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Study Of Zooplankton Diversity In Ramoua Dam At Gwalior District Of Madhya Pradesh

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Abstract

The present study was conducted on zooplankton diversity of Ramoua Dam. The Dam is 5 km away from Gwalior city, located at the bank of Ramoua village in Gwalior district of Madhya Pradesh. The dam is mainly used for irrigation purpose. Zooplanktons are one of the important micro-organism of food chain of an aquatic ecosystem which acts as bio-indicators of pollution.Sstudy was carried out during June, 2016 to May, 2018. The planktonic forms were collected from the surface of the dam water with plankton net of 20µ mesh size nylon cloth. The plankton samples were preserved for laboratory analysis. The collected samples were identified using standard references. Total 24 species of zooplankton were recorded among these species belonging to Rotifera, 02 species belonging to Copepoda, 02 species belonging Cladocera. Study revealed that rotifer was more dominant group through the study period. Diversity of zooplankton affected due to different environmental condition of water bodies. The minimum zooplankton was in March and maximum were in the month of October.

Keywords: Zooplankton, Diversity, Ramoua Dam, Gwalior, micro-organism

Introduction

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 (Narwat and Patel, 2021).

Zooplanktons vary from site to site within the same location with similar ecological conditions and as such both qualitative and quantitative studies of zooplankton in a water body are of great importance in managing successful aquaculture operation (Sivakami *et al.*, 2015). Zooplanktons are valuable food sources

for fishes and other aquatic animals. They are responsible for eating millions of little algae that may otherwise grow to an out of control state (Wilkinson, 2011).

It also maintains proper equilibrium between biotic and abiotic components of the aquatic ecosystem. 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). Zooplankton communities respond to a wide variety of disturbances including nutrient loading, acidification, and sediment input etc. It is a well-suited tool for understanding water pollution status (Contreras *et al.,* 2009). Zooplankton communities respond to a wide variety of disturbances including nutrient loading, acidification and sediment input etc. The distribution and diversity of zooplanktons in aquatic ecosystems depend mainly on the physicochemical parameters of water (Saba and Sadhu, 2015).

Study Area

Ramoua dam is located at Gwalior district in Madhya Pradesh. It is about 6 km from the main city of Gwalior. This Located along the geological coordinates 78° 10' 58.1916" E and 26° 13' 5.8332" N near the Ramaua village. It has a sub-tropical climate. Summers have significantly more rainfall than winters. This perennial water resource is formed by throwing Harsi canal life line of entire Gwalior district.

Material and Method

The zooplanktonic samples were collected from the surface water at all the four stations. Samples were collected by filtering a volume of 50 liter surface water through a plankton net made up of bolting silk cloth (mesh no. size 20) and immediately preserved by adding few drops of 4 % formalin and glycerine and the total volume was made to 20 ml and observing them under a microscope. Systematic identification was done by taking the help of Edmondson (1992), Battish (1992), Dhanapati (2000) and Sharma and Sharma (2008).

Quantitative study of zooplankton:

The counting of the zooplankton was done with the help of a Sedwick Rafter counting cell. A sub sample of 1.0 ml was transferred to Sedgwick Rafter cell for differential counting of zooplankton species. An Average of 5 counting was taken. The number of each species and total zooplankton in a sample was calculated by the following formula of Welch (1952):

$$\text{Zooplanktonic Organisms } L^{-1} = a \times b/L$$

Where,

a = the average number of zooplankton in a counting cell of 1.0 ml capacity
b = the volume of original concentrate in ml (20 ml)
L = the volume of water filtered though plankton net in liter (50 liters)

Result and Discussion

In the present study 24 species were listed belongs to 12 families, 7 orders and 5 different group Groups (Table 1). Dange (2023) reported 30 genera of zooplankton were recorded from the wetland belonging to the three groups viz. Rotifera, Cladocera, Copepoda. Among the recorded genera 12 belongs to

Rotifera, 4 belongs to Copepoda and 14 belongs to Cladocera in Jakkarpur Dam, at Osmanabad district in Maharastra.

Group wise and family wise contribution was recorded shown in fig 2 and 3. Investigation shows that Roifera was recorded most dominant group with 12 species of (50%) followed by Copepoda with 4 species of (17%), Protozoa and Ostracoda each with 3 species of (12.5%) and Cladocera with 2 species of (8%). Similarly Rahatgaonkar (2019) observed most dominant group during the study of zooplankton diversity of fresh water lake of Kondeshwar near Amravati, Maharashtra.

