

Effect of thermal stratification and dissolved oxygen on Rotifer distribution in Manasbal Lake, Kashmir

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ABSTRACT

Present investigation was carried on during 2018-2019 with the aim to assess effect of thermal stratification and dissolved oxygen in the distributional pattern of Rotifera at limnetic zone of Manasbal Lake. The objective of it was to assess which factors regulate distribution of Rotifera in the Lake . A conspicuous depth wise variation in water temperature and clinograde type of dissolved oxygen curve was recorded . Decrease in temperature with increasing depth and gradual decline in Oxygen from surface to bottom resulted in depth wise distribution of Rotifera . During Summer stratification a notable phenomenon of concentration of most of the species of Rotifera were recorded in Metalimnion region .

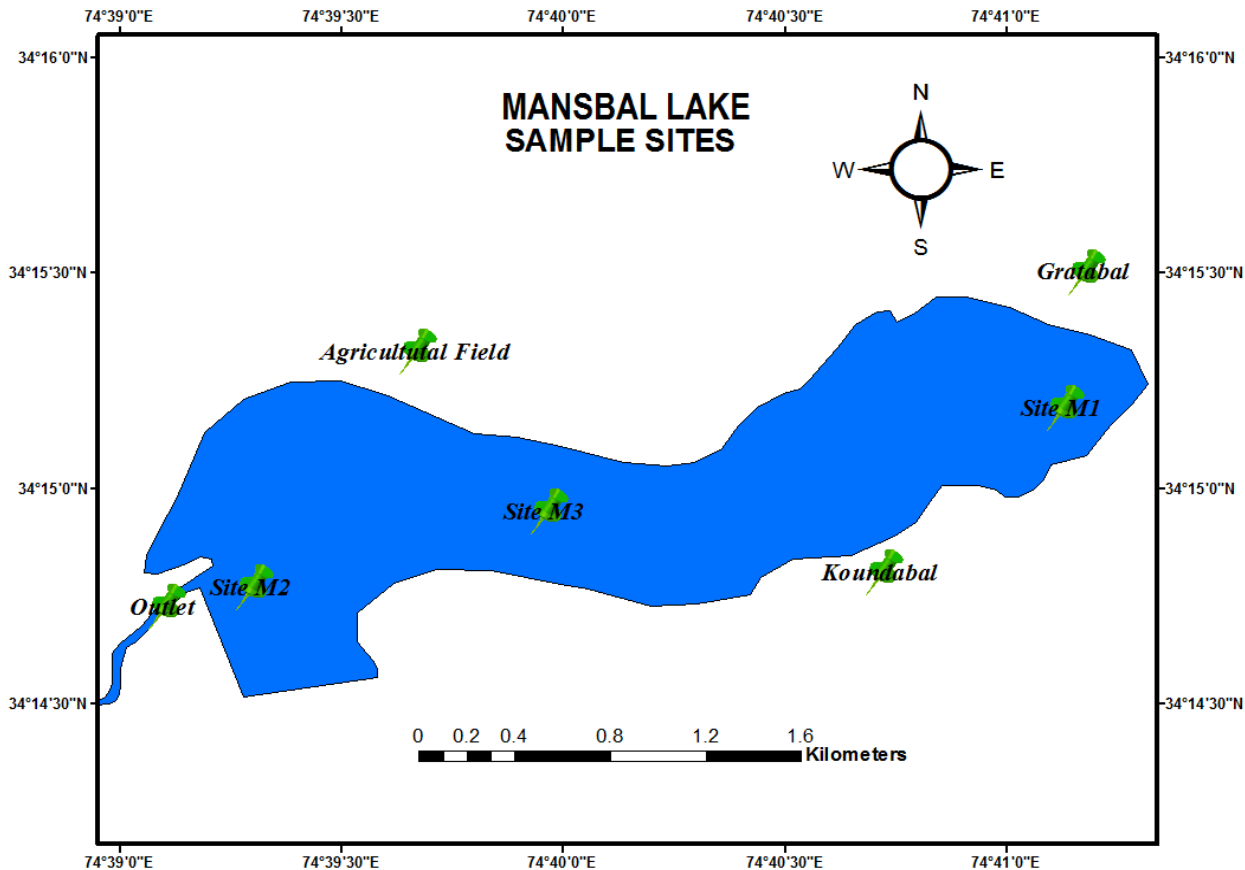
Key words:- Clinograde , Diversity , Littoral , Limnetic, Metalimnion, Temperature

INTRODUCTION

Any change in the distributional pattern of the Rotifera can provide useful information about the environmental changes occurring in their habitat . A series of concomitant changes in the Community structure of aquatic organisms is caused due to the eutrophication . For understanding the level of trophic progression of a water body it is important to know the abundance , species diversity and spatial distribution of the Rotifer community in it. Their unique manner of occupying diverse niches of continental water ecosystems is influenced by the interaction of physical , chemical and biological parameters . These factors determine the complexity that results in the presence of different species (Keppeler and Hardy, 2004). During the present study Manasbal Lake of Kashmir Himalaya was studied for unraveling the distributional pattern of Rotifera . The objective of it was to assess which factors regulate distribution of Rotifera in the Lake .

