

Seasonal Occurrence of Zooplankton in Lentic Water Bodies of Chikmagalur and Shivamogga Districts, Karnataka

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ABSTRACT

Zooplankton play an important role as primary consumers. The present investigation was carried out selecting few lentic water bodies of Chikmagalur and Shivamogga districts during February 2009 to January 2010. During the study presence of 18 different species belonging to 4 different groups namely 33.33% Rotifera, 33.33%, Cladocera, 22.22% Copepoda and Protozoa 11.11% of total zooplankton recorded. Seasonal abundance status of the zooplankton groups were also recorded. Among the 4 zooplankton groups the Cladocera was represented by 5 genera and 6 species. Rotifers was represented by 4 genera and 6 species. However, Copepoda represented by 4 genera and 4 species and protozoan by 2 genera and 2 species respectively. Occurrence of Paramecium and Vorticella species in Lakkavalli and Tarikere tanks indicated that the water bodies are eutrophicated.

1. Introduction

The Zooplankton in general are important for their role in the tropho-dynamics and in energy transfer in an aquatic ecosystem. They provide food for fishes in fresh water ponds, lakes and play a major role in fish production. The knowledge of their abundance, diversity and their spatial distribution is important in understanding profodynamics and trophic progression of water bodies. With the global loss of thousands of species as a result of pollution and habitat disturbance, assessment of species diversity and richness are highly needed (May,1986).

Naturally zooplankton are a standout amongst the most imperative biotic parts impacting all the practical and organic parts of an oceanic environment, for example, evolved ways of life, nourishment networks, vitality stream and cycling of matter (Alcaraz M, Calbet,2009). Zooplankton are a gathering of significant living being of key significance in controlling examples and systems through which matter, vitality and pollutants are moved from the base to the upper dimensions of an oceanic nourishment networks. It assumes a critical job in sea-going biological system as they are cosmopolitan in nature and they occupy all freshwater living spaces of the world (Sunkad and Patil,2004). As expansive as the well-organized zooplankton, is their size range. In spite of the fact that they are generally extremely little, so the vast majority of their segments are just noticeable through a magnifying lens or an amplifying glass, ordinarily they are short of what one millimeter long, some thick structures jellyfish and related creatures are in the range estimate from centimeters to meters (Gadekar,2014 ; Shivshankar S. Abbai,2017).

Therefore, the authors felt that it is necessary to enlighten on the zooplankton complexes of the lentic water bodies of Chikmagalur and Shivamogga districts.

2. Materials and methods - Study Area

Chikmagalur is an area in the province of Karnataka. Coffee was first developed in India in Chikmagalur (www.chikmagalur.nic.in. 2016.). The mountains in Chikmagalur which are a piece of the Western Ghats are the wellspring of waterways like Tunga and Bhadra. Mullayanagiri, which is the most noteworthy crest in Karnataka is situated in the area. It is additionally a vacationer's heaven containing slope stations like Kemmanagundi and Kudremukh and cascades like Manikyadhara, Hebbe, Kallathigiri. Chikmagalur area has a rich history as is found in the Hoysala sanctuary at Amrithapura. Untamed life devotees would be keen on the Kudremukh National Park and Bhadra Wildlife Sanctuary present in this region. Keresanthe Srimahalakshmi sanctuary Keresanthe kadur tq is a religious community for dedicates.

Shivamogga locale is a piece of the malnad district of Karnataka and is otherwise called the 'Gateway to Malnad' or 'Malenaada Hebbagilu' in Kannada. The locale is landlocked and limited by Haveri, Davanagere, Chikmagalur, Udipi and Uttara Kannada areas. The region positions ninth as far as the complete zone among the locale of Karnataka. It is spread over a territory of 8465 km² (National Informatics Center. "Topography of Shivamogga". The Official site of Shimoga District. Area Administration, Shimoga,2007).

