

AN ECOLOGICAL STUDY ON DIVERSITY AND DISTRIBUTION OF ROTIFERS IN RAJSAMAND LAKE

Prem Singh¹, Deepali Lal² and *Pankaj Nath Yogi¹

¹S.P.C Government College, Bhim, Rajasthan

²S.D. Government College, Beawar, Rajasthan

*Author for Correspondence: yogipankaj418@gmail.com

ABSTRACT

This study examines the diversity of rotifers in Rajsamand Lake, a significant freshwater ecosystem in Rajasthan, India. Field surveys conducted across various sites (5) in the lake during different seasons for 2 years aimed to identify rotifer species and assess their abundance and ecological roles. The group of rotifers known as the Monogononta was sampled, and it yielded members of two orders (Pliomida and Flosculariacea). There were a total of 17 different Rotifer species found in this research, spread throughout 4 different families and 5 different genera. In the summer, Rotifera were most numerous at site V, whereas in the winter and spring, they were most numerous at site I. There were 13 species (2 genera) of Brachionidae, 2 species (1 genus) of Filiniidae, 1 species (1 genus) of Lecanidae, and 1 species (1 genus) of Testudinellidae. Ten species belonged to the genus Brachionus, three to the genus Keratella, two to the genus Filiinia, one to the genus Lacana, and so on. The genera Brachionus, Keratella, Filiinia, Lacana, and Testudinella are home to the majority of these 17 species.

Keywords: Rotifers, Diversity, Rajsamand lake, Pliomida, Flosculariacea

INTRODUCTION

Water is essential to the survival of every kind of life on Earth. The lentic and lotic ecosystems are not the same. It's safe to say that life on Earth depends on water. The development of life on Earth and the emergence of human civilisation would not have been feasible without water. Since the beginning of civilisation, people have had a strong bond with bodies of water (Salve and Hiware, 2010). Biodiversity is a priceless treasure that nature has bestowed to protect the planet and humanity. It is a diversity of life that comprises different genera, species, communities, and ecosystems together with their relative abundance, according to Gaston (1996) and Malik et al. (2012). The freshwater ecosystem is made up of primary consumers like zooplankton and phytophagous fish, secondary and tertiary consumers like fish and other animals, and primary producers like phytoplankton, algae, and hydrophytes. One of the most significant members of the zooplankton population in freshwater environments are rotifers. Dadhich & Saxena (1999) assert that zooplankton are bioindicators and play a crucial function. It is a useful instrument for determining the level of water pollution (Ahmad 1996; Contreras et al. 2009). According to Sharma et al. (2000), rotifers are small, sensitive creatures that play a crucial role in the aquatic food chain. These are among the greatest bioindicators of water quality because they are resilient enough to withstand harsh climatic conditions (Sharma & Srivastava, 2016). It is typically noted that rotifers are more prevalent in reservoir waters that are eutrophicated. Additionally, compared to stagnant water, such as that found in reservoirs, the variety of zooplankton is always lower in flowing freshwater (Arak & Mokashe, 2014). Because of its distinct freshwater environment, variety of habitats, and notable seasonal fluctuations in water quality, the Rajsamand Lake is a great place to study zooplankton. The lake's exposure to man-made stresses including urbanisation and agricultural runoff offers an appropriate setting for researching how human activity affects aquatic life. By studying zooplankton in Rajsamand, we can learn a great deal about how environmental stressors impact these creatures and advance our knowledge of ecological dynamics in general. Establishing baseline data, guiding conservation initiatives, and efficiently managing the lake's resources all depend on this research.

MATERIALS AND METHODS

Study area: The Rajsamand Lake, also known as Rajsamundra Lake, is a lake in the Rajsamand district of the Rajasthan that is situated 67 km from Udaipur. It measures around 4 miles (6.4 km) in length, 1.75 miles (2.82 km) in width, and 60 feet (18 m) in depth. The Gomti River was built across a catchment area of around 196 square miles (510 km²). The Sewantri, Kelwa, and Tali rivers are its sources.

Sampling: From October 2019 to September 2021, rotifer samples were collected once a week in the morning, approximately between 6 and 9 a.m., at five separate locations using conical plankton net. A net tow was used to collect water samples from the lake's surface, which was then put in collection bags. After being collected, the samples were brought to the laboratory and placed in a 100 ml Tarson container after being filtered through plankton net. After filtering, the rotifers are kept in a cool, dark place in Lugol's solution.

Qualitative estimation: To identify zooplankton, a drop of preserved material was placed in a Sedgwick-Rafter counting chamber and viewed under a light microscope at the appropriate magnification (X 10 first, then X 40). Then, Edmondson (1959), Battish (1992), Sharma (1998), and Sharma and Sharma (2008) used the conventional literature to identify rotifers.

RESULTS

The group of rotifers known as the Monogononta was sampled, and it yielded members of two orders (Pliomida and Flosculariacea). There were a total of 17 different Rotifer species found in this research, spread throughout 4 different families and 5 different genera. In the summer, Rotifera were most numerous at site V, whereas in the winter and spring, they were most numerous at site I. There were 13 species (2 genera) of Brachionidae, 2 species (1 genus) of Filinidae, 1 species (1 genus) of Lecanidae, and 1 species (1 genus) of Testudinillidae (Table 1). Ten species belonged to the genus Brachionus, three to the genus Keratella, two to the genus Filiinia, one to the genus Lacana, and so on. The genera Brachionus, Keratella, Filinia, Lacana, and Testudinella are home to the majority of these 17 species. The following are the known taxonomic characteristics of Rotifera:

3.2.1. *Brachionus plicatilis*

The lorica is smooth and pliable; its shape is vaguely oval; its dorsal and ventral plates are not sharply separated; its greatest width is located roughly two-thirds of the way along the lorica from its anterior end; the lorica tapers slightly from the front to the back; the anterodorsal and pectoral margins are nearly the same length; the lorica's pectoral margin is firm and is divided into four lobes with considerable variations; This is a frequent staple in the diets of aquarium fish kept only for aesthetic purposes. Its geographic range is large, suggesting it might be used as a 'live feed' supplement in fish farms.

