

Review Article

Zooplankton diversity of a Freshwater wetland of Assam

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ABSTRACT:

Zooplankton are passively drifting microscopic organism in an aquatic waterbody which occupy a central position between the autotrophs and heterotrophs in an aquatic ecosystem. They are good bio-indicator of environmental pollution as they response quickly to any changes in water quality. Zooplankton are also known as staple food item of fishes especially the larvae of fishes. For success in an aquaculture activity they are known to play very important role indicating the presence or absence of certain species of fishes or the determining the population densities of an aquatic farm. The present work was undertaken in Madhura anua, an oxbow lake in Cachar, Assam which is mainly used by people residing in the catchment area for aquacultural program and also household activities. The study was carried out for a period of one year (September 2014 to August 2015) to study the diversity of zooplankton in the freshwater ecosystem. The present analysis reveals presence of good diversity of zooplankton in the lake. In this oxbow lake, three major groups of zooplankton were reported namely, Cladocera, Copepoda and Rotifera. Among the three groups, rotifers are found to dominate the lake ecosystem. Among the 37 taxa reported, 20 were from rotifera group followed by that of cladocera with 13 taxa and 4 taxa from copepoda. On quantitative analysis of zooplankton in the oxbow wetland, shows higher abundance percentage of 58% by rotifera which is reported to be much more higher than that of cladocera and copepod. Higher presence of rotifera in the lake is an indication of its pollution leading to eutrophication in near future. Present investigation may help in conservation of the oxbow lake.

Keywords: Oxbow, zooplankton, abundance, rotifera, conservation.

INTRODUCTION:

Zooplankton, the microscopic free floating organism in an aquatic ecosystem are cosmopolitan in nature and found to inhabit all freshwater ecosystem in the world. The knowledge of the species diversity, abundance and special distribution of zooplankton in a freshwater aquatic waterbody is very much necessary as it is important in understanding trophodynamic and trophic progression of waterbodies [18]. Zooplankton are known to occupy a central position between the autotrophs and other heterotrophs in any freshwater ecosystem and thus forms an important food item in an aquatic ecosystem [7]. They have an important function in transitional ecosystem as

they are able to filter phytoplankton and also act as food source for larger organisms in the aquatic system such as fish and hence linking primary production with higher trophic levels of aquatic ecosystem [23]. The occurrence of zooplankton depends on the productivity of the waterbody as it plays a very important role in increasing photosynthesis in some algae which pass through their nutrient rich elementary canal in viable condition and are also known to form an important component of fish food in an aquatic environment and hence provides ways of predicting productivity [4]. Fish and fisheries play an important role in socio-economic life of the people. The successful farm management

depends on natural feed and good water quality management [22]. Zooplankton plays important role in indicating the presence or absence of certain species of fishes or the determining the population densities of an aquatic farm [21]. Freshwater waterbodies are important for survival as the water quality of the waterbodies are of great importance for the health and economy of the surrounding catchment area [8]. The present work was undertaken to study the diversity of zooplankton of Madhura Anua, an oxbow lake which is mainly used as fish farm by the people residing the catchment area. For aquaculture development and increase in fish production level in the waterbody, proper knowledge of zooplankton diversity of the waterbody is very much important as they are known to be directly responsible for determining success in commercial fisheries [16]. Madhura Anua is also used for household activities like washing clothes, utensils and bathing of animals etc which lead to certain pollution of the water body.

Zooplankton are also good indicator of changes in water quality because it is strongly affected by environmental conditions and responds quickly to changes in physical and chemical conditions as well as environmental conditions. Zooplankton communities respond to a wide variety of disturbances including nutrient loading, acidification, sediment input etc. It is a well-suited tool for understanding water pollution status [5]. Some of the worthmenting work on zooplankton of this part of the country are that of Kar and Barbhuiya (2004); Sharma and Sharma (2008); Kar (2007); Kar and Kar (2013); Kar (2013) and Kar and Kar (2016). So, the present work is an attempt to study the diversity of zooplankton in Madhura Anua of Cachar, Assam.

MATERIALS AND METHODS:

STUDY AREA: Madhura Anua, an oxbow lake is located at Cachar district of Assam. It lies between 24°50'27.6"N and 92°49'51.1"E.

