COMPOSITION AND ABUNDANCE OF PLANKTON IN NALANDA RESERVOIR AND THEIR RELATIONSHIP TO SOME SELECTED ENVIRONMENTAL VARIABLES

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Introduction

Plankton can be either phytoplankton or zooplankton and both groups have enormous diversity in both tropical and temperate regions of the world. They respond rapidly to changes of the environmental conditions, especially to limnological changes. In addition climatic changes also can be reflected by community changes of this group of aquatic organisms. Diversity and abundance of different groups of plankton in water bodies are known to be determined by the physical, chemical and biological factors of the environment where they live. The important environmental factors that act as limiting factors for the growth of algae are mainly nutrients (*e.g.* nitrogen and phosphorus), temperature, conductivity, pH, Dissolved Oxygen (DO) and availability of light. As planktons are sensitive organisms, this study was carried out to find the various types of planktons in Nalanda reservoir and if they respond to changing environmental conditions.

Materials and Methods

Nalanda Reservoir is a relatively large reservoir situated in the Intermediate Climatic Region (ICR) of Sri Lanka. Six sites, that appear to contain different environmental conditions such as abundance of macrophytes, areas that receive effluents (*e.g.* agrochemicals, domestic wastes) *etc.* were selected for the study. Samples were collected monthly from January to June 2007, from each site at 30cm depth. For plankton analysis a plankton net (mesh size 50µm) was used. For chemical analysis water samples were collected according to the American Public health Association (APHA) guidelines. Site measurements for conductivity, salinity, temperature and pH were also taken by portable meters. Transparency of water was measured by a Secchi disk of 25 cm diameter. Plankton were examined under a light microscope (10×4 – 10×100) and counting was carried out using a Sedgewick – Rafter cell. The relationship between species composition of plankton and environmental variables were identified using Correlation Coefficients (Minitab 14 version).

Results

Three groups of zooplankton were recorded from Nalanda Reservoir, namely Cladocera, Copepoda and Rotifera. In addition larval forms of some crustaceans were also found (Table 1). Eleven genera of zooplankton were recorded and the highest relative abundance was shown by the genus *Brachionus*, a rotifer that belongs to family Brachionidae. During the study three major groups of phytoplankton (Chlorophyta, Chrysophyta and Cyanophyta) were

recorded (Table 2). A total of eighteen genera were recorded from Nalanda Reservoir. Out of three recorded groups, Phylum-Chlorophyta was the most diverse group. The most abundant genus was *Pediastrum duplex* and its calculated relative abundance was 30.01 %.

During the survey it was observed that all limnological conditions varied among study sites. One site was comparatively more deviated from others especially by means of DO and conductivity. The correlation between species composition and pH shows a negative correlation ($r = - 0.776$), while temperature and conductivity showed a positive ($r = 0.777$; $r = 0.539$) correlation. Further, species composition showed a weak correlation with other measured environmental variables.

Discussion and Conclusion

During the study, eighteen genera of phytoplankton and eleven genera of zooplankton were identified. *Pediastrum duplex* (Phytoplankton) and *Brachionus* sp. (zooplankton) were recorded as the dominant species in the Nalanda Reservoir. According to the statistical analysis, important limnological variables that could affect the communities of planktonic organisms in the reservoir were identified as pH, temperature and conductivity, while other measured variables did not appear to have a strong influence on the plankton. Although DO is known as a major determinant factor of the diversity and abundance of plankton (Yatigammana, 2004), the weak relationship encountered may be due to a sampling artifact. In one site the abundance of planktons were high and that site appear to have high nitrate content, conductivity, temperature and DO, which is similar to the findings of previous studies (Fernando, 1980 and Fernando and Rajapaksa, 1983). Accordingly, our study also supports the idea of that planktons are sensitive organisms that respond to environmental conditions.

References

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Table1. Relative abundance of zooplankton in six selected sites

Class	Genera	Relative Abundance (%)
Maxillopoda (Copepods)	*Cyclpos* sp.	05.75
	Canthocampus sp.	01.15
	Diaptomus sp.	04.60
	Heliodiaptomus sp.	02.30
Larvae of several invertebrate groups	Nauplius larva	19.54
Brabchiopoda (Cladocerans)	*Alonella* sp.	04.60
	Dadaya sp.	05.75
	Daphnia sp.	04.60
Monogononta (Rotifers)	*Brachionus* sp.	47.13
	Keratella sp.	01.15
	Trichocerca sp.	03.45

Table 2. Relative abundance of phytoplankton in six selected sites

Class	Genus	Relative Abundance (%)
Chlorophyceae	*Pediastrum duplex*	30.18
	Treubaria sp.	00.44
	Eudorina sp.	05.95
	Pleurotaenium sp.	02.90
	Staurastrum sp.	05.10
	Arthrodesmus sp.	02.20
	Cosmarium sp.	01.76
	Mougoetia sp.	12.56
	Spirogyra sp.	06.17
Bacillariophyceae	*Fragillaria* sp.	07.27
	Synedra sp.	00.66
	Navicula sp.	07.05
	Pinnularia sp.	01.54
	Cymbella sp.	01.10
	Gomphoneis sp.	00.22
	Cyclotella sp.	01.10
	Aulacoseira sp.	12.77
Myxophyceae	*Mycrocystis* sp.	01.10