3.2.2 *Brachionus angularis*

Usually two median spines flank a V-shaped notch on the anterodorsal margin; lateral and intermediate spines are usually obliterated, but intermediate spines may be present in some; lorica is firm, lightly or heavily stippled, and divided into dorsal and ventral plates; dorsal plate has pattern of cuticular ridges, moderately compressed dorsoventrally; lorica is divided into dorsal and ventral plates the ventral edge is firm and somewhat raised, with a little notch in the middle; relatively broad and irregular foot opening; An increased size of the opening for the foot on the ventral plate, with cuticular projections on each side; no posterior spines; no hind feet or toes.

3.2.3. *Brachionus calyciflorus*

Polymorphism is common in this species. Body slightly compressed dorso-ventrally, anterior dorsal margin with four broad-based spines of variable length, medians longer than laterals; ventral margin flexible, usually somewhat elevated, with shallow 'v'- or 'u'-shaped notch, unflanked; posterior spines present or absent; lorica oval to sub-circular, without plaques, not split into dorsal and ventral plates.

3.2.4. *Brachionus caudatus*

Anterior dorsal margin of lorica is with four occipital spines, the lateral slightly longer than the median, the intermediate spine is long and curved. Median spines are smaller than lateral spines. Lorica firm, stippled, with a pattern of cuticular ridges, divided into dorsal and ventral plates, somewhat compressed dorsoventrally; anterodorsal margin with 2 median spines separated by V- or V-shaped notch; laterals Mostly longer than medians; intermediate spines reduced. Poster lateral spines well developed; foot opening between bases of posterior spines and overhung

by a triangular or rounded extension of dorsal plate. The body is slightly oval in shape.

3.2.5. *Brachionus forficula*

Lorica firm, stippled, divided into dorsal and ventral plates, moderately compressed dorsoventrally; occipital margin with four spines; laterals always longer than medians; all occipital spines rounded at tips, rarely pointed.

3.2.6. *Brachionus quadridentatus*

Lorica is firm, moderately compressed dorsoventrally, and divided into dorsal and ventral plates; occipital margin with six spines; medians longest, curved outwards, and when extra long bent downwards over the head; laterals longer than intermediates; ventral margin rigid, wavy, elevated, with median notch flanked on either side by a small tooth like papilla; poster lateral spines usually present but their length varies; ventroposterior portion of lorica prolonged in form of tubular foot- sheath around base of retractile foot; sheath on dorsal side with well-defined subsquare piece.

3.2.7. *Brachionus rubens*

Lorica firm, oval, smooth, compressed dorsoventrally and composed of dorsal and ventral plates; anterior dorsal margin with six spines; medians longest, intermediates somewhat longer than laterals; medians and intermediates with peculiar asymmetric shape, each spine with a narrow anterior part, then rounding outwards and forming broad base; all these spines provided with strengthening ridges; ventral margin serrated and markedly elevated towards the centre with a central notch; posterior spines absent; foot opening sub square and small.

3.2.8. *Brachionus diversicornis*

Lorica is elongate with four occipital spines, of which the lateral spines much longer than medians. Right posterior spine is longer than the left. Foot long and toes with characteristic claws.

3.2.9. *Brachionus falcatus*

Lorica firm, lightly stippled, greatly compressed dorso-ventrally and composed of dorsal and ventral plates; antero-dorsal margin with six spines; intermediate spines considerably larger than laterals and medians and curved ventrally; medians and laterals are short and almost equal in length; foot opening terminal; median spines mostly equal to laterals but sometimes smaller. Posterior spines widely separated, long, their width much more than anterior spines, converge, then twist towards their apices, bent inwards ; pectoral margin firm.

3.2.10. *Keratella cochlearis*

Body transparent and vase shaped. Lorica with strong median spine. Corona circular, lateral antenna fused proximally. Trophi asymmetric. Foot slender and wrinkled in contracted forms and is present with toes.

3.2.11. *Brachionus bidentata*

Lorica firm with dorsal, ventral and basal plates. The dorsal and ventral plates soldered together for three-fifths length of lorica, where they diverge and are united to a third plate, the basal plate; dorsal margin with six spines; lateral always longer than medians, medians longer than intermediates; ventral margin flexible, elevated in the middle; posterior spines vary in length and position of origin but may be absent; foot opening with foot-sheath.

3.2.12. *Filinia terminalis*

Lorica thin, flexible and barrel shaped when contracted. Two anterolateral spines equal in length; with one terminal posterior spine

3.2.13. *Lacana papuana*

Lorica sub – circular, anterior dorsal margin strait and ventral with ‘V’ shaped sinus. Toes two slender, parallel and sided ending in claws with basal spicule. (Plate.3: Fig.13).

