

Diversity of Cyanophyceae in lakes of HD Kote

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Abstract

The alpha, beta and Gamma diversity of Cyanophyceae in four lakes of H D Kote taluk has been done and the Shannon's entropy has been calculated for a period of 12 months. Comparison of diversity in all four lakes indicates that Lake 1 and Lake 2 have medium alpha diversity while Lake 3 and Lake 4 have medium alpha diversity. The Shannon alpha diversity is 9.58 being high. The entropy reduces from 2.31 to 2.22 indicating that the alpha diversity in the lakes is from medium to low. Considering the diversity of Cyanophyceae month wise, in all four lakes it is observed that entropy becomes low and alpha diversity ranges from low medium during August to low during October and medium during February, March and April. The alpha diversity reduces from 1.23(August) to 1.12(July). Diversity of Cynophyceae is found to reduce from 1.23 to 1.12. Diversity measures are more useful in lake ecosystems

KEYWORDS: Cyanophyceae, Alpha, Beta, Gamma Diversity, Shannon Entropy

Introduction

Cyanophyceae are a group of plankton that occur in almost all freshwaters. Sometimes they occur seasonally and many a times they occur as permanent blooms. Cyanophyceae are also known to interact with others groups of plankton as well as during varied physical and chemical parameters that support them. The earliest works like Pearsall(1932), Philipose(1960) and Munnawar(1970) relate the abundance of Cyanophyceae to phosphates and nitrates. Ganapathi(1940) considers that low pH and dissolved oxygen content of water support the abundance of Cyanophyceae. However it is quite difficult to consider the life communities in any water body as a whole because they are so varied. Nutritional requirements of Cyanophyceae differ from species to species and sporadic appearance or disappearance is a marked feature. During an extensive study of plankton in fresh water lakes of HD Kote a large number of Cyanophyceae occurred during the 12 months of study. Diversity calculations on Cyanophyceae are not much. Hosmani(2010) has described diversity indices of plankton in lakes of Mysore district using the PAST software The richness, evenness and dominance have been determined. The present study is an attempt to describe the diversity of Cyanophyceae in four lakes situated in HD Kote Taluka of Mysore district. Alpha, beta and Gamma diversity and the Shannon's Entropy is discussed.

Materials and Methods.

H.D. Kote taluk of Mysore district is located 12^o 04' 45.84" N and 76^o 20' 18.50" E at an elevation of 688 meters above MSL. Hombargalli Lake (L1), Karadilake (L2), Boppanakere Lake (L3) and Kodligere Lake (L4) are situated at 60KM away from

Mysore. They differ in shape and size, in the nature of pollution, aquatic vegetation and usage patterns. The water in these lakes is mainly used for irrigation and domestic purposes. They support abundant Cyanophyceae throughout the year. The soil types within the lake also differ considerably. Collection, identification and enumeration of the Cyanophyceae are as per the methods described by Hosmani(2010). Lackey(1938) and Suxena(1987). Monographs such as Desikachary(1959), Prescott(1982) were consulted for the identification of species. The alpha, Beta and Gamma diversities were calculated using the software of Klaus Goepal, (2014)

Results and discussion

The results of the plankton distribution are presented in Table 1. The statistical analysis of the diversity lake wise is presented in Table 2 and diversity, month wise in Table 3. The concept of diversity includes richness, abundance and evenness. Richness is the number of differing elements and variety of characteristics. Abundance is plentiful while richness is free from variations, equal in measure or quantity. Richness has been a popular diversity index in ecology, since it quantifies how many different sets of organisms a test contains. The diversity is calculated as $D=1/P_{max}$ (Maximum proportional abundance. The Shannon entropy or the true diversity index explains that the more unequal or proportional abundance the smaller the Shannon entropy. Diversity of the individual sample is called alpha diversity. Diversity of all samples consolidated is gamma diversity. The difference, gamma diversity- alpha diversity is called beta diversity. Beta diversity is a measure for similarity and overlap samples of distributions or locations. This helps comparison of organisms in different locations (Klaus Goepal, 2014).

An alpha, beta diversity matrix was developed for the Cyanophyceae in four lakes of H D Kote. The results are presented in Tables 1, 2&3. Comparison of diversity in all four lakes indicates that Lake 1 and Lake 2 have medium alpha diversity while Lake 3 and Lake 4 have medium alpha diversity. The Shannon alpha diversity is 9.58 being high. The entropy reduces from 2.31 to 2.22 indicating that the alpha diversity in the lakes is from medium to low. (Table 2).