STUDY AREA

Manasbal lake , is the deepest fresh water valley lake of Kashmir.It is situated at an altitude of 1585 m (a.s.l) within the geographical coordinates of North latitude $34^{\circ}15'28''$ - $34^{\circ}14'30''$ and East longitude $74^{\circ}39'10''$ - $74^{\circ}41'30''$. The lake is oblong in out line, measuring 2.8 km² in area with maximum depth of 13m . Having no major tributary, its water supply is chiefly derived from internal springs and precipitation. The lake has hamlets of Kondabal, Jarokabal and Gratabal overlooking it.



Map of the Manasbal Lake

MATERIALS AND METHODS

Water temperature was recorded by directly immersing the bulb of Celsius thermometer into the water sample, for 2 minutes, immediately after its collection from different depths. Depth was determined with a weighted graduated non-stretchable line. The weight was lowered in water until it touched the bottom of lake and depth was recorded. Azide modification of winklers method was used to determine dissolved oxygen (APHA, 1998). Collection of the plankton samples was done by sieving 10 litres of water obtained from different depths with the help of 2 litre Ruttner sampler and preserved in 4% formalin. Detailed qualitative investigations were made under binocular microscope at 40X and 100X. Identification of Zooplankton was done with the help of standard taxonomic keys like Edmondson (1959) and Pennak (1978).

RESULT AND DISCUSSION

Manasbal lake remains thermally stratified from March to November and water column is divided into 3 layers, Upper surface layer or Epilimnion, Middle layer or Metalimnion and Lower bottom layer or Hypolimnion. A characteristic depth wise variation in water temperature was recorded. Surface water temperature remained high than deeper waters. During the study period, Epilimnion depicted mean temperature of 19.5°C while as hypolimnion showed 8.8°C. A vertical oxygen gradient was also recorded with a mean of 7.3 mg/l at epilimnion, 3.8 mg/l at metalimnion and resulted in complete absence in the region of hypolimnion (Table 1).

Twenty two taxa of Rotifera were recorded from the Lake which showed a conspicuous depth wise distribution . A remarkable phenomenon of concentration of most of the species were recorded during summer stratification in the region of metalimnion (18 species) while least in hypolimnion (6 species) Table 2 . This is explained on the premise that due to abrupt decrease in the temperature of successive layers of water result in the slowing down of the sinking velocity of food particles , which probably attracts these organisms in the region of metalimnion . Such a situation has also been observed by Yousuf and Qadri (1985); Yousuf and Farooq (1994). The hypolimnion, with its anoxic condition and high nutrient concentration did not attract many rotifers and crustaceans, as lower dissolved oxygen affects distribution, growth and reproduction rate of zooplankton resulting in their migration from hypolimnion into the metalimnion (Bozkurt and Guven, 2009).

Table 1 :- Mean Temperature and Dissolved Oxygen at different depths

Depth	Mean Temperature	Mean Dissolved Oxygen
Epilimnion	19.5°C	7.3mg/l
Metalimnion	14.7°C	3.8mg/l
Hypolimnion	8.8°C	Anoxic

Table 2 :- Distributional pattern of Rotifera in three layers of the Manasbal Lake .

Epilimnion (0.5m-3m) 15 taxa	Metalimnion (3m-6m) 18 taxa	Hypolimnion (6m -12m) 6 taxa
<i>Brachionus calyciflorus</i>	<i>Brachionus calyciflorus</i>	<i>Brachionus calyciflorus</i>
<i>Brachionusquadridentata</i>	<i>Brachionusquadridentata</i>	<i>Brachionus quadridentata</i>
<i>Euchlanis dilatata</i>	<i>Euchlanis dilatata</i>	<i>Euchlanis dilatata</i>
<i>Keratella cochlearis</i>	<i>Keratella cochlearis</i>	<i>Keratella cochlearis</i>
<i>Keratella quadrata</i>	<i>Keratella quadrata</i>	<i>Notholca acuminata</i>
<i>Keratella valga</i>	<i>Keratella valga</i>	<i>Philodina roseola</i>
<i>Mytilina mucronata</i>	<i>Notholca acuminata</i>	
<i>Mytilina ventralis</i>	<i>Platias patulus</i>	
<i>Notholca acuminata</i>	<i>Monostyla bulla</i>	
<i>Platias patulus</i>	<i>Monostyla lunaris</i>	
<i>Platias quadricornis</i>	<i>Monostyla quadridentata</i>	
<i>Monostyla bulla</i>	<i>Lepadella patella</i>	
<i>Monostyla closterocerca</i>	<i>Lepadella ovalis</i>	
<i>Monostyla lunaris</i>	<i>Lecane luna</i>	
<i>Monostyla quadridentata</i>	<i>Squatinella mutica</i>	
	<i>Philodina roseola</i>	
	<i>Polyarthra dolicooptera</i>	
	<i>Polyarthra vulgaris</i>	

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