International Journal of Global Science Research
Vol. 12, Issue. 2, October 2025, pp. 2846-2855
Available Online at www.ijgsr.com

ISSN: 2348-8344 (Online)
DOI: https://doi.org/10.26540/ijgsr.v12.i2.2025.323

Research Paper

A report on some Planktonic Rotifers occurring in and adjacent areas of Hyderabad, Telangana

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Received: 21/09/2025
Revised: 30/09/2025
Accepted: 09/10/2025

Abstract: Zooplankton samples from 10 different localities in the adjacent areas of Hyderabad were collected during to September 16 &17 2022. These water bodies include the permanent stagnant water bodies around Hyderabad. A total of 49 rotifer species were identified. The trophic status showed a clear effect on the distribution of different rotifer species. These species included *Brachionus plicatilis, B. quadridentatus, B. unreolaris* commonly occurring in brackish water, while *Keratella quadrata* and *Keratella cochlearis* were common in freshwater. In the present study 49 species of rotifers belonging to 13 families were recorded. Of the 13 families, Brachionidae was the most represented with 17 species (4 genera), followed by Lecanidae with nine species (1 genera), Philodinidae with four species (3 genera), Notomatidae with three species (2 genera). Asplanchnidae, Mytilinidae, Trocosphaeridae, Fillinidae and Euchlanidae were represented by two species each (1 genus each). Families such as Lepadellidae and Conochilidae were represented by one species each. Polymorphic forms of the genus Brachionidae were also represented during the present study. Three species are identifiable upto generic level. However eutrophic species were also recorded during the present study.

Keywords: Zooplankton, Rotifera, Trophic status, Hyderabad, Polymorphic, Eutrophic species.

Introduction:

Hyderabad is the capital of the Indian state, Telangana which includes a part of the metropolitan capital city area of Hyderabad. Earlier the city was known as Bagyanagaram. It is also called the "city of pearls." Hyderabad was founded in 1591 and planned as a grid with the Charminar at its centre. It is the smallest in terms of area, among all the districts in the state, but has the highest human density. The city covers an area of approximately 217 square kilometres and Geographically the city is located in the northern part of Deccan plateau, in Southern India on the banks of Musi River. The co- ordinates of the city are 17.366° N latitude and 78.476° E longitude altitude of about 1,778 feet (542 m) above mean sea Level (MSL). The highest point in the city is Banjara Hills. The contour level falls gradually from west to east creating almost

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a trough near the Musi River which runs through the city. Hyderabad and Secunderabad are called as 'Twin cities' as they are closely linked with each other. A man lake, known as the Hussain Sagar Lake, separates the two cities. Hyderabad houses 140 large and small size lakes in and around its neighbourhood. More than 75 per cent of the rainfall is received during the south-west monsoon season.

Zooplankton plays an important role in trophic link in food chain and plays a key role in cycling of organic materials in aquatic ecosystem. The presence of the indicator species in the diversity of zooplankton indicate the quality of water caused by pollution or eutrophication. The changes in the water quality as well as zooplankton quality are indicators of rate and magnitude of cultural eutrophication (Kulshrestha *et. al*., 1989; Chari and Abbasi 2003). Several workers viz.. Sinha *et, al*.. 1994; Das 2002; Khan 2003; and Nandi and Das 2003 have made contributions on zooplankton population abundance in different types of wetlands.

Rotifers are considered to be most diverse group of zooplankton. They increase and decrease abruptly depending upon availability of food and other favourable climatic conditions (Allan, 1976). They play important role in aquatic ecosystem. They transfer energy from producers to the higher consumers like invertebrates, crustaceans, and small fish. Some rotifer species are also considered as indicators of the lake type. The salt tolerance of different species differs, some species are stenohaline however others are considered to be euryhaline. Present work aims to document the distribution of rotifer species occurring at different salinity and trophic status in different water bodies near Hyderabad city.

Materials and Methods:

Zooplankton samples were collected from 12 different localities near to Hyderabad, Telengana viz. Stations: 1. Kokapet lake 2. Attapur lake 3. Shameerpet lake 4. Pasumala Cheruvu 5. Gangaram lake 6. Alwal lake 7. Ameenpur lake 8. Kutloor Pedda 9. Fox Sagar 10. R.K. Puram Cheruvu 11. Turkamagal Masad Cheruvu 12. Udma Sagar and were provided by the FBRC, Hyderabad and also some samples were collected as a part of the Deccan survey.

