UTTAR PRADESH JOURNAL OF ZOOLOGY

42(24): 672-682, 2021
ISSN: 0256-971X (P)

DIVERSITY ANALYSIS OF PHYTOPLANKTON COMMUNITY IN RELATION TO PHYSICOCHEMICAL CHARACTERISTICS OF CHATLA FLOODPLAIN LAKE OF DISTRICT CACHAR, ASSAM, NORTH EAST INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author BA designed the study and managed the analyses of the study. Author SBL managed the literature searches, wrote the protocol and wrote the first draft of the manuscript. Author AHC performed the statistical analysis. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Pınar Oguzhan Yildiz, Ataturk University, Turkey.
Reviewers:
(1) Maria Monica Salusso, Universidad Nacional Salta, Argentina.
(2) Nemia M. Galang, President Ramon Magsaysay State University, Philippines.

Received: 20 October 2021
Accepted: 24 December 2021
Published: 24 December 2021

Original Research Article

ABSTRACT

A study was carried out to investigate phytoplankton diversity in three different areas in Chatla floodplain lake (popularly known as *Chatla Haor*) in Cachar district of Assam, North East India over a period of one year (four seasons) (March, 2019-February, 2020). Composition, density and diversity of phytoplankton community were studied in relation to physicochemical characteristics of water. Phytoplankton community was comprised of 36 taxa out of which 19 belonged to Chlorophyceae, 10 to Cyanophyceae, 6 to Bacillariophyceae and 1 to Euglenophyceae. The most common genera belonging to Chlorophyceae are *Chlorella*, *Desmidium*, *Microspora*, *Spirogyra*, and *Zygnema*, that belonging to Cyanophyceae are *Anabaena*, *Nostoc*, and *Spirulina*, that belonging to Bacillariophyceae are *Cymbella*, *Navicula*, *Nitzschia*, and *Synedra*, and that belonging to Euglenophyceae are *Euglena*. In terms of relative abundance, Chlorophyceae was highest and Euglenophyceae was lowest in all the three sites. Shannon-Wiener diversity index was highest in Site II and lowest in Site III. The *F* value for one-way analysis of variance (ANOVA) was significant at 1% probability level for both phytoplankton classes and phytoplankton species.

Keywords: ANOVA; correlation matrix; density; relative abundance; seasonal variation.

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1. INTRODUCTION

Floodplain wetlands are one of the most diverse and productive ecosystems on earth. They create an environment for the aquatic food web which is generally consumed by fish and other living entities [1]. Wetlands are often referred to as 'Biological Supermarkets' as they support all forms of life through extensive food chain and biodiversity [2].

Diversity, distribution, abundance and variation in the biotic factors provide information of energy turnover in the aquatic systems [3]. In these systems phytoplankton is of great importance as a major source of organic carbon located at the base [4]. Their sensitivity and large variations in species composition are often a reflection of significant alteration in ambient condition within an ecosystem [5,6]. Hence for any scientific utilization of water resources plankton study is of primary interest.

The phytoplankton community is the basis of the nutrient cycle in an aquatic ecosystem and plays an important role in maintaining the equilibrium between living organisms and abiotic factors [7]. The phytoplankton community on which the whole floodplain population depends is largely influenced by a number of physicochemical factors [8]. The composition of the community is clearly related to hydrology, relevant nutritional resources, and habitat characteristics. The phytoplankton species richness is related to the complexity of habitats formed by the presence of aquatic vegetation [9]. Phytoplankton productivity and composition are influenced by the spatial and temporal dynamics of physicochemical parameters and dominated by the solar energy cycle [10,11].

A number of studies have been carried out on the diversity of the phytoplankton community in relation to physicochemical characteristics of different aquatic ecosystems [12-21]. However, information on the role of different habitats in determining the phytoplankton diversity of a particular aquatic ecosystem is hardly available.

In this paper an attempt has been made to study the seasonal variation of phytoplankton diversity and dynamics of a part of Chatla floodplain lake and its correlations with the physicochemical properties of water. This study may be of help to the poor people of Chatla as abundance of phytoplankton is of considerable assistance in evolving fish culture programmes [22].

A limited number of works have been done on the phytoplankton dynamics of Chatla floodplain, e.g., [23-27,7]. The main focus of the present study is to depict the relevance of physicochemical characteristics and the role of different habitats in assessing the phytoplankton diversity, composition and abundance in three different habitats.

2. MATERIALS AND METHODS

This study was conducted in Chatla floodplain wetland (*Chatla Haor*) during March, 2019 to February, 2020. This wetland (Fig. 1) is one of the lakes in Cachar district in southern Assam in India. It is located at an elevation of 43.6 msl, at a latitude of $24^0$42'40" N and at a longitude of $92^0$44'30" E. It is formed by the meandering river Ghagra, a south bank tributary of river Barak of southern Assam, North-East India, and has a unique hydrology due to the presence of different types of habitats (inlets, floodplain fisheries, beels and outlets) which maintains a network among the floodplains, rivers and streams.

