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Zooplankton diversity in Amaravathi Dam Tirupur District, Tamilnadu, India

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ABSTRACT

Zooplankton occupies a vital part in the trophic structure of an aquatic ecosystem and plays a key role in the energy transfer. It is a valuable food for planktivorous fish and other organism. The zooplankton is good indicators of changes in water quality hence study of zooplankton is great importance in freshwater reservoir water body. The present investigation to study the diversity and density of zooplankton of Amaravathi Lake. Samples were collected monthly once at five different regions of the lake and the seasonal average was calculated. There are 25 species of zooplankton were identified. Among them 10 species of Rotifers, 4 species of Copepods, 6 species of Cladocerans, 5 species of protozoan, The species density maximum abundance during post-monsoon season and minimum occurs during pre-monsoon season. In all the seasons the rotifer species population is higher than other zooplankton species. The seasonal variation is due to influenced by feeding ecology, predation pressure, water level and water quality. Zooplankton also acts as a pollution indicator in a water body.

Key words: *Zooplankton, Rotifer, Copepods, Cladocerans*

Introduction

Zooplanktons are microscopic aquatic animals that are very weak swimmers and they drift in water column to move any great distance. Zooplankton occupies a vital part in the tropic structure of an aquatic ecosystem and plays a key role in the energy transfer from producer to primary consumers. They are heterotrophic in nature and are a very good nutrients and important food for almost all fish species at some stage in their life history. In fresh water ecosystem, zooplanktons are serves as an ecological indicator. Some species distribution in abundant indicates the quality of the water of aquatic ecosystem. Composition and diversity of zooplankton provide information on the characteristics and quality of the water body (Okayi *et al.,* 2001). Biodiversity of zooplankton is to keep our ecosystem healthy. The physicochemical parameters of the water bodies have the considerable effect on the aquatic life. They play a vital role in determine the productivity and distribution pattern and also quantitative abundance of organisms inhabiting in a particular aquatic ecosystem (Kumar *et al.,* 2009). A change in the physicochemical aspect of water body brings about respective changes in the composition and abundance of organisms in the water body. Bio monitoring is the systematic use of living organisms or their responses to determine the quality of the environment (Adeyemi *et al.,* 2009). There are many investigations on zooplanktons diversity have been reported from different parts of India but there is scarcity of reports from southern part of India. So the present investigation was aimed to study species

diversity, abundance and distribution of the zooplankton in Amaravathi Dam.

Study area

Amaravathi dam ($10^0$24.64N $77^0$15.6E) was constructed in Amaravathinagar across the Amaravathi river in 1957. It located 25 km south of Udumalpet on SH 17 in the Indira Gandhi Wildlife Sanctuary, Tirupur district in Tamil Nadu, India. The dam has 9.31 square kilometres in area and 33.53 metres (110 ft) depth. Now the capacity of the dam has shrunk 25% due to siltation. The dam was primarily built for irrigation and flood control, now installing 4 MW capacity hydro-electric power stations.

Materials and Methods

Zooplankton samples were collected monthly once in the second week of every month from the five sampling site of the dam. Samples were collected by filtering 100 litres of surface water through a round silk cloth net of mesh size about 158µm. The net held open with a diameter of 17.5 cm metal frame and attached to a wooden handle with a 165 mL bottle attached to the distal end. The concentrated samples were then transferred from the sampling net bottle to sample bottle and immediately preserved with 4% formalin. All the sampling was performed between 8 to 9 a.m. Species diversity was identified by using keys from Edmondson (1992) and Battish (1992).