Table: 1. Details of sample collection localities

No.	Station name	Alt.	Lat.	Long.	St. No.	Lot no.	Date
1	Kokapet lake	562m	17°24'08"N	78°19'39"E	5	4	16-09-2022
2	Attapur lake	543m	17°21'34"N	78°25'27"E			16-09-2022
3	Shameerpet lake	574m	17°36'34"N	78°33'51"E	5	6	17-09-2022
4	Pasumala Cheruvu	493m	17°21'19"N	78°39'08"E			17-09-2022
5	Gangaram lake	561m	17°30'01"N	78°19'46"E	5	7	16-09-2022
6	Alwal lake	587m	17°30'28"N	78°30'42"E			17-09-2022
7	Ameenpur lake	575m	17°31'01"N	78°20'13"E			16-09-2022
8	Kutloor Pedda	507m	17°20'53"N	78°37'10"E	5	4	17-09-2022
9	Fox Sagar	581m	17°31'37"N	78°28'09"E	5	5	17-09-2022
10	R.K. Puram Cheruvu	521m	17°25'36"N	78°34'19"E			17-09-2022
11	Turkamagal Masad Cheruvu	550m	17°17'21"N	78°34'48"E	1	5	16-09-2022
12	Udma Sagar	583m	17°17'29"N	78°27'21"E	5	3	16-09-2022

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Figure:1. Showing the details of collection localities