For the purpose of analyzing the phytoplankton dynamics of Chatla floodplain wetland in relation to the physicochemical characteristics of water, water and phytoplankton samples were collected from March, 2019 to February, 2020 in four different seasons, viz., pre-monsoon (March-May), monsoon (June-August), post-monsoon (Sepetmber-November) and winter (Decmber-February) [26] from three selected areas, viz. Dargakuna (Site I), Baluchuri (Site II) and Mitapani (Site III) of the floodplain lake.

Surface water temperature, transparency and turbidity were measured on the spot by using a Mercury Thermometer, a Secchi disc and a Turbidimeter (Systronics) respectively. Other chemical parameters such as pH, electrical conductivity (EC), dissolved oxygen (DO), total alkalinity (TA), total dissolved solids (TDS), free carbon-dioxide (FCO_2), chloride (Cl^-), total hardness (TH), calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), nitrate (NO_3), phosphate (PO_4) and biological oxygen demand (BOD) were analyzed by standard methods [28,29].

For phytoplankton collection, twenty litres of water sample in three replicates from each site was filtered through a standard plankton net (mesh size 30 µm) and preserved in 3% formaldehyde solution. Qualitative and quantitative estimation of phytoplankton from each site were carried out with the help of "Sedgwick Rafter" counting cell under a compound microscope and identified using standard literature [30,31]. The community structure was analysed using Shannon-Wiener diversity index (H'), Menhinick's richness index, Evenness index (J') and Berger-Parker dominance index (D_{BP}) [32]. One-way

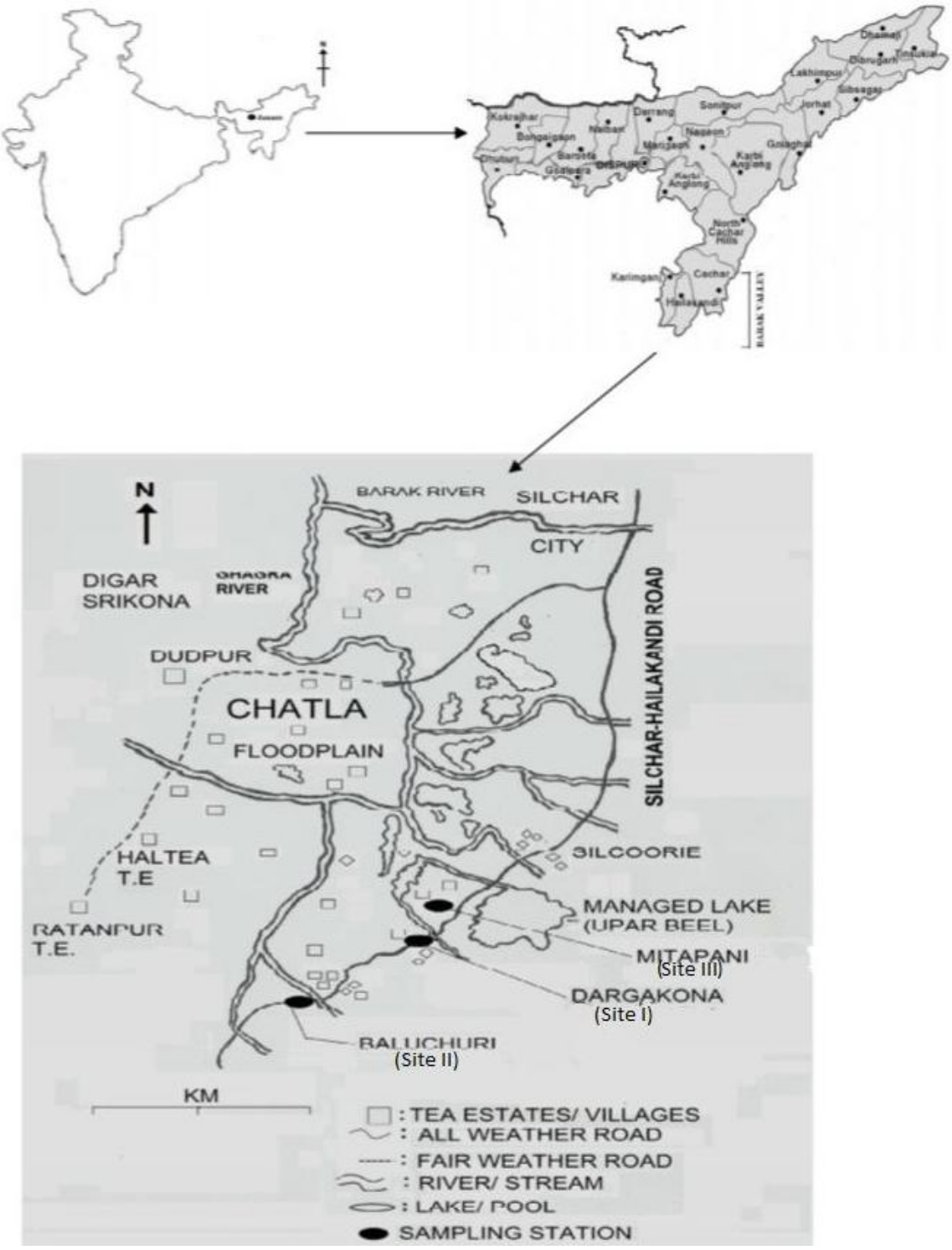

Fig. 1. A Map of Chatla Floodplain Lake of Cachar District, Assam, India with a mention of all the sampling sites

