



Study On Zooplankton Diversity Of Tighra Reservoir District Gwalior, Madhya Pradesh

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Abstract: The present investigation deals with the study of Zooplankton diversity from Tighra reservoir dist. Gwalior. Study was carried out at four different sampling sites during Nov. 2021- to Oct.-2023. The planktonic forms were collected from the surface of the dam water with plankton net of 20 μ mesh size nylon cloth. The plankton samples were preserved for laboratory analysis. The collected samples were identified using standard references. During the present study total 30 species of zooplankton belonging to five groups i.e. Protozoa (3 species), Rotifera (12 species), Copepoda (5 species), Ostracoda (4 species) and Cladocera (6 species). Rotifer was more dominant group through the study period. Maximum density of zooplankton population was recorded in summer season while less in winter season. Diversity of zooplankton affected due to different environmental condition of water bodies.

Keywords: Zooplankton, Season, Diversity, Density, Tighra reservoir, micro-organism

I. INTRODUCTION

Plankton is one of the most favorable food items for many aquatic organisms; almost all the fishes at their larval stages depend on it and some of them exclusively feed on zooplankton. They invariably form an integral component for fresh water communities and contribute to biological productivity. The Zooplanktons are the heterotrophic component of the Planktonic group that drifts in the water body. The freshwater Zooplankton form an important group as most of them feed upon incorporate the primary producers in to their bodies and makes themselves available to higher organisms in food chain, Michale (1973). The Zooplankton plays an important role in indicating the presence and absence of certain species as they play key position in the food chain of reservoir (Donar and Reddy, 2012).

Zooplankton are the intermediate link between the primary producers and the higher trophic level as they are grazers on the phytoplankton and are main food base of the larvae of most carnivorous and omnivorous fishes as well as other aquatic vertebrates and invertebrates (Dutta *et al.*, 2017). Zooplankton are microscopic, free-floating organisms occurred in all natural water bodies. They are a major form of energy source between phytoplankton and other aquatic animals (Khandayat and Singh, 2019). Due to their huge density, shorter lifespan, drifting nature, high species diversity and different tolerance to the stress, they are being used as indicator organisms for the physical, chemical and biological processes in the aquatic ecosystem (Gadekar, 2020). Zooplanktons vary from site to site within the same location with similar ecological conditions (Boyd, 1982). The Zooplankton community fluctuates according to physicochemical parameters of the environment, especially Rotifer species change with biotic factors (Karuthapandi *et al.*, 2013). The study of zooplankton is necessary to evaluate the fresh water bodies in respect to their ecology and toxicology of zooplankton due to their important role in rapidly emerging concepts in environmental management (Rao *et al.*, 2017).

II. STUDY AREA:

Tighra Reservoir is present near Gwalior city in Tighra village on Saank river of Gwalior District, Madhya Pradesh, India (Fig. 1). Geographically, the Tighra reservoir lies on 78001'30" E to 77057'54" E longitude and 26011'42" N to 26014'08" N latitude. It is situated approximately 23 km west of Gwalior city at an altitude of 218.58 m from mean sea level. Samples were collected from four stations of reservoir i.e. Tighra Village (S-1), Mallipura (S-2), Shankhya River (S-3) and Nalkeshwar (S-4).

III. METHODOLOGY

IV. Zooplankton samples were collected seasonally with plankton net (Bolting silk mesh Size 25 μ from November 2021 to October 2022 between 8:00 to 10:00 am. 100 lit of surface water was sieved through the plankton net and transferred to plastic containers and preserved by using 0.5 ml of formalin, examined under microscope and Systematic identification was done by taking the help of Edmondson (1992), Battish (1992) and Dhanapati (2000) and several research publications. Zooplankton were counted using Lackey's drop method (Adoni *et al.*, 1985). The total number of zooplankton present in a litre of water sample calculated by using the following formula:

$$N = n \cdot v / V$$

Whereas,

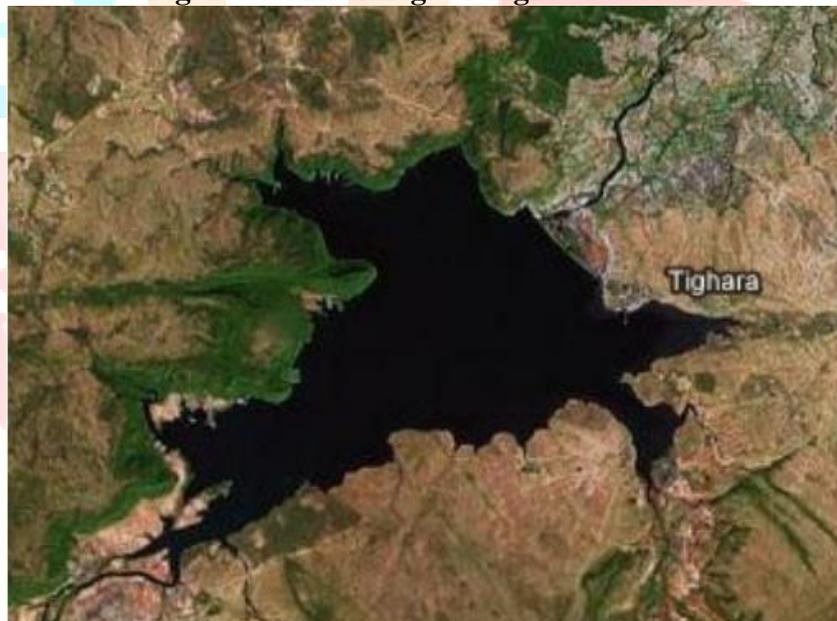
N= Total no. of organism/ lit of water filtered.