It is about 12 km from the main town of Silchar. The catchment area is quite densely habituated and the lake is the main source of water for day

to day life of the people residing in the catchment area.

SAMPLING: Zooplankton samples were collected using conical plankton net weekly during morning hours approximately at about 7 am to 9 am for a period of one year from September 2014 to August 2015. The water sample were collected in collection bags by towing the net on the surface of the lake water. The collected samples were then brought to laboratory, filtered using plankton net and placed in 100 ml Tarson container. Subsequently, the filtered zooplankton are preserved in Lugol's solution and kept in cool and dark place [3].

QUALITATIVE ESTIMATION: For identification of zooplankton, a drop of preserved sample taken in a Sedgwick-Rafter counting chamber and observed under a light microscope under required magnification (X 10 initially , followed by X 40). Zooplankton were then identified following the standard literature of Edmondson 1959; Battish, 1992; Michael and Sharma, 1998; Sharma, 1998; Sharma and Sharma, 2008.

RESULTS AND DISCUSSION:

37 taxa of zooplankton were registered from Madhura Anua during the study period of one year from September 2014 to August 2015; 13 taxa reported from cladocera group, 4 from copepoda and 20 taxa were reported from rotifera group of zooplankton (Table 1). During the study period in Madhura Anua, Cladocera group was represented by *Diaphanosoma* sp., *Scapholeberis* sp., *Sida* sp., *Macrothrix* sp., *Chydorus* sp., *Ceriodaphnia* sp., *Bosminopsis* sp., *Bosmina* sp., *Alona* sp., *Alonella* sp., *Moinodaphnia* sp., *Moina* sp. and *Euryalona* sp.; Copepoda group was represented by *Mesocyclops* sp., *Thermocyclops* sp., *Neodiaptomus* sp. and *Heliodiaptomus* sp. and the group Rotifera which is the minor phylum were represented by highest number of taxa viz, *Brachionus* sp., *Plationus* sp., *Lecane* sp., *Lepadella* sp., *Keratella* sp., *Anuraeopsis* sp., *Asplanchna* sp., *Ascomorpha* sp., *Rotaria* sp.,

Testudinella sp., *Trichocerca* sp., *Trichotria* sp., *Cephalodella* sp., *Mytilina* sp., *Macrochaetus* sp., *Horaella* sp., *Pompholyx* sp., *Filinia* sp., *Colurella* sp. and *Trochosphaera* sp (Table 1). 26 species were previously recorded from Madhura Anua by Kar and Kar (2013) of which 7 taxa were reported from Cladocera group, 2 from Copepoda and 10 from Rotifera.

Quantitative analysis of zooplankton in Madhura Anua indicates that the abundance percentage of Rotifera(58%) in the study site is much more higher than that of Cladocera (21%) and Copepoda (21%) in the oxbow lake (Fig 1). Highest abundance percentage of Rotifera in the lake may be due to the pollution in the lake. Sedimentation of the organic matter in the water of a wetland leads to the degradation of the lake which leads to the increase in abundance density of the minor phylum i.e, Rotifera. Similar views were represented by Jalilzadeh, 2008 where on comparison of three water bodies, the highly polluted waterbody shows higher percentage Rotifera than other groups of zooplankton. Arora and Mehra, 2003 also observed dominance of Rotifers among other zooplankton during their study in Yammuna river. Abundance of Rotifera was also observed by Aquino *et. al.*, 2008 in Paoay lake, Phillipines. Verma *et.al.*, 2013 registered highest abundance percentage of Rotifera over other groups of zooplankton. Similarly highest abundance percentage of rotifera over other groups of zooplankton was reported by Kar and Kar, 2016 in Sat Beel, Cachar, Assam.

Rotifers form a significant component of zooplankton as they are known to exhibit a very wide range of morphological variations and adaptations and as such responds more quickly to environmental changes more precisely to the changes in water quality [4].

On observing the monthly distribution of zooplankton in Madhura Anua during the study period of September 2014 to August 2015 it was found that Rotifera are found to show peak population in the month of September'14, October'14, November'14, December'14,

July'15 and August'15. Rotifera population was found to be highest in the month of October'14. Similarly, Cladocera and Copepoda group of zooplankton were showed their highest population peak in the month of September'14 (Fig 2).