analysis of variance (ANOVA) was also performed. The Carl-Pearson correlation coefficient and regression analysis was used to examine the relationship among various parameters (physicochemical parameters of water and phytoplankton classes). All the statistical analysis done in this paper has been performed using MATLAB, v. 7.

3. RESULTS AND DISCUSSION

3.1 Physicochemical Parameters of Water

The mean value of physicochemical parameters of water in all the three selected habitats of Chatla floodplain wetland are shown in Table 1. Water temperature shows a little variation, ranging between 24.55^0C (Site II) and 25.35^0C (Site III). Transparency and turbidity are found ranging from 1.64 cm (Site II) to 2.19 cm (Site I) and from 18.24 NTU (Site II) to 23.84 NTU (Site I), respectively. DO concentration ranges between 4.08 mgL^{-1} (Site III) and 4.92 mgL^{-1} (Site I). TA is found ranging from 36.80 mgL^{-1} (Site II) to 62.44 mgL^{-1} (Site I). The pH of different sites is found to be in the range of 6.44 (Site II) to 6.92 (Site I) (slightly acidic to normal). Higher EC values indicate the presence of a high concentration of salts in water. The range of TH varies from 48.52 mgL^{-1} (Site II) to 54.48 mgL^{-1} (Site I). The range of chloride (Cl^-) concentrations is well within the permissible limit. NO_3 concentration ranges from 3.47 mgL^{-1} (Site I/II) to 3.64 mgL^{-1} (Site III) which is much lower than the permissible value (45 mgL^{-1}). However, the range of PO_4 concentrations from 3.13 mgL^{-1} (Site I) to 4.16 mgL^{-1} (Site III) in different habitats are found to be slightly higher. The high range of BOD from 8.82 mgL^{-1} (Site I) to 10.51 mgL^{-1} (Site III) confirms that high organic load is present in water. The value of the TDS variable varies from 29.12 mgL^{-1} (Site II) to 39.69 mgL^{-1} (Site III). The range of Free CO_2 falls in between 10.59 mgL^{-1} (Site III) and 12.25 mgL^{-1} (Site II). The range of Ca varies between 32.90 mgL^{-1} (Site I) and 46.50 mgL^{-1} (Site III), and the value of K variable varies from 1.34 mgL^{-1} (Site I) and 3.10 mgL^{-1} (Site III). Finally, the values of Mg and Na variables fall in between 14.47 mgL^{-1} (Site III) and 35.14 mgL^{-1} (Site I) and 6.87 mgL^{-1} (Site II) and 7.50 mgL^{-1} (Site I) respectively.

3.2 Phytoplankton

A total of 36 phytoplankton taxa were identified out of which 19 belong to Chlorophyceae, 10 to Cyanophyceae, 6 to Bacillariophyceae, and 1 to Euglenophyceae. Table 2 bears the details of the mean value (with respect to the four seasons mentioned earlier) of density ($ind.L^{-1}$) of all the species present in all the three sites. The mean density of total phytoplankton in Chatla floodplain ranges from 1951.77 $ind.L^{-1}$ (Site II) to 2623.18 $ind.L^{-1}$ (Site III). Hulyal and Kaliwal [8] reported that the density of total phytoplankton ranged from 110 org. L^{-1} to 555 org. L^{-1} during 2003 and 95 $org.L^{-1}$ to 564 $org.L^{-1}$ during 2004 in the Almatti reservoir of Bijapur district in the state of Karnataka, India, which was much lower than the density obtained in the present study. They suggested that the variation in phytoplankton density was influenced by temperature and pH, as they found the maximum population in the summer season. In the current study, the density of phytoplankton was influenced by temperature, and

Table 1. Physicochemical parameters of water (Mean of four seasons)