3.2.14. *Keratella tropica*

Anterodorsal margin of lorica has six spines. Median spines are curved and longest. Intermediate spines are shortest. Posterior end has two unequal spines. The right posterior spine is longer than left posterior spine. Three hexagonal plaques are present on dorsal plate of lorica. A small four sided plaque is present between the posterior border of lorica and the last hexagonal plaque.

3.2.15. *Testudinella mucronata*

Lorica nearly circular, thin, dorso- ventrally flattened, foot opening ventral and at one – third distance from the posterior end, round or shield like amour.

3.2.16. Keratella quadrata

Anterior margin of lorica with six spines, medians longest and curved ventrally, laterals shortest. Posterior spines are almost equal. Dorsal plate of lorica with three median plaques and one pentagon terminates in to a short median line. The body is segmented into polygonal shapes.

3.1.17. Filinia longiseta

Body oval and transparent with very long anterior skipping spines. Spine base not bulged, foot absent. Lorica with two equal anterior spines and posterior spine on ventral side. Under the genus *Filinia* two species were identified and recorded in the present study.

Table 1: Month-wise population density of Rotifers (Org. /L) at Site – I in the Rajsamand Lake, (October 2019 - September 2021).

S. No	Rotifer species	2019		2020												2021												Range	Mean ±SD	Total
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S					
1	<i>B. angularis</i>	-	-	-	-	2	9	11	14	9	8	4	9	-	-	-	10	9	11	14	9	50	65	70	-	2-70	18± 22	304		
2	<i>B. forficula</i>	4	37	18	14	-	-	-	-	-	12	9	8	40	37	18	14	52	40	25	65	75	12	10	8	4-75	26±21	498		
3	<i>B. diversicornis</i>	12	15	22	28	25	32	35	5	4	2	2	5	12	15	22	34	30	45	70	65	40	25	40	22	2-70	25±18	607		
4	<i>B. plicatilis</i>	15	14	13	16	18	22	32	3	-	-	-	-	15	14	13	16	18	22	32	30	15	16	8	5	3-32	17±8	337		
5	<i>B. calyciflorus</i>	12	45	55	47	65	79	125	78	57	24	33	35	60	45	75	85	90	120	140	200	180	115	85	40	12- 200	79±48	1890		
6	<i>B. quadridentatus</i>	18	12	5	13	-	-	-	-	12	2	13	15	18	12	10	13	5	4	4	6	12	10	13	15	2-18	11±5	212		
7	<i>B. bidentata</i>	3	6	4	9	11	9	5	25	12	6	6	-	30	60	40	60	90	85	8	-	-	-	-	-	3-90	26±29	469		
8	<i>B. caudatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	15	13	8	3	6	7	5	3	-	-	-	-	3-15	8±5	60		
9	<i>B. rubens</i>	2	15	-	-	-	22	2	6	6	4	2	25	32	40	50	60	65	70	13	15	8	20	12	2-70	23±22	469			
10	<i>B. falcatus</i>	15	12	2	-	-	12	9	2	8	-	-	32	22	15	12	13	30	40	32	22	15	-	-	-	2-40	17±10	293		
11	<i>K. tropica</i>	8	4	35	3	45	9	75	65	5	11	9	2	80	40	75	70	90	100	140	95	85	70	40	30	2-140	49±39	1186		
12	<i>K. quadrata</i>	4	35	25	45	4	9	13	2	6	4	2	2	50	75	50	75	70	80	95	85	65	40	20	20	2-95	37±31	876		
13	<i>K. cochlearis</i>	25	13	9	12	8	14	14	23	-	-	-	-	25	13	9	12	8	14	14	23	15	8	12	9	8-25	14±6	280		
14	<i>F. longiseta</i>	-	-	-	-	-	-	-	-	-	-	-	-	4	2	5	3	-	-	-	-	-	-	-	2	5	2-5	4±1..3	21	
15	<i>F. terminalis</i>	2	15	12	9	-	-	-	-	-	-	6	9	20	15	12	9	-	-	-	-	12	8	35	28	2-35	14±9	192		
16	<i>Lacana papuana</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
17	<i>Testidunella mucronata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Table 2: Month-wise population density of Rotifers (Org./L) at Site – II in the Rajsamand Lake, (October 2019- September 2021).