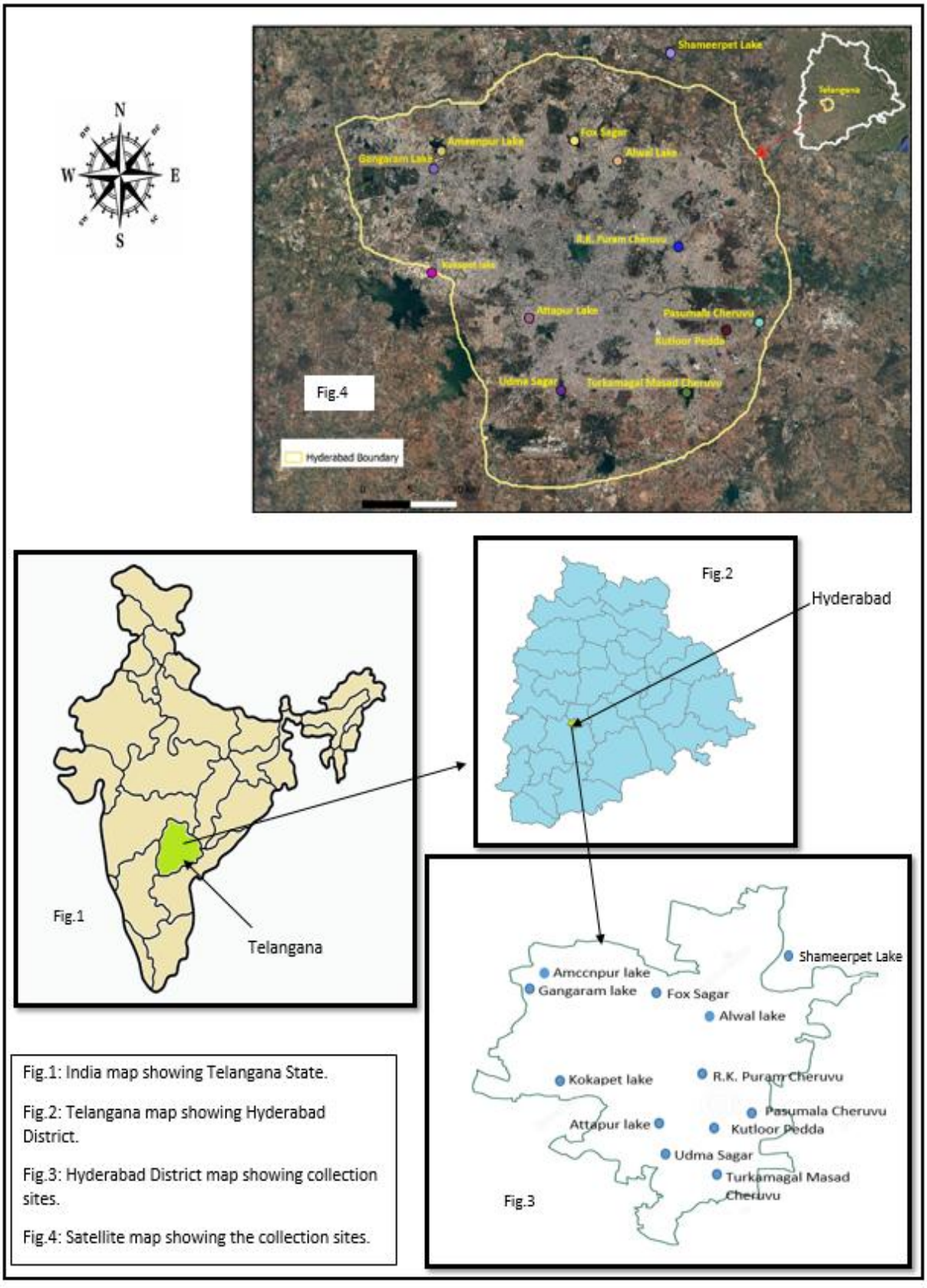

Fig.1: India map showing Telangana State.

Fig.2: Telangana map showing Hyderabad District.

Fig.3: Hyderabad District map showing collection sites.

Fig.4: Satellite map showing the collection sites.

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Zooplankton samples were collected using plankton net having a mesh size of 55 µm. All samples were preserved in 5% formaldehyde on the spot and were brought to the laboratory for identification. Samples were observed under Stereo Microscope (80i Nikon) and rotifers were identified to the species level (in some cases genera, form or variety) using the keys and illustrations given by Edmondson (1959), Needham & Needham (1962), Pennak, (1978), Mizunoand Takahashi (1991), Sharma & Sharma (2008).

PLATE-1
Some photographs of the sample collection localities.

Fox Sagar Lake Hyderabad

Kuntloor Pedda Cheruvu, Hyderabad

Pasumula Lake, Hyderabad

Ameenpur Lake, Hyderabad

Umdasagar, Hyderabad

Attapur pond, Hyderabad

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Sammerpet Lake, Hyderabad

Alwal lake Hyderabad

Table: 2. List of Rotifers recorded from Hyderabad, Telangana during the present study.

Phylum ROTIFERA
Class EUROTATORIA De Ridder, 1957
Subclass MONOGONONTA Wesenberg-Lund, 1889
Order PLOIMA Hudson and Gosse, 1886
Family BRACHIONIDAE Wesenberg-Lund, 1889
Genus ***Anuraeopsis*** Pallas, 1776
1. *Anuraeopsis fissa* Gosse, 1851
Genus ***Brachionus*** Pallas, 1776
2. *Brachionus angularis* Gosse, 1851
3. *Brachionus calyciflorus* Pallas, 1766
4. *Brachionus falcatus* Zacharias,1898
5. *Brachionus calyciflorus f.doracus* (Gosse, 1851)
6. *Brachionus calyciflorus f.amphiceros* (Gosse, 1851)
7. *Brachionus quadridentatus* Hermann, 1783
8. *Brachionus quadridentatus cluniorbicularis* Hermann, 1783
9. *Brachionus quadridentatus brevispinous* Ehrenberg, 1832
10. *Brachionus caudatus* Barrois and Daday, 1894
11. *Brachionus caudatus personatus* Ahlstrom, 1940
12. *Brachionus kostei* Shiel, 1983
13. *Brachionus forficula* Wierzejski, 1891
14. *Brachionus patulus*(O.F. Muller, 1786)

Genus ***Keratella*** Bory de St. Vincent, 1822
15. *Keratella tropica* (Apstein, 1907)

Genus ***Platyias*** Harring, 1913
16. *Platyias quadricornis* (Ehrenberg, 1832)
17. *Platyias leolopi* Gillard, 1957
Family EUCHLANIDAE Bartos, 1959
Genus ***Euchlanis*** Ehrenberg, 1832
18. *Euchlanis dilatata* Ehrenberg, 1832
Family MYTILINIDAE Bartos, 1959
Genus ***Mytilina*** Bory de St. Vincent, 1826
19. *Mytilina ventralis* (Ehrenberg, 1830)
20. *Mytilina ventralis longidactylia* (Ehrenberg, 1830)