The family Brachionidae was contributed (25%) by 6 species followed by Lecanidae, Cyclopidae and Cypridiidae each (13%) by 3 species, Trochosphaeridae (8%) by 2 species while Arcellidae, Centropyxidae, Difflugiidae, Synchaetidae, diaptomidae, Dahniidae and Moinidae each (4%) by 1 species.

Table 1: Abundance of Zooplankton species of Ramoua Dam, Gwalior

S. No.	Group	Order	Family	Species
1	Protozoa	Arcellinida	Arcellidae	*Arcella discoides*
2			Centropyxidae	*Centropyxis ecornis*
3			Difflugiidae	*Difflugia lebes*
4	Rotifera	Ploima	Brachionidae	*Brachionus angularis*
5				*Brachionus budapestinensis*
6				*Brachionus calyciflorus*
7				*Brachionus caudatus*
8				*Brachionus diversicornis*
9				*Keratella tropica*
10			Lecanidae	*Lecane luna*
11				*Lecane (M) bulla*
12				*Lecane (L) papuana*
13			Synchaetidae	*Polyarthra vulgaris*
14		Flosculariaceae	Trochosphaeridae	*Filinia longiseta*
15				*Filinia opoliensis*
16	Copepoda	Cyclopoida	Cyclopidae	*Mesocyclops hyalinus*
17				*M. thermocyclops*
18				*Thermocyclops crassus*
19		Calanoida	Diaptomidae	*Diaptomus sp.*
20	Ostracoda	Podocopida	Cypridiidae	*Cypris sp.*
21				*Cypris dravidensis*
22				*Cprinotus gunning*
23	Cladocera	Diplostraca	Daphniidae	*Semocephalus expinosus*
24			Moinidae	*Moina brachiata*

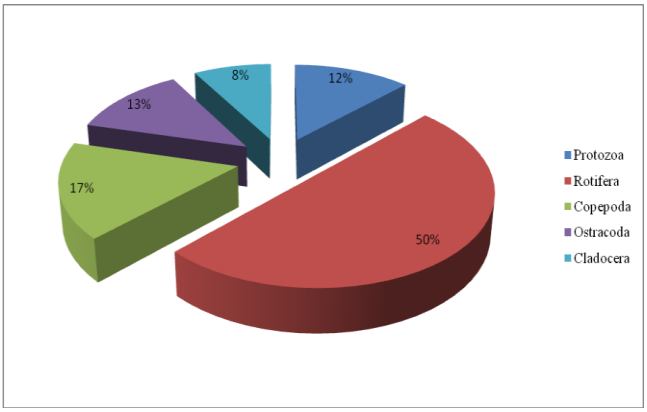


Fig.1: Group wise zooplankton species composition (%)

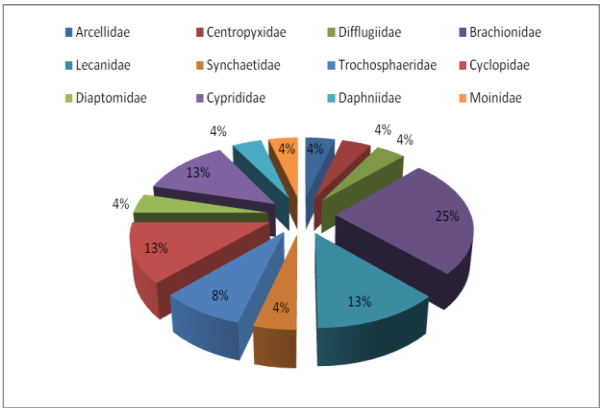


Fig. 2: Family wise zooplankton species composition (%)

Study revealed the Monthly variation and percentage of zooplankton diversity in Ramoua Dam (Table 2 and 3) and Annual variation of zooplankton composition shown in fig. 3 and 4. Rotifera was recorded to be dominant among all the identified groups of zooplankton during both the years of study period. Total 2353 individual number of zooplankton recorded belonging to identified group. Out of them, higher population of zooplankton (226) was recorded in the month of November while less number of zooplankton populations (173) was recorded in the month of October. Rotifera group was reported to be dominant among all other Zooplankton groups with 1210 (617.94 %) numbers followed by protozoa group with 449 (228.27%) numbers, Copepoda group with 311 (158.99%) numbers, Ostracoda group with 223 (111.9%) and Cladocera group with 160 (82.69%).