The density of total zooplankton was found to be at peak of its population at the month of September'14 and October'14 i.e., at post monsoon. The minimum zooplankton densities were observed in the month of February'15 to May'15. Rotifera group was found to be in higher densities compared to other two groups all throughout the year.

The composition of freshwater zooplankton taxa of Madhura Anua generally resembles the distribution of zooplankton taxa of other lakes from this part of the country. Similar observation on zooplankton monthly distribution in this part of the country was reported by Kar and Kar, 2016 during their study in Sat Beel, Cachar, Assam. The presence of Rotifera in higher densities compared to other group of zooplankton may be attributed due to the presence of suspended material in the lake. The presence of Rotifera in the lake and the fact of their population reaching the peak at certain periods of the year indicate clearly that the waterbody is rich in organic matter [17].

Madhura Anua is being subjected to high human activity resulting to pollution of the lake as human changes in land use have greatly increases the nutrient level and silt in the water body. Increase of nutrient flow in the waterbody may be linked to urban run-off, sewage effluents flowing to the lake, agricultural run-off, bathing and washing of clothes, animals etc. which lead to the increase in nutrient level in the waterbody. Similar observation was made by Keppeler and Hardy, 2004 during their study in an abandoned meander lake of Brazil.

These high level of nutrient in the waterbody becomes helpful for some species of zooplankton more precisely Rotifers to adapt in this environment which may gradually lead to the eutrophication of the lake.

Table 1: Monthly distribution of Zooplankton in Madhura Anua during the study period of September 2014 to August 2015

ZOOPLANKTON	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
CLADOCERA												
<i>Diaphanosoma sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Scapholeberis sp.</i>	-	+	+	+	+	+	+	+	+	+	+	+
<i>Sida sp.</i>	+	+	+	+	-	+	+	+	+	+	+	+
<i>Macrothrix sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Chydorus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ceriodaphnia sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Bosminopsis sp.</i>	+	+	+	+	-	+	+	+	+	+	+	+
<i>Bosmina sp.</i>	+	+	-	-	-	+	-	+	+	+	+	-
<i>Alona sp.</i>	+	+	+	+	-	+	+	+	-	+	+	+
<i>Alonella sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Moinodaphnia sp.</i>	+	+	+	+	+	-	+	+	+	+	+	+
<i>Moina sp.</i>	+	-	-	-	-	+	-	-	-	+	+	+
<i>Euryalona sp.</i>	+	+	-	+	+	-	+	+	-	+	+	+
COPEPODA												
<i>Mesocyclops sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Thermocyclops sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Neodiaptomus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Heliodiaptomus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
ROTIFERA												
<i>Brachionus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Plationus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Lecane sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Lepadella sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Keratella sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Anuraeopsis sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Asplanchna sp.</i>	+	+	+	+	+	+	-	+	+	+	+	+
<i>Ascomorpha sp.</i>	+	+	+	+	+	+	+	+	-	+	+	+
<i>Rotaria sp.</i>	+	-	-	+	+	-	+	+	+	+	-	-
<i>Testudinella sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Trichocerca sp.</i>	+	+	+	+	+	-	+	+	+	+	+	+
<i>Trichotria sp.</i>	+	-	+	+	-	-	-	+	+	-	+	+
<i>Cephalodella sp.</i>	+	+	+	+	+	-	-	+	+	+	+	+
<i>Mytilina sp.</i>	+	+	+	+	+	-	-	+	+	-	+	+
<i>Macrochaetus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Horaella sp.</i>	+	+	+	+	-	-	+	+	+	+	+	+
<i>Pompholyx sp.</i>	+	+	+	-	+	+	+	+	+	+	+	+
<i>Filinia sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Colurella sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Trochosphaera sp.</i>	+	+	+	+	-	-	-	+	+	+	+	+

Fig 1: Abundance status of Zooplankton during the study period from September 2014 to August 2015 in Madhura Anua.