Family LEPADELLIDAE Harring, 1913
Genus ***Lepadella*** Bory de St. Vincent, 1826
21. *Lepadella ovalis* (O.F. Muller, 1786)
Family LECANIDAE Bartos, 1959
Genus ***Lecane*** Nitzsch, 1827
22. *Lecane (M) bulla* (Gosse, 1851)
23. *Lecane (M) decipines* (Murray, 1913)
24. *Lecane ungulata* (Gosse, 1887)
25. *Lecane leontina* (Turner,1892)
26. *Lecane curvicornis* (Murray, 1913)
27. *Lecane (M) obtusa* (Murray, 1913)
28. *Lecane (M) sympoda* Hauer, 1929
29. *Lecane papuana* (Murray, 1913)
30. *Lecane pertica* Harring & Myers, 1926
Family NOTOMMATIDAE Remane, 1933 (Partim)
Genus ***Cephalodella*** Bory de St. Vincent, 1826.
31. *Cephalodella gibba* (Ehrenberg, 1830)

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Family TRICHOCERCIDAE Remane, 1933
Genus ***Trichocerca*** (Lamarck, 1801)
32. *Trichocerca similis* (Wierzejski, 1893)
33. *Trichocerca jenningsi* Voigt, 1957

Family ASPLANCHNIDAE Harring & Mayers, 1926
Genus ***Asplanchna*** Gosse, 1850
34. *Asplanchna brightwelli* Gosse, 1850
35. *Asplanchna priodonta* Gosse, 1850
Family CONOCHILIDAE Remane, 1933
Genus ***Conochilus*** Ehrenberg,1834
36. *Conochilus unicornis* Rousselet, 1892

Family FILINIDAE Bartos 1959
Genus ***Filinia*** Bory de St. Vincent, 1824
37. *Filinia longiseta* (Ehrenberg, 1834)
38. *Filinia pejleri* Hutchinson, 1964

Family TESTUDINELLIDAE Bartos 1959
Genus ***Testudinella*** Bory de St. Vincent, 1826

39. *Testudinella parva* (Ternetz, 1892)
40. *Testudinella patina* (Hermann, 1783)

Family TROCHOSPHAERIDAE Bartos 1959
Genus ***Horaella*** Donner, 1949
41. *Horaella brehmi* Donner, 1949

Genus ***Trochosphaera*** Semper, 1872

42. *Trichosphaeria aequatorialis* Semper, 1872

Subclass BDELLOIDEA
Family PHILODINIDAE Remane, 1933
Genus ***Pleosoma*** Herrick, 1885
43. *Pleosoma lenticularae* Herrick, 1885

Genus ***Colurella*** Bory de St.Vincent, 1823
44. *Colurella adriatica* (Ehrenberg, 1831)
45. *Colurella sps*
Genus ***Habrotrocha*** Bryce, 1910
46. *Habrotrocha sps*
Family EUCHLANDIAE Bartos, 1959
Genus ***Beauchampiella*** Remane, 1929
47. *Beauchampiella eudactylota* (Gosse, 1886)
Genus ***Pomphlo****x* Gosse, 1851
48. *Pomphlox sulcata* Hudson, 1885
Genus ***Pseudoharringia*** Fadeew, 1925
49. *Pseudoharringia* sps.

Table: 3. Showing the Occurrence of Rotifer species in the different collection localities.

No	Name of species	Stations											
		1	2	3	4	5	6	7	8	9	10	11	12
1.	*Anuraeopsis fissa* Gosse, 1851								*				
2.	*Brachionus angularis* Gosse, 1851					*			*	*			
3.	*Brachionus calyciflorus* Pallas, 1766		*		*		*						
4.	*Brachionus falcatus* Zacharias,1898												
5.	*Brachionus calyciflorus f.amphiceros*(Gosse, 1851)			*			*			*			
6.	*Brachionus quadridentatus* Hermann, 1783				*								
7.	*Brachionus quadridentatus cluniorbicularis* Hermann, 1783								*	*			
8.	*Brachionus quadridentatus brevispinous* Ehrenberg, 1832				*								
9.	*Brachionus caudatus* Barrois and Daday, 1894												
10.	*Brachionus caudatus personatus* Ahlstrom, 1940									*			