Shivamogga lies between the latitude 13°27' and 14°39' N and between the longitudes 74°38' and 76°04' E at a mean elevation of 640 meters above ocean level (National Informatics Center. "Topography of Shivamogga". The Official website of Shimoga District. Administration, Shimoga,2007). The pinnacle Kodachadri slope at a height of 1343 meters above ocean level is the most astounding point in this area. Streams Kali, Gangavati, Sharavati and Tadadi begin in this region. The two noteworthy waterways that move through this area are Tunga and Bhadra which meet at Koodli close Shimoga city to pick up the name of Tungabhadra, which later joins River Krishna.

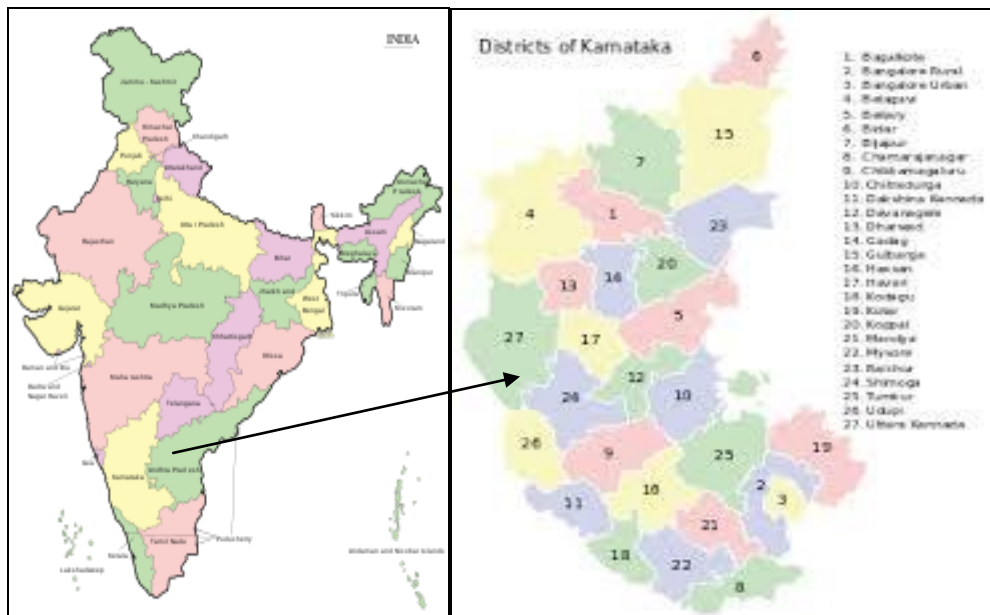


Figure 1: Location of the study area (Source: en.wikipedia.org)

Zooplankton sampling and collection

The examination was directed for a time of one year from February 2009 to January 2010. The inspecting convention included month to month testing of zooplankton from the site following standard method of Battish (1992).

Water tests were gathered month to month by utilizing tiny fish net made of nylon mesh (No: 25 and 60 μ in size) by sieving a known volume of water test. Tests were fixed in 5% formalin and protected in 50 ml bottles. Numerical estimation of zooplankton was done under magnifying instrument utilizing Sedge-Wick Raftar Cell. Normal 10 checks were made for each example and communicated in numbers per liter.

3. Results and discussion

Altogether a total of 15 genera and 18 species of zooplankton were identified from 4 major groups. The most common groups recorded are as follows:

1. Rotifers
2. Cladocerans
3. Copepoda
4. Protozoans

Figure 2 depicts the percentage occurrence of zooplankton in the lentic water bodies of the present study. The group Cladocera is represented by 5 genera and 6 species. Rotifers are represented by 4 genera and 6 species. However, Copepoda represented by 4 genera and 4 species and protozoan by 2 genera and 2 species respectively. Occurrence of *Paramecium* sp and *Vorticella* species in Lakkavalli tank and Tarikere tanks indicated that the waterbodies are eutrophicated.

Among Zooplankton Cladocerans viz., *Daphnia* and *Moina* species constitute fish food in aquatic food chain. But, occurrence of *Mesocyclops* in Lakkavalli, Tarikere and Rangenahalli tanks may be possible due to the input of allochthonous litter from marginal vegetation on the banks of the waterbodies or land run-off into these aquatic systems.

