



International Journal of Fisheries and Aquatic Studies

E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2017; 5(3): 372-374
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www.fisheriesjournal.com
Received: 19-03-2017
Accepted: 20-04-2017

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Studies on zooplankton abundance and Physico-chemical parameters of Rukni Anua at Bekirpar in Cachar district, Assam

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Abstract

Zooplankton forms a primary productive system of any aquatic ecosystem. The present study was aimed to evaluate the abundance of zooplankton along with the seasonal variation of physico-chemical parameters in Rukni Anua of Barak valley. A total of 29 different genera of zooplankton were recorded of which 13 genera were belonging from rotifera group, 12 individuals were recorded from cladocera group and 4 were representing the group copepoda. The physico-chemical parameter were also evaluated and reveals a significant variation in water chemistry parameters. The study revealed that the availability of zooplankton was diversified and among total available population the copepoda contributes 23.56%, rotifera contributes 37.13% whereas the group cladocera contributes about 38.84%. The detailed aspect of diversity and seasonal variation of zooplankton is discussed herein.

Keywords: Zooplankton, ecosystem, diversity, seasonal variation, species composition

1. Introduction

Zooplankton is one of the fascinating groups of microorganism which is economically and ecologically vital group found in the aquatic environment [1, 2]. They have been used as indicators to monitor and assess the condition and change of the freshwater environment but are also helpful for ameliorating polluted waters. Several studies indicated that this group of aquatic organisms enhanced the performance of fish larvae because it contains essential nutrients which are desirable for aquatic organisms for effective growth and survival [3-5]. These groups of microorganism occupy a wide range of habitats, as their distribution and abundance largely depends on availability of nutrients and climatic conditions along with physico-chemical parameters of the water body. Zooplankton is ecologically the most important biotic component as the potentiality of an ecosystem directly depends on it because they begin the primary fixation of energy and subsequently transfer to higher trophic levels. Hence qualitative and quantitative studies of zooplankton diversity are of immense importance.

Therefore, the study aimed at evaluating the taxonomic composition, abundance and diversity of zooplankton throughout the year in Rukni Anua of Barak valley to determine the diversity trend along with the suitability of water body by evaluating the physico-chemical parameters of the said wetland.

2. Materials and Methods

2.1 Study site

The study was conducted in a perennial oxbow lake named Rukni Anua at Bekirpar of Cachar district of Assam (Fig1 A and B) located between 24° 38'12.2" N latitude and 92° 50'36.5" E longitude situated at a range of 750m -100m FSL and 725m- 80m DSL and the average depth was found to be 20 feet during rainy season and 12 feet during dry season. It is one of the unregistered wetland formed due to change in course of river Rukni.

2.2 Zooplankton sampling:

Zooplankton samples were collected and studied for a whole year during 2017. Qualitative sampling of zooplankton was done with the aid of plankton net by sweeping and towing it through the weeds in the water.

Quantitative samples were collected by filtering 100 L water. Collected specimens were transferred carefully to a plankton tube and preserved in 5% formalin for taxonomic identification. Analysis was done on a Sedgwick – Rafter counting cell, under a light microscope. Detailed taxonomic identification was done following the standard literature [6-10].

Analysis involved transfer of 1 ml sub sample from each samples to the Sedgwick-Rafter counter and counting of cells within 20 squares of the cells, chosen randomly. The cells counted were used for quantitative estimation of cell density using the standard formula [11].

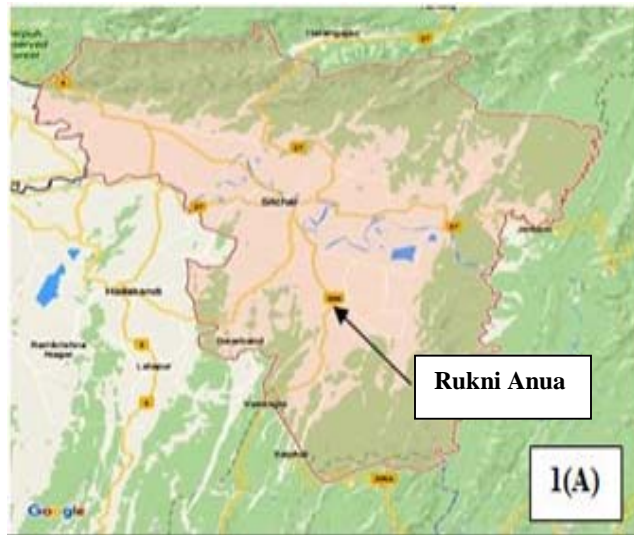


Fig 1(A) and (B): Rukni Anua at Bekirpar.

2.3 Water Sampling

Water samples were also collected periodically from the study site in a 500 ml bottle for analyzing the various physico-chemical characteristics. A centigrade thermometer was used to measure water temperature. DO was measured by Winkler’s Titration method [11]; FCO₂, alkalinity (TA) was measured by titration method [12].

3. Result

The present study reveals a variation in diversity and abundance of zooplankton during different seasons. All through the study period, 29 different genera of zooplankton were recorded. Among the diversified organisms, 13 genera were belonging from rotifera group, 12 individuals were recorded from cladocera group and 4 were representing the group copepoda (Table1). Such a pattern is in general conformity with the findings of other research workers [13-15]. Interestingly, the profusion of cladocera (38.84%) was high, which was followed by the group rotifera (37.13%) and copepoda (23.56%) apart from the diversity tendency of zooplankton which were represented in the present study (Fig 2).

