ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2015; 2(4): 205-207
www.allresearchjournal.com
Received: 25-02-2016
Accepted: 26-03-2016

Bristi Dutta
Assistant Professor, dept. Of Zoology, S.P.P. College, Namti, Sivsagar, Assam

Dr. Debojit Baruah
Associate professor, Dept. Of Botany, Lakhimpur Girls College, North Lakhimpur, Assam

Correspondence
Bristi Dutta
Assistant Professor, dept. Of Zoology, S.P.P. College, Namti, Sivsagar, Assam

Study of phytoplankton abundance and diversity of River Dikhow, Assam, India

Bristi Dutta, Dr. Debojit Baruah

Abstract
An assessment has been made on phytoplankton abundance and diversity of Dikhow River, a southern tributary of River Brahmaputra. For the study, five stations from the tail race of River Dikhow were selected. A total of 29 phytoplankton species belonging to four classes (Bacillariophyceae, Chlorophyceae, Euglenidae and Myxophyceae) were quantified through the analysis of samples collected from 05 stations in 04 seasons (pre-monsoon, monsoon, post-monsoon and winter). Baciariophyceae was found to be dominant over the other three classes. Presence of pollution tolerant species of phytoplankton indicated that the water of the river is organically polluted. The diversity and evenness index values like Shannon diversity index, Pielou evenness index, Simpson diversity index and Margalef diversity index values of phytoplankton of tail race of River Dikhow summarized the exposure to organic pollution, because most of the values were significantly lower indicating the pollution level.

Keywords: River Dikhow, tail race, Phytoplankton, River Brahmaputra, organic pollution

1. Introduction
The phytoplankton in a river or reservoir is an important biological indicator of the water quality. While phytoplankton are important primary producers and the basis of the food chain in open water, some species on the other hand can be harmful to human and other vertebrates by releasing toxic substances into the water body [1]. Phytoplankton studies and monitoring are useful for control of the physico-chemical and biological conditions of the water in any irrigation project. Therefore certain groups of phytoplankton like blue green algae, can degrade recreational value of surface water particularly thick surface scum which can cause deoxygenation of water leading to death of aquatic organisms like fish [2]. Over the last few decades, there has been much interest in the processes influencing the development of phytoplankton communities, [3, 4, 5]. The present study was conducted in the tail race of Dikhow River which is a southern tributary of the mighty River Brahmaputra. The major objective of the study was to assess the present ecological status and water quality of River Dikhow through the study of abundance and diversity of phytoplankton along with appropriate biological indices. The stations selected for the study are mainly human populated areas and as a result the river water passing through these stations is mainly influenced by different anthropogenic activities like effluents of domestic uses, waste disposal and industrial wastes etc.

2. Materials and Methods
The study was conducted from Jun 2012 to May 2013 on seasonal basis -pre-monsoon (Mar-May), monsoon (Jun-Aug), post-monsoon (Sept-Nov) and winter (Dec-Feb). Five sampling stations were selected from the tail race of River Dikhow (Fig: 1). Phytoplankton samples were collected using plankton net 55 µm mesh-size. Samples were preserved in 250 ml polyethylene bottles and fixed with Lugol's iodine. The samples were then transported to the laboratory and identified according standard literature and methods.
Plankton abundance and density was calculated counts/ml of the original sample using the equation: Boyd [6]; APHA [7].

$$D = T (1000) \times Vc / AN \times Vs$$

Where
D = Density of plankton (ind/mil), T = Total number of planktons counted, A = Area of grid in mm^2, N = Number of grids employed, 1000 = Area of counting chamber (mm^2), Vc and Vs = Volumes of concentrate and sample respectively.
Community structure was analyzed by using Shannon diversity index [8], Pielou evenness index [9], Simpson diversity index [10] and Margalef diversity index [11].

