

Phytoplankton's Comparative Diversity of Karadi Kere Lake, H.D Kote Taluk of Mysuru

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Abstract: Lakes are highly valued for their recreational, aesthetic and scenic qualities. Water content is one of the most treasured of our natural resources. This paper is an attempt to understand the biodiversity of phytoplankton in Karadi Kere Lake, H.D kote taluk of Mysore districts of Karnataka. Species richness, species dominance and species evenness have been stressed. The water in this lake is mainly used for irrigation and domestic purposes these human activities 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). In the present study we observed very high population of phytoplanktons. Desmids, Myxophyceae, and Chlorococcales dominate the lake to a greater extent.

Keywords: Cyanophyceae, Phytoplankton, biodiversity, Desmids, Myxophyceae, Chlorococcales, CCME

1. Introduction

Lakes are highly valued for their recreational, aesthetic and scenic qualities. Water content is one of the most treasured of our natural resources. Lakes constitute important habitats and food resources for a diverse array of fish, aquatic life, Cyanophyceae members of plankton but lake ecosystems are fragile. Lake ecosystems can undergo rapid environmental changes, often leading to significant declines in their aesthetic, recreational, and aquatic ecosystem functions. Exposed to external effects from the atmosphere, their watersheds and ground water, lakes are subject to change through time, During an extensive study on the distribution of phytoplankton from different districts a large number of phytoplankton were recorded. This paper is an attempt to understand the biodiversity of phytoplankton in district of Karnataka. Species richness, species dominance and species evenness have been stressed. Karadi Kere Lake, H.D kote taluk of Mysore district was chosen for the present study. Different sites in Karadi Lake were sampled during two year 2012-2013; 2013-2014 so in the present study diversity measures of phytoplankton in Karadi Lake is discussed.

2. Materials and Methods

H.D. Kote taluk of Mysore district is located 120 04' 45.84" N and 760 20' 18.50" E at an elevation of 688 meters above MSL. Karadilake is situated at 60KM away from Mysore.

The water in this lake is mainly used for irrigation and domestic purposes these human activities 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). 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. The results are calculated after the survey of two years (2012-2013; 2013-2014). Monographs such as Desikachary(1959), Prescott(1982) were Consulted for the identification of species. The diversities were calculated using by number of organisms. Cyanophyceae that were abundant were *Chroococcus disperses*, *Chroococcus turgidus*, *Anabaena spiroides*, *Merismopedia glauca* and *Microcystiscrass Oscillatoria acutissima*, *Spirulinagigentea*, *Chroococcus turgidus* appeared with low diversity.



Karadi kere lake over view



Karadi kere lake route map

Coordinates: 13°17'15"N 76°33'

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Table 1: Monthly variations in the phytoplankton Population in Karadi Lake (2012-2013)(Organisms/liter)

Species /Months	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
<i>Chroococcusdispersus</i>	0	5600	4200	0	7000	5600	7000	1400	8400	7000	11200	13400
<i>C. turgidus</i>	0	1400	1400	0	2800	2800	11200	5600	7000	1400	9800	5600
<i>Merismopediatenmissima</i>	0	7000	11200	0	0	0	0	0	0	9800	14000	12600
<i>M. glauca</i>	1400	0	9800	5600	0	8400	5600	2800	9800	7000	0	0
<i>Oscillatoriaacutissima</i>	0	0	2800	1400	1400	9800	2800	1400	4200	8400	0	0
<i>Microcystiscrassa</i>	1400	23800	18200	0	0	1400	11200	2800	7000	7000	9800	5600
<i>M. wesenbergii</i>	1400	9800	11200	0	0	1400	0	23800	0	1400	4200	5600
<i>Cosmariumocellatum</i>	1400	0	0	0	1400	1400	1400	1400	1400	1400	0	0
<i>P. simplex</i>	1400	2800	0	0	0	1400	0	0	0	0	0	0
<i>P. ovatum</i>	1400	1400	0	0	0	0	0	1400	0	1400	1400	1400
<i>Scenedesmusquadricaudavar parvus</i>	1400	5600	1400	2800	1400	1400	0	0	0	1400	1400	2800
<i>S. quadricauda var. westii</i>	0	0	0	1400	1400	1400	1400	1400	1400	11200	0	1400
<i>S. dirmorphous</i>	1400	4200	1400	0	0	1400	0	0	0	1400	1400	1400
<i>Chlorella vulgaris</i>	1400	1400	1400	0	0	1400	0	0	0	1400	1400	1400
<i>Coelastrummicroporum</i>	0	1400	2800	1400	0	0	0	0	0	1400	1400	1400
<i>Nitzschiaamphiba</i>	1400	0	1400	0	0	0	1400	0	0	1400	1400	1400
<i>Melosiragranulata</i>	2800	9800	5600	5600	2800	14000	1400	2800	7000	23800	14000	5600
<i>Synedraacus</i>	1400	4200	5600	2800	2800	9800	5600	1400	0	2800	1400	1400

