsoon and attained their maximum population towards the end of Monsoon season.

### Summary and conclusion

The results found during the present study show that the Cyanophycean population of Kayamkulam lake showed a characteristic seasonal succession. Pollution tolerant genera like *Oscillatoria*, *Lyngbya*, *Chroococcus* and *Microcystis* were also present in lake.

### Acknowledgement

The authors would like to thank Principal, Sree Narayana College, Kollam for offering facilities to carry out this project and grateful to the government of Kerala for financial assistance.

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