

**DIVERSITY AND COMMUNITY COMPOSITION OF
PHYTOPLANKTON IN A LENTIC WATER BODY OF BURDWAN,
WEST BENGAL, INDIA**

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ABSTRACT

The study of phytoplankton diversity and community composition was studied by collecting water samples from a lentic water body of Burdwan, West Bengal, India between November 2012 to July 2013. A total number of 29 phytoplankton species belonging to Cyanophyceae (12), Bacillariophyceae (4), Euglenophyceae (3) and Chlorophyceae (10) were recorded from two collection spots (A and B) of the water

body with less (A) or more (B) human interference respectively. These two specific collection spots were selected to compare the phytoplankton diversity and community structure of the water body of which one collection spot (B) with much more human interferences than the other (A). It was found that the stress of human interference reduces the phytoplankton diversity. Shannon Species Diversity value of collection spot A (3.096-3.951) and collection spot B (2.772-3.619) and species composition pattern also support the fact.

KEY WORDS: Phytoplankton diversity, community composition, anthropogenic stress.

INTRODUCTION

Phytoplanktons are autotrophic in nature and they constitute the basic representatives of the aquatic food chain. They play their role as producer organisms in the aquatic systems. They can pinpoint the ecological status and the pollution scenario of any water body by their diversity characterization and community composition^[1-2]. Phytoplankton diversity, species

composition and seasonal fluctuation of lentic water bodies of India have been studied by several workers [3-14]. Our present investigation establishes the phytoplankton diversity and composition in a seasonal frame work, along with the effect of anthropogenic stress to modify the occurrence and availability of phytoplankton.

MATERIAL AND METHODS

The studied lentic water body is located in Burdwan district of West Bengal. This pool is rectangular in shape (Fig.1). We selected two collection spot, A (23°14'58.37"N; 87°50'59.15"E) with less human interferences and covered with trees and spot B (23°14'58.00"N; 87°51'00.75"E) with much greater human activities and with very few trees. Phytoplankton samples were collected from the lentic water body in pre-monsoon (March -May), post-monsoon (September- November) and monsoon (June- August) between 10-10.30 am in a 500 ml amber colour bottle and subsequently fixed with Lugol's Iodine solution in a 100:1 ratio. The collected samples were left overnight for sedimentation purpose. After that the supernatant part was pipetted out and the sedimented sample was concentrated to 5 ml. The drop count method [15] was followed to quantify the phytoplankton flora. Phytoplanktons were identified following standard works [16-20].

The geographic coordinates of the water body was studied by GARMIN GPS 60 device and the locational map was constructed by using Google Earth software.

Species diversity was calculated using Shannon's formula proposed by Odum [21] by the software Bio Diversity Pro Ver. 2.0 program [22].

$$H' = \sum_{i=1}^s \frac{n_i}{N} \log_2 \frac{N}{n_i}$$

Where, N= Total number of individuals per liter.

s = is the species number

n_i = is the number of individuals of each species

H' = species diversity in bits of information per individual.

RESULTS

A total number of 29 species of phytoplankton of four taxonomic classes Cyanophyceae (12), Bacillariophyceae (4), Euglenophyceae (3) and Chlorophyceae (10) were recorded from the pool from November 2012 to July 2013 (Table 1 and 2) in respect of two collection spots namely A and B of the water body. Among these the collection spot A was mostly represented by Cyanophyceae, followed by Chlorophyceae, Bacillariophyceae and Euglenophyceae. The collection spot B was dominated by jointly Cyanophyceae and Bacillariophyceae and followed by jointly Euglenophyceae and Chlorophyceae (Fig. 2). The Shannon Species Diversity value of collection spot A (3.096-3.951) and collection spot B (2.772-3.619) were reported under the study period (Fig. 3).

DISCUSSION

It has been said from the study that Cyanophycean members can withstand wide ecological preferences. So they are found mostly in two spots, where spot B has much more human interferences (Bathing of human and other domestic animals, washing of cloths and use of the ghat for various cultural and religious purposes) than spot A. But there is a change in the cyanophycean representatives in spot B by *Oscillatoria limosa* and *Oscillatoria tenuis* which represent increasing pollution status. The same shift towards pollution indicating form from non-polluting status indicators were represented by *Nitzschia palea*, *Euglena acus*, *Stigeoclonoum tenue* and *Phacus helicoides* which were found in spot B. These species shift may be mostly due to the anthropogenic load which affects the quality of the water body in a negative way. The reduction in the species Diversity value in both the spots in monsoon season was caused by the dilution effect of the rain water.