Lackey's Drop method=organisms/drop x 28(28 drops =1 ml)x 50(1 litre sample fixed , sediment and reduced to 50 ml concentration)

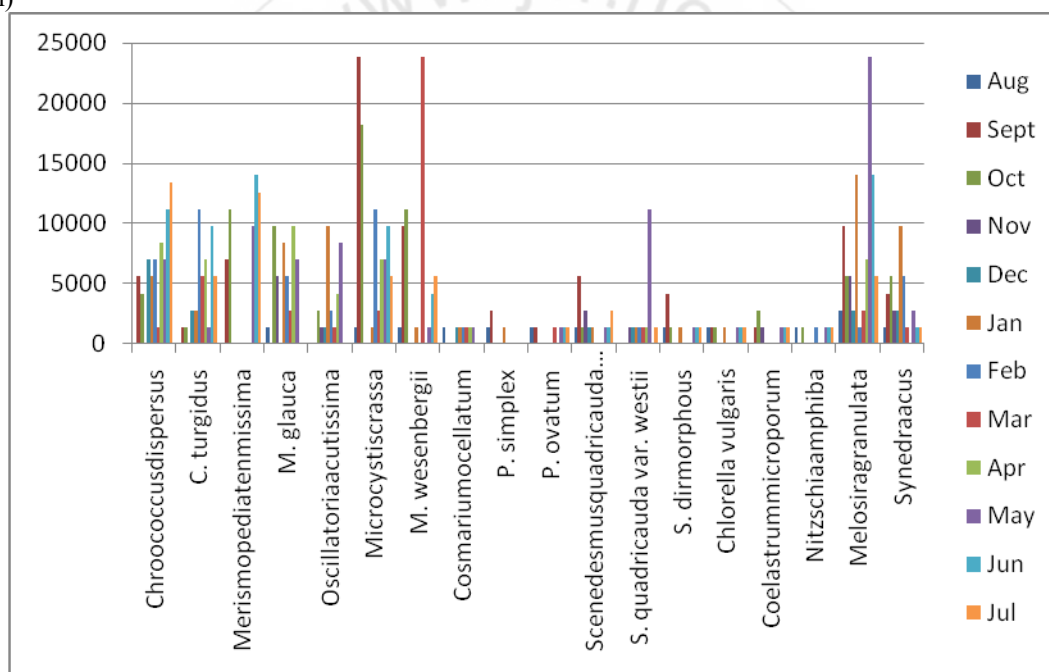


Table-1 of Diversity (2012-13)