Seasonal distribution of Zooplankton

The rotifer population was highest during summer season at Lakkavalli tank with 3800 O/l and lowest in Rangenahalli tank during Monsoon season with 84 O/l. The rotifers were not recorded during Monsoon season in Basavanahalla, Tunga backwater and Bhadra backwater.

Population of Cladocerans were found to be maximum during summer season and minimum during monsoon season in all the waterbodies while, Lakkavalli tank harboured peak density Cladocerans during summer season with 1373 O/l and Tunga backwater lodged lowest population of Cladocera with 38 O/l during winter season.

Copepod population was highest in Lakkavalli tank (5500 O/l) followed by Tarikere tank (3700 O/l) during summer season and their population was lowest in Sidukanahalli tank (18 O/l) during monsoon season.

However, protozoans were found to be maximum in Lakkavalli tank during summer season with 2624 O/l and minimum during monsoon season at Sidukanahalli tank (15 O/l). These protozoans were lacking in Basavanahalla, Tunga backwater and Bhadra backwater.

In the present study, Rotifera was found as the most dominating group in all the waterbodies and represented by species like *Brachionus*, *Filinia*, *Keratella* and *Lepadella*. Rotifera are chiefly freshwater forms and presence of these organisms in abundance is related to suitable condition for their survival (Dhanapati, 2000). Kaushik and Saxena (1995) have also reported abundance of genus *Brachionus* in various waterbodies of central India. The genus *Brachionus* is of Gondwanian origin and invaded Euresia and North America by dispersal from Africa and India (Dumont, 1983). It is missing in the cold regions like Arctic but dominates in the tropics and subtropics. An abundance of *Brachionus* sp. in tropical region has been registered and various species of this genus

dominate plankton community in the warmer part of peninsular India (Fernando, 1980; Sharma, 1983). *Keratella* was also abundantly observed in Lakkavalli tank. Occurrence of this genus along with *Brachionus* indicate nutrient rich status of the waterbody (Berzins & Pejler, 1987).

Rotifer richness and diversity were found to be maximum in summer in Lakkavalli, Rangenahalli, Tarikere, Basavanahalla, Tunga and Bhadra waterbodies indicating the influence of temperature which was supported by direct relation between summer temperature and rotifer population. This observation is in concurrence with work of Kaushik and Sharma (1994) and Singh (2000) who have studied zooplankton population in Matsya Sarovar Gwalior and in tropical lake respectively.

In Lakkavalli and Tarikere tanks biodiversity of protozoans was represented by *Paramecium* and *Vorticella* while, Rangenahalli and Sidukanahalli tanks showed presence of only one species i.e., *Vorticella*. Protozoan population was recorded peak in summer season and their count remains low during monsoon months. Dilution of water caused by monsoon rain may explain low protozoan count observed during monsoon while maximum in summer months indicated a positive relationship with temperature, HCO₃, Cl, Ca, Mg, etc. Similar type of observation were recorded by Paliwal (2005) in Kali- Nadi.

Cladoceran species observed were *Daphnia*, *Diaphanosoma*, *Moina daphnia*, *Macrothrix* and *Bosmina* species. During the present investigation, Cladocerans were found to be maximum in summer season followed by winter season in all the waterbodies. The peak populace of Cladocerans in summer and winter might be ascribed to great temperature and accessibility of sustenance as microscopic organisms, nanoplankton and suspended waste while in rainstorm the variables like water, temperature, DO, turbidity and straightforwardness assume a significant job in controlling the decent variety and density of Cladocera (Edmondson, 1965; Baker, 1979).

In the present investigation, *Cyclops*, *Mesocyclops*, *Paracyclops* and *Heliodiaptomus* were recorded. While, *Cyclops* were found to be common in all the waterbodies. *Heliodiaptomus* were found in Sidukanahalli tank,

Basavanahalla, Tunga backwaters and Bhadra backwater. Pawar and Pulle (2005) also observed the presence of *Cyclops* and *Diaptomus* in Pethwadaj dam. The Copepod population in Lakkavalli tank was recorded as 5500 O/l during summer while that of Tarikere tank 3700 O/l. These tanks rich in organic matter support higher number of Cyclopids, thus suggesting their preponderance in higher tropic state of water (Subbamma, 1992). Similar observation was also made by Somani and Pejaver (2004) in Masunda lake.