Sl. No.	Parameters	Mean ± SE		
		Site I	Site II	Site III
1.	Temp. (ºC)	25.08 ± 3.85	24.55 ± 4.12	25.35 ± 4.18
2.	Tran. (cm)	2.19 ± 0.65	1.64 ± 0.40	1.99 ± 0.56
3.	Turb. (NTU)	23.84 ± 3.88	18.24 ± 2.24	21.45 ± 1.25
4.	DO (mgL^{-1})	4.92 ± 0.53	4.30 ± 0.60	4.08 ± 0.53
5.	TA (mgL^{-1})	62.44 ± 13.19	36.80 ± 9.30	41.24 ± 7.62
6.	pH	6.92 ± 0.22	6.44 ± 0.08	6.60 ± 0.13
7.	EC (μScm^{-1})	2921.00 ± 908.10	3834.30 ± 380.11	3453.40 ± 1152.80
8.	TDS (mgL^{-1})	34.49 ± 5.54	29.12 ± 5.31	39.69 ± 6.42
9.	FCO_2 (mgL^{-1})	11.72 ± 0.55	12.25 ± 0.54	10.59 ± 0.54
10.	Cl^- (mgL^{-1})	27.76 ± 7.03	41.53 ± 7.07	29.39 ± 5.82
11.	TH (mgL^{-1})	54.48 ± 10.44	48.52 ± 7.85	49.00 ± 6.23
12.	Ca (mgL^{-1})	32.90 ± 10.89	42.93 ± 4.51	46.50 ± 5.88
13.	K (mgL^{-1})	1.34 ± 0.28	2.31 ± 0.20	3.10 ± 0.96
14.	Mg (mgL^{-1})	35.14 ± 3.91	16.84 ± 3.72	14.47 ± 2.99
15.	Na (mgL^{-1})	7.50 ± 0.99	6.87 ± 1.20	7.20 ± 1.06
16.	NO_3 (mgL^{-1})	3.47 ± 0.22	3.47 ± 0.13	3.64 ± 0.34
17.	PO_4 (mgL^{-1})	3.13 ± 0.50	3.49 ± 0.64	4.16 ± 0.51
18.	BOD (mgL^{-1})	8.82 ± 1.59	8.94 ± 1.18	10.51 ± 1.04

Temp. = Temperature, Tran. = Transparency, Turb. = Turbidity, DO = Dissolved oxygen, TA = Total alkalinity, EC = Electrical conductivity, TDS = Total dissolved solids, FCO_2 = Free carbon di oxide, Cl^- = Chloride, TH = Total hardness, Ca = Calcium, K = Potassium, Mg = Magnesium, Na = Sodium, NO_3 = Nitrate, PO_4 = Phosphate, BOD = Biological oxygen demand

Table 2. Density (ind.L^{-1}) of Phytoplankton community (Mean of four seasons)

Sl. No.	Genus/Species	Mean ± S.E		
		Site I	**Site II**	**Site III**
Class: Chlorophyceae				
1.	*Actinastrum* sp.	14.29 ± 8.75	16.07 ± 11.80	32.14 ± 19.45
2.	*Chlorella* sp.	142.86 ± 18.67	60.71 ± 9.45	55.36 ± 9.84
3.	*Chlamydomonas* sp.	71.43 ± 9.67	69.64 ± 9.39	55.36 ± 33.17
4.	*Cladophora* sp.	51.78 ± 20.49	78.57 ± 8.75	73.22 ± 24.64
5.	*Closterium* sp.	19.64 ± 11.43	-	71.43 ± 12.71
6.	*Cosmarium* sp.	53.57 ± 4.61	69.64 ± 3.42	64.28 ± 21.63
7.	*Cylindrocapsa* sp.	23.22 ± 13.48	30.36 ± 6.76	19.64 ± 7.36
8.	*Desmidium* sp.	58.92 ± 8.93	69.64 ± 12.16	94.64 ± 54.97
9.	*Golenkinia* sp.	42.86 ± 25.42	64.28 ± 7.71	155.35 ± 58.93
10.	*Microspora* sp.	110.72 ± 15.84	69.64 ± 8.93	119.64 ± 39.38
11.	*Mougeotia* sp.	66.07 ± 19.86	53.57 ± 26.16	119.64 ± 31.46
12.	*Scenedesmus* sp.	-	-	8.93 ± 5.36
13.	*Sphaerozosma* sp.	23.22 ± 16.85	19.64 ± 12.16	5.36 ± 5.36
14.	*Spirogyra* sp.	153.57 ± 20.72	135.72 ± 23.87	139.29 ± 32.27
15.	*S. indica*	83.93 ± 5.36	35.71 ± 7.14	73.21 ± 8.93
16.	*Triploceras sp.*	35.71 ± 21.43	33.93 ± 27.26	10.72 ± 10.72
17.	*Ulothrix* sp.	62.50 ± 21.70	80.36 ± 28.63	91.07 ± 48.74
18.	*Volvox* sp.	48.22 ± 29.65	73.21 ± 25.15	69.64 ± 54.27
19.	*Zygnema* sp.	78.57 ± 8.75	42.86 ± 9.67	71.43 ± 8.75
Chlorophyceae Total		**1141.08 ± 64.38**	**1003.55 ± 93.25**	**1330.35 ± 170.14**
Class: Cyanophyceae				
1.	*Anabaena* sp.	123.22 ± 1.78	94.64 ± 16.59	82.14 ± 23.78
2.	*Aulosira fertilissima*	17.86 ± 17.86	26.79 ± 16.07	17.86 ± 17.86
3.	*Chlorococcus* sp.	26.79 ± 16.07	51.78 ± 27.26	51.78 ± 18.30
4.	*Microcoleus acutissimus*	21.43 ± 21.43	42.86 ± 15.15	100.00 ± 30.30
5.	*Lyngbya* sp.	16.07 ± 9.39	25.00 ± 18.56	-
6.	*Nostoc* sp.	133.93 ± 7.36	96.43 ± 11.10	116.07 ± 5.36
7.	*Oscillatoria* sp.	35.72 ± 20.62	30.36 ± 30.36	35.71 ± 25.25
9.	*Rivularia* sp.	46.43 ± 29.23	32.14 ± 18.78	69.64 ± 40.23
8.	*Scytonema* sp.	8.93 ± 8.93	19.64 ± 19.64	21.43 ± 21.43
10.	*Spirulina* sp.	66.07 ± 4.49	44.65 ± 13.48	101.79 ± 41.89
Cyanophyceae Total		**496.45 ± 33.82**	**464.29 ± 57.95**	**596.42 ± 89.62**
Class: Bacillariophyceae				
1.	*Cymbella* sp.	94.64 ± 21.30	66.07 ± 21.50	55.36 ± 6.76
2.	*Fragillaria* sp.	64.29 ± 31.27	41.07 ± 15.53	39.28 ± 17.62
3.	*Gyrosigma* sp.	75.00 ± 35.66	12.50 ± 12.50	48.21 ± 17.83
4.	*Navicula* sp.	137.50 ± 41.38	130.36 ± 25.65	192.85 ± 44.13
5.	*Nitzschia* sp.	98.22 ± 7.92	62.50 ± 8.93	107.14 ± 30.30
6.	*Synedra* sp.	89.28 ± 19.01	87.50 ± 17.10	80.36 ± 20.90
Bacillariophyceae Total		**558.93 ± 84.94**	**400.00 ± 47.20**	**523.19 ± 53.95**
Class: Euglenophyceae				
1.	*Euglena* sp.	98.21 ± 18.98	83.93 ± 29.79	173.22 ± 46.87
Euglenophyceae Total		**98.21 ± 18.98**	**83.93 ± 29.79**	**173.22 ± 46.87**
Total Phytoplankton		**2294.67 ± 136.20**	**1951.77 ± 174.93**	**2623.18 ± 263.12**
Total No. of Taxa		**35**	**34**	**35**
% Composition		**33.40%**	**28.41%**	**38.19%**