Protozoa group contributed to highest population 57 (30.31%) in the month of June and lest population 26 (12.87%) in the month of September. Maximum population of Rotifera was recorded 118 (58.41%) while minimum was recorded 78 (41.48%) in the month of June. Copepoda group was contributed higher population 35 (17.5%) in August and lowest population 17 (9.83%) in the month of October. Higher population was recorded 31 (13.72%) in November month and lower population was recorded 7 (4.04%) in the month of October of Ostracoda group while lowest population of zooplankton was recorded 7 (3.5%) in May and higher population was recorded 22 (12.72%) in the month of October during 2016-17.

During the study period 2017-18 total 2510 population of zooplankton recorded belonging to identified group. Out of them, higher population of zooplankton (254) was recorded in the month of April while least number of zooplankton (135) was recorded in the month of January. Out of total recorded zooplankton protozoa group contributed to 383 with (184.51 %) followed by rotifera group contributed with 1145 (547.93%), Copepoda group contributed with 436 (207.69%), Ostracoda group contributed with 375 (176.14%) and Cladocera group contributed to 171 (83.49%).

Maximum number of zooplanktons was recorded 39 with (16.31%) during October, November and March while minimum number zooplanktons were recorded 21 with (15.55%) in the month of January of Protozoa group. Similarly rotifera contributed higher zooplankton 119 with (47.6%) during October while

lowest zooplankton was recorded 60 (44.44%) in January, Copepoda group was recorded higher 45 with (18.83%) in November and April while lower 23 with (14.19%) in June, Ostracoda group population was higher 49 (20.50%) in March and lower 19 (9.45%) in August and Cladocera group contributed higher number of zooplankton population 21 with (8.26%) in April while it contributed to lowest population 7 with (3.48%) in August.

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 (%) of Zooplankton density (Cell/l) 2016-17

S. No.	Month	Total Zooplankton	Protozoa		Rotifera		Copepoda		Ostracoda		Cladocera	
		n/l	n/l	%	n/l	%	n/l	%	n/I	%	n/I	%
1	July	177	28	15.82	99	55.93	25	14.12	13	7.34	12	6.77
2	Aug.	200	30	15	97	48.5	35	17.5	26	13	12	6
3	Sep.	202	26	12.87	118	58.41	29	14.35	10	4.95	19	9.41
4	Oct.	173	29	16.76	98	56.64	17	9.83	7	4.04	22	12.72
5	Nov.	226	53	23.45	113	50	20	8.84	31	13.72	9	3.98
6	Dec.	194	32	16.49	96	49.48	27	13.91	25	12.88	14	7.21
7	Jan.	202	33	16.33	97	48.01	27	13.36	28	13.86	17	8.41
8	Feb.	193	33	17.09	103	53.36	30	15.54	16	8.29	11	5.69
9	Mar.	209	51	24.40	103	49.28	25	11.96	18	8.61	12	5.74
10	Apr.	189	43	22.75	98	51.85	23	12.16	14	7.40	11	5.82
11	May	200	34	17	110	55	24	12	25	12.5	7	3.5
12	June	188	57	30.31	78	41.48	29	15.42	10	5.31	14	7.44
Total		2353	449	228.27	1210	617.94	311	158.99	223	111.9	160	82.69

Table 3: Monthly variation (%) of Zooplankton density (Cell/l) 2017-18

S. No.	Month	Total Zooplankton	Protozoa		Rotifera		Copepoda		Ostracoda		Cladocera	
		n/l	n/l	%	n/l	%	n/l	%	n/I	%	n/I	%
1	July	196	32	16.32	91	46.42	35	17.85	28	14.28	10	5.10
2	Aug.	201	29	14.42	118	58.70	28	13.93	19	9.45	7	3.48
3	Sep.	217	31	14.28	100	46.08	39	17.97	27	12.44	20	9.21
4	Oct.	250	39	15.6	119	47.6	43	17.2	37	14.8	12	4.8
5	Nov.	239	39	16.31	103	43.09	45	18.83	39	16.32	13	5.44
6	Dec.	200	29	14.5	95	47.5	34	17	31	15.5	11	5.5
7	Jan.	135	21	15.55	60	44.44	26	19.25	16	11.85	12	8.88
8	Feb.	225	23	10.22	112	49.77	43	19.11	31	13.77	16	7.11
9	Mar.	239	39	16.31	94	39.33	43	17.99	49	20.50	14	5.85