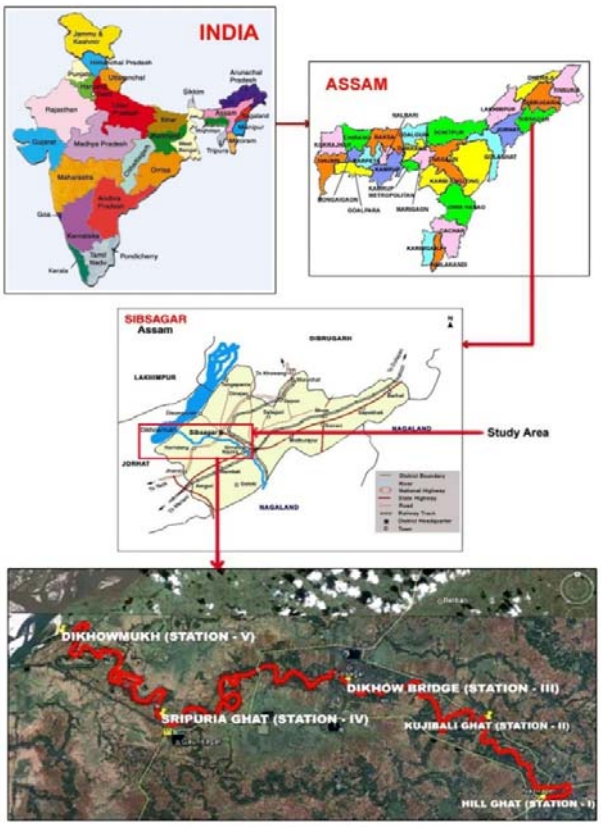

Fig. 1 : Location Map of the Study Area

3. Result and Discussion

A total of 29 phytoplankton species belonging to four classes (Bacillariophyceae, Chlorophyceae, Euglenidae and Myxophyceae) were quantified through the analysis of samples collected from 05 stations in 04 seasons. Bacillariophyceae made up the highest number (11 genera, 11 species) followed by Chlorophyceae (6 genera, 8 species) (Table: 1). Bacillariophyceae and Chlorophyceae were more abundant both qualitatively and quantitatively (41%) and (27 %) respectively than the other taxonomic groups (Fig: 2). Thus, The diversity of the phytoplankton community of overall sites in the tail race of the Dikhow River is dominated by diatoms (Bacillariophyceae) and Chlorophyceae as compared to Euglenidae and Myxophyceae. Dominance of Bacillariophyceae and Chlorophyceae may be due to favourable amount of dissolved oxygen and fair amount of pH and alkalinity as was observed by Rajagopal *et al*., [12]. Most of the phytoplankton species recorded from the sampling stations during the study period are organic pollution – tolerant [13]. Thus their presence may indicate organic pollution of the river. On the other hand, Shannon diversity index (H) was maximum in station III and IV and minimum in station I (Fig: 3). Seasonal fluctuation in all the stations was found to be less. The values were found to be under 1 and hence it can be said that there may be pollution and degradation of habitat structure [14]. Pielou evenness index values were far below 1 in all the stations, which means that the individuals belonging to the recorded classes are not distributed equally in all the stations. This result may be due to organic pollution and eutrophication. Simpson diversity index also indicated poor diversity in all the stations. Seasonally there is no vast difference between the Margalef diversity index values in the stations. The water quality cannot be considered as clean as Margalef index value smaller than 3 as shown in fig: 3 indicate unclean conditions [15].

Table 1: Distribution of phytoplankton in River Dikhow

Sl. No.	Taxa	Sl. No.	Taxa
	Fam: Chlorophyceae		
1	*Chlorella vulgaris*	16	*Gyrosigma spencerii*
2	*Cladophora glomerata*	17	*Raphidonema* sp.
3	*Closterium turgidum*	18	*Stauroneis acuta*
4	*Coelastrum reticulatum*	19	*Surirella ovalis*
5	*Microspora quadrata*	20	*Synedra pulchella*
6	*Oedogonium gracilis*		Fam: Myxophyceae
7	*Spirogyra pratensis*	21	*Anabaena fertilissima*
8	*Spirogyra singularis*	22	*Lyngbya limnetica*
	Fam: Bacillariophyceae	23	*Nostoc vaginicola*
9	*Asterionella gracillima*	24	*Oscillatoria limnetica*
10	*Calonesia* sp.	25	*Oscillatoria homogenea*
11	*Cocconeis* sp.		Fam: Euglenidae
12	*Cyclotella ocellata*	26	*Euglena acus*
13	*Denticula elegans*	27	*Euglena viridis*
14	*Diatoma elongatum*	28	*Phacus caudatus*
15	*Gomphonema montanum*	29	*Phacus viridis*

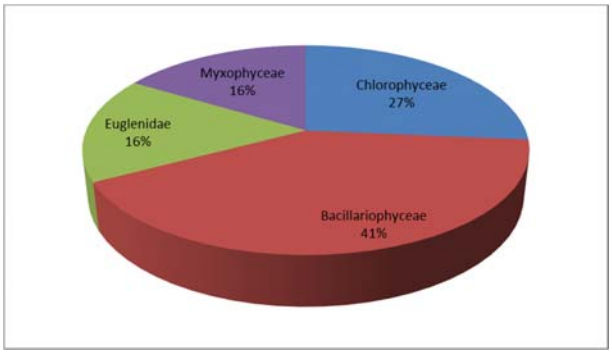

Fig 2: Mean seasonal variation of phytoplankton groups of tailrace of River Dikhow

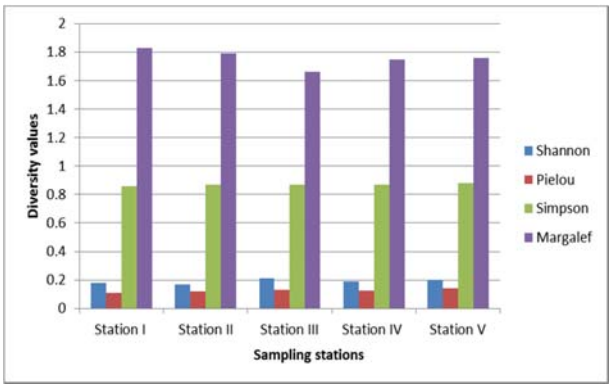

Fig 3: Mean annual diversity indices of phytoplankton in five sampling stations of the tail race of River Dikhow

4. Conclusion

Bacillariophyceae (diatoms) topped the list followed by Chlorophyceae, Bacillariophyceae and Euglenidae. Bacillariophyceae and Chlorophyceae were more abundant both qualitatively and quantitatively. Presence of organic pollution tolerant species indicated the ecological status of the river and the river water quality. The diversity and evenness index values of phytoplankton of tail race of river Dikhow summarized the exposure to organic pollution. Most of the values were significantly lower indicating the pollution level. Comparatively lower values of the diversity and evenness indices were obtained in station I and III. However, in all the stations, the values were lower than the values classified as unpolluted. The reason behind introduction of organic pollution may be various anthropogenic activities like washing, bathing throwing of human and animal excreta, emersion of statues particularly in station III during Durga Puja, disposal of garbage and certain harmful wastes in and near the river.

5. References

1. Ariyadej C, Tansakul R, Tansakul P, Angsupanich S. Phytoplankton diversity and its relationships to the physico-chemical environment in the Banglang Reservoir, Yala Province. Songklanakarin. J Sci Technol. 2004; 26(5):595-607.
2. Whitton BA, Patts M. The Ecology of Cyanobacteria. Kluwer Academic Publishers, Netherlands, 2000.
3. Akbay N, Anul N, Yerti S, Soyupak S, Yurteri C. Seasonal distribution of large phytoplankton in Keban dam reservoir. Plank. Res 1999; 21(4):771-787.
4. Peerapornpisal Y, Sonthichai W, Somdee T, Mulsin P, Rott E. Water quality and phytoplankton in the Mae Kuang Udomtara Reservoir, Chiang Mai, Thailand. J Sci Fac Cmu. 1999; 26(1):25-43.
5. Elliott JA, Irish AE, Reynolds CS. Predicting the spatial dominance of phytoplankton in light limited and incompletely mixed eutrophic water column using the PROTECH model. Fresh Biol 2002; 47:433-440.
6. Boyd CE. Water quality in warm water fish ponds. Craft master printers. Inc. Opelika, Alabama, 1981, 359.
7. APHA, Standard Methods for Examination of Water and Waste water. 18th Ed. Washington, D.C., 1992, 1268.
8. Shannon CE, Weaver W. The Mathematical Theory of Communication. Univ. Illinois Press, Urbana, 1949, 125.
9. Pielou EC. The Measurement of Diversity in Different Types of Biological Collections, Journal of Theoretical Biology. 1966; 13:131-144.
10. Simpson EH. Measurement of diversity. Nature 1949; 163:688.
11. Margalef R. Perspectives in ecological theory. University of Chicago Press, 1968, 111.
12. Rajagopal TT, Thangamani IA, Arunachalan G. Comparison of physic-chemical parameters and phytoplankton species diversity of two potential ponds in Sattur Area, Tamil Nadu. Journal of Environmental Biology. 2010; 3(5):787-794.
13. Sakset A, Chankaew W. Phytoplankton as a bioindicator of water quality in the fresh water fishing area of Pak Phanang River Basin (Southern Thailand). Chiang Mai Journal of Science. 2013; 40(3):344-355.
14. Adesalu TA, Nwakwo DI. Effect of Water Quality Indices on Phytoplankton of a Sluggish Tidal Creek in Lagos, Nigeria, Pakistan. Journal of Biological Science. 2008; 11:836-844.
15. Lenat DR, Smock LA, Penrose DL. Use of benthic macro invertebrates as indicator of environmental quality. In: Biological monitoring for environmental effects (Ed. Douglass, L.W.). Lexington books. Toronto, 1980, 97-114.