change in nutrient dynamics during monsoon. This is because most of the phytoplankton taxa were transferred from nearby fisheries and other freshwater ecosystems by surface runoff. This is same with the findings in a study on the South Pantanal floodplain, Brazil [33], where the highest phytoplankton density was recorded in the rising water period.

The relative abundance of different classes of phytoplankton revealed that Chlorophyceae is the

most diversified and abundant group of phytoplankton with a contribution of 49.73% in Site I, 51.42% in Site II and 50.72% in Site III. Euglenophyceae remains to be the least dominant group with a contribution of 4.28% in Site I, 4.30% in Site II and 6.60% in Site III. The second abundant group in Site I is Bacillariophyceae (24.36%) followed by Cyanophyceae (21.63%), whereas it is different in Site II with Cyanophyceae (23.79%) as the second abundant group followed by Bacillariophyceae (20.49%). Site III preserves a similar trend with that of Site II in respect of ranking in relative abundance of phytoplankton classes. [7] also reported Chlorophyceae as the most diversified and abundant group of phytoplankton in Chatla floodplain lake. The relative abundance of different classes of phytoplankton are presented in Fig. 2.

The analysis of the phytoplankton community in different habitats of Chatla wetland revealed some similarities with phytoplankton studies in Imo River Estuary, Nigeria [34], where the predominance of Chlorophyceae in lotic systems with flowing water and Cyanophyceae bloom in eutrophic and polluted water was described. Laskar and Gupta [26,27,7] reported similar trends of phytoplankton community composition in terms of density and abundance for Chatla floodplain lake.

Shannon-Wiener diversity index (H'), Menhinick's richness index, Evenness index (J') and Berger-Parker dominance index (D_{BP}) were computed for all the three sites in Table 3. The lowest value of Shannon Wiener diversity index (H') is 3.10 (Site III) and the highest value is 3.19 (Site II). Richness index varies from 0.53 (Site III) to 0.63 (Site II). Evenness index (J') ranges from 0.94 (Site III) to 0.96 (Site I/Site II) and the Berger-Parker dominance index (D_{BP}) ranges from 0.08 (Site I/Site II) to 0.10 (Site III).

One Way Analysis of Variance (ANOVA) (Table 4) shows site-wise variation of phytoplankton classes and phytoplankton species with respective *P* values which are significant at 1% probability level.

Table 5 shows the Carl-Pearson correlation matrix among various parameters (physicochemical parameters of water and phytoplankton classes) along with their *P* values.

