

Species Composition and Habitat Preference of Rotifera in Ahansar Lake

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Abstract: During the course of an extensive study of the ecology and systematics of the rotifera from Ahansar lake , 26 species of rotifer belonging to 14 genera, 9 families were recorded for the first time . An analysis of the family wise representation of the recorded species depicted the relative qualitative sequence to be Brachionidae > Trichocercidae = Lecanidae . Brachionidae comprised 65% of the overall species richness . Shannon's diversity index showed highest species richness at macrophyte infested littoral zone and maximum diversity was recorded in Summer .

Key Words: Rotifers , Species richness , Littoral zone

I. Introduction

Rotifers are among the groups of zooplankton with the largest populations in continental waters , frequently dominating the fauna . They are considered to be cosmopolitan in nature .Globally around 2000 species of rotifers are known (Shiel , 1995) . They are usually restricted into a littoral zone due to favourable light conditions (Mikulski , 1974) . The occurrence and number of rotifers are often modified by the habitat preference of a species which is connected with overall food conditions which occur within a particular water body (De Azavedo and Bonecker , 2003) . The littoral region is often the most diverse part of the lake community , supporting variety of macrophytes , their associate microflora and large number of animal species . Diversity is often high in the vegetative habitats as compared with pelagic (Pennak , 1966) . Representatives of rotifers are found in aquatic and semi aquatic habitats , but are predominantly fresh water inhabitants (Pejler ,1995) . They contribute to a a very important part of these ecosystems due to extremely fast reproductive rates

Rotifera an integral and important component of aquatic food webs have been documented from a wide variety of fresh water bodies of Kashmir . But there is currently limited information on their diversity in flood plain lakes of Kashmir as many of the lakes have been neglected , Ahansar lake is one of them . The aim of present work was to study species composition of Rotifera and their habitat preferences in Ahansar lake .

II. Study Area And Study Sites

The present study is a part of limnological survey undertaken during December 2011 to October 2012 in Ahansar lake .Ahansar lake is a small fresh water rural lake situated at Sumbal (District , Ganderbal) ,26 Km north of Srinagar . It lies between 34⁰ 13' 43 . 5" N Latitude 74⁰ 39' 49 .4" E Longitude at an elevation of 1594 m(a.s.l).

He lake has a maximum depth of 5m and is spread over an area of 0.8 Km square . The lake is fed by many springs . The lake supports luxuriant growth of macrophytes which form continuous belt along the periphery of the lake . Few studies have been undertaken on this lake . The present study is the first survey of Rotifera from Ahansar lake . In present day research TBiodiversity is achieving a tremendous importance where collection of base line data related to flora and fauna is important . If such studies are not carried out many of the organisms may go unrecorded . Hence it is very important to put into record the studies of organisms .

III. Two study sites were selected from the lake .

SITE 1 : - It is located in the littoral zone with dense tall emergents towards the north side . SITE 2 : -It is located in the open water zone towards the east side .

IV. Materials And Methods

For qualitative analysis collection of the plankton was carried out by hauling plankton net fitted with nylobolt net cloth no . 140T through water in vertical and horizontal directions . The contents collected in the tube attached to the lower end of the net were transferred to separate marked polythene tubes and preserved in 4% formalin . Detailed qualitative investigations were made under compound microscope and different taxa identified with the help of standard taxonomic works like Edmondson (1959) , Pennak (1978).For quantitative enumeration 100 litres of water was sieved through the plankton net and preserved in 4% formalin . The samples were reduced or concentrated to known volume of 10 ml in a centrifuge for about 10 -15 minutes at 1500 rpm . The quantitative enumeration of the individuals was done by counting 1ml aliquot of the centrifuged sub sample

in a Sedgwick rafter cell (1 ml capacity) under a binocular microscope .For accuracy same volume of the sub sample were counted 3 – 5 times and average of the values was taken for calculating the number of organisms per cubic meter of the water by the formula given in APHA (1998). The results were expressed in indi /l . Diversity index \hat{H} (Shannon and Weaver, 1949) was applied to define the species diversity of rotifers inhabiting two zones.

$$\hat{H} = -\sum \frac{n_i}{N} \times \ln \frac{n_i}{N} \quad \text{Where } \hat{H} = \text{Shannon –weaver index}$$

n_i =The number of individuals of its species
 N = The total no. of individuals

V. Result And Discussion

In the present investigation 26 different Rotifer taxa from 3 orders Ploima, Flosculariaceae and Philodinidae belonging to 14 genera and 8 families were recorded from two sampling sites in Ahansar Lake. Out of these 24 species, 12 genera and 6 families belonged to order Ploima.