0	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Taxa S	12	13	14	7	8	14	10	11	8	17	13	14
Individuals	18200	78400	78400	21000	21000	61600	49000	46200	46200	89600	72800	61000
Dominance_D	0.08876	0.1499	0.1276	0.1911	0.1822	0.1353	0.1576	0.2966	0.157	0.1284	0.1398	0.1304
Simpson_1-D	0.9112	0.8501	0.8724	0.8089	0.8178	0.8647	0.8424	0.7034	0.843	0.8716	0.8602	0.8696
Shannon_H	2.458	2.195	2.286	1.784	1.894	2.24	2.018	1.743	1.927	2.367	2.158	2.283
Evenness_e^H/S	0.9738	0.6905	0.7026	0.8504	0.831	0.6709	0.7526	0.5195	0.8582	0.6272	0.666	0.7008
Brillouin	2.456	2.194	2.285	1.783	1.893	2.239	2.017	1.742	1.926	2.366	2.158	2.282
Menhinick	0.08895	0.04643	0.05	0.0483	0.05521	0.05641	0.04518	0.05118	0.03722	0.05679	0.04818	0.05668
Margalef	1.121	1.065	1.154	0.6029	0.7034	1.179	0.8334	0.931	0.6517	1.403	1.072	1.18
Equitability_J	0.9893	0.8556	0.8663	0.9167	0.911	0.8487	0.8766	0.7269	0.9265	0.8353	0.8415	0.8653
Fisher_alpha	1.252	1.17	1.269	0.6768	0.7847	1.3	0.9187	1.027	0.723	1.55	1.178	1.302
Berger-Parker	0.1538	0.3036	0.2321	0.2667	0.3333	0.2273	0.2286	0.5152	0.2121	0.2656	0.1923	0.2197

Principal Component analysis of **Karadi Kere Lake** (2012-13)

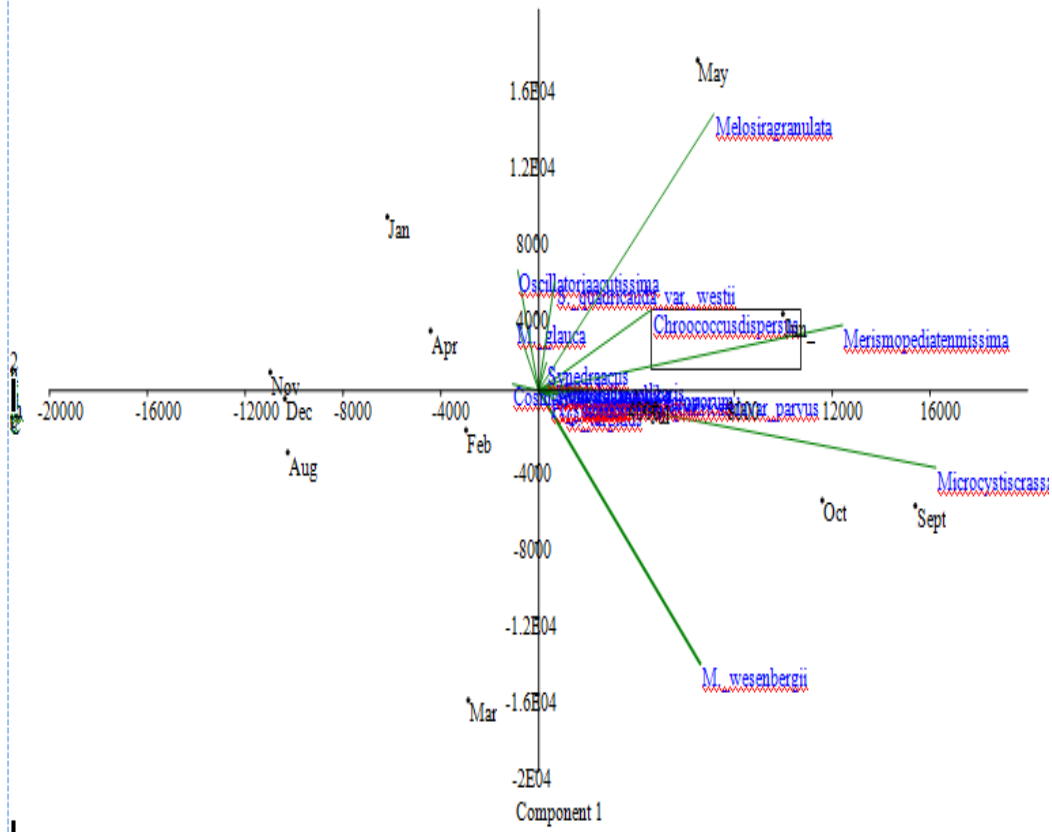


Table 1: Monthly variations in Physico-chemical parameters in Karadi Lake (2012-2013)