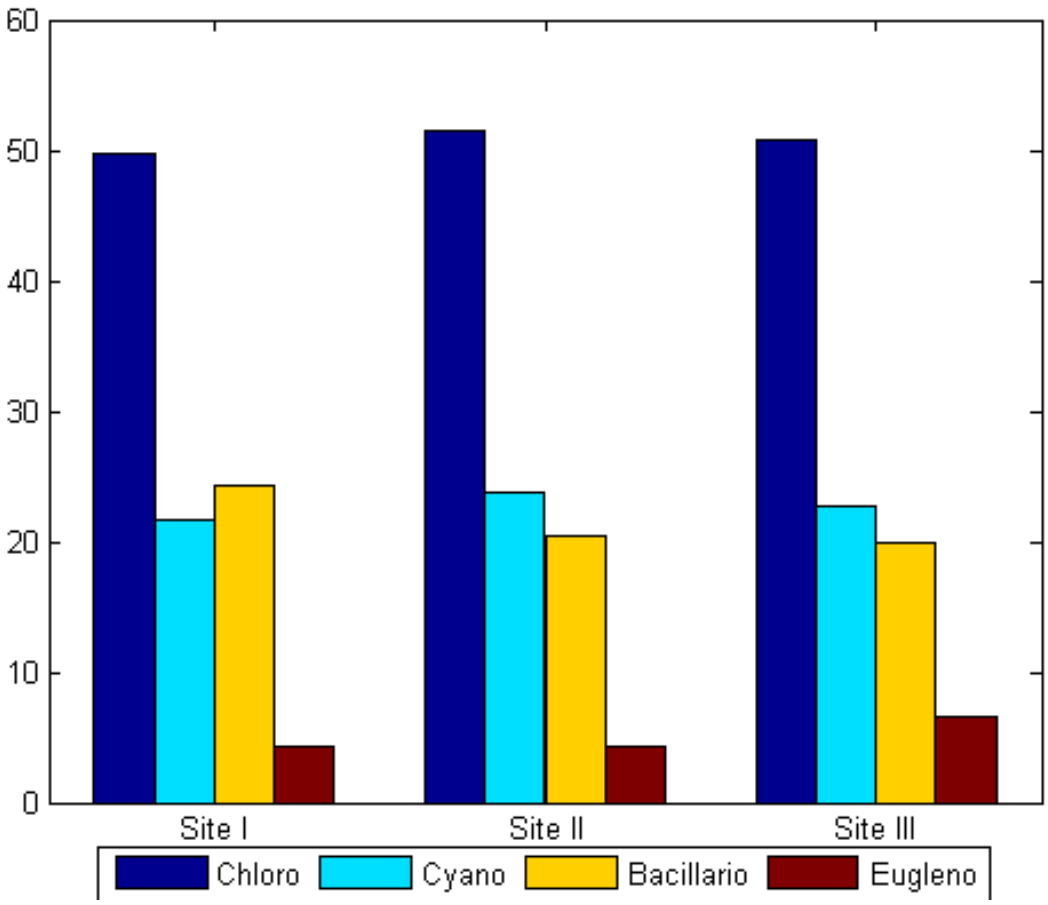

Fig. 2. Relative abundance of phytoplankton classes

Table 3. Diversity indices of phytoplankton community

Index	Site I	Site II	Site III
Shannon-Wiener diversity index (H')	3.16 ± 0.07	3.19 ± 0.05	3.10 ± 0.06
Menhinick's richness index	0.55 ± 0.02	0.63 ± 0.01	0.53 ± 0.02
Evenness index (J')	0.96 ± 0.01	0.96 ± 0.01	0.94 ± 0.01
Berger-Parker dominance index (D_{BP})	0.08 ± 0.01	0.08 ± 0.01	0.10 ± 0.01

Table 4. One way analysis of variance (ANOVA) for Phytoplankton Classes and phytoplankton Species among different sites

Sl. No.	Parameters	F	*P*
1.	**Phytoplankton Classes**	84.08 *	.000
2.	**Phytoplankton Species**	7.46 *	.000