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11.	*Brachionus kostei* Shiel, 1983						*						
12.	*Brachionus forficula* Wierzejski, 1891								*				
13.	*Brachionus patulus*(O.F. Muller, 1786)					*				*			
14.	*Keratella tropica* (Apstein, 1907)		*						*	*			
15.	*Platyias quadricornis* (Ehrenberg, 1832)				*							*	
16.	*Platyias leolopi* Gillard, 1957				*								
17.	*Euchlanis dilatata* Ehrenberg, 1832				*								
18.	*Mytilina ventralis* (Ehrenberg, 1830)				*			*	*				
19.	*Mytilina ventralis longidactylia* Wulfert, 1965				*								
20.	*Lepadella ovalis* (O.F. Muller, 1786)			*	*			*			*	*	
21.	*Lecane (M) bulla* (Gosse, 1851)	*	*	*	*	*		*			*	*	*
22.	*Lecane (M) decipines*(Murray, 1913)											*	
23.	*Lecane ungulata* (Gosse, 1887)	*		*	*	*							
24.	*Lecane leontina* (Turner,1892)				*			*			*		
25.	*Lecane curvicornis* (Murray, 1913)												
26.	*Lecane (M) obtusa* (Murray, 1913)	*											
27.	*Lecane (M) sympoda* Hauer, 1929			*									
28.	*Lecane papuana* (Murray, 1913)					*							
29.	*Lecane pertica* Harring & Myers, 1926				*								
30.	*Cephalodella gibba* (Ehrenberg, 1830)					*	*						
31.	*Trichocerca similis* (Wierzejski, 1893)										*		
32.	*Trichocerca jennigsi* Voigt											*	
33.	*Asplanchna brightwelli* Gosse, 1850			*	*					*	*	*	
34.	*Asplanchna priodonta* Gosse, 1850	*											*
35.	*Conochilus unicornis* Rousselet, 1892									*		*	
36.	*Filinia longiseta* (Ehrenberg, 1834)					*	*			*			
37.	*Filinia pejleri* Hutchinson, 1964						*						
38.	*Testudinella parva* (Ternetz, 1892)							*	*	*			
39.	*Testudinella patina* (Hermann, 1783				*	*							
40.	*Horaella brehmi* Donner, 1949							*	*	*			
41.	*Trichosphaeria aequitorialis* Semper, 1872				*								
42.	*Pleosoma lenticularae* Herrick, 1885									*		*	
43.	*Colurella adriatica* (Ehrenberg, 1831)										*		
44.	*Colurella* sps									*			
45.	*Habrotrocha* sps			*	*								
46.	*Beauchampiella eudactylota* (Gosse, 1886)				*								
47.	*Pomphlox sulcata* Hudson, 1885			*									
48.	*Pseudopharyngea* sps.			*									

Stations: 1. Kokapet lake 2. Attapur lake 3. Shameerpet lake 4. Pasumala Cheruvu 5. Gangaram lake 6. Alwal lake 7. Ameenpur lake 8. Kutloor Pedda 9. Fox Sagar 10. R.K. Puram Cheruvu 11. Turkamagal Masad Cheruvu 12. Udma Sagar

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Results and Discussion:

A total of 49 rotifer species were identified belonging to different genera (Tabl. 2). Taxonomic dominance of rotifers was reported in several water bodies (Nogueira, 2001; Cavalli et al., 2001; Sampaio et al., 2002; Neves et al., 2003). This pattern is common in tropical and subtropical freshwaters, whether in lakes, ponds, reservoirs, rivers, or streams (Neves et al., 2003). Rotifers are considered to respond more quickly to environmental changes than crustacean zooplankton. They appear to be more sensitive indicators of changes in water quality (Gannon and Stemberger, 1978). Most of the species belonging to and *Lecane* are typical cosmopolitan (Mangestou et al., 1991). *Brachionus*, a cosmopolitan genus, is considered to be abundant in eutrophic environments. The dominance of Rotifers in water bodies may be due to their special characteristics, i.e., less specialized feeding, high fecundity and frequent parthenogenetic reproduction. This may be also due to a wide spectrum of food particles exploited by this group, which display the ability to consume bacteria, algae and detritus of different sizes, which allows quite distinct diets for the many species simultaneously present in the water body (Starkweather, 1980).

The global status of freshwater rotifers is about 2030 species (Segers, 2007, 2008, and 2012). According to (Sharma & Sharma 2017) from the freshwaters of India, 419 valid rotifer species belonging to 65 genera and 25 families are recognized. As per the latest information provided by Sharma & Sharma (2021) the Indian Rotifer diversity represents 434 species belonging to 25 families and 68 genera.