Variables/Months	August	September	October	November	December	January	February	March	April	May	June	July
Temp. °C	24.6	23.8	24.6	23.7	22.6	21.9	21	21.7	23.8	24.2	24	23.9
pH(Units)	7.4	7.8	7.2	7.1	8.1	7.5	7.2	7.3	7.3	8.1	7.9	7.1
Cond. µmho/cm	410	370	310	300	390	340	410	420	510	510	860	650
Turb(NTU)	0.4	13.6	8.6	0.5	2.6	8.5	0.5	12.0	0.7	15.7	9.6	14.5
Alkalinity(mg/L)	3.42	2.9	2.67	2.9	2.9	3	3.1	3.3	3.6	2.5	2.5	2.1
TSS(mg/L)	110	270	120	40	30	50	50	120	140	170	120	70
TDS(mg/L)	130	650	430	60	240	30	230	260	290	310	240	520
T. Hardness(mg/L)	160	130	110	150	140	150	130	110	110	120	130	150
Ca+. Hardness(mg/L)	70	60	38.6	71.5	42.7	19.1	75.9	69.3	63.7	43.6	79.2	75.9
Mg+. Hardness(mg/L)	22.6	20.8	19.4	18.7	27.3	34.2	20.3	10.1	12.6	20.7	14.8	17.7
Sodium(mg/L)	4.6	14.8	7.9	9.8	12.6	12.8	1.3	1.1	2.1	2.9	30.7	7.3
Potassium(mg/L)	5.2	5.6	3.2	4.9	3.6	8.9	3.2	1.5	2.5	2.7	9.2	9.9
T. Phosphorous(mg/L)	3.5	1.6	0.4	0.4	0.2	0.03	0.07	0.2	0.2	0.2	0.10	2.15
Sulphates(mg/L)	0.6	9.0	19.2	4.9	8.9	4.7	9.9	58.8	9.8	22.3	47.7	71.2
Nitrates(mg/L)	0.7	0.7	0.5	0.14	0.2	0.12	0.15	0.27	0.25	0.05	0.04	0.6
BOD(mg/L)	4.9	0.2	0.3	0.2	0.2	0.2	0.4	0.2	0.4	0.2	0.3	0.3
COD(mg/L)6.9	5.9	10.4	38.5	21.6	38.6	23.6	4.0	4.0	15.5	20	58.5	96.5
Chlorophyll mg/gram	60	48	42	54	41	41	52	54	56	68	71	75

Table 1: CCME WQI in Karadi Lake (2012-2013)

Data Summary	Overall	Drinking	Aquatic	Recreation	Irrigation	Livestock
CWQI	23	17	13	7	38	56
Categorization	Poor	Poor	Poor	Poor	Poor	Marginal
F1 (Scope)	88	100	100	100	100	33
F2 (Frequency)	38	43	67	89	17	17
F3 (Amplitude)	92	93	91	91	33	66

Table 2: Monthly variations in the phytoplankton Population in Karadi Lake(2013-2014) (Organisms/liter)