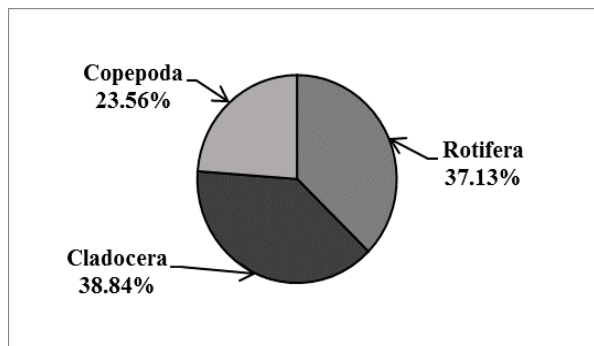


Fig 2: Percentage composition of available zooplankton groups.

Table 1: Seasonal variation of zooplankton groups.

Zooplankton	PRM	MON	POM
Group: Rotifera			
<i>Brachionus</i> sp.	+	+	+
<i>Keratella</i> sp.	+	+	+
<i>Cephalodella</i> sp.	-	+	+
<i>Conochilus</i> sp.	-	-	+
<i>Filinia</i> sp.	+	+	+
<i>Lecane</i> sp.	+	+	+
<i>Trichocerca</i> sp.	+	-	+
<i>Anuraeopsis</i> sp.	+	-	+
<i>Lepadella</i> sp.	-	-	+
<i>Ascomorpha</i> sp.	+	+	+
<i>Asplanchna</i> sp.	+	+	+
<i>Testudinella</i> sp.	+	+	+
<i>Plationus</i> sp.	-	-	+
Group: Cladocera			
<i>Scapholeberis</i> sp.	-	-	+
<i>Chydorus</i> sp.	+	+	+
<i>Bosminopsis</i> sp.	+	+	+
<i>Alona</i> sp.	-	+	+
<i>Alonella</i> sp.	-	-	+
<i>Simocephalus</i> sp.	-	-	+
<i>Diaphanosoma</i> sp.	+	+	+
<i>Bosmina</i> sp.	+	+	+
<i>Ceriodaphnia</i> sp.	+	-	+
<i>Macrothrix</i> sp.	+	-	+
<i>Moina</i> sp.	+	+	+
<i>Sida</i> sp.	+	-	+
Group: Copepoda			
<i>Neodiaptomus</i> sp.	+	+	+
<i>Mesocyclops</i> sp.	+	+	+
<i>Heliodyptomus</i> sp.	-	-	+
<i>Thermocyclops</i> sp.	+	-	+

Abbreviations: PRM = Pre-monsoon, MON = Monsoon, POM = Post-monsoon ‘+’ = present, ‘-’ = absent.

Furthermore, the various water quality parameters were studied throughout different seasons (Table 2). There are remarkable variations in the air and water temperature, being highest during the Premonsoon season as this comprises with other seasons. The pH value was recorded slightly high during the monsoon season. The Dissolved oxygen was lowest

during Premonsoon season; this could be attributed due to high temperature during that season. The Free CO₂ was highest during monsoon season was possibly due to high temperature and heavy rainfall. The Total alkalinity was higher during Premonsoon season.

Table 2: Seasonal variation of various physico-chemical parameters.

Parameters	PRM ± SD	MON ± SD	POM ± SD
Water temperature (°C)	28.4 ± 0.69	25.6 ± 0.66	23.5 ± 0.59
Air temperature (°C)	35.2 ± 0.57	30.7 ± 0.81	28.4 ± 0.76
pH	6.9 ± 0.41	7.1 ± 0.15	5.3 ± 0.32
Dissolved Oxygen (DO)(mg ⁻¹)	6.87 ± 0.24	5.66 ± 0.38	6.37 ± 0.46
Free CO ₂ (FCO ₂)(mg ⁻¹)	0.6 ± 0.04	0.7 ± 0.04	0.6 ± 0.07
Total Alkalinity (TA) (mg ⁻¹)	55 ± 1.86	56 ± 1.41	60 ± 1.96

Abbreviations: PRM = Pre-monsoon, MON = Monsoon, POM = Post-monsoon

4. Discussion:

In the present study, it was evident that zooplankton species recorded was comparatively high. Mainly three groups of zooplankton rotifera, cladocera and copepoda were documented throughout the investigation period. The study also reveals that the availability of zooplankton is most importantly depended upon the favorable physico-chemical parameters and the availability of nutrients in the lake. During the study, the pH was found to vary between 5.3 –7.1 which was favorable for the aquatic life. The dissolved oxygen content in the anua was always found to be moderately high throughout the year varying between 5.66–6.87. This reveals that the water body is not in immediate threat of eutrophication. The average amounts of water parameters show the good quality of water which was similar to the findings of other workers around the globe [1, 2, 13, 16].

5. Conclusion:

The perennial oxbow lake of Cachar district is an abundant harbor of various groups of zooplankton which signifies its healthy climatic conditions. The detailed analysis revealed that the density of cladocera was high during the study period. The result indicates that maximum density of zooplankton occurred during the post monsoon season. This might promote the availability of abundant food, favorable temperature for the developmental stage.

6. Acknowledgement

The author conveys her gratitude to Assam University for financial assistance to pursue the research work and also convey the sincere thankfulness to the Department of Life Science and Bioinformatics, Assam University, Silchar.

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