In the present study 49 species of rotifers belonging to 13 families were recorded. Of the 13 families, Brachionidae was the most represented with 17 species (4 genera), followed by Lecanidae with nine species (1 genera), Philodinidae with four species (3 genera), Notomatidae with three species (2 genera). Asplanchnidae, Mytilinidae, Trocosphaeridae, Fillinidae and Euchlanidae were represented by two species each (1 genus each). Families Lepadellidae and Conochilidae were represented by one species each (Tab. 2). According to Sharma, 1987, of the seven genera of Brachionidae five genera i.e., *Brachionus, Keratella, Platyias, Anuraeopsis* and *Notholca* are found in India and they form a significant fraction of Rotifer. *Brachionus* was the prominent genus represented by 13 species i.e., *Brachionus angularis* Gosse, 1851., *Brachionus calyciflorus* Pallas, 1766, *Brachionus falcatus* Zacharias,1898, *Brachionus calyciflorus f. doracus* (Gosse, 1851), *Brachionus calyciflorus f.amphiceros* (Gosse, 1851), *Brachionus quadridentatus* Hermann, 1783, *Brachionus quadridentatus cluniorbicularis* Hermann, 1783, *Brachionus quadridentatus brevispinous* Ehrenberg, 1832, *Brachionus caudatus* Barrois and Daday, 1894, *Brachionus caudatus personatus* Ahlstrom, 1940, *Brachionus kostei* Shiel, 1983., *Brachionus forficula* Wierzejski, 1891., *Brachionus patulus*(O.F. Muller, 1786). The genus *Brachionus* is the index of eutrophic waters (Sladecek, 1983) and its abundance is considered as a biological indicator for eutrophication (Nogueira, 2001) (Tab. 3). The species *B. calyciflorus* is considered to be a good indicator of eutrophication (Sampaio et al., 2002). Presence of *B. calyciflorus* in Attapur lake, Shameerpet lake, Pasumala Cheruvu, Alwal lake, Kutloor Pedda and Fox Sagar lakes suggests that these tanks have reached eutrophic stage (Tab. 3). This may be may be due to entry of sewage. The presence of the acidophilic eutrophic Brachionids like *Brachionus angularis, Brachionus calyciflorus, Brachionus forficula* are also reported. The polymorphic forms of *Brachionus*

ISSN: 2348-8344 (Online)
DOI: https://doi.org/10.26540/ijgsr.v12.i2.2025.323

calyciflorus such as the *Brachionus calyciflorus f.doracus* (Gosse, 1851) and *Brachionus calyciflorus f.amphiceros* (Gosse, 1851) were also recorded during the present study.

Brachionus was most diverse genera constituting thirteen species followed by *Lecane* 9 species. *Anuraeopsis. Keratella, Euchlanis, Lapadella, Cephalodella, Conochilus, Horaella, Trichosphaeria, Pleosoma, Beauchampella, Pomphlox* are having 1 species each. *Platyias, Mytilina, Trichocerca, Asplanchna, Filinia, Testudinella* contributed two species each (Tab. 2). *Hexarthra mira*, a eutrophic species, having higher trophic status. The other species *Monostyla bulla, Asplanchna priodonta, Pompholyx sulcata, L. luna, Platiyas quardicornis, P. patulus* and *Euchlanis dilatata* also appeared in freshwater habitats only. However, species like, *Testudinella patina, Keratella tropica* occurred in freshwater bodies having higher trophic status. Most of *Brachionus* species occurred at comparatively higher trophic status as well as at higher salinity. Species like *Filinia longiseta, Mytilina ventralis, Mytilina ventralis longidactylia. Euchlanis dilatata, Testudinella patina, Hexarthra mira* are saline species.

Conclusion:

Increased anthropogenic activities, siltation, sewage contamination, and high nutrients problems due to the indiscriminate use of fertilizers in the agricultural catchment area is the major cause for the eutrophication. The study indicates that these water bodies have already reached the eutrophication stage. Most of the above water bodies attract variety of birds and considered as stopover sites for migratory birds. If the water bodies have to be preserved for their intended use, protect its biota; a sustainable and holistic management planning is necessary for conservation of these tanks.

Acknowledgements:

The authors are thankful to the Director, Zoological Survey of India, Kolkata and also to all the members of the survey team.

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