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Diversity of zooplankton of gangulpara dam district balaghat (M.P.)

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Abstract
Zooplankton diversity reflects the quality of water hence constitutes the important ecological parameter to assess it. These are not only useful as bioindicators, but are also helpful for ameliorating polluted waters. Zooplankton community is cosmopolitan in nature and they live in all freshwater habitats of the world. Zooplankton is the transitional link between phytoplankton and fish. They are good indicators of the changes in water quality because they are strongly affected by environmental conditions & respond quickly to changes in water quality. Hence qualitative and quantitative studies of zooplankton are of great importance. In the present paper qualitative and quantitative studies of zooplanktons in were carried out during June 2017 to May 2018. Using microscopic studies of zooplankton, this investigation revealed that 11 genera belonging to five major groups i.e. Cladocera (two genera), Copepoda (three genera), Ostracoda (one genus), Protozoa (two genera) and Rotifera (three genera) were present.

Keywords: gangulpara dam, zooplankton diversity, balaghat district

1. Introduction
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 According to Dadhick and Saxena (1999) [1] the zooplankton plays an integral role and serves as bio-indicators. Zooplanktons comprise the food source of organisms at elevated trophic levels (Gajbhiye, 2002) [2]. They occupy an transitional place in the aquatic food web (Altaff, 2004) [3]. It is a well suitable device for understanding water pollution status (Contreras *et al*., 2009) [4]. 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.
A number of studies has been carried out on the condition of ecology and freshwater bodies in various parts of India (Smitha *et al*, 2007) [5] but in some parts of Gangulpara (Madhya Pradesh), the ecological studies of freshwater bodies especially zooplankton studies is very scanty. So the present study was undertaken to investigate the zooplankton diversity in Gangulpara dam through different months and season during the period June 2017 to May 2018 in order to assess the species composition, population density and seasonal fluctuation of this faunal group.

2. Materials and methods
Study area
The Gangulpara and Waterfall is located in the Balaghat district of the central Indian state of Madhya Pradesh. It is at a distance of 14 kilometers away from Balaghat. It is a part of Godavari basin and was completed as reservoir in the year 1960. It is situated 21°53'00" longitude and 80°17'00" latitude. The height of dam is 19.51 m and length 3009m. The catchment area is 28.5 sq. km. The water of this dam is used for irrigation and fish culture. It is a marvelous mixture of natural beauty and splendor, feasting the eyes of the onlooker! An ideal picnic spot for the locals, it is frequently visited by them for their weekend getaways. Nature lovers appreciate this water body, which also serves as a storage tank for the waters of Ghysri Nala. This water reserve fulfills the irrigation needs of the farmers of the local village nearby, Tekadi.

Collection of Sample
Water samples were collected from dam every month during June 2017 to May 2018 in the morning between 6 AM to 7 AM. For collection of zooplanktons sample 25 litres of surface water passed through standard plankton net of bolting silk No. 25. The collected samples were preserved in 4% formalin solution and stored in 250 ml bottles.
The naming of zooplankton was made by using standard keys of Dhanapathi (2000) [6] and Altaff (2004) [3]. The quantitative analysis of planktonic organisms was carried out using Sedgwick Rafter's plankton counting chamber.

3. Observation
As shown in Table 1 for month wise population density (No./lit) of unlike zooplankton groups from June 2017 to May 2018.

- **Cladocera:** In this study two species out of 110 species recorded in India (Patil *et al*, 1989) [7] were recorded. They play key role in food chain and energy transformation (Uttangi, 2001) [10]. The Cladoceran population showed minimum in monsoon, i.e. in June 41/lit and maximum in winter, i.e. in December 183/lit. This variation in population was due to favourable temperature and availability of food, while in monsoon the factors like temperature, turbidity, and transparency

play an important role in controlling the diversity and density of Cladocera (Edmondson, 1965) [8].

- **Copepods:** In the present investigation, they were found to be maximum during summer, i.e. 130 in April and minimum during winter, 90/lit in October. They serve as food to several fishes and play a major role in ecological pyramids. Similar trend was observed in Renukalake, Himachal Pradesh (Chauhan, 1993) [9].
- **Ostracods:** In the present investigation one species of ostracods were recorded. Maximum ostracods population was recorded in summer, 88/lit in March month while minimum in monsoon, i.e. 24/lit in July. They occur in all kinds of freshwater and marine environments. The abundance of these provides a good food for aquatic organisms. Similar observations were also made in Fort Lake of Belgaum, Karnataka (Sunkad *et al*, 2004) [11].
- **Protozoa:** Two species had been reported from the Gangulpara dam where density was maximum in winter, i.e. 166/lit in December, while it was minimum in monsoon, i.e. 15/lit in June. They are both herbivores and consumers in the decomposer link of the food chain. They also control bacteria populations and biomass to some extent (Alcamo *et al*, 2009) [12].
- **Rotifers:** The rotifers are being considered as the most important soft bodied invertebrates (Hutchinson, 1991) [13]. The dominance of rotifers was reported in several water bodies. In this study population density of rotifers was maximum in winter, 278/lit in December and minimum in monsoon, 37/lit in June.