Brachionidae was the dominant family .According to Sharma and Michael (1980) Brachionidae form significant fraction of total Rotifera and form an important component of plankton. In the present study Brachionidae was represented by 15 species(65 %) . Trichocercidae (13%) , Lecanidae(13%) form notable fraction of rotifer at Ahansar lake . Notammatidae , Gastropodidae and Synchaetidae also showed some importance with only one species each (see Systematic list and fig 1).

Systematic list of Rotifers from Ahansar lake

ORDER	PLOIMA
(A) Family	Brachionidae
1 . Genus	Brachionus
Species	Brachionus angularis Gossi 1851
	Brachionus bidentata Anderson , 1889
	Brachionus calyciflorus Pallas , 1766
	Brachionus plicatalis Muller , 1786
	Brachionus quadridentata Hermann 1783
2 . Genus	Keratella
Species	Keratella cochlearis Gosse , 1851
	Keratella haemalis Carlin , 1943
	Keratella quadrata Muller, 1786
3 . Genus	Mytilina
Species	Mytilina mucronata Muller , 1773
4 . Genus	Notholca
Species	Notholca acuminata Gosse , 1887
5 . Genus	Platias
Species	Platias patulus O.F .Muller, 1786
	Platias quadricornis Ehrenberg , 1832
6 . Genus	Trichotria
Species	Trichotria tetractris Ehrenberg , 1830
7 . Genus	Lepadella
Species	Lepadella O . F .Muller, 1786
	Lepadella patella O . F .M uller , 1773
(B) .Family	Lecanidae
8 . Genus	Monostyla
Species	Monostyla bulla Gosse , 1851
	Monostyla lunaris Ehrenberg , 1832
	Monostyla quadridentata Ehrenberg , 1830
(C) . Family	Notommatidae

9. Genus	Cephalodella
Species	Cephalodella auriculata Ehrenberg, 1838
(D). Family	Trichocercidae
10. Genus	Trichocerca
Species	Trichocerca longiseta Schrank, 1802
	Trichocerca cylindrical Imhof, 1891
	Trichocerca porcellus Gosse, 1886
(E). Family	Gastropodidae
11. Genus	Ascomorpha
Species	Ascomorpha saltans Bartsch, 1870
(F). Family	Synchaetidae
12. Genus	Polyarthra
Species	Polyarthra vulgaris Carlin 1943
ORDER	FLOSCULARIACEAE
(G). Family	Trochosphaeridae
13. Genus	Filinia
Species	Filinia longiceta Ehrenberg 1834
ORDER	BDELLOIDEA
(H). Family	Philodinidae
14. Genus	Philodina
Species	Philodina roseola Ehrenberg 1832