Species /Months	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
<i>Chroococcusdispersus</i>	0	7000	5600	0	8400	7000	9800	2800	11200	9800	14000	16200
<i>C. turgidus</i>	0	1400	2800	0	4200	4200	12600	8400	9800	2800	11200	7000
<i>Merismopediatenmissima</i>	0	9800	12600	0	0	0	0	0	0	14000	16800	15400
<i>M. glauca</i>	1400	0	14000	7000	0	11200	7000	4200	11200	9800	0	0
<i>Oscillatoriaacutissima</i>	0	0	4200	2800	2800	11200	4200	1400	5600	9800	0	0
<i>Microcystiscrassa</i>	1400	28000	21000	0	0	2800	12600	4200	8400	8400	11200	8400
<i>M. wesenbergii</i>	1400	11200	14000	0	0	1400	0	28000	0	1400	5600	7000
<i>Cosmariumocellatum</i>	1400	0	0	0	1400	1400	1400	1400	1400	1400	0	0
<i>P. simplex</i>	1400	2800	0	0	0	1400	0	0	0	0	0	0
<i>P. ovatum</i>	1400	1400	0	0	0	0	0	1400	0	1400	1400	1400
<i>Scenedesmusquadricaudavar.parvus</i>	1400	7000	2800	4200	2800	2800	0	0	0	2800	2800	4200
<i>S. quadricauda var. westii</i>	0	0	0	2800	2800	1400	2800	1400	1400	14000	0	1400
<i>S. dirmorphous</i>	1400	5600	1400	0	0	2800	0	0	0	2800	1400	1400
<i>Chlorella vulgaris</i>	1400	1400	1400	0	0	2800	0	0	0	2800	1400	1400
<i>Coelastrummicroporum</i>	0	1400	4200	1400	0	0	0	0	0	1400	1400	1400
<i>Nitzschiaamphiba</i>	2800	0	2800	0	0	0	2800	0	0	2800	2800	2800
<i>Melosiragranulata</i>	4200	11200	7000	7000	4200	18200	2800	4200	8800	28000	15400	7000
<i>Synedraacus</i>	1400	5600	7000	4200	2800	12600	7000	1400	0	4200	2800	2800

Lackey's Drop method=organisms/drop x 28(28 drops =1 ml)x 50(1 litre sample fixed , sediment and reduced to 50 ml concentration)