* *Significant at 1% probability level*

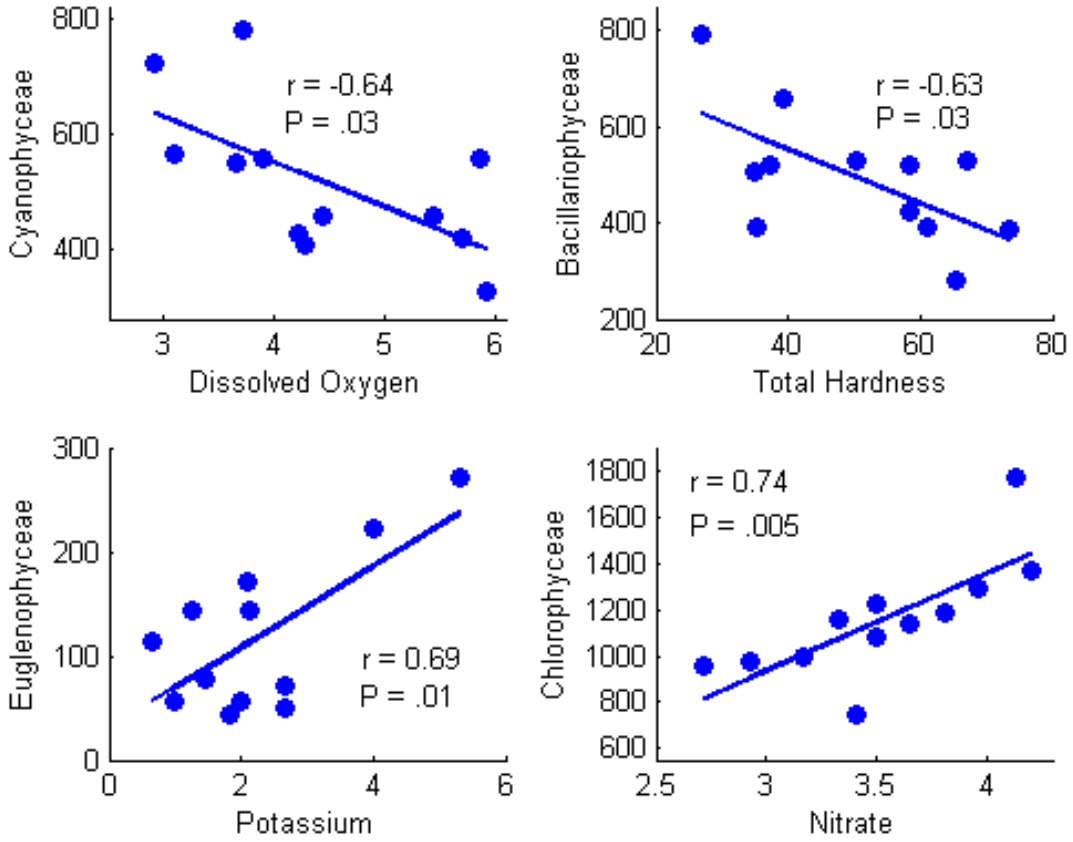

Fig. 3. Simple linear regression between physicochemical parameters of water and phytoplankton classes

Linear regression analysis has been performed for the significant correlations

(i) between dissolved oxygen and Cyanophyceae (r = −0.64, P= .03),
(ii) between total hardness and Bacillariophyceae (r = −0.63, P= .03),
(iii) between potassium and Euglenophyceae (r=0.69, P = .01),
(iv) between nitrate and Chlorophyceae (r=0.74, P =.005)

which are shown in Fig. 3.