n= Number of organism counted in 1 ml of sample

V= volume of concentrate plankton sample (ml)

V= Volume of total water filtered through (L)

Fig. 1: Satellite image of Tighra reservoir



IV. RESULT AND DISCUSSION

The Zooplankton recorded in the present investigation has been summarized in table 1. There are diverse taxonomic groups of zooplankton representing Protozoa, Rotifera, Copepoda, Ostracoda and Cladocera were observed in Tighra Reservoir. During investigation, total 30 species of zooplankton with 13 families and 7 orders among them 3 species of protozoans belonging to 3 families with 1 order, Rotifers were represented by 12 species belonging to 4 families with 2 orders, 5 species belonging to 2 families with 2 orders of Copepoda, 4 species were with 1 family and 1 order of Ostracoda were enlisted, Besides these, 6 species of Cladocera were recorded with 4 families and 2 orders. Mourya *et al.*, 2024 reported 24 species of zooplankton in Ramoua Dam and notify that rotifer was more dominant group through the study period at Gwalior district Madhya Pradesh.

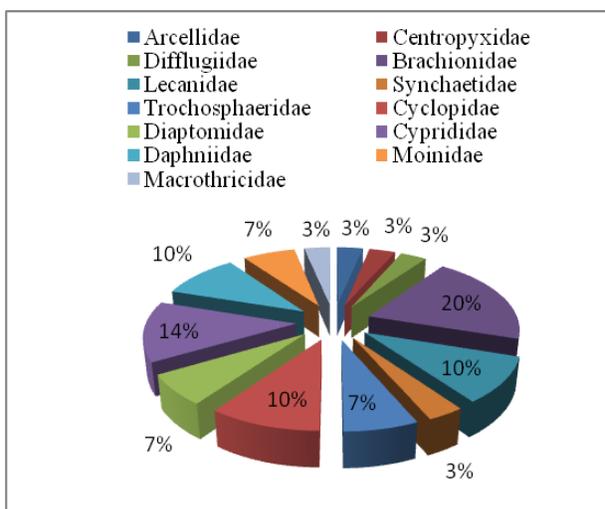
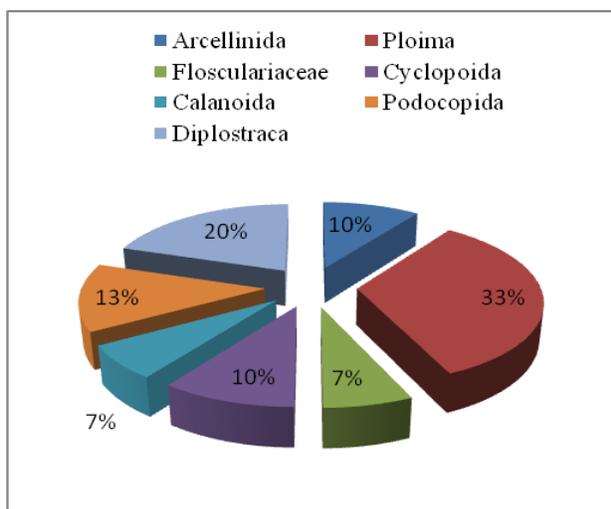
Rotifera constituted 34.62 % number of zooplanktons followed by Protozoa 26.52 %, Copepoda 14.79 %, Ostracoda 14.44 % and Cladocera 9.64 %. Sayasrao and Rambhau (2020) recorded total number of 15,058 zooplanktons in Sukhana dam, consisting of 23.83% of Rotifera; 28.52% of Cladocera; 44.48% of Copepoda

and 3.17% of Ostracoda. Ploima was the most dominant order recorded with 33% followed by Diplostraca 20%, Podocopida 13%, Arcellinida and Cyclopoida 10% each, Calanoida and Flosculariaceae 7% each respectively. The family Brachionidae was contributed (20%) by 6 species followed by Cyprididae (13.33%) by 4 species, Lecanidae, Cyclopidae and Daphniidae each (10%) by 3 species, Trochosphaeridae and Diaptomidae (6.66%) by 2 species while Arcellidae, Centropyxidae, Diffugiidae, Synchaetidae, and Macrothricidae each (3.33%) by 1 species (Fig. 2&3).