S. No	Rotifer species	2019			2020												2021												Range	Mean \pm SD	Total
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S						
1	<i>B. angularis</i>	-	-	-	2	9	11	14	9	50	65	70	-	43	35	28	19	16	11	14	9	50	65	70	85	2-85	3.8 \pm 26	675			
2	<i>B. forficula</i>	4	37	18	14	-	-	-	-	-	12	10	8	40	37	18	14	75	50	135	120	70	80	75	80	4-135	47.2 \pm 39	897			
3	<i>B. diversicornis</i>	12	15	22	34	4	2	28	85	70	60	40	22	12	15	22	34	40	51	80	85	70	60	40	22	2-85	38.5 \pm 25	974			
4	<i>B. plicatilis</i>	15	14	13	16	18	22	32	30	-	-	-	-	15	14	13	16	18	22	32	30	-	-	-	-	15-32	20 \pm 7	320			
5	<i>B. calyciflorus</i>	22	45	55	7	65	9	11	80	70	40	30	35	90	80	100	120	130	70	200	80	70	40	30	35	7-200	63 \pm 44.4	1514			
6	<i>B. quadridentatus</i>	18	12	9	-	-	-	-	-	12	10	13	15	18	12	10	13	12	90	20	40	12	10	13	15	9-90	18.6 \pm 18	354			
7	<i>B. bidentata</i>	3	6	5	45	6	12	-	-	-	-	-	-	30	60	40	60	90	100	60	95	70	40	50	20	3-100	41.9 \pm 32	792			
8	<i>B. caudatus</i>	15	13	8	3	6	7	5	3	-	-	-	-	15	15	22	26	9	18	5	3	-	-	-	-	2-26	10.8 \pm 7	173			
9	<i>B. rubens</i>	2	32	-	-	-	-	-	-	65	55	20	2	120	100	-	-	-	-	50	20	40	80	20	10	2-120	44 \pm 36.5	616			
10	<i>B. falcatus</i>	32	22	12	13	3	4	32	22	15	-	-	-	32	22	35	42	55	60	40	32	22	15	-	-	3-60	26.3 \pm 15	510			
11	<i>K. tropica</i>	8	4	15	7	9	3	14	65	50	11	9	10	60	45	75	55	65	70	100	75	50	10	25	55	5-100	37 \pm 29	890			
12	<i>K. quadrata</i>	5	75	5	35	11	9	65	45	20	35	20	20	50	75	50	75	95	85	120	40	30	60	20	20	8-32	44 \pm 31	1065			
13	<i>K. cochlearis</i>	25	13	9	12	8	14	14	23	-	-	-	-	25	13	9	25	32	12	10	9	-	-	-	-	8-32	15.8 \pm 7.5	253			
14	<i>F. longiseta</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	21	14	16	13	8	9	5	5-21	9.6 \pm 6.2	102				
15	<i>F. terminalis</i>	2	15	12	9	-	-	-	-	12	8	35	28	20	15	12	9	15	-	-	-	12	8	35	28	2-35	16 \pm 10	154			
16	<i>Lacana papuana</i>	-	-	-	-	-	-	-	-	-	-	-	-	8	4	6	3	2	-	-	-	-	-	-	-	2-8	4.6 \pm 2.4	23			
17	<i>Testidumella mucronata</i>	--	-	-	-	-	-	-	-	-	-	-	-	5	8	4	3	1	-	-	-	-	-	-	-	1-8	4.2 \pm 2.5	21			

Table 3: Month-wise population density of Rotifers (Org./L) at Site – III in the Rajsamand Lake (October 2010 - September 2012).

S. No	Rotifer species	2019			2020												2021												Range	Mean \pm SD	Total
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S						
1	<i>B. angularis</i>	40	35	28	19	16	11	14	59	50	65	70	85	45	35	28	19	16	11	14	59	60	65	70	85	11-85	37 \pm 25	999			
2	<i>B. forficula</i>	-	-	-	-	-	12	9	8	7	5	4	3	-	-	10	20	46	90	185	120	70	80	75	80	3-185	48 \pm 51	824			
3	<i>B. diversicornis</i>	12	15	22	34	4	51	8	85	70	60	40	22	12	15	22	34	40	51	110	80	90	60	40	22	4-110	42 \pm 29	999			
4	<i>B. plicatilis</i>	15	14	13	16	18	22	32	30	-	-	-	-	15	14	13	26	28	35	45	20	-	-	-	-	13-45	21 \pm 10	356			
5	<i>B. calyciflorus</i>	12	25	4	9	5	8	11	40	30	20	10	5	60	55	65	60	90	80	150	100	70	90	50	30	4-150	44.9 \pm 38	1079			
6	<i>B. quadridentatus</i>	18	12	3	13	12	9	2	40	30	20	10	5	18	12	10	13	75	110	90	40	12	10	13	15	2-110	24 \pm 28	592			
7	<i>B. bidentata</i>	3	6	4	6	9	11	12	65	70	40	50	20	30	60	40	60	90	105	150	105	70	40	50	40	3-150	47.7 \pm 42	1136			
8	<i>B. caudatus</i>	15	13	8	3	6	7	5	3	-	-	-	-	25	45	18	12	16	7	5	3	-	-	-	-	3-45	12 \pm 10	191			
9	<i>B. rubens</i>	12	3	-	-	-	22	-	-	15	0	80	20	10	120	100	-	-	-	-	-	15	8	2	5	2-150	44.5 \pm 100	547			
10	<i>B. falcatus</i>	32	22	15	12	13	3	4	32	22	15	-	-	32	22	15	12	23	35	15	45	15	-	-	-	3-45	20 \pm 10.6	384			
11	<i>K. tropica</i>	6	7	75	5	8	9	11	125	70	50	40	50	60	72	55	60	75	80	140	100	80	60	100	90	5-140	59.5 \pm 38	1428			
12	<i>K. quadrata</i>	15	75	60	75	45	29	13	100	60	40	20	20	20	15	9	12	20	35	50	45	20	15	5	8	5-100	33.6 \pm 25	806			
13	<i>K. cochlearis</i>	25	13	9	12	8	14	14	23	-	-	-	-	25	13	9	22	18	20	15	10	-	-	-	-	9-25	15.6 \pm 5.8	250			
14	<i>F. longiseta</i>	-	-	-	-	-	14	16	13	8	9	5	8	10	6	12	16	21	14	16	13	8	9	5	5	5-21	12 \pm 4.8	203			
15	<i>F. terminalis</i>	2	15	12	9	-	-	-	-	12	8	35	28	20	15	12	9	5	4	3	2	12	8	35	28	2-35	13.7 \pm 10	274			
16	<i>Lacana papuana</i>	-	-	-	-	-	-	-	-	-	-	-	-	4	2	5	3	5	4	4	3	12	8	2	5	2-12	4.7 \pm 3	57			
17	<i>Testidumella mucronata</i>	-	-	-	-	-	-	-	-	-	-	-	-	7	9	4	8	10	15	12	6	8	9	4	5	4-15	8 \pm 3.2	97			

Table 4: Month-wise population density of Rotifers (Org./L) at Site – IV in the Rajsamand Lake, (October 2019 - September 2021).