Rotifer fauna of Lakkavalli and Tarikere tanks appeared rich and diverse dominating the tank throughout the study period. Rotifers have a remarkable quality that they are able to survive for long periods in dried or frozen condition and will resume normal behaviour when rehydrated or thawed. Zooplankton fauna of Lakkavalli tank was much more diversified and dominating than Tarikere tank indicating that Lakkavalli tank is highly nutrient rich water body and appears to undergo the state of eutrophication, if not managed properly.

4. Conclusion

Zooplankton variety of the present water bodies during the present examination affirm the environment to be rich for zooplankton populace and reasonable for aquaculture, as zooplankton are known to be the best nourishment for fish hatchlings in aquaculture. Further, the examination showed that the microscopic fish populace is exceedingly impacted by tainting of release of local waste, floral contributions, washing garments, cleaning vehicles, washing and other anthropogenic exercises. The move in the zooplankton network strength of contamination resilience structures showed decay of the water quality in the water bodies. Open mindfulness is required to think about the water quality and biodiversity. Despite the fact that the oceanic living space is by and large very irritated by various anthropogenic aggravations like washing garments and utensils, direct washing in the lake, store dumping of various types of waste materials from the shops and sellers close-by the water bodies and so on., yet there is different nearness of the Zooplankton in lake. Therefore, keeping the above in view, steps ought to be taken for upkeep and preservation of lentic water bodies.

References

1. Alcaraz M, Calbet A. 2009. Zooplankton ecology. Marine Ecology: 295.
2. About Chikkamagaluru". www.chickmagalur.nic.in. Retrieved 19 July 2016.
3. Baker, R.L. 1979. Specific status of *Keratella cochearis* (Goose) and *K. earliner*, Ahlstrom (Rotifera: Branchionidae). Morphological and ecological considerations. *Can. J. Zool.*, 57(9): 1719-1722.
4. Battish, S.K. 1992. Freshwater Zooplankton of India. Oxford and IBH Publication Co. New Delhi. 1-231.
5. Berzins, B. And B. Pejler. 1987. Rotifer occurrence in relation to pH. *Hydrobiologia*. Vol. 182 : 171-182.
6. Dhanapathi, M.V.S.S. (2000). Taxonomic notes on the rotifers from India. IAAB, Hyderabad.
7. Dumont, H.J., 1983. Biography of rotifers *Hydrobiologia*. Vol. 104 : 19-30.
8. Edmondson, N.T. 1965. Reproductive rates of planktonic rotifers related to food temperature in Nature. *Ecol.* Vol. 5 : 61-68.
9. Edmondson WT (1959). *Freshwater Biology*, 2nd Edition John Wiley & Sons, Inc, New York; 1248.
10. Fernando, C.H. 1980. The freshwater zooplankton of Sri Lanka with a discussion of tropical freshwater zooplankton composition. *Int. Revueges. Hydrobiologia*. Vol. 65 : 85-129.
11. Gadekar, G.P. 2014. Seasonal Variations in Zooplankton Diversity of Railway Pond, Gondia, District Gondia (MS). *International Journal of Life Sciences*. 2014 Oct 18:169-71.
12. https://en.wikipedia.org/wiki/Chikmagalur_district

13. Kaushik, S. And D.N. Saxena, 1995. Trophic status of rotifer fauna of certain waterbodies in central India. *J. Environ. Biol.* Vol. 16(4): 283-291.
14. Kaushik, S. And D.N. Sharma. 1994. Physico-chemical characteristics and zooplankton population of a perennial lake, Matsya Sarovar, Gwalior. *J. Environ. Ecol.*, vol. (1): 429-434.
15. National Informatics Centre. "Geography of Shivamogga". *The Official website of Shimoga District*. District Administration, Shimoga. Retrieved 25 March 2007.
16. Paliwal, A.K. 2005. Seasonal variation in freshwater protozoans in Kali- Nadi. District Etach, U.P. India, Ecology of plankton.
17. Pawar, S.K