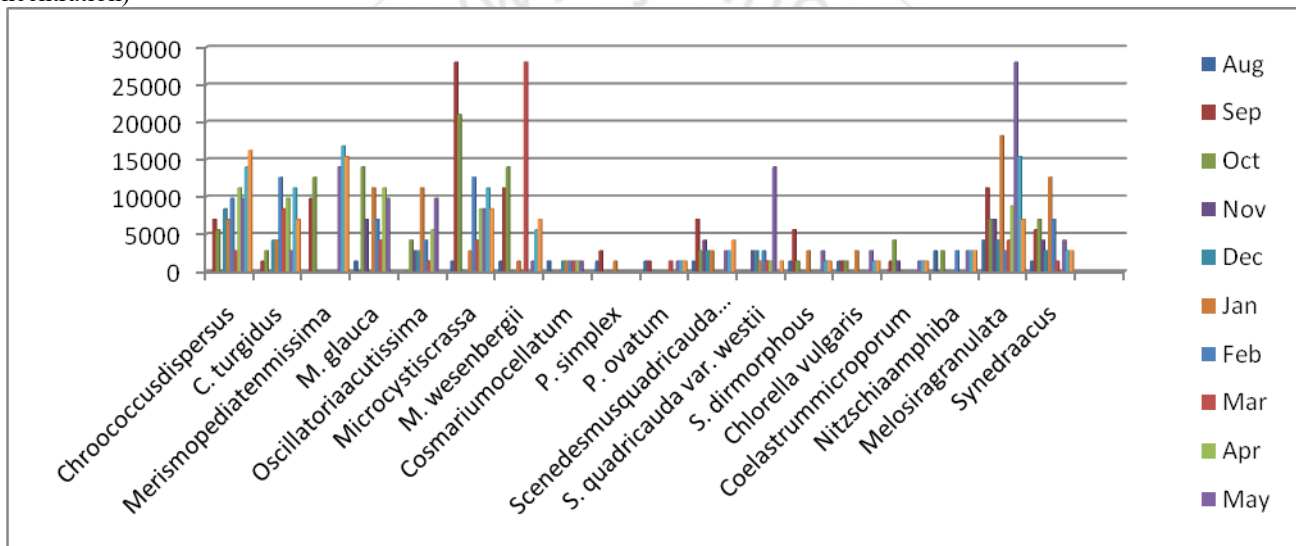


Table 2 of Diversity

0	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Taxa_S	12	13	14	7	8	14	10	11	8	17	13	14
Individuals	21000	93800	100800	29400	29400	81200	63000	58800	57800	117600	88200	77800
Dominance_D	0.1022	0.1486	0.1165	0.1746	0.161	0.1284	0.1398	0.2676	0.1587	0.1156	0.1323	0.1256
Simpson 1-D	0.8978	0.8514	0.8835	0.8254	0.839	0.8716	0.8602	0.7324	0.8413	0.8844	0.8677	0.8744
Shannon H	2.396	2.184	2.348	1.832	1.955	2.28	2.102	1.787	1.91	2.433	2.204	2.296
Evenness e^H/S	0.9148	0.6833	0.7477	0.8925	0.8827	0.6982	0.8181	0.5427	0.8442	0.6702	0.6967	0.7097
Brillouin	2.394	2.183	2.348	1.831	1.954	2.279	2.101	1.786	1.91	2.432	2.203	2.295
Menhinick	0.08281	0.04245	0.0441	0.04082	0.04666	0.04913	0.03984	0.04536	0.03328	0.04957	0.04377	0.05019
Margalef	1.105	1.048	1.128	0.5832	0.6804	1.15	0.8144	0.9106	0.6384	1.37	1.054	1.154
Equitability_J	0.9642	0.8515	0.8899	0.9416	0.94	0.8639	0.9128	0.7451	0.9186	0.8588	0.8591	0.87
Fisher_alpha	1.232	1.149	1.238	0.6533	0.757	1.265	0.896	1.002	0.7072	1.509	1.156	1.27
Berger-Parker	0.2	0.2985	0.2083	0.2381	0.2857	0.2241	0.2	0.4762	0.1938	0.2381	0.1905	0.2082

Principal Component analysis of Karadi Kere Lake (2013-14)