Sl No	Rotifer species	2019			2020												2021												Range	Mean ±SD	Total
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S						
1	<i>B. angularis</i>	25	35	68	12	18	6	45	36	50	65	35	20	53	45	30	15	16	11	14	9	60	75	60	40	6-75	35±21	843			
2	<i>B. forficula</i>	4	37	18	14	75	9	125	60	70	80	25	15	40	37	18	14	75	85	90	210	70	80	75	80	4-210	58.5±45	1406			
3	<i>B. diversicornis</i>	12	15	22	45	65	12	65	60	45	60	12	15	12	15	22	34	40	51	110	90	70	60	40	22	12-110	41±27.5	994			
4	<i>B. plicatilis</i>	15	14	13	16	9	15	62	60	45	60	12	5	15	14	13	16	18	22	35	30	28	25	14	10	5-62	21±11	566			
5	<i>B. calyciflorus</i>	9	8	15	12	27	20	12	80	40	10	8	4	110	80	100	140	125	150	200	80	70	40	30	35	4-200	58±55	1405			
6	<i>B. quadridentatus</i>	18	12	2	25	8	12	2	40	12	6	2	1	8	12	10	13	12	90	20	40	12	10	13	15	1-90	16±19	395			
7	<i>B. bidentata</i>	3	6	4	6	9	11	12	70	45	20	15	5	30	60	40	55	65	80	110	65	70	40	50	20	3-110	37±30	391			
8	<i>B. caudatus</i>	15	13	8	3	6	7	5	3	-	-	-	-	15	13	8	3	6	7	5	3	5	8	14	15	3-15	8±4	162			
9	<i>B. rubens</i>	12	5	-	-	-	-	-	5	40	60	10	20	25	30	90	100	90	120	65	90	112	80	30	5-120	54±39	984				
10	<i>B. falcatus</i>	32	22	15	12	13	4	32	22	15	-	12	20	15	12	13	30	50	20	12	7	-	-	-	3-50	18±11	361				
11	<i>K. tropica</i>	55	122	125	40	25	24	12	80	60	40	20	15	40	90	50	150	105	125	200	100	75	75	65	70	12-200	73±47	1763			
12	<i>K. quadrata</i>	5	45	5	25	8	13	6	25	60	40	20	20	50	60	70	65	80	90	130	100	60	40	20	20	5-130	44±33	1057			
13	<i>K. cochlearis</i>	25	13	9	12	8	14	14	23	-	-	-	25	13	9	12	8	14	14	23	12	8	6	4	4-25	13±6	266				
14	<i>F. longiseta</i>	-	-	-	-	16	21	14	16	13	8	9	5	3	9	12	9	20	21	14	16	13	8	9	5	3-21	12±5	241			
15	<i>F. terminalis</i>	2	-	12	9	-	-	-	12	8	35	28	20	15	12	9	8	9	12	10	12	8	35	28	2-35	15±10	284				
16	<i>Lacana papuana</i>	-	-	-	-	-	-	-	-	-	-	-	-	8	4	6	3	-	-	-	-	5	3	2	5	2-8	5±2	36			
17	<i>Testidunella mucronata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	8	14	16	12	10	-	2	22	2-22	12±6	99			

Table 5: Month-wise population density of Rotifers (Org./L) at Site – V in the Rajsamand Lake, (October 2010 - September 2012).

Sl No	Rotifer species	2010			2011												2012												Range	Mean ±SD	Total
		O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S						
1	<i>B. angularis</i>	25	35	28	19	16	11	14	90	50	65	70	85	43	35	28	35	46	15	25	19	50	65	70	85	11-90	42±25	704			
2	<i>B. forficula</i>	-	-	-	-	35	70	35	30	20	15	40	40	37	18	14	14	75	100	65	120	70	80	75	80	14-120	53.6±31	1019			
3	<i>B. diversicornis</i>	12	15	22	34	40	51	80	85	40	60	40	22	12	15	22	75	85	51	80	85	70	60	40	22	12-85	46.7±26	1118			
4	<i>B. plicatilis</i>	19	14	13	16	18	22	32	30	-	-	-	-	15	14	13	16	18	22	32	30	-	-	-	-	13-30	20.3±7	324			
5	<i>B. calyciflorus</i>	40	36	55	60	70	95	100	130	35	50	25	20	120	150	200	220	330	250	150	80	70	40	30	35	20-330	99.6±81	2391			
6	<i>B. quadridentatus</i>	18	12	10	13	12	19	20	40	12	10	13	15	18	12	10	13	12	45	30	65	12	10	13	15	10-65	18.9±13	454			
7	<i>B. bidentata</i>	3	6	4	5	16	95	48	65	45	40	50	20	30	60	40	60	75	80	60	55	70	40	50	20	3-80	45±24.6	1037			
8	<i>B. caudatus</i>	15	13	8	3	6	7	5	8	-	-	-	-	15	12	9	8	15	7	5	3	-	-	-	-	3-15	8.6±4	139			
9	<i>B. rubens</i>	10	3	-	-	-	8	15	30	80	20	10	65	45	50	80	105	90	80	85	70	80	20	10	3-105	46.3±33	926				
10	<i>B. falcatus</i>	15	12	25	9	8	12	14	65	22	15	-	-	32	22	15	12	13	30	50	20	12	7	-	7-50	21±13	410				
11	<i>K. tropica</i>	17	26	33	46	75	80	75	90	40	30	50	45	90	120	125	100	150	100	45	65	80	110	100	90	17-150	74±34.9	1782			
12	<i>K. quadrata</i>	2	15	9	12	2	35	5	45	20	15	5	8	50	75	50	75	80	65	75	100	60	40	20	20	2-100	37±30	883			
13	<i>K. cochlearis</i>	25	13	9	12	8	14	14	23	-	-	-	-	25	13	9	12	8	14	14	23	12	8	9	5	5-25	13±6	270			
14	<i>F. longiseta</i>	-	-	-	-	16	21	14	16	13	8	9	5	3	9	12	9	20	21	14	16	13	8	9	5	3-21	10.6±6	241			
15	<i>F. terminali</i>	2	15	12	9	4	6	9	10	12	8	35	28	12	10	12	8	35	28	11	9	12	6	4	3	2-35	12.5±9	300			
16	<i>Lacana papuana</i>	-	-	-	-	-	-	-	-	-	-	-	-	9	12	8	6	5	15	8	12	10	9	4	9	4-12	8.9±3	107			
17	<i>Testidunella mucronata</i>	-	-	-	-	-	-	-	-	-	-	-	-	8	19	35	48	20	25	22	16	18	19	14	15	8-48	22±9.8	268			