Table 5. Pearson correlation matrix among various parameters

	Tem	**Tran**	**Turb**	**DO**	**TA**	**pH**	**EC**	**TDS**	**FCO_2**	**Cl^-**	**TH**	**Ca**	**K**	**Mg**	**Na**	**NO_3**	**PO_4**	**BOD**	**Chlo**	**Cyan**	**Baci**	**Eugl**
Tem	-	0.95* (.000)	-0.26 (.41)	-0.81* (.001)	-0.61** (.04)	-0.44 (.16)	0.73* (.007)	0.05 (.87)	-0.15 (.65)	-0.20 (.53)	-0.34 (.28)	0.70 (.01)	0.50 (.10)	0.34 (.28)	0.61** (.04)	0.28 (.38)	0.63** (.03)	0.49 (.11)	0.47 (.12)	0.69** (.01)	0.24 (.45)	0.20 (.52)
Tran		-	-0.36 (.25)	-0.70** (.01)	-0.47 (.12)	-0.37 (.24)	0.72* (.008)	0.07 (.82)	-0.22 (.48)	-0.18 (.57)	-0.42 (.18)	0.69** (.01)	0.39 (.22)	0.44 (.15)	0.55 (.06)	0.36 (.25)	0.58** (.048)	0.50 (.10)	0.54 (.07)	0.58 (.05)	0.38 (.22)	0.27 (.40)
Turb			-	0.28 (.39)	0.36 (.25)	0.49 (.10)	-0.64** (.03)	0.09 (.77)	0.10 (.75)	-0.43 (.16)	0.54 (.07)	-0.54 (.07)	-0.13 (.68)	0.12 (.72)	-0.04 (.91)	-0.41 (.19)	-0.25 (.44)	-0.37 (.23)	-0.15 (.63)	0.24 (.46)	-0.05 (.89)	-0.16 (.61)
DO				-	0.73* (.007)	0.53 (.08)	-0.80* (.002)	-0.21 (.52)	0.10 (.75)	0.25 (.44)	0.17 (.60)	-0.69** (.01)	-0.51 (.09)	-0.06 (.84)	-0.61** (.04)	-0.30 (.35)	-0.43 (.16)	-0.56 (.06)	-0.30 (.34)	-0.64** (.03)	-0.02 (.95)	0.00 (.99)
TA					-	0.59** (.04)	-0.48 (.12)	-0.40 (.19)	0.43 (.17)	0.26 (.41)	0.14 (.65)	-0.88* (.000)	-0.43 (.16)	0.22 (.48)	-0.60** (.04)	0.22 (.50)	-0.76* (.004)	-0.65** (.02)	0.07 (.82)	-0.35 (.26)	0.16 (.61)	0.06 (.86)
pH						-	-0.42 (.17)	0.37 (.23)	-0.04 (.89)	-0.50 (.10)	0.58** (.046)	-0.65** (.02)	-0.50 (.10)	0.53 (.08)	0.14 (.68)	-0.30 (.34)	-0.40 (.20)	-0.12 (.71)	-0.23 (.48)	-0.27 (.40)	0.03 (.92)	-0.20 (.53)
EC							-	-0.00 (.99)	0.12 (.72)	-0.00 (.99)	-0.22 (.49)	0.58** (.046)	0.46 (.14)	0.24 (.45)	0.52 (.08)	0.48 (.12)	0.25 (.43)	0.39 (.22)	0.33 (.29)	0.41 (.18)	-0.05 (.87)	0.17 (.60)
TDS								-	-0.75* (.005)	-0.86* (.000)	0.36 (.26)	0.34 (.29)	-0.13 (.68)	0.15 (.64)	0.68** (.02)	-0.44 (.15)	0.34 (.27)	0.69** (.01)	-0.21 (.51)	0.04 (.90)	-0.01 (.97)	-0.24 (.46)
FCO_2									-	0.47 (.12)	0.21 (.50)	-0.53 (.08)	0.00 (.99)	0.13 (.68)	-0.31 (.32)	0.18 (.57)	-0.67** (.02)	-0.76* (.004)	-0.19 (.56)	-0.05 (.87)	-0.39 (.21)	-0.12 (.72)
Cl^-										-	-0.58** (.048)	-0.18 (.57)	0.02 (.95)	-0.41 (.19)	-0.80* (.002)	0.50 (.09)	-0.24 (.44)	-0.42 (.17)	0.18 (.58)	-0.33 (.29)	0.11 (.74)	0.19 (.56)
TH											-	-0.37 (.24)	-0.06 (.86)	0.23 (.47)	0.39 (.22)	-0.69** (.01)	-0.31 (.33)	-0.32 (.31)	-0.60** (.04)	0.04 (.90)	-0.63** (.03)	-0.18 (.58)
Ca												-	0.51 (.09)	-0.17 (.60)	0.53 (.08)	0.00 (.10)	0.82* (.001)	0.64** (.02)	0.22 (.50)	0.42 (.18)	0.01 (.98)	0.25 (.44)
K													-	-0.34 (.28)	0.22 (.49)	0.12 (.72)	0.52 (.08)	-0.03 (.94)	0.49 (.10)	0.82* (.001)	-0.34 (.28)	0.69** (.01)
Mg														-	0.50 (.10)	0.01 (.98)	-0.15 (.64)	0.11 (.72)	-0.02 (.96)	0.03 (.92)	0.27 (.39)	-0.24 (.45)
Na															-	-0.34 (.28)	0.46 (.13)	0.55 (.06)	-0.13 (.69)	0.43 (.16)	-0.19 (.56)	-0.11 (.73)
NO_3																-	-0.17 (.60)	0.11 (.73)	0.74* (.005)	0.13 (.69)	0.52 (.08)	0.23 (.48)
PO_4																	-	0.59** (.04)	0.28 (.38)	0.46 (.13)	0.15 (.64)	0.39 (.21)

	Tem	Tran	Turb	DO	TA	pH	EC	TDS	FCO_2	Cl^-	TH	Ca	K	Mg	Na	NO_3	PO_4	BOD	Chlo	Cyan	Baci	Eugl
BOD																		-	0.19 (.55)	0.09 (.79)	0.43 (.16)	-0.20 (.54)
Chlo																			-	0.56 (.06)	0.54 (.07)	0.61** (.04)
Cyan																				-	-0.07 (.82)	0.50 (.10)
Baci																					-	0.01 (.97)
Eugl																						-

P values are given in parenthesis
*Correlation significant at 1% probability level
**Correlation significant at 5% probability level

4. CONCLUSION

In this paper, a study was carried out in Chatla floodplain lake in Cachar district of Assam, North East India diversity over a period of one year (March, 2019-February, 2020). Composition, density and diversity of phytoplankton community were studied in relation to physicochemical characteristics of water which is comprised of 36 taxa out of which 19 belonged to Chlorophyceae, 10 to Cyanophyceae, 6 to Bacillariophyceae and 1 to Euglenophyceae. The *F* value for one-way analysis of variance (ANOVA) is significant at 1% probability level for both phytoplankton classes and phytoplankton species. Regression lines for Dissolved oxygen-Cyanophyceae, Total hardness-Bacillariophyceae, Potassium-Euglenophyceae and Nitrate-Chlorophyceae are plotted the P values of correlations for which are .03, .03, .01 and .005 respectively.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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