Table 1: Check list of Zooplankton species at Tighra reservoir

S. No.	Group	Order	Family	species
1	Protozoa	Arcellinida	Arcellidae	<i>Arcella discoides</i>
2			Centropyxidae	<i>Centropyxis ecornis</i>
3			Diffugiidae	<i>Diffugia lebes</i>
4	Rotifera	Ploima	Brachionidae	<i>Brachionus angularis</i>
5				<i>Brachionus budapestinensis</i>
6				<i>Brachionus calyciflorus</i>
7				<i>Brachionus caudatus</i>
8				<i>Brachionus diversicornis</i>
9				<i>Keratella tropica</i>
10			Lecanidae	<i>Lecane luna</i>
11				<i>Lecane (M) bulla</i>
12			Synchaetidae	<i>Lecane (L) papuana</i>
13				<i>Polyarthra vulgaris</i>
14	Flosculariaceae	Trochosphaeridae	<i>Filinia longiseta</i>	
15			<i>Filinia opoliensis</i>	
16	Copepoda	Cyclopoida	Cyclopidae	<i>Mesocyclops hyalinus</i>
17				<i>M. thermocyclops</i>
18		Calanoida	Diaptomidae	<i>Thermocyclops crassus</i>
19				<i>Diaptomus sp.</i>
20	Ostracoda	Podocopida	Cyprididae	<i>Cyclops sps.</i>
21				<i>Cypris sp.</i>
22				<i>Cypris dravidensis</i>
23				<i>Cprinotus gunning</i>
24	Cladocera	Diplostraca	Daphniidae	<i>Syprinotus sps.</i>
25				<i>Semocephalus expinosus</i>
26				<i>Simocephalus vetulus</i>
27			Moinidae	<i>Daphnia pulex</i>
28				<i>Moina brachiata</i>
29				<i>Moina micrura</i>
30	Macrothricidae	<i>Microthrix spinosa</i>		

Fig. 2: Order wise zooplankton density (%) Fig. 3: Family wise zooplankton density (%)



The seasonal zooplankton population density has been given (Table 2 &3). Total 9897 number of organism were counted belong to all zooplankton group. Summer season were most dominant in number of zooplankton population during both the years of study. Rotifera were consisting more number of zooplankton with 1997 and 1567 organism during 2023 and 24 respectively (Fig 4). Verma *et al.*, (2013) observed monthly Variations of Zooplankton in a freshwater body, Futera Anthropogenic Pond of Damoh District, similarly Manickam *et al.*, (2014) investigated seasonal variations of zooplankton diversity in a perennial Reservoir at Thoppaiyar, Dharmapuri District, South India. Monthly variation in the species diversity index of the major zooplankton population was also recorded. Composition and abundance of each zooplankton group varied from time to time and season and depended on limnological characteristics of the water body. Zooplanktons density and composition exhibit a monthly variation. Zooplankton was recorded in the month May and August exhibited maximum and minimum in January zooplankton per liter respectively while whole zooplankton exhibited higher density in summer season (Prajapati, 2017).

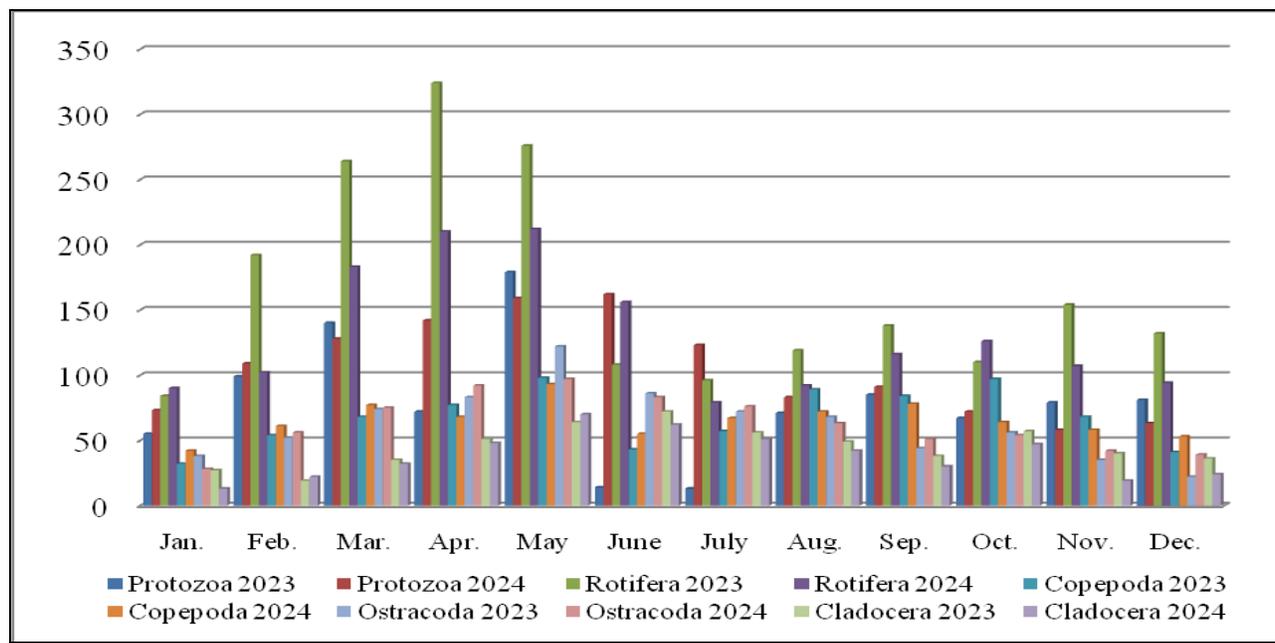
Table 2: Monthly variation in zooplankton density (no/liter) during, 2023