4. Results and discussion

Zooplanktons are fine indicators of changes in water quality, because they are strongly affected by environmental conditions and responds quickly to changes in environmental quality. Hence, qualitative and quantitative studies of zooplanktons are of great importance. The monthly and seasonal variations of zooplankton are tabulated (Table 1).

In the present investigation, total 11 species of zooplanktons were recorded. Two species belonging to Cladocerans were recorded as *Alona pulchella* and *Ceriodaphnia cornuta*. Three species of Copepods were recorded as *Cyclops strenuus*, *Diaptomus pallidus* and *Heliodiaptomus viduus*. Belonging to Ostracods one species *Cypris subglobosa* were recorded. Two species of Protozoa were found as follows; *Vorticella, Paramecium*. In Rotifera three species such as *Asplanchna*, *Brachionus durgae* and *Keratella valga* were recorded.

The physiochemical parameters such as temperature, light, pH, organic and inorganic constituents and the interrelationship with their organisms play an important role in determining the nature and pattern of fluctuation of population densities of zooplanktons. Maximum species richness was observed during winter season and minimum was during monsoon. The maximum species richness was observed in group Rotifera and minimum in group Ostracods. The total number of zooplanktons was recorded maximum in the month of December and minimum number observed in month of June (Table 1).

Table 1: Monthly population density (No./ lit) of different zooplanktons.

Month	Monsoon Season				Winter season				Summer season				Total
Groups	Jun	Jul	Aug	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	
Cladocera	41	107	121	111	126	162	183	108	88	97	56	44	1244
Copepoda	73	66	94	100	90	88	90	89	102	124	130	116	1160
Ostracods	24	12	55	32	46	35	08	24	70	88	75	60	529
Protozoa	15	36	49	105	149	135	166	132	113	95	90	62	1446
Rotifers	37	53	49	186	220	246	278	266	126	106	98	81	1746

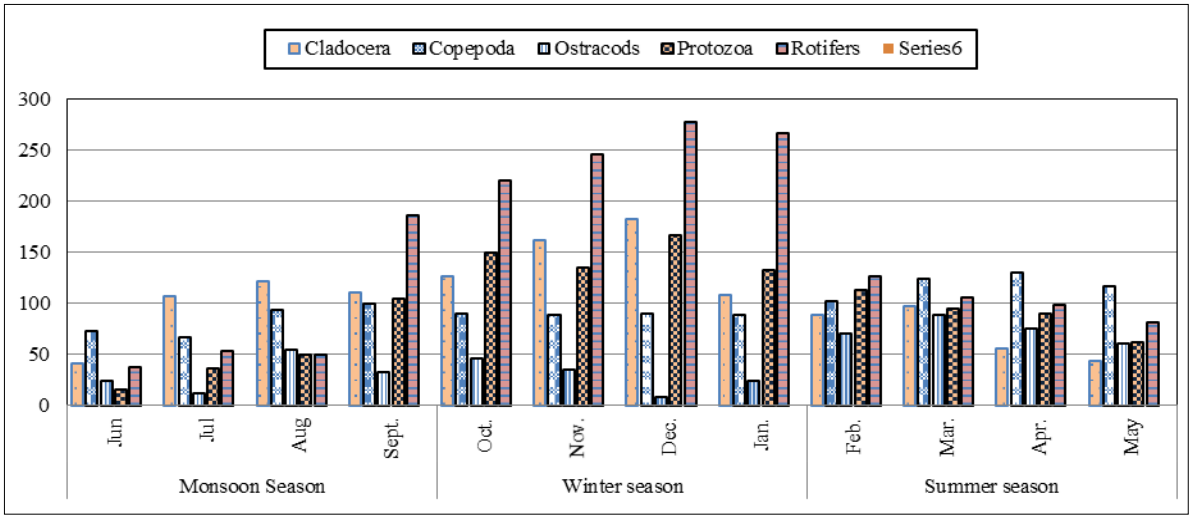

Fig 1: Graphics analysis of monthly population density (No./ lit) of different zooplanktons.

5. Conclusion

The zooplankton investigation showed that, the total zooplankton density was more in winter season due to low temperature, favourable for phytoplanktonic growth as an abundance of food.

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