Enumeration of zooplankton

For the quantitative study of zooplankton, the samples were concentrated to 10 mL by sedimentation process the zooplankton was settle down to the bottle. The bottle was agitated thoroughly then a drop (approximately 1 mL) was taken with a wide-bore dropper. The sample was carefully introduced into a counting chamber (Sedgwick Rafter chamber) and covered with cover slide. Counts of different groups of zooplankton present were made with a compound microscope. Five sub samples were taken from the bottle and counted. The average number of individuals per mL was computed from this sub sample. The number of zooplankton per litre was calculated by using the following formula.

$$\text{Number of zooplanktons} = \frac{\text{zooplankton per ml of concentrate}}{\text{Volume of water filter}} \times \text{volume of concentrate.}$$

Per litre of water

Results and Discussion

During the study period 25 zooplanktons species were identified (Table 1). These included 10 species of Rotifers, 5 species of protozoa, 6 species of cladocera, 4 species of copepods and larval forms. The zooplankton community was dominated by rotifer (40.4%), followed by copepod (26.0%), cladocera (19.5%), protozoa (12.1) and other larval forms (2%). Similar observation was reported by many investigators throughout the country. Kar and Kar (2013) observed 26 species of zooplankton from an Oxbow lake of Cachar.

Zooplanktons are a diverse group of microscopic, heterotrophic organisms that act as a main source of food for aquatic organisms. They are the natural food for omnivorous and planktivorous fishes and fish larvae (Alam *et al.,* 1987). It plays an important role in recycling nutrients as well as transfer energy to higher trophic levels within their respective ecosystem (Miah *et al.,* 2013). The freshwater zooplankton comprise of Protozoa, Rotifers, Cladocerans, Copepods and Ostracods. In the present study, the seasonal population density status of the zooplankton recorded from the Amaravathi dam is depicted in Fig. 1.

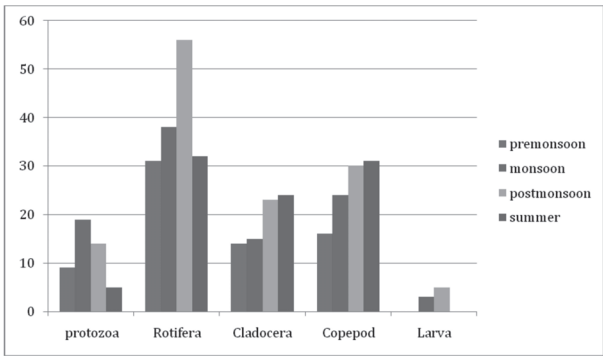

Fig. 1. Seasonal abundance of zooplankton community during the study period

During the study period, Rotifer population was dominant among all other zooplankton community (40.4%). In tropical freshwater habitat, dominance of Rotifers group is a common feature. Among the Rotifers, *Branchionous* species was most abundant and *Keratella* species secondly dominated in the group. The other common Rotifer species of *Rotaria*, *Lepadella*, *Kelliota*, *Asplanchna*, *Proales*, *Euchlanis*, *Gastropus* were contributed very low population. Similar observation was reported (Baloch *et al.,*

2005) in Rawal Lake, Islamabad, (Sulata Kar and Devashish Kar, 2016). Rotifers density was reported to be highest in the post-monsoon (56 nos/L) and minimum during pre-monsoon (31nos/L). Copepods ranked second in the order of dominance (26%) their abundant maximum during summer (24nos/L) and minimum during pre-monsoon (14nos/L). Among the copepods *Calanus* species was most dominant and followed by *Cyclops, Diaptomus* and *Halloblaptomus.* Cladoceras ranked third in the order of dominance (19.5%) their abundance maximum during summer (24nos/L) and minimum during pre-monsoon (16nos/L). Among the cladocera spe-