Considering the diversity of Cyanophyceae month wise, in all four lakes it is observed that entropy becomes low and alpha diversity ranges from low medium during August to low during October and medium during February, March and April. The alpha diversity reduces from 1.23(August) to 1.12(July). These observations indicate that beta diversity in all locations is not well marked and the distribution of Cyanophyceae is almost same in all four lakes.(Table 3).

Cyanophyceae that were abundant were *Chroococcus disperses*, *Chroococcusturgidus*, *Anabaena spiroides*, *Merismopediaglauca* and *Microcystiscrassa*. *Oscillatoriaacutissima*, *Spirulinagigantea*, *Chroococcusturgidus* appeared with low diversity.

Conclusion:

Hombargalli Lake and Karadi Lake have medium alpha diversity of Cyanophyceae while Boppankere Lake and Kodilgere Lake have low alpha diversity of Cyanophyceae. The month of August has low alpha diversity; October has low alpha diversity, while the

months of February, March and April have medium alpha diversity. The diversity of Cyanophyceae in all four lakes is not well marked. Diversity of Cynophyceae is found to reduce from 1.23 to 1.12. Diversity measures are more useful in lake ecosystems. The diversity of a community may be described by referring to a model which can provide the closest fit to the observed pattern of species abundance

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Table 1: Distribution of Cyanophyceae in Lakes of HD Kote(Organisms/Litre)

Months	Lake 1	Lake 2	Lake 3	Lake 4
August ,2013	13430	2510	6710	5870
September, 2013	5030	36110	7550	23510
October, 2013	2510	57110	6710	21830
November, 2013	830	6710	8390	10070
December, 2013	3350	10070	16790	6710
January, 2014	8390	22670	5030	31070
February, 2014	13430	31910	63830	39470
March, 2014	11750	14270	37790	10910
April,2014	9230	29390	42830	57110
May, 2014	4200	34430	47030	23510
June, 2014	7550	36950	38630	8390
July, 2014	7550	33590	36110	5030

Table 2: $\alpha, \beta,$ and γ Diversity of Cyanophyceae in Lakes of H D Kote

Shannon α -Diversity		Lake 1	Lake 2	Lake 3	Lake 4
		1	2	3	4
2.26		2.31	2.3	2.2	2.22
9.58		10.1	10.0	9.0	9.2
Lake 1	1	2.31	2.31	2.26	2.27
Lake 2	2	2.31	2.30	2.25	2.26
Lake 3	3	2.26	2.25	2.20	2.21
Lake 4	4	2.27	2.26	2.21	2.22

Annotations:
 - Green box: Medium α Divers
 - Red box: Low α Diversi

Table 3: α, β and γ diversity of Cyanophyceae in lakes of H D Kote

Shannon α -Diversity		August	September	October	November	December	January	February	March	April	May	June	July
		1	2	3	4	5	6	7	8	9	10	11	12
1.17		1.23	1.13	0.92	1.19	1.24	1.18	1.26	1.23	1.24	1.18	1.16	1.12
3.24		3.4	3.1	2.5	3.3	3.5	3.2	3.5	3.4	3.4	3.3	3.2	3.1
August	1	1.23	1.18	1.08	1.21	1.24	1.21	1.25	1.23	1.24	1.21	1.19	1.18
September	2	1.18	1.13	1.03	1.16	1.19	1.16	1.20	1.18	1.19	1.16	1.14	1.13
October	3	1.08	1.03	0.92	1.06	1.08	1.05	1.09	1.08	1.08	1.05	1.04	1.02
November	4	1.21	1.16	1.06	1.19	1.22	1.18	1.23	1.21	1.21	1.19	1.17	1.15
December	5	1.24	1.19	1.08	1.22	1.24	1.21	1.25	1.24	1.24	1.21	1.20	1.18
January	6	1.21	1.16	1.05	1.18	1.21	1.18	1.22	1.20	1.21	1.18	1.17	1.15
February	7	1.25	1.20	1.09	1.23	1.25	1.22	1.25	1.25	1.25	1.22	1.21	1.19
March	8	1.23	1.18	1.08	1.21	1.24	1.20	1.25	1.23	1.24	1.21	1.19	1.17
April	9	1.24	1.19	1.08	1.21	1.24	1.21	1.25	1.24	1.24	1.21	1.20	1.18
May	10	1.21	1.16	1.05	1.19	1.21	1.18	1.22	1.21	1.21	1.18	1.17	1.15
June	11	1.19	1.14	1.04	1.17	1.20	1.17	1.21	1.19	1.20	1.17	1.16	1.14
July	12	1.18	1.13	1.02	1.15	1.18	1.15	1.19	1.17	1.18	1.15	1.14	1.13

Annotations:
 - Green box: Low Medium α Dive
 - Red box: Low α Diversity
 - Blue box: Medium α Diversity