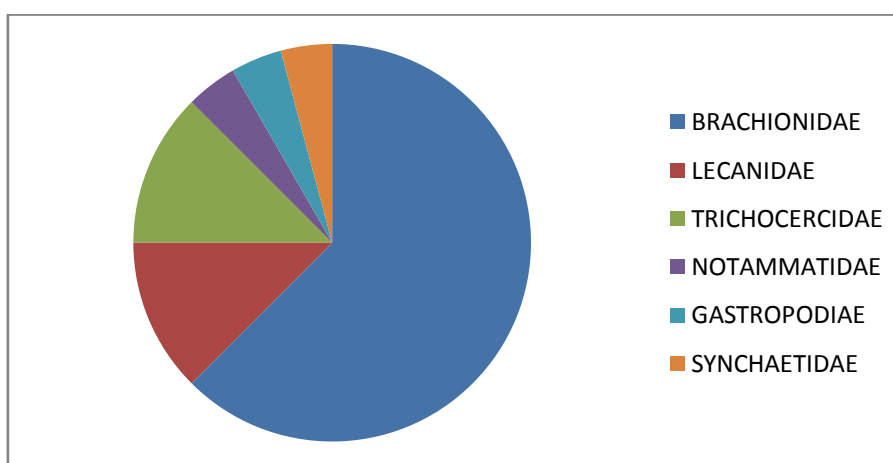


Fig 1 . BRACHIONIDAE 65%, LECANIDAE 13% , TRICHOCERCIDAE 13% , NOTAMMATIDAE 1% , DASTROPODIAE 1% , SYNCHAETIDAE 1% .

VI. Habitat Preference

Present study showed a clear relationship of rotifer richness and habitat heterogeneity (Table 1). Rotifer distribution was non-homogeneous. In the present study the Shannon's index for the Rotifers sampled at two sites was found (2.93 and 2.07). These index values indicate Site 1 has a well-rotifer community. 24 taxa were recorded at Site 1 in vegetated littoral zone with dense emergent, floating macrophytes, while less number of rotifer 11 taxa were recorded at Site 2 in pelagic zone. This site is not typical open water zone but only a small area of unvegetated part of the lake surrounded by submerged macrophytes which may provide this zone with some littoral species being washed out from macrophytes. Littoral zone of a lake has more biodiversity as light is more available here which results in abundant vegetation. It causes more dissolved oxygen in water. So consumers are more in this zone. Water is relatively warmer in the littoral zone. Light can

penetrate up to the bottom . The present study relates diverse species of rotifers with dense vegetation which gives refuge , light, food , warmth and dissolved oxygen . Lawniczak .et .al (2007) reported most diverse species in the littoral zone and related it with heterogeneity of macrophyte dominated area . Hakanson (2003) attributed this to food availability .

Brachionus calyciflorus , Brachionus plicatalis , Keratella cochlearis , Platiyas patulus , Platiyas quadricornis , , Lepadella ovalis , Monostyla bulla , Ascomorpha saltans were common in both sampling sites .The presence of some littoral species with in the pelagic zone is often accidental due to washing out from aquatic plants and as a result of increase in trophy (Pejler and Berzins 1993 a) .

Among the two sites Polythra vulgaris and Filinia longiceta occurred only at Site 2 (pelagic zone). Polyarthra vulgaris was also recorded in limnetic zone of Manasbal lake (Yusuf and Farooq; 1994). Polyarthra vulgaris are common in the limnetic zone than in the littoral zone (Jose de paggi, S. 1995). Brachionus angularis, Brachionus bidentata, Brachionus quadridentata, Monostyla lunaris , Monostyla quadridentata , Keratella quadrata , Keratella haemalis , Mytilina mucronata , Notholca acuminata , Lepadella patella , Cephalodella auriculata , Trichocerca longiceta , Trichocerca cylindrica , Trichocerca porcellus , Philodina roseola were recorded only at Site 1 (littoral zone). According to Jyoti and Sehgal (1979) more than two species of a rotifer genus do not occur together in a water body . In the present study the presence of 5 species of Brachionus at Site 1 were recorded simultaneously .This indicates their wide distribution in water body . Brachionus was represented by 5 species . Brachionus is the index of eutrophic water (Sladeck , 1983) and its abundance is considered as a biological indicator of eutrophication (Noguero .M . G ; 2001). more Analyzing seasonal variation it was found that Summer peiod was characterised by highest density and lowest density in Winter at both sites(Table 2 and fig 2).

Table 1
List of rotifer indi/l recorded at two sites of Ahansar lake from December 2011-October 2012.