S. No	Group/ Month	Protozoa		Rotifera		Copepoda		Ostracoda		Cladocera		Individuals n/l
		n/l	%	n/l	%	n/l	%	n/l	%	n/l	%	
1	Jan.	55	23.30	84	35.59	32	13.55	38	16.10	27	11.44	236
2	Feb.	99	23.79	192	46.15	54	12.98	52	12.5	19	4.56	416
3	Mar.	140	24.09	264	45.44	68	11.70	74	12.74	35	6.02	581
4	Apr.	72	11.86	324	53.37	77	12.68	83	13.67	51	8.40	607
5	May	179	24.22	276	37.35	98	13.26	12	16.50	64	8.66	739
6	June	14	4.33	108	33.43	43	13.31	86	26.62	72	22.29	323
7	July	13	4.42	96	32.65	57	19.38	72	24.48	56	19.04	294
8	Aug.	71	17.93	119	30.05	89	22.47	68	17.17	49	12.37	396
9	Sep.	85	21.85	138	35.47	84	21.59	44	11.31	38	9.76	389
10	Oct.	67	17.31	110	28.42	97	25.09	56	14.47	57	14.72	387

11	Nov.	79	21.0 1	154	40.95	68	18.08	35	9.31	40	10.63	376
12	Dec.	81	25.9 6	132	42.31	41	13.14	22	7.05	36	11.54	312
Total		955		1997		808		75 2		544		5063

Table 3: Monthly variation in zooplankton density (no/liter) during, 2024

S. No.	Group / Month	Protozoa		Rotifera		Copepoda		Ostracoda		Cladocera		Individuals n/l
		n/l	%	n/l	%	n/l	%	n/l	%	n/l	%	
1	Jan.	73	29.6 7	90	36.58	42	17.0 7	28	11.38	13	5.28	246
2	Feb.	109	31.1 4	102	29.14	61	17.4 2	56	16	22	6.28	350
3	Mar.	128	25.8 5	183	36.96	77	15.5 5	75	15.55	32	6.46	495
4	Apr.	142	25.3 5	210	37.5	68	13.7 3	92	18.58	48	9.69	560
5	May	159	25.1 9	212	33.59	93	14.7 3	97	15.37	70	11.09	631
6	June	162	31.2 7	156	30.11	55	10.6 2	83	16.02	62	11.96	518
7	July	123	31.0 6	79	19.94	67	16.9 1	76	19.19	51	12.87	396
8	Aug.	83	23.5 7	92	26.13	72	20.4 5	63	17.89	42	11.93	352
9	Sep.	91	24.8 6	116	31.69	78	21.3 1	51	13.93	30	8.19	366
10	Oct.	72	19.8 3	126	34.71	64	17.6 3	54	14.87	47	12.94	363
11	Nov.	58	20.4 2	107	37.67	58	20.4 2	42	14.78	19	6.69	284
12	Dec.	63	23.0 7	94	34.43	53	19.4 1	39	14.28	24	8.79	273
Total		1263		1567		788		756		460		4834

Fig. 4: Monthly compositions of various groups of zooplankton

V. CONCLUSION

Rotifers are an important group of zooplankton that can be considered a valuable component of the freshwater ecosystem. Their community structure can be used as a bio-indicator of water quality assessment whereas their long-term changes need to be monitored. Presumably, the abundance of rotifers is strongly dependent on the trophic state of the water bodies. The present information on the zooplankton composition and seasonal variation of Tighra Reservoir is helpful for further diversity and conservation studies of invertebrates. It will also be useful in the awareness of water pollution and maintenance of such aquatic ecosystems.

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