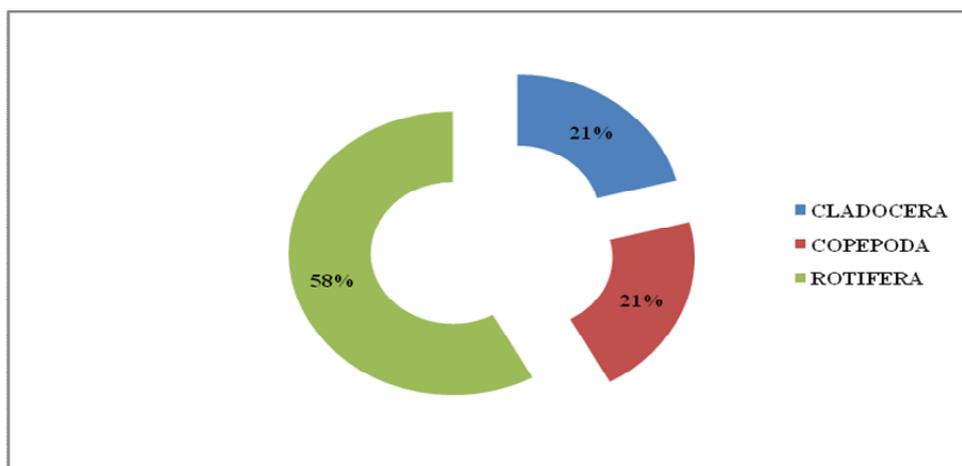
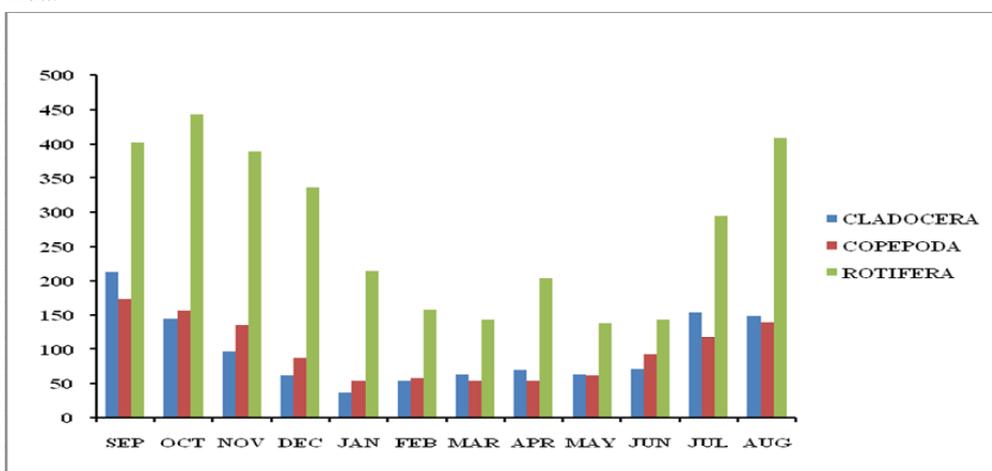


Fig 2: Groupwise monthly status of Zooplankton during the study period from September 2014 to August 2015 in Madhura Anua.



CONCLUSION:

The quality of waterbody is very much necessary for the regulation of biotic and abiotic factors of the waterbody. The present investigation reveals the presence of high density of Rotifer among other Zooplankton groups that are registered from the Madhura Anua during the study period. Presence of high density of Rotifer in the waterbody is an indication that the lake is gradually enhancing towards pollution. During the study period, there are instances of human activity being observed such as sewage effluents, washing of households, bathing of animals, flow of agricultural effluents etc. which is leading to pollution of the lake. Moreover, this wetland is mainly used for aquaculture so effective measures should be immediately taken. Awareness to educate local people in this regard should be taken, management authority should be formed to take care of the wetland. More

importantly regular dredging of sediments from the waterbody should be done for the present and future use of the lake. On the other hand presence of high diversity of zooplankton reveals that though at the threshold of pollution, the waterbody is still suitable for aquaculture. Thus, the present investigation not only reflects the Zooplankton diversity of the waterbody but also in turn helps in planning exploitation, strategies of pollution control and valuable conservation strategies for the wetland and aquaculture.

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