Site 1	Site 2
Ascomorpha saltans	16
Brachionus angularis	9
Brachionus bidentata	6
Brachionus calyciflorus	43
Brachionus plicatalis	12
Brachionus quadridentata	43
Keratella cochlearis	25
Keratella haemalis	4
Keratella quadrata	25
Mytilina mucronata	8
Notholca acuminata	4
Platiyas patulus	12
Platiyas quadricornis	8
Trichotria tetractris	8
Lepadella ovalis	8
Lepadella patella	4
Monostyla bulla	21
Monostyla quadridentata	8
Monostyla lunaris	4
Cephalodella auriculata	6
Trichocerca longiceta	6
Trichocerca cylindrica	15
Trichocerca porcellus	4
Philodina roseola	10
Shannon wiener index	2.879

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Ascomorpha saltans	4
Brachionus calyciflorus	30
Brachionus plicatalis	4
Platias patulus	7
Platias quadricornis	4
Lepadella ovalis	8
Lepadella patella	4
Monostyla bulla	16
Filinia longiceta	6
Polythra vulgaris	6
Keratella cochlearis	38
Shannon wiener index	2.013

Table 2.

Taxa	Winter	Spring	Summer	Autumn
Ascomorpha saltans	0	4	12	0
Brachionus angularis	0	0	3	6
Brachionus bidentata	0	2	4	0
Brachionus calyciflorus	0	5	21	17
Brachionus plicatalis	0	1	5	2
Brachionus quadridentata	0	2	7	3
Keratella cochlearis	4	16	2	21
Keratella haemalis	0	0	4	0
Keratella quadrata	5	17	3	0
Mytilina mucronata	0	0	8	0
Notholca acuminata	4	0	0	0
Platias patulus	0	3	9	0
Platias quadricornis	0	0	5	3
Trichotria tetractris	2	4	2	0
Lepadella ovalis	2	4	2	0
Lepadella patella	0	2	2	0
Monostyla bulla	0	5	12	4
Monostyla lunaris	0	0	4	0
Monostyla quadridentata	2	2	4	0
Cephalodella auriculata	0	2	4	0
Trichocerca longiceta	0	0	6	0
Trichocerca cylindrica	2	2	3	8
Trichocerca porcellus	0	4	0	0
Filinia longiceta	0	0	0	0
Polyarthra vulgaris	0	0	0	0
Philodina roseola	0	2	3	5
Shannon wiener index	1.869	2.476	2.853	1.9

Fig 2

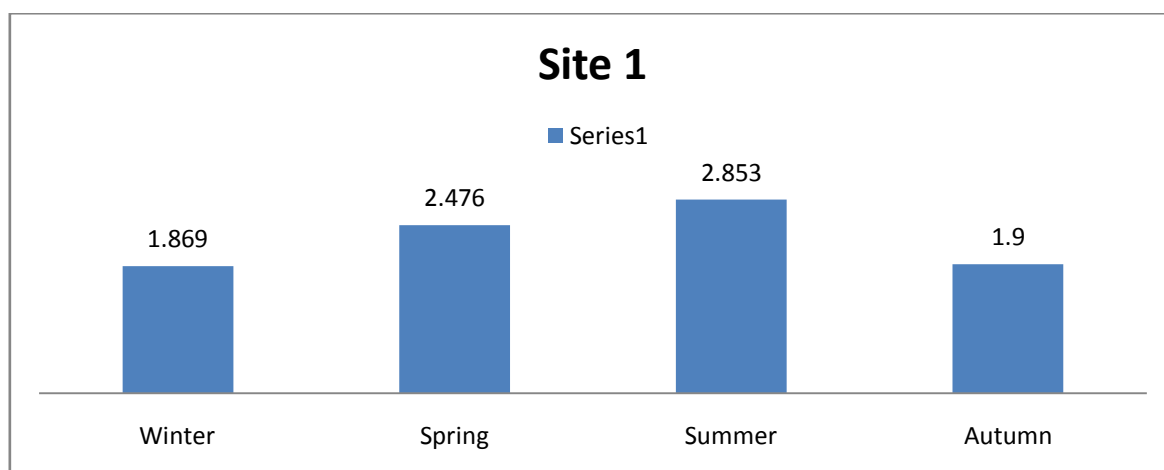
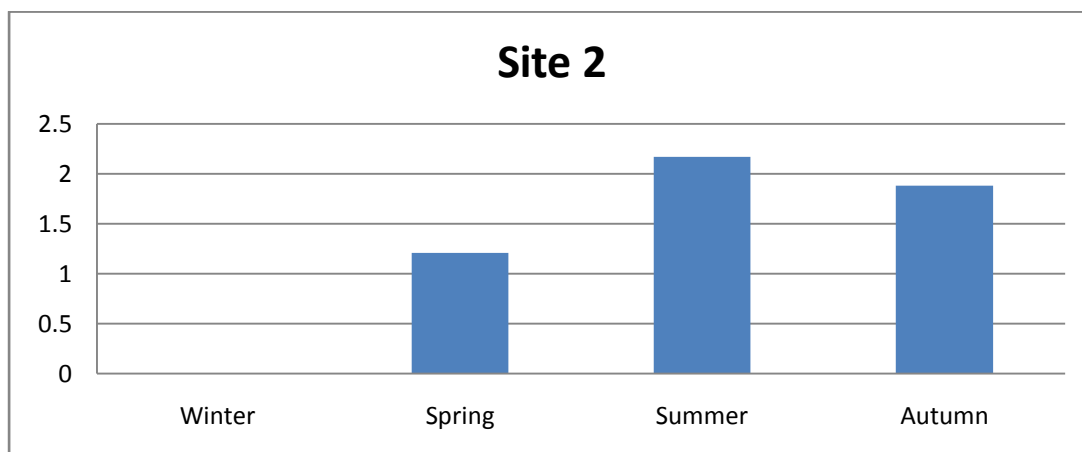