3.2.18. Species diversity of Rotifera.

Tables 1–5 show the species richness of Rotifers over Sites I – V. The rotifers found at Site I included 15 different species: *Brachionus angularis* (304), *Brachionus forficula* (498), *Brachionus diversicornis* (607), *Brachionus plicatilis* (337), *Brachionus calyciflorus* (1890), *Brachionus quadridentatus* (212), *Brachionus bidentata* (469), *Brachionus caudatus* (60), *Brachionus rubens* (192). Among the rotifers found at Site-I, *B. calyciflorus* and *K. tropica* played a disproportionate role. The absence of *Lacana papuana* and *Testidunella mucronata* at Site I over the duration of the research is an intriguing finding. Figures 1– 4 depict monthly fluctuations in the diversity of Rotifera species from families Brachionidae, Filinidae, Lecanidae, and Testudinillidae at locations S–I to S–V.

At the Site II, total of 17 rotifer species were identified, comprising of *Brachionus angularis* (675), *B. forficula* (897), *B. diversicornis* (974), *B. plicatilis* (320), *B. calyciflorus* (1514), *B. quadridentatus* (354), *B. bidentata* (792), *B. caudatus* (173), *B. rubens* (616), *B. falcatus* (510), *K. tropica* (890), *K. quadrata* (1065), *K. cochlearis* (253), *Filinia longiseta* (102), *Filinia terminalis* (154), *Lacana papuana* (23) and *Testidunella mucronata* (21). *B. calyciflorus* and *K. quadrata* were the major contributors towards Rotifer density of Site-II.

At the Site III, total of 17 Rotifer species were identified, comprising of *Brachionus angularis* (999), *B. forficula* (824), *B. diversicornis* (999), *B. plicatilis* (356), *B. calyciflorus* (1079), *B. quadridentatus* (592), *B. bidentata* (1136), *B. caudatus* (191), *B. rubens* (547), *B. falcatus* (384), *Keratella tropica* (1428), *Keratella quadrata* (806), *Keratella cochlearis* (250), *Filinia longiseta* (203), *Filinia terminalis* (274), *Lacana papuana* (57) and *Testidunella mucronata* (97). *Keratella tropica* and *B. bidentata* and *B. calyciflorus* were the major contributors towards Rotifer diversity of site - III. It is interesting to note that some species including *Lacana papuana* and *Testidunella mucronata* were noticed only during the second year and were completely absent during the first year at Site II & III.

At the Site IV, total of 17 rotifer species were identified, comprising of *Brachionus angularis* (843), *B. forficula* (1406), *B. diversicornis* (994), *B. plicatilis* (566), *B. calyciflorus* (1405), *B. quadridentatus* (395), *B. bidentata* (391), *B. caudatus* (162), *B. rubens* (984), *B. falcatus* (361), *Keratella tropica* (1782), *Keratella quadrata* (883), *Keratella cochlearis* (270), *Filinia longiseta* (241), *Filinia terminalis* (284), *Lacana papuana* (36) and *Testidunella mucronata* (99). *B. calyciflorus*, *B. forficula* and *K. quadrata* were the major contributors towards Rotifer density of Site - IV.