Fig.1 Map of the study site with two collection spot A and B.

Table 1: Phytoplankton composition of collection spot A (The numbers for each species denotes total number of individuals/Litre in each season)

Phytoplankton Samples	Number of Phytoplankton Species		
	Pre-monsoon	Monsoon	Post-monsoon
<i>Merismopedia punctata</i>	8	64	16
<i>Merismopedia glauca</i>	0	16	22
<i>Merismopedia elegans</i>	0	3	64
<i>Oscillatoria curviceps</i>	12	3	2
<i>Oscillatoria nigra</i>	22	0	13
<i>Lyngbya majuscula</i>	12	0	8
<i>Arthospira jenneri</i>	6	6	1
<i>Chroococcus minor</i>	12	0	7
<i>Coelosphaerium kuetzingianum</i>	25	12	9
<i>Anabaena variabilis</i>	30	20	3
<i>Nitzschia linearis</i>	32	0	33
<i>Navicula cincta</i>	3	64	16
<i>Euglena viridis</i>	0	16	22
<i>Scenedesmus dimorphus</i>	0	3	13
<i>Scenedesmus acutus</i>	12	3	2
<i>Scenedesmus armatus</i>	22	0	0
<i>Scenedesmus quadricauda</i>	18	0	8
<i>Cosmarium armatum</i>	6	6	1
<i>Cosmarium angulatum</i>	12	0	7
<i>Euastrum spinulosum</i>	25	12	9
<i>Micrasterias alata</i>	30	20	44
<i>Arthrodesmus subulatus</i>	32	0	33

Table 2: Phytoplankton composition of collection spot B (The numbers for each species denotes total number of individuals/Litre in each season)

Phytoplankton Sample	Number of Phytoplankton Species		
	Pre-monsoon	Monsoon	Post-monsoon
<i>Merismopedia punctata</i>	8	12	16
<i>Oscillatoria limosa</i>	22	12	22
<i>Oscillatoria tenuis</i>	12	11	18
<i>Lyngbya majuscula</i>	12	0	8
<i>Nitzschia linearis</i>	32	0	21
<i>Nitzschia palea</i>	13	3	23
<i>Navicula cincta</i>	3	64	16
<i>Cyclotella meneghiniana</i>	12	10	19
<i>Euglena viridis</i>	0	16	22
<i>Euglena acus</i>	22	12	11
<i>Phacus helicoides</i>	23	12	25
<i>Stigeoclonoum tenue</i>	18	4	12
<i>Scenedesmus armatus</i>	22	0	0
<i>Scenedesmus quadricauda</i>	18	0	8