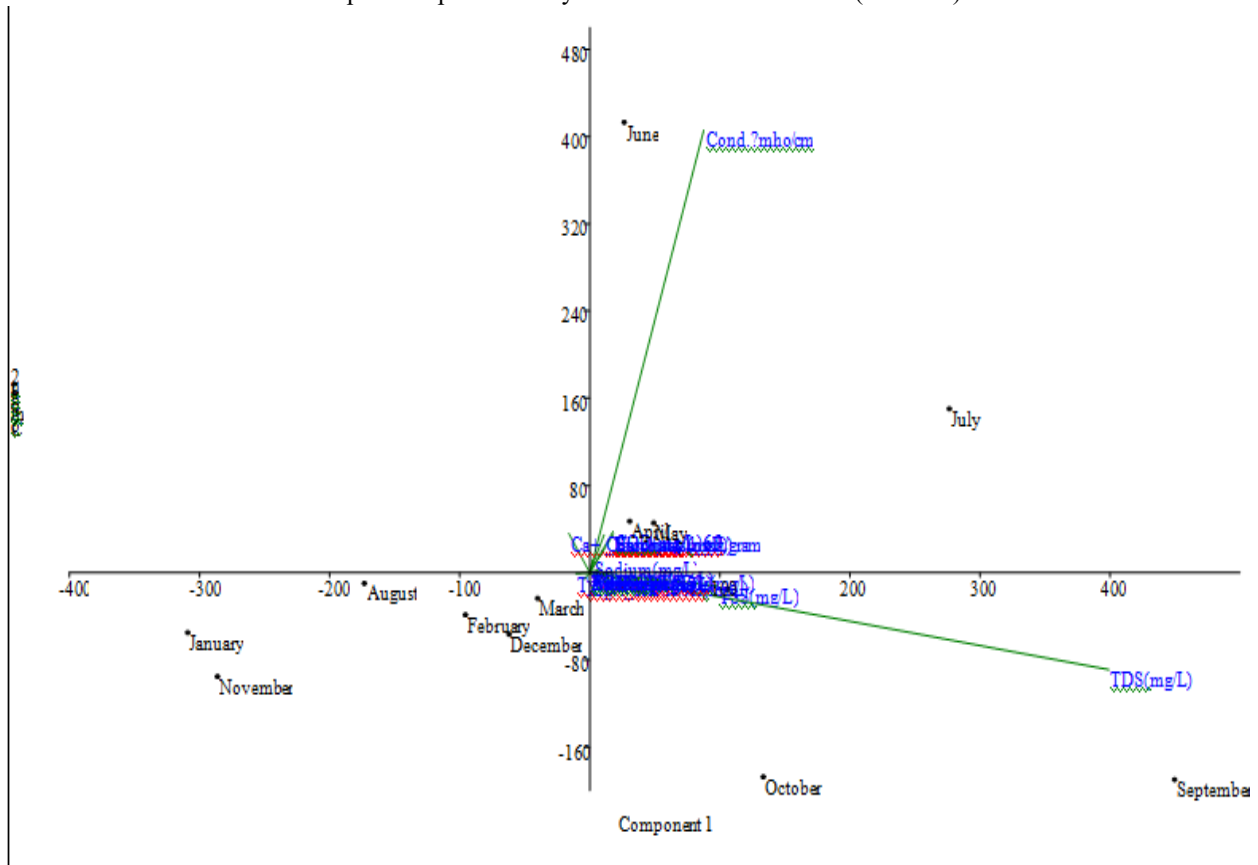


Table 2: Monthly variations in Physico-chemical parameters in Karadi Lake (2013-2014)

Variables/Months	August	September	October	November	December	January	February	March	April	May	June	July
Temp. °C	26	25.5	26.5	25.5	24.5	24.5	23	23.5	25.5	26.5	26	25.5
pH(Units)	7.9	8.0	7.5	7.5	8.57.8	7.8	7.6	7.5	7.5	8.5	8.2	7.5
Cond.µmho/cm	430	390	320	320	410	360	420	440	530	530	880	670
Turb(NTU)	0.6	15.7	8.9	0.7	3.5	10.0	0.8	15.0	1.0	17.9	10.9	16.9
Alkalinity(mg/L)	3.65	3.05	2.98	3.66	3.66	3.23	3.5	3.6	3.6	2.8	2.7	2.5
TSS(mg/L)	120	290	130	50	30	70	50	130	160	190	140	90
TDS(mg/L)	150	770	490	70	290	30	250	280	330	340	250	570
T. Hardness(mg/L)	190	160	130	170	160	170	160	120	120	140	150	170
Ca+. Hardness(mg/L)	90	8.0	43.7	79.0	47.6	20.0	79.6	71.9	67.6	45.3	81.9	79.6
Mg+. Hardness(mg/L)	25.9	22.6	21.1	20.4	29.2	35.1	21.1	11.8	14.4	22.5	15.5	19.8
Sodium(mg/L)	5.4	16.5	8.2	10.6	13.5	13.6	1.5	1.2	2.2	3.1	32.8	8.9
Potassium(mg/L)	6.2	6.3	3.6	5.3	3.9	9.2	3.6	1.9	2.9	3.0	9.9	10.6
T. Phosphorous(mg/L)	4.4	1.9	0.6	0.6	0.2	0.05	0.09	0.2	0.2	0.2	0.13	2.25
Sulphates(mg/L)	0.9	10.0	21.2	5.9	9.9	5.7	10.9	69.9	10.9	24.5	50.1	73.9
Nitrates(mg/L)	0.9	0.9	0	0.16	0	0.16	0.18	0.31	0.3	0.07	0.06	0.9
BOD(mg/L)	5.8	0.3	0.4	0.3	0.2	0.3	0.60.5	0.3	0.4	0.3	0.4	0.4
COD(mg/L)6.9	6.9	11.8	40.2	24.5	40.2	24.5	5.0	5.0	16.5	22.0	60.6	98.9
Chlorophyll mg/gram	50	45	40	50	38	38	50	50	50	70	80	90

CCME WQI for Karadi Lake (2013-2014)

Data Summary	Overall	Drinking	Aquatic	Recreation	Irrigation	Livestock
CWQI	36	31	4	2	34	38
Categorization	Poor	Poor	Poor	Poor	Poor	Poor
F1 (Scope)	50	57	100	100	50	40
F2 (Frequency)	46	51	97	100	46	38
F3 (Amplitude)	88	91	92	93	92	92

3. Results and Discussion

The results of the analysis are presented in Phytoplankton Population Table 1 and 2. The tests performed were to

determine whether there was any significant difference between the different groups of algae and the chemical variables. According to the test of variance it was observed that Desmids and Myxophyceae showed a highly significant

association indicating that the two groups tolerated each other in the ecosystem and there was no antagonism. Diatoms and Myxophyceae also showed a similar association.

