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RESEARCH ARTICLE

A COMPARATIVE STUDY ON QUALITATIVE AND QUANTITATIVE ANALYSIS OF ZOOPLANKTON IN RELATIONSHIP WITH PHYSICO-CHEMICAL PROPERTIES OF WATER BETWEEN KARBALA LAKE AND BARAM BABA POND OF CACHAR DISTRICT, ASSAM

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ABSTRACT

A comparative study was conducted between two waterbody, Karbala lake and Barambaba pond. In this regard quantitative and qualitative analysis of zooplankton and physico-chemical parameters of water has been done. The study was about six month from January 2013 to July 2013. During this study different types of zooplankton species from different groups were found and physico-chemical parameters such as DO (Dissolved Oxygen), pH, Free CO_2, Alkalinity, Water temperature and air temperature were recorded.

INTRODUCTION

Zooplanktonare aquatic micro-organisms. They are tiny floating living animals which are easily found in fresh and marine aquatic system. These organisms are identified as important component of aquatic ecosystems (Okogwu 2010). They constitute an important link in food chain and also an important food source for many species of fish. Therefore any adverse effect on them will be reflected in the wealth of fish population. In present time, most common and severe problem is the enrichment of water by a nutrient that increases the biological growth and renders the waterbodies unfit for diverse uses (Ahmed *et al*., 2011). Zooplankton have several advantages as they are the source of faster growth and greater feed efficiency. Zooplankton are a valuable source of protein, amino acids, lipids, fatty acids, minerals enmzymes. They could be an inexpensive ingredient to replace expensive fishmeal (Kibria *et al*., 1997; Fernando, 1994). They are the central trophic link between primary producers like phytoplankton and fish (Schriver *et al.,* 1995, Tatrai *et al.*, 1997). Zooplankton are of great importance in bio-monitoring of pollution (Davies *et al.*, 2008). They help in regulating algal microbial productivity to fish and other consumers (Dejan *et al.,* 2004). Zooplankton research is becoming more and more important in recent years since these floating animals with a little or no power of independent horizontal migration are the reproductive base for all ecosystems (Mahboob and Sheri, 1993; Mahboob and Zahid, 2002). Productivity of zooplankton is strongly effected by the several physico-chemical parameters such as Dissolved Oxygen (DO), free carbon di-oxide (FCO_2), pH, Total Alkalinity (TA) etc.Pollution of water is one of the major concern. Water quality is an index of health and well being of a soceity (Laskar *et al*., 2011). A well known method of expressing water quality that offers a simple, stable andreproducible unit of measure is the water quality index which responds to changes in the principal characteristics of water (Brown *et al*., 1970). It is regarded as one of the most effective way to communicate water quality (Sinha, 1989; Pradhan *et al*., 2001). Hence, the aim of this study was to analyse the distribution and abundance of zooplankton collected monthly from the selected sites along with study of physico-chemical parameters. Statistical analysis were also done to correlate these parameters.

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MATERIALS AND METHODS

Water samples were taken from the two experimental site once in a day after every 15 days at 12.30 pm for 6 months. Analysis of some parameters were done on the spot while the others were done at the laboratory.

Temperature: Mercury thermometer (110^{o}C) was lowered into water upto 2cm below the water surface, and allowed to stabilize for 2 minutes and readings were taken in degree celcius (^{o}C).

pH: The pH of water sample was measured using a standard electronic pH meter.

Dissolve oxegen (DO): Dissolved oxygen measured using titration procedure according to ''APHA''(1998).

Total alkalinity: Four drops of phenolphthalein indicator was added to 100ml of sample water & titrated with 0.02 (N) H2SO4 till the sample becomes colourless.

Free CO_2: Ten drops of phenolphthalein indicator was added to 100ml of sample water & titrated with N/44 NaOH till the sample becomes weak pink colour.

Plankton collection

The way of collecting zooplankton is through plankton net having 200 meshes or linear inch is good. The plankton net is dragged across the surface water for collecting plankton inhabiting the upper strata of water, but for collection of samples from the deeper reaches, the net is suspended under water upto a desired depth and is handled slowly and steadily till it reaches the surface. To set uniform collection, a number of samples were collected from the waterbody. The plankton samples were taken in a conical and few drops of 4% formalin is added for identification at a later period in the laboratory.

Identification of plankton

1.Sample.
2.Microscope (Olympus CH 20i).
3.Glass slides.
4.Needle.
5.Distilled water.
6.Dropper.
7.Blotting paper.