Fig 3

Table 3

Taxa	Winter	Spring	Summer	Autumn
Ascomorpha saltans	0	0	4	0
x	0	0	0	0
x	0	0	0	0
Brachionus calyciflorus	0	7	13	10
Brachionus plicatalis	0	0	3	1
x	0	0	0	0
Keratella cochlearis	8	16	6	8
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
Platias patulus	0	0	4	3
Platias quadricornis	0	0	4	0
x	0	0	0	0
Lepadella ovalis	0	0	2	6
Lepadella patella	0	4	0	0
Monostyla bulla	0	4	4	8
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
x	0	0	0	0
Filinia longiseta	0	0	4	2
Polythra vulgaris	0	0	6	12
x	0	0	0	0
Shannon wiener index	0	1.206	2.167	1.881



(Fig 2) Seasonal variation of rotifers at two sites in Ahansar Lake during December 2011 – October 2012

VII. Discussion

In the present study, the majority of the recorded species were Monogonanta whereas Bdelloids were represented by Philodina. The former was dominated by Order Ploima. The rotifer communities of Ahansar lake are characterised by notably high richness of Brachionidae and that of Brachionus in particular which was represented by five species. Brachionus is the index of eutrophic water (Sladeck, 1983) and its abundance is considered as a biological indicator of eutrophication.

Less number of Rotifera were recorded at site 2 (pelagic zone). This site is not typical open water zone but only a small area of unvegetated part of the lake surrounded by submerged macrophytes which may provide this zone with some littoral species being washed out from macrophytes. According to (Pejler and Berzins 1993a) the presence of some littoral species within the pelagic zone is often accidental due to washing out from aquatic plants.

Littoral zone of a lake has more biodiversity as light is more available here which results in abundant vegetation. It causes more dissolved oxygen in water. So consumers are more in this zone. Water is relatively more warmer in the littoral zone. The present study relates diverse species of Rotifers with dense vegetation which gives refuge, light, food, warmth and dissolved oxygen. Lawniczak et al (2007) reported most diverse species in the littoral zone and related it with heterogeneity of macrophyte dominated area. Hakanson (2003) attributed this to food availability.

Polyarthra vulgaris was recorded in pelagic zone. This species was also recorded in the limnetic zone by (Yousuf and Farooq; 1994). According to Jose de paggi, S (1995) *Polyarthra vulgaris* are more common in limnetic zone than in littoral zone.

To sum up it was found that the heterogeneity of the habitat is responsible for the greatest species diversity of the Rotifera community. High temperature increases the reproductive and metabolic rates resulting in abundant growth.

VIII. Conclusion

Distribution of Rotifers were influenced greatly by various factors. From the results it could be concluded that availability of safe habitat, food resources, warmth are important for the occurrence and abundance of Rotifers.

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