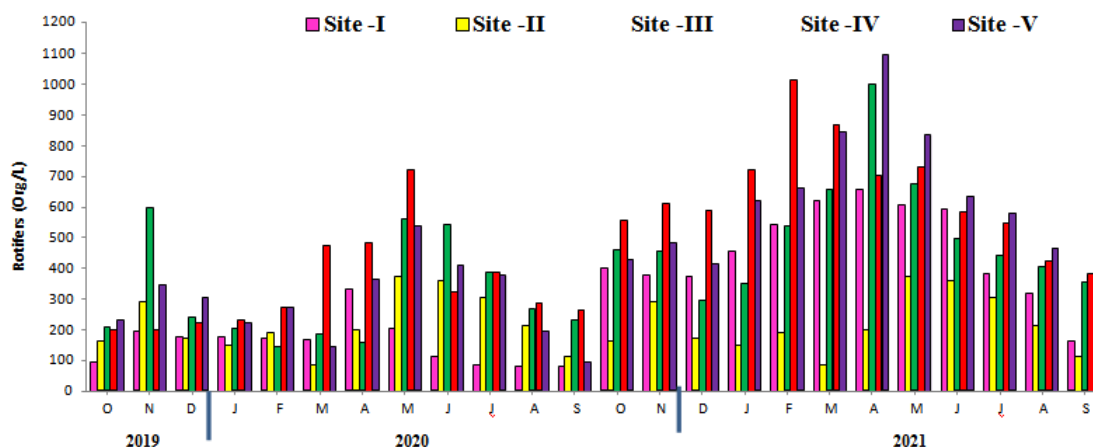


Figure 1: Monthly variations in Rotifera (Org/L) diversity of species belonging to Brachionidae (*Brachionus angularis*, *B. forficula*, *B. diversicornis*, *B. plicatilis*, *B. calyciflorus*, *B. quadridentatus*, *B. bidentata*, *B. caudatus*, *B. rubens*, *B. falcatus*, *Keratella tropica*, *Keratella quadrata*, *Keratella cochlearis*, *Filinia longiseta*, *Filinia terminalis*) in surface waters of Rajsamand Lake.

At the Site V, total of 17 rotifer species were also identified, comprising of *Brachionus angularis* (704), *B. forficula* (1019), *B. diversicornis* (1118), *B. plicatilis* (324), *B. calyciflorus* (2391), *B. quadridentatus* (454), *B. bidentata* (1037), *B. caudatus* (139), *B. rubens* (926), *B. falcatus* (410), *Keratella tropica* (1782), *Keratella quadrata* (883), *Keratella cochlearis* (270), *Filinia longiseta* (241), *Filinia terminalis* (300), *Lacana papuana* (107) and

Testidunella mucronata (268). *B. calyciflorus*, *Keratella tropica* and *B. forficula* and *B. diversicornis* were the major contributors towards Rotifer density of Site - V. It is interesting to note that some species including *Lacana papuana* and *Testidunella mucronata* were noticed only during the second year and were absent during the first year from Sites II – V. Percentage contribution of Rotifers (Org/L) in Rajsamand Lake ore (October 2019 – September 2021) are shown in Fig.5.

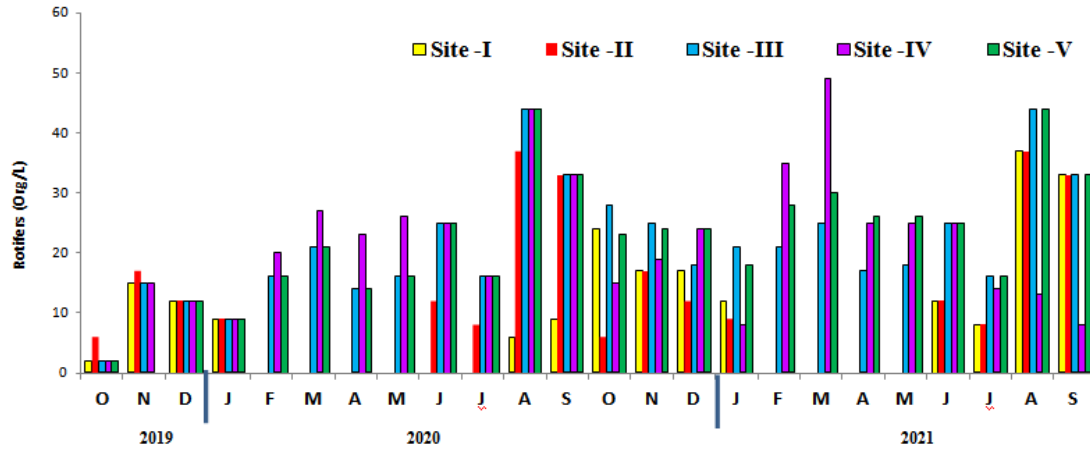


Figure 2: Monthly variations in Rotifera (Org/L) diversity of species belonging to Filinidae (*Filinia terminalis*, *F.longista*) in surface waters of Rajsamand Lake.