1ml of water sample was taken on a glass slide. The sample on the glass slide was then examined under compound microscope. Zooplankton were identified following standard literature.

RESULT AND DISCUSSION

Freshwater zooplankton are the most important food source of newly hatched fishes and also play an important role in aquatic foodchain. During the whole study period all four groups of

Table 1. Qualitative and Quantitative analysis of zooplankton of Baram baba pond.

Months/Genera	Jan	feb	march	april	may	june
Cladocera						
Chydorus sp.	+	+	-	+	-	-
Diaphanosoma excisum	+	-	+	+	+	+
Macrothrix sp.	-	+	+	-	-	-
Pleuroxus sp.	-	-	-	+	+	-
Moina micrura	+	+	+	-	+	+
Copepoda						
Mesocyclops sp.	+	+	+	+	+	+
Nauplius stage	+	-	+	+	+	+
Copepodite stage	+	+	-	-	+	-
Neodiaptomus schamakeri	-	+	+	-	-	+
Rotifera						
Brachionus rubens	-	+	-	+	-	-
Filinia opoliensis	-	-	+	-	-	+
Trichocerca	+	-	-	-	+	-
Conochilus natans	-	-	+	-	-	-
Asplanchna priodonta	-	+	-	-	+	+
Dipleuchlanis propatula	-	-	+	-	-	-
Ostracoda						
Cypris sp.	+	-	-	+	+	-

Table 2. Qualitative and Quantitative analysis of zooplankton of Karbala lake

Months/Genera	Jan	feb	march	april	may	june
Cladocera						
Chydorus sp.	-	+	+	-	+	+
Diaphanosoma excisum	+	+	-	+	+	+
Alona sp.	-	-	+	-	+	-
Macrothrix sp.	+	+	-	+	-	-
Copepoda						
Mesocyclops sp.	+	+	+	+	+	+
Nauplius stage	-	-	+	+	+	+
Copepodite stage	+	+	-	+	-	+
Rotifera						
Macrochateus sericus		+				+
Brachionus falcatus	-	-	+	-	+	-
Brachionus quadridentatus brevispinus	+	-	-	-	+	-

zooplankton were recorded from both Karbala Lake and Barambaba Pond. These are cladocera, copepoda, rotifera and ostracoda. In Barambaba pond rotifera are dominant group according to qualitative analysis and copepoda are dominant group according to quantitative analysis. Average quantity of each group of zooplankton of the two water bodies during the study period are shown in Fig. 1. Several species found from several groups of two waterbodies which shown in Table 1 and Table 2. Correlation coefficient shown in Table 3 and Table 4.

Table 3. Correlation matrix between several physico-chemical parameters of water of Karbala Lake

Parameters	Air tem	pH	CO_2	DO	TA
Air tem	-	-0.39865	0.970993	-0.96277	0.992653
pH		-	-0.42384	0.343725	-0.29488
CO_2			-	-0.87764	0.948359
DO				-	-0.96939
TA					-

Table 4. Correlation matrix between several physico-chemical parameters of water of Barambaba Pond

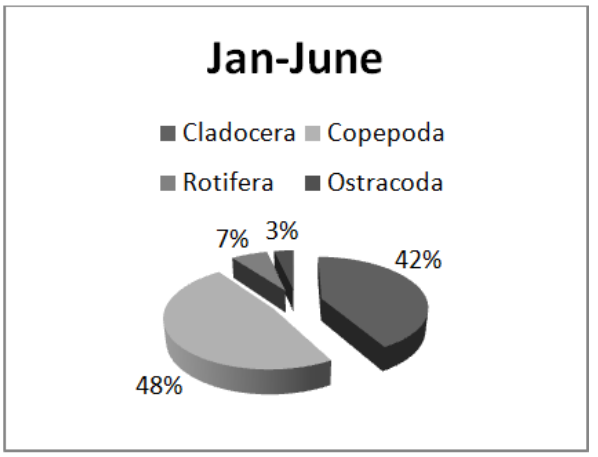
Parameters	Air tem	ph	CO_2	DO	TA
Air tem	-	-0.35407	0.93645	-0.96638	0.887236
pH		-	-0.26077	0.121309	-0.07643
CO_2			-	-0.90994	0.779015
DO				-	-0.90056
TA					-

Table 5. Physico-chemical properties of water (Mean ± SD) of two waterbodies (Karbala Lake and Barambaba Pond) during January 2013 to June 2013 (No. of samples-12 from Karbala Lake and 12 from Barambaba pond)