10	April	254	36	14.17	107	42.12	45	17.71	45	17.71	21	8.26
11	May	192	34	17.70	75	39.06	32	16.66	33	17.18	18	9.37
12	June	162	31	19.13	71	43.82	23	14.19	20	12.34	17	10.49
Total		2510	383	184.51	1145	547.93	436	207.69	375	176.14	171	83.49

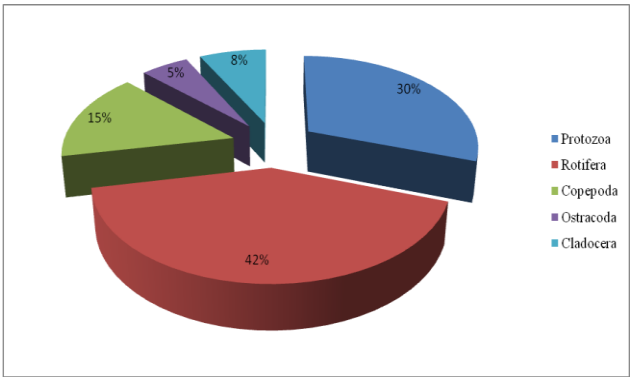


Fig. 3: Annual variation in Zooplankton Composition (2016-17)

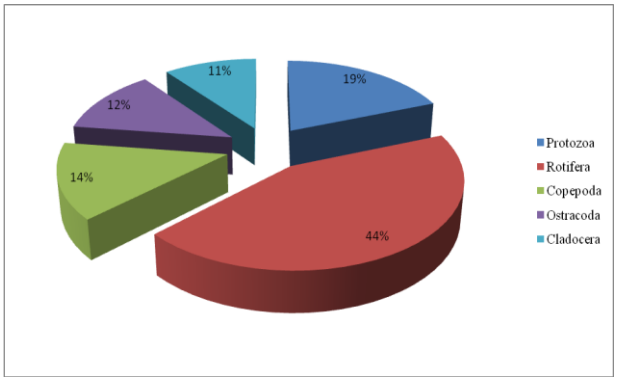
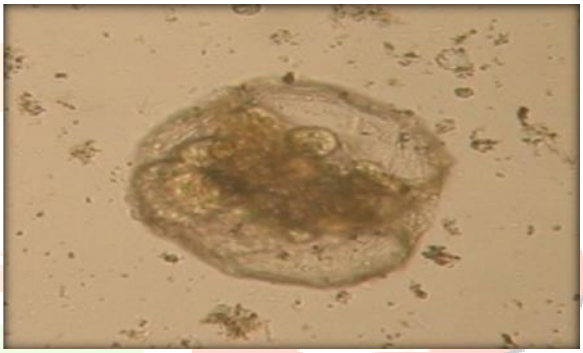
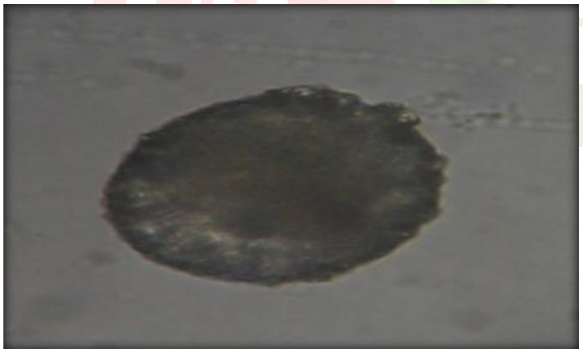


Fig.4: Annual variation in Zooplankton Composition (2017-18)