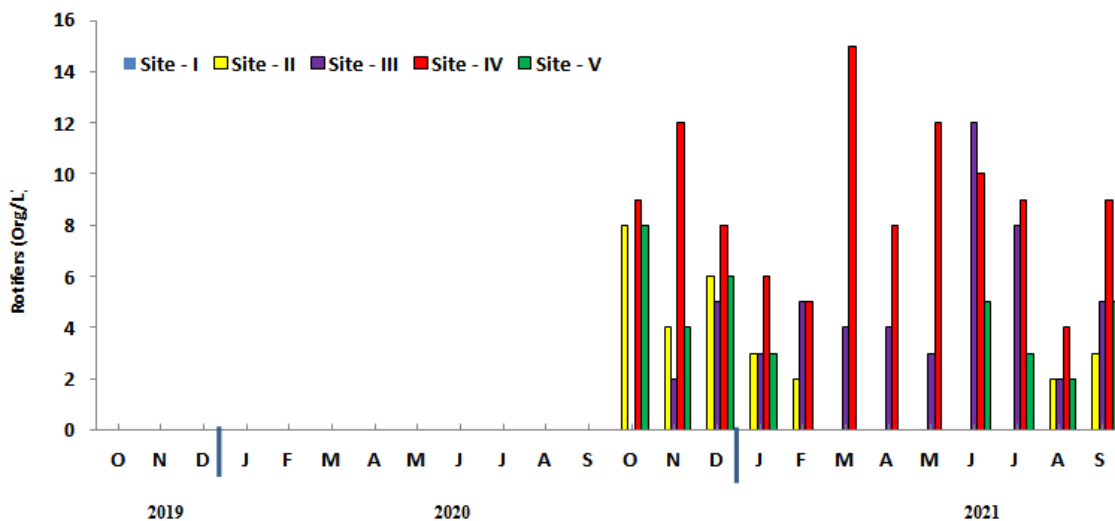


Figure 3: Monthly variations in Rotifera (Org/L) diversity of species belonging to Lacanidae (*Lacane papuana*) in surface waters of Rajsamand Lake.

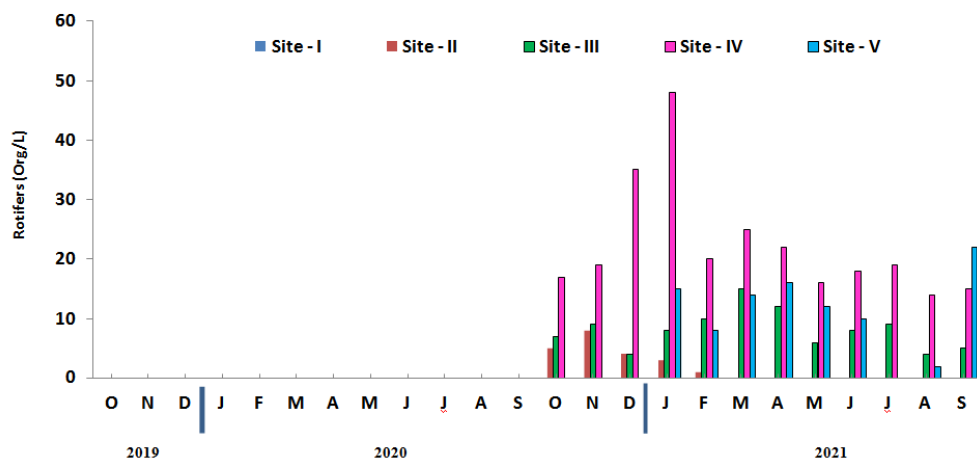


Figure 4: Monthly variations in Rotifera (Org/L) diversity of species belonging to Testudinillidae (*Lacana papuana*) in surface waters of Rajsamand Lake.

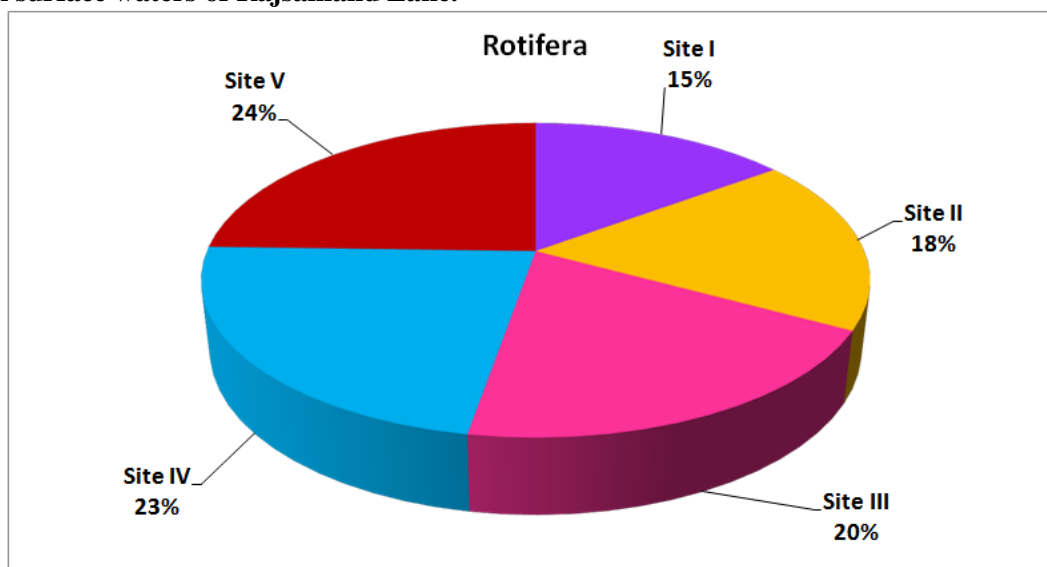


Figure 5: Percentage contribution of Rotifers (Org/L) in Rajsamand Lake

CONCLUSION

In this study, the distribution and diversity of rotifers in Rajsamand Lake, a crucial freshwater environment in Rajasthan, India, are thoroughly examined. Field observations over two years at five separate locations in different seasons identified a variety of rotifer species from four families and five genera. This variety emphasises the lake's ecological diversity and its significance as a vital habitat for these microbes. The results of this study not only improve our knowledge of Rajsamand Lake's rotifer ecology and diversity, but they also offer vital baseline information for further study. Effective conservation and management methods depend on an understanding of the behaviour and composition of these important biological groupings, as pollution, climate change, and habitat degradation pose growing challenges to freshwater ecosystems. In the end, our study emphasises how crucial it is to maintain the ecological integrity of freshwater settings like Rajsamand Lake in order to support their varied biological groups.

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