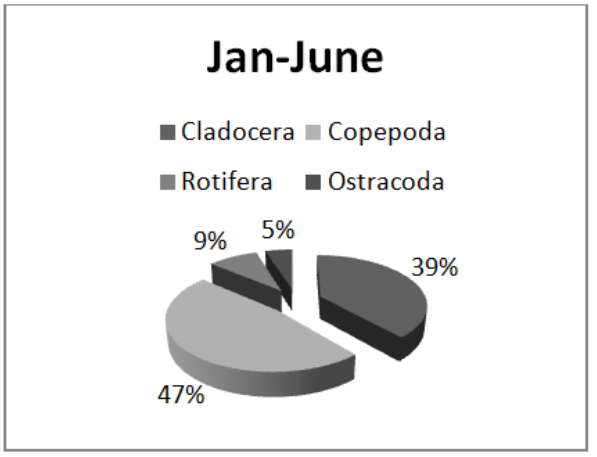
Parameters	Karbala Lake	Barambaba Pond
Air Temperature (^oC)	26.41 ± 6.08	26.41 ± 6.08
Water Temperature (^oC)	25.08 ± 5.49	25.4 ± 5.90
DO (mg/l)	6.95 ± 0.96	6.78 ± 0.98
T. Alkalinity (mg/l)	41.33 ± 6.28	48.33 ± 7.42
pH	6.86 ± 0.25	6.78 ± 0.34
Free CO_2 (mg/l)	5.18 ± 1.21	5.6 ± 1.03

In both waterbody pH shows negative correlation with air temperature, free CO_2 and Total Alkalinity (TA). Whereas it shows positive correlation with Dissolved Oxygen (DO). CO_2 shows positive correlation with air temperature, Total Alkalinity (TA) and negative correlation with Dissolve Oxygen (DO). Dissolve Oxygen (DO) shows negative correlation with Total Alkalinity (TA) and air temperature. Total alkalinity shows positive correlation with air temperature. Mean and standard deviation of several physico-chemical parameters of water are shown in Table 5. In Karbala lake during the study period Dissolved Oxygen (DO) range varied from 8.3(mg/l) in January to 5.4(mg/l) in June, pH range varied from 6.7 in January to 6.5 in June, free CO_2 range varied from 4.1(mg/l) in January to 6.7(mg/l) in June, Total Alkalinity(TA) range varied from 33(mg/l) in January to 59(mg/l) in June. Water temperature recorded from 18.5^{O}C in January to 34^{O}C in June. Air temperature recorded from 19^{O}C in January to 35^{O}C in June.

In Barambaba pond during the study period Dissolved Oxygen (DO) range varied from 8.1(mg/l) in January to 5.5(mg/l) in June, pH range varied from 6.9 in January to 6.7 in June, free CO_2 range varied from 4.9(mg/l) in January to 6.9(mg/l) in June, total alkalinity(TA) range varied from 39(mg/l) in



Site 1: Karbala Lake



Site 2: Barambaba Pond

Fig. 1. Groupwise distribution of Zooplankton during the total study duration of Karbala Lake and Barambaba Pond

January to 61(mg/l) in June. Water temperature recorded from 18.3^{O}C in January to 33.2^{O}C in June. Air temperature recorded from 19^{O}C in January to 35^{O}C in June. Mean DO with higher ranges of 5.4-8.3 mg/l in Karbala lake and 5.5-8.1mg/l in Barambaba pond recorded fell within the ranges documented by Swingle (1969), Boyd (1979) and Alabaster (1982) for good water quality on fish culture. This is because oxidation converts otherwise poisonous compounds to useful material. It also enhance good feeding, food utilization and high stocking density of fish eggs, larvae, adults (Alabaster, 1982) and also increase the growth rate of plankton. The average pH values of Karbala lake and Barambaba pond ranges from 6.5-6.7 and 6.7-6.9 respectively, which are within pH values 6.5-9.0 documented by Swingle (1961) and Boyd (1985) as values most suitable for fish productivity. The mean total alkalinity in Karbala lake and Barambaba pond of 33-52 (mg/l) and 39-61(mg/l) respectively, agreed with the range values documented by Moyle (1946) and Boyd (1981) for natural waters. The value of free CO_2 in Karbala lake (4.1-6.7 mg/l) and Barambaba pond (4.9-6.9 mg/l) recorded fell within the range accepted (4.5-60 mg/l) for zooplankton survival and fish production (Haskel and Davies, 1958; APHA, 1991). On the basis of above mentioned data, it is concluded that all the listed physico-chemical parameters and available zooplankton are enough for enrich the water quality and suitable for fish production.

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