The significance of association between the chemical parameters showed that Oxidisable Organic matter was significant and correlated to Dissolved oxygen and Nitrate as in Physico-chemical parameters Table no 1 and 2. Dissolved Oxygen played a very significant role in the diversity and distribution of algae in this lake. Albuminoidal ammonia and free carbon dioxide showed high significance while Phosphate had a minor role in the distribution of algae. This is in spite of large amount of agricultural waste flowing into the lake. Variations in the algal groups and the chemical parameters are represented.

CCME WQI in Karadi Lake for livestock is marginal in table no.1 but poor in table no.2. So, gradually quality of water deteriorating due to increase of biomass. pH has an important role in the ecology of fresh water algae. The variation of pH was very high. The mean pH during the 24 months was 8.12 and fluctuated between 6.52 and 7.52. The last quarter showed minor variations up to 8.72. The lake water was considered to be alkaline.

4. Conclusion

The algal diversity of Karadi Lake of H.D. Kote is very high. Desmids, Myxophyceae and Chlorococcales dominate the lake to a greater extent. Desmids and Myxophyceae are dominant. Dissolved oxygen plays a significant role in the distribution of algae in this lake.

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References

- [1] Aiayz. R, Mir. A, Wangones, A and R. Yusuf (2010) Diversity index of algae in Kashmir lake. *Nature, Environment and Pollu. Tech.* 9(2):293-298.
- [2] APHA, (1998). Standard Methods for the Examination of Water and Waste Water. 19th Edition.
- [3] Basavarajappa, H.S., N.S Raju., S.P. Hosmani and S.R. Niranjana. (2009) Studies on the water quality parameters of four fresh water lakes of Mysore, Karnataka State, India. *J. of Env.&Ecoplaning.* 16(2-3):413-419.
- [4] Basavarajappa S.H., Raju, N.S. Hosmani, S. P. and Niranjana, S. R., Algal diversity and Physicochemical parameters in Hadhinaru Lake, Mysore, Karnataka State, India. *The Bioscan* 5(3): 377-38 (2010).
- [5] Desikachary T V 1959 Cyanophyceae ICAR, New Delhi
- [6] Dixit, S.S., Smol, J.P., Kingston, J.C. and Charles, D.F., Diatoms as powerful indicators of Environmental change *Environmental Sciences and Technology* 26: 22-23 (1992)
- [7] Eckhpou, S., Brown, C.A. and King, J.M., National Biomonitoring Programme for Revirine Ecosystems. Technical consideration and protocol for selection of reference and monitoring sites, MPB Report Series No 3. Institute for Water Quality Studies Department of Water Affairs and Forestry, Pretoria (1996)
- [8] Lackey, J.B. (1938) *Public Health Reports.* 53:2080-2093.
- [9] Magurran.A.E. (1983) *Ecological Diversity and its Measurement.* University Press, Cambridge.
- [10] Philipose, M.T. (1967). *Chlorococcales,* ICAR Publication, New Delhi.
- [11] Pianka, E.R. (1983) *Evolutionary Ecology.* Harper and Row Pub., New York.
- [12] Prescott, G.W. (1998) *Algae of the Western Great Lakes area.* Otto.Kaetz, Science Publishers, W. Germany. Pp977.
- [13] Suxena, M.R.(1987) *Environmental Analysis. Water, Soil and Air.* Agro Botanical Publishers, India.
- [14] Hammer, D. HA R, D.A.T and Rayan P.D. 2001. *Palentological Statistics Software Package for Education and data analysis.* Paleontological Electronica (1)9pp.
- [15] R.A. Manjunatha, S.P. Hosmani, (2015) Diversity of Cyanophyceae in lakes of HD Kote, *Online International Interdisciplinary Research Journal, {Bi-Monthly},* pp101-104.