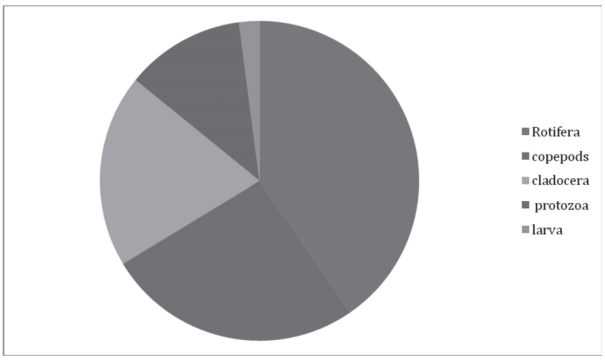

Fig. 2. Abundance of zooplankton in Amaravathi Dam

Table 1. Enumeration of zooplanktons during the study period

Zooplanktons community	per-monsoon no/l	Monsoon no/l	post-monsoon no/l	summer no/l	annual %in group	annual %in community
Protozoa						
Vorticella	3	6	4	2	32.9	3.9
Paramecium	2	5	3	1	23.4	2.8
Diffugia	1	3	2	1	12.8	1.8
Coleps	1	2	3	-	12.8	1.5
Arcella	2	3	2	1	17.0	2.1
Total	9	19	14	5	100	12.1
Rotefera						
Keratella	8	9	12	5	21.7	8.7
Branchionus	9	10	15	10	28.0	11.3
Rotaria	3	5	6	4	11.5	4.6
Lepadella	2	4	5	3	8.9	3.6
Kelliota	2	3	4	1	6.4	2.6
Filinia	3	3	6	4	10.2	4.1
Asplachna	1	1	2	1	3.2	1.3
Preales	1	1	2	1	3.2	1.3
Euchlanis	1	1	1	1	2.5	1.1
Gastropus	1	1	3	2	4.5	1.8
Total	31	38	56	32	100	40.4
Cladocera						
Daphnia	5	6	8	7	34.2	6.7
Diaphanosoma	1	1	2	2	7.9	1.5
Moino	2	2	4	4	15.8	3.1
Cypris	2	3	3	4	15.8	3.1
Bosmia	3	2	4	5	18.4	3.6
Chydorus	1	1	2	2	7.9	1.5
Total	14	15	23	24	100	19.5
Copepod						
Calanus	8	12	15	17	51.5	13.4
Cyclops	4	5	7	6	21.8	5.7
Diaptomus	3	5	6	7	20.8	5.4
Heliodiaptomus	1	2	2	1	5.9	1.5
Total	16	24	30	31	100	26.0
Larvae	-	3	5	-	8	2.0
Grand total	70 (18%)	99 (25.4%)	128 (32.9%)		92 (23.7%)	100

cies *Daphnia* was most abundance followed by *Cypris, Moina, Bosmina* and *Chydorus.* Protozoan was ranked fourth in the order of dominance (12.1%), their abundance maximum during monsoon (19nos/l) and minimum during summer (5nos/l). Among the protozoan *Verticella* species was most abundance followed by *Stentor*, *Arcella, Diffugia* and *Coleps.* Larva ranked in fifth, their abundance only (2%) they observed during post-monsoon and rainy season only and not found in pre-monsoon and summer season.

The community structure of zooplankton showed a mixed composition of mesotrophic and eutophic species in the dam may be the higher quantity of phosphate are being added through catchment area during rainy season. Zooplankton diversity is one of the most important ecological parameters in water quality assessment. It is a good indicator of the changes in water quality. In the present study, zooplankton density occur a cyclic pattern with lowest in the late pre-monsoon month and raising through late part of post monsoon to early part of summer. Similar result was observed in Veeranam Lake, Tamil Nadu, (Krishnamoorthi and Selvakumar, 2012) and in Triveni Lake, Maharashtra (Khan Rafiullah *et al.,* 2016). Rotifers dominance among the zooplankton group indicates polluted nature of the water. Copepods shows lest diversity with only 4 species constituting 26% of the total zooplanktons community. The peak value of zooplankton during post-monsoon may be due to optimum temperature, higher concentration of oxygen, rich nutritional conditions, high light penetration and low predation. Trivedi *et al.,* (2003) suggested that, zooplankton growth was less during low temperature, low light penetration, and heavy water flow. After monsoon due to debris deposition in the dam make soil fertility may provide suitable habitat for propagation of zooplankton population.

Conclusion

The present study reveals the diversity and seasonal abundance of zooplankton in Amaravathi Dam. All the groups of zooplankton were found throughout the year in all seasons. The number was highest during post-monsoon and lower during pre-monsoon due to the influence of biotic and abiotic factors. The seasonal trend in zooplankton density was reported as post-monsoon > summer> monsoon> pre-monsoon. Dominated by Rotifers indicates the water quality.

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