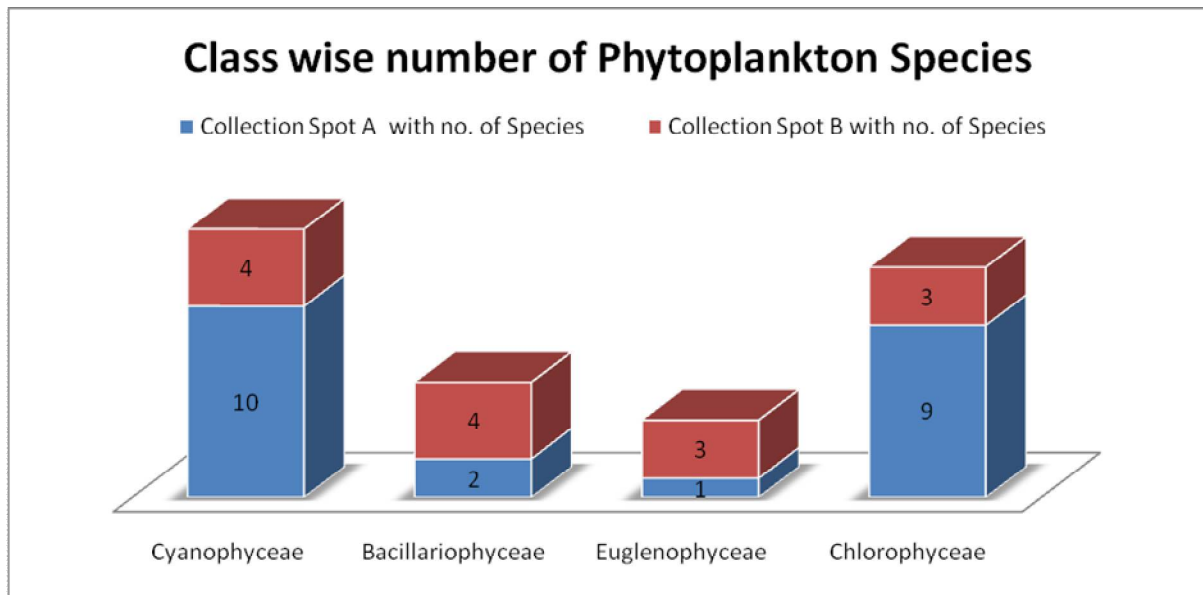


Fig.2 Class wise number of Phytoplankton species from the two collection spots.

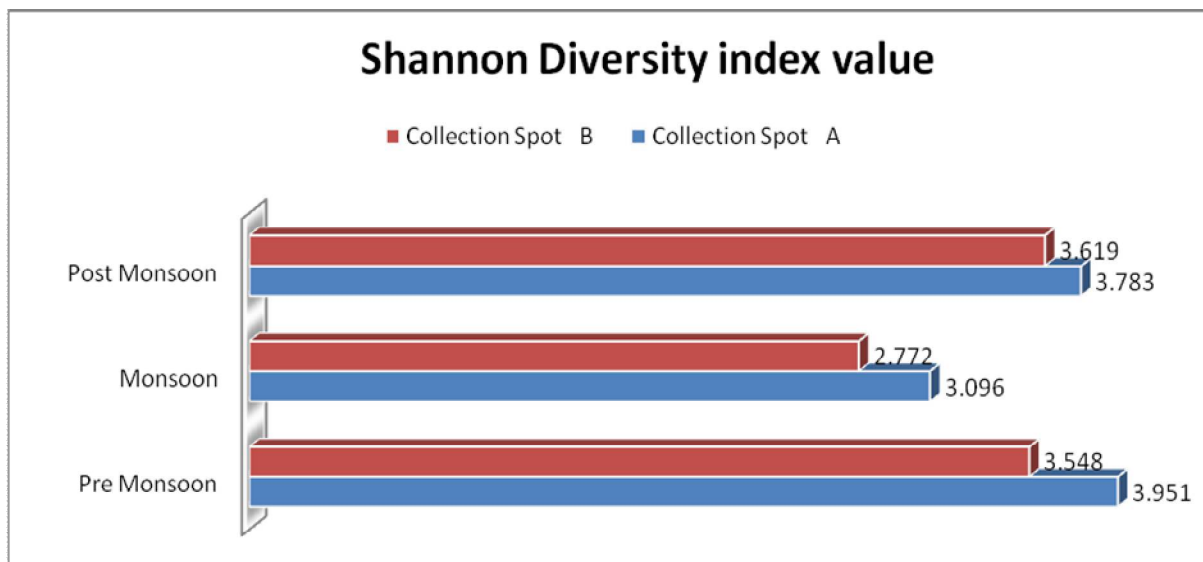


Fig.3 Variation in the Shannon Diversity Index value under the seasonal frame for the two collection spots.

CONCLUSIONS

This paper deals with the detail phytoplankton species composition under seasonal basis along to study of changes in species spectra due the anthropogenic activities leading to changes in quality of the particular water body. It was found that in spot B in every season the species diversity was decreased from spot A and in future if unchecked the reduced diversity will ultimately lead to development of few tolerant forms which create toxic blooms. So to maintain the ecological and aesthetic aspects of a water body, we have to study and conserve the diversity criteria and as phytoplankton play a crucial role as primary

producer; their functionality should be critically studied along with other environmental parameters. It is concluded that there should be a proper planning for use and maintenance of every water body.

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