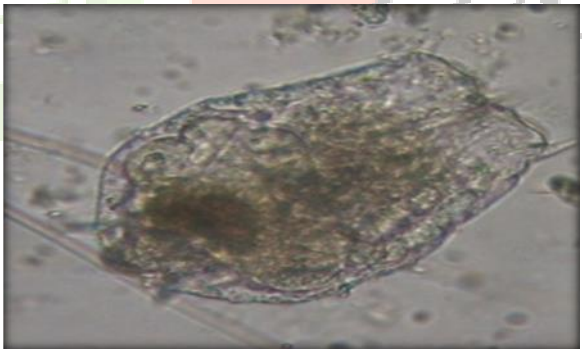
Arcella discoides



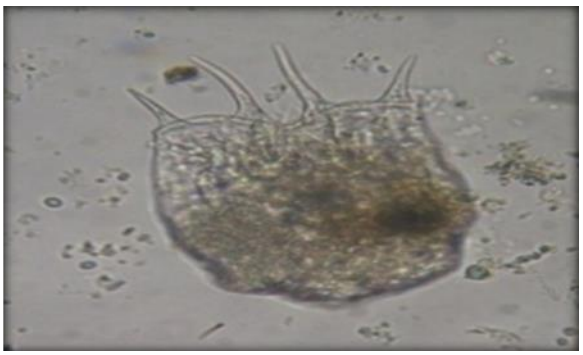
Centropyxis ecornis



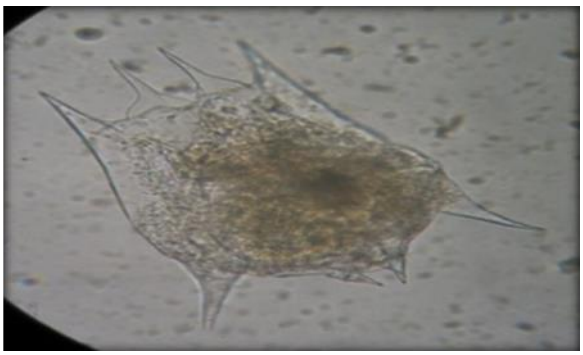
Difflugia lebes



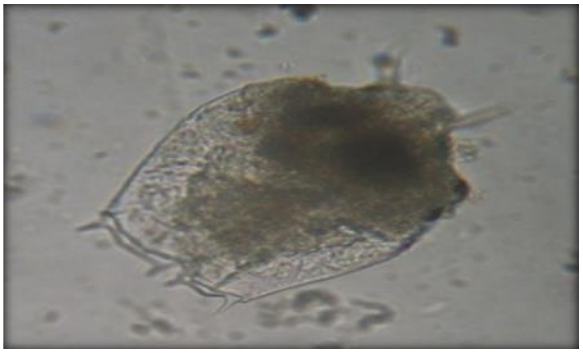
Brachionus angularis



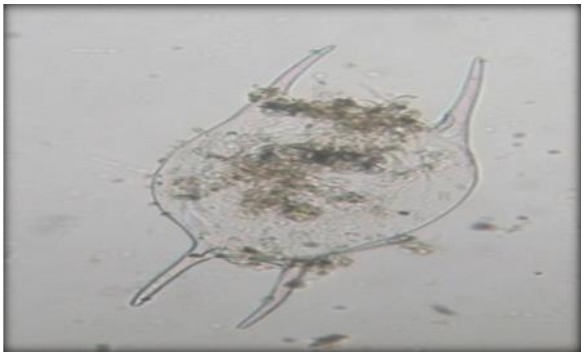
B. budapestinensis



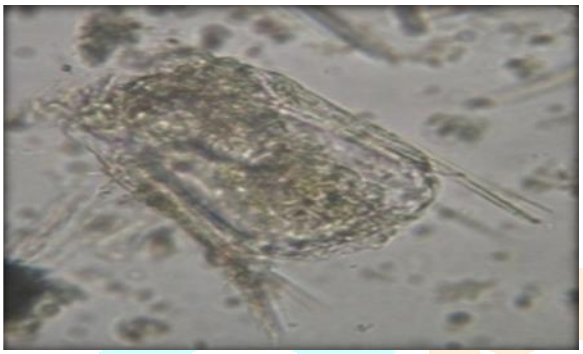
B. calyciflorus



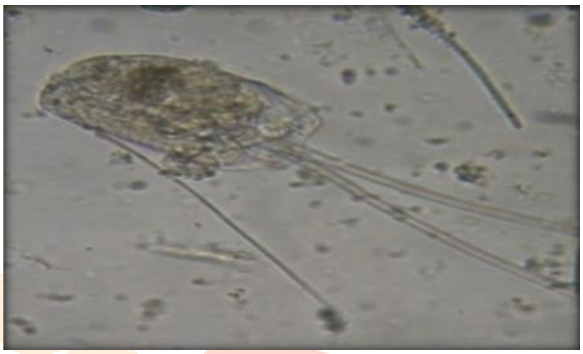
B. caudatus



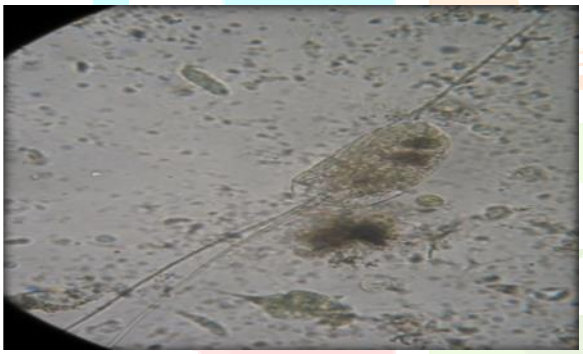
B. diversicornis



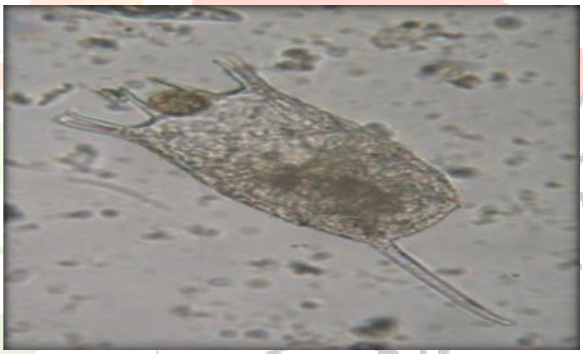
Polyarthra vulgaris



Filinia longiseta



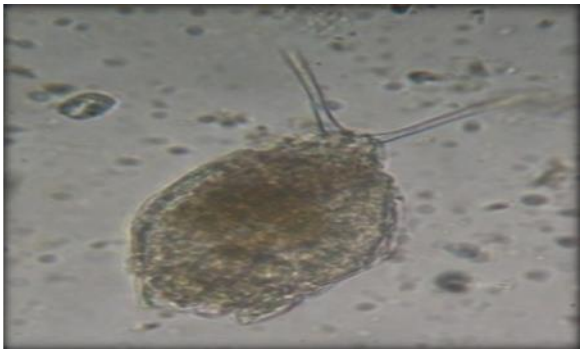
F. opoliensis



Keratella tropica

Lecane (L) luna

L. (M) bulla



L. (L) papuana

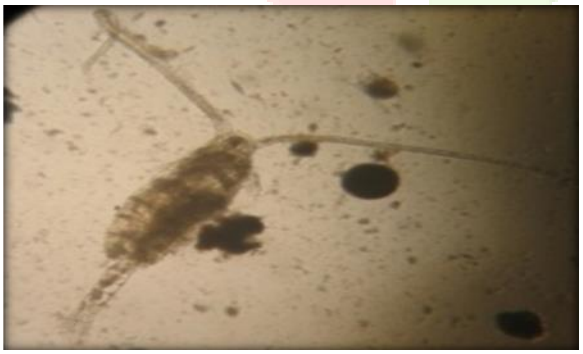
Moina brachiata

Semocephalus expinosus

Mesocyclops hyalinus

M. thermocyclops

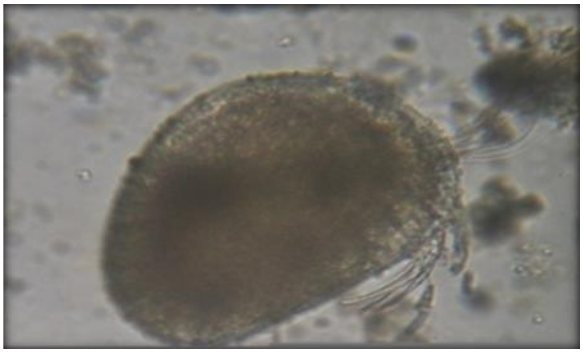
Thermocyclops crassus



Diaptomus sp.

Cypris sp.

C. dravidensis



Cprinotus gunning

Conclusion

Study on Ramoua Dam exhibits Rotifers are important group of zooplankton which is dominated throughout the study period can be considered as a valuable component of freshwater ecosystem. Zooplankton particularly rotifer are known to be the best food for the fish larvae for aquaculture. Their community structure can be used as bio-indicator of water quality assessment whereas their long-term changes need to be monitored. Presumably, the abundance of rotifers is strongly dependant on the trophic state of the water bodies. Thus, keeping in view the importance of the study, steps should be taken for the conservation of zooplankton community, maintenances, protection and sustainable management of the dam.

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