



A PRELIMINARY SURVEY ON THE PLANKTONIC DIVERSITY AND RELATED ECOLOGICAL PARAMETERS OF SOME LENTIC WATERBODIES OF HAFLONG, N.E. INDIA

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ABSTRACT

A preliminary study was made on planktonic diversity in relation to certain physico-chemical parameters of three lentic water bodies of Haflong in Assam, India. The abiotic parameters of the waterbodies were found within the permissible limit of BIS. Phytoplanktonic diversity in all the three sites for both weed-bed zone and open water zone indicated a marked diversity between the three lentic water bodies studied. Haflong Lake has been represented by 28 types in weed bed zone and 25 types in open water zone. In the other two waterbodies, 41 and 34 types of phytoplankton were recorded. Paramecium, Keratella, Bosmina, Ceriodaphnia, Daphnia and Cyclops were found dominant amongst zooplankton.

KEYWORDS: *Planktonic Diversity, Ecological Parameters, Lentic Water Body, Haflong*

INTRODUCTION

The plankton community plays an important role directly and indirectly in determining the productivity of any aquatic ecosystem. Substantial investigations on the quantitative and qualitative composition of plankton of lakes and ponds have been made by a number of workers from the state of Assam. However published report on these organisms from Dima Hasao district is still not available. Fish growth is associated with the availability of plankton. Like other organisms, fish prefers a particular group of plankton and therefore a preliminary knowledge about the diversity and density of phytoplankton and zooplankton is very essential to ascertain the productivity of any aquatic ecosystem. Further, alterations in water quality are very well reflected in the structure and composition of biotic community as shown by occurrence, diversity and abundance pattern of species (Kumar *et al.*, 2006). Present study attempts to find correlation between planktonic diversity in weed bed zone and weed free zone of three water bodies and also to study the variation in physio-chemical and planktonic diversity of all these water bodies.

MATERIALS & METHODS

The study was conducted during January, 2013 to June, 2013 to have a preliminary idea of planktonic diversity in three different lentic water bodies of Haflong the headquarters of Dima Hasao district, Assam is a Sub-Himalayan hilly town located at the foothill of Barail Range at the elevation of 935.1 MSL and at 25°11' N latitude and 93°11' E longitude.

For carrying out the present work, two lakes namely Haflong Lake and Dibarai Lake and a domestic pond were taken into consideration. Collection of plankton samples: The plankton samples were collected by filtering 25 litres of water from all the three spots during January to June, 2013 through nylon bolt plankton net (No. 25). Plankton was collected from open water area and water under weed bed of all the three spots. Individual collections were preserved in 5% formalin and their volumes were concentrated to 25ml each.

Planktons were then identified at the laboratory with the help of taxonomic keys by observing them under the microscope. Qualitative estimation of plankton was done by the identification of plankton following Edmonson (1959), Needham and Needham (1972), Battish (1992), Anand (1998), APHA (2005) and Dutta Munshi, *et al.*, (2010).

For analysis of physiochemical parameters, the samples were brought to the laboratory and their analysis were done following standard methods of Wetzel (1983), Michael (1984) and APHA (2005).

- Temperature: Air and water temperature was determined by a centigrade thermometer graduated in 0.1°C.
- Transparency: It was measured and recorded by using Sacchi disc.
- pH: pH value of was recorded with the help of ELICO pH meter in the laboratory.
- Dissolved oxygen was measured by the modified Winkler's method.

- Free Carbon-di-Oxide was estimated by the method given in APHA (2005).

RESULTS

The aquatic macrophytes and variation in physio-chemical properties in the three water bodies are presented in Table 1 and 2 respectively. The variations in physio-chemical properties like transparency, DO, free CO₂, pH, etc., for all the study sites are represented in Table 2. pH of the water bodies varied between 7.12 and 7.9 i.e., slightly towards alkaline side. DO level was observed to vary from 4.8 to 6.4 for Site I, 1.5 to 3.4 (very low) for Site II and 2.8 to 3.2 for Site III. CO₂ was found to be highest in Site III, following heavy algal bloom in the domestic pond. Similarly transparency level was lowest for Site I was minimum (22.5 cm). For other two sites of study, the transparency ranges between 47 and 66 cm.

Table 1: Dominant macrophytes of studied waterbodies

Sl. No.	Water-bodies	Aquatic Macrophytes
1	Haflong Lake	<i>Eichhornia crassipes</i> <i>Alternanthera philoxeroides</i>
2	Dibarai Lake	<i>Alternanthera philoxeroides</i>
3	Domestic Pond	<i>Nymphaea sp.</i>

Table 2: Physio-chemical parameters of studied waterbodies

Parameter	Haflong Lake	Dibarai Lake	Domestic Pond
Air temp (0°C)	22.5- 26.5	25.0- 26.0	20.0 -28.0
Water temp (0°C)	18.0- 23.0	21.0 -23.0	17.0- 25.0
DO (mg/l)	4.8 -6.4	1.5 -3.4	2.8- 3.2
CO ₂ (mg/l)	1.5-1.6	5.0-6.0	26.0- 44.0
pH	7.3-7.9	7.2-7.4	7.1- 7.24
Transparency (cm)	64.0-66.0	47.0 -50.0	22.5- 39.0

Phytoplanktonic diversity in all the three sites for both weed-bed zone and open water zone indicated a marked diversity between the three lentic water bodies studied (Table 3). Haflong Lake has been represented by 28 types in weed bed zone and 25 types in open water zone. The phytoplankton belonging to five classes has been found in the following sequence in their order of diversity starting from maximum to minimum: Chlorophyceae > Bacillariophyceae > Myxophyceae > Xanthophyceae > Euglenophyceae. 11 representatives from Chlorophyceae, 9 from Bacillariophyceae, 7 from Myxophyceae, 2 from Xanthophyceae and 2 from Euglenophyceae was found in weed bed. The most abundant phytoplankton as observed during the

study period was *Chlorella*, *Spirogyra*, *Ulothrix*, *Volvox*, *Penium*, *Microcystis*, *Diatoma*, *Melosira*, *Navicula*, *Cyclotella* and *Euglena* in weed bed zone.

In Dibrarai Lake, phytoplankton has been represented by 4 classes only and class Xanthophyceae was not represented at all. It includes 22 types of phytoplankton in weed bed zone and 19 types in open water zone. The most abundant phytoplanktons of Dibrarai Lake were *Spirogyra*, *Volvox* and *Euglena*. The diversity and density of phytoplankton was more in weed bed than that of open water zone. Similarly, 18 types of phytoplankton were observed in weed bed and 16 types in open water zone in the domestic pond. *Volvox*, *Euglena* and *Microcystis* were the dominant genera. Here also, no representative from the class Xanthophyceae.

Zooplankton were represented by Protozoa, Rotifera, Cladocera and Copepoda in the in the Haflong lake. Following sequence of their diversity in population: Cladocera > Protozoa > Rotifera > Copepoda (Table 4). 19 types Haflong Lake.

of Zooplankton were found in weed bed zone and 18 types in open water zone. *Paramecium*, *Epistylis*, *Keratella*, *Brachionus*, *Moina*, *Bosmina*, *Ceriodaphnia*, *Daphnia*, *Bosminopsis* and *Cyclops* were the most abundant. In Dibrarai Lake, 13 types of zooplankton were observed in both weed bed zone and open water zone. The most abundant were *Paramecium*, *Keratella*, *Bosmina*, *Ceriodaphnia*, *Daphnia*, *Bosminopsis*, *Diphnosomas* and *Cyclops*. Likewise, 15 types of zooplankton from weed bed zone and 12 types from open water zone were recorded in the domestic pond. The dominant genera were *Brachionus*, *Keratella*, *Moina*, *Bosmina*, *Daphnia* and *Cyclops*.

The phytoplanktonic population was found belonging to classes Chlorophyceae, Bacillariophyceae, Myxophyceae, Xanthophyceae and Euglenophyceae in The representative from class Xanthophyceae was absent in other two water bodies, i.e., Dibrarai lake and Domestic pond as shown in Table- 3.

Table 3: Phytoplankton diversity of the three waterbodies during study period

Taxa	Haflong Lake		Dibrarai Lake		Domestic Pond	
	Weed bed	Open water	Weed bed	Open water	Weed bed	Open water
Chlorophyceae						
<i>Chlorella sp.</i>	+++	+++	-	-	++	+
<i>Closterium sp.</i>	+	-	-	-	+	+

Taxa	Haflong Lake		Dibarai Lake		Domestic Pond	
Class	Weed bed	Open water	Weed bed	Open water	Weed bed	Open water
<i>Spirorogyra sp.</i>	+++	++	+++	+++	++	++
<i>Ulothrix sp.</i>	+++	-	+	+	+	+
<i>Scenedesmus sp.</i>	+	+	-	-	+	-
<i>Volvox sp.</i>	+++	+++	+++	+++	+++	+++
<i>Uronema sp.</i>	+	++	+	-	-	-
<i>Chlorococcum sp.</i>	+	-	+	+	-	-
<i>Penium sp.</i>	+++	-	+	+	-	-
<i>Coleochaeta sp.</i>	-	+	+	-	-	+
<i>Pediastrum sp.</i>	++	-	+	-	-	-
Myxophyceae						
<i>Microcystis sp.</i>	+++	+++	++	++	++	+
<i>Spirulina sp.</i>	++	++	++	++	+	+
<i>Raphidiopsis sp.</i>	-	++	-	-	-	-
<i>Arthrospira sp.</i>	+	+	+	+	-	-
<i>Oscilllatoria sp.</i>	++	++	++	+	+	+
<i>Lyngbya sp.</i>	-	+	-	+	-	+
<i>Anabaena sp.</i>	++	++	+	+	+	-

Taxa	Haflong Lake		Dibarai Lake		Domestic Pond	
Class	Weed bed	Open water	Weed bed	Open water	Weed bed	Open water
Xanthophyceae						
<i>Centriotractus sp.</i>	+	+	-	-	-	-
<i>Ophiocystium sp.</i>	+	+	-	-	-	-
Basacillariophyceae						
<i>Cymbella sp.</i>	+	+	+	-	+	+
<i>Diatoma sp.</i>	+++	++	++	++	+	+
<i>Melosira sp.</i>	+++	++	++	+	+	-
<i>Navicula sp.</i>	+++	++	++	++	+	+
<i>Tabellaria sp.</i>	+	+	+	+	-	-
<i>Cyclotella sp.</i>	+++	+	+	++	+	+
<i>Synedra sp.</i>	+	+	+	+	+	-
<i>Fragillaria sp.</i>	++	+	+	++	+	+
<i>Pinnularia sp.</i>	++	-	-	-	-	-
Euglenophyceae						
<i>Euglena sp.</i>	+++	+++	+++	+++	+++	+++
<i>Trachelomonas sp.</i>	++	++	-	-	-	-

Symbols: +++Mostly abundant; ++ Moderately abundant; +Rare; - Absent.

Table 4: Zooplankton diversity of the three waterbodies

Taxa	Haflong Lake		Dibarai Lake		Domestic Pond	
Class	Weed bed	Open Water	Weed bed	Open Water	Weed bed	Open Water
Protozoa						
<i>Tricodina sp.</i>	+	+	+	+	+	+
<i>Campanella sp.</i>	+	-	-	+	-	-
<i>Paramoecium sp.</i>	+++	+	+++	+++	++	++
<i>Nebella sp.</i>	+	+	+	+	+	+
<i>Epistylis sp.</i>	+++	+	-	-	-	-
<i>Ceratium sp.</i>	+	+	-	-	-	-
Rotifera						
<i>Keratella sp.</i>	+++	+++	+++	+++	+++	+++
<i>Brachionus sp.</i>	+++	+++	++	++	+++	+++
<i>Trichocera sp.</i>	++	++	-	-	++	++
<i>Polyarthra sp.</i>	+	+	-	-	+	-

Taxa	Haflong Lake		Dibarai Lake		Domestic Pond	
Class	Weed bed	Open Water	Weed bed	Open Water	Weed bed	Open Water
Clodocera						
<i>Moina sp.</i>	+++	+++	++	++	+++	+++
<i>Bosmina sp.</i>	+++	+++	+++	-	+++	+++
<i>Ceriodaphnia sp.</i>	+++	+++	+++	+	++	++
<i>Daphnia sp.</i>	+++	+++	+++	+++	+++	+++
<i>Bosminopsis sp.</i>	++++	+++	+++	++	+++	-
<i>Diphnosomas sp.</i>	+	+	+++	+	+	-
Copepoda						
<i>Cyclops sp.</i>	+++	+++	+++	+++	+++	+++
<i>Mesocyclops sp.</i>	++	++	++	+	++	++
<i>Diaptomas sp.</i>	++	++	-	-	-	-

Symbols: +++Mostly abundant; ++ Moderately abundant; + Rare; - Absent

DISCUSSION

The present study revealed a good diversity of planktons in Haflong lake (28 species of phytoplankton and 19 species of zooplankton), Dibarai lake also comprised of a significant diversity of planktons (22 phytoplankton and 13 zooplankton) whereas 18 species of phytoplankton and 15 species of zooplankton have been recorded from the domestic pond. Among phytoplankton, Chlorophyceae showed the highest number of plankton species followed by Bacilliriophyceae and Myxophyceae for all the three water bodies whereas Euglenophyceae was the lowest. The best phytoplanktonic diversity has been exhibited by Haflong Lake.

The study also revealed that the dissolved oxygen content of Haflong lake was higher than the other two water bodies during the period of study. Transparency was higher in two lakes in comparison with the domestic pond, which has also shown a heavy algal bloom and very high free carbon-di-oxide content during the study period. Greater pH value (towards alkaline side) in Haflong Lake is attributed to high variety and density of phytoplankton accompanied by higher water depth (Subramaniam and Mahadevan, 1999).

The taxonomic richness as well as density of both phyto and zooplankton communities in Haflong lake has been greater as compared to Dibarai lake and Domestic pond thereby revealing the utilization of nutrients and habitat conditions by the prevailing aquatic communities in a better way in Haflong lake. However, richness of biodiversity of plankton has been indicated for almost all the water bodies.

CONCLUSION

1. The present study indicated a high density of phytoplankton and zooplankton in the weed bed zones.
2. The diversity of plankton study reveals a rich variety of various species of plankton. But density cannot be ascertained as the study was restricted for qualitative identification only.
3. Detailed study on this would yield information which could be utilised for evolving strategies for improving the lakes from the productivity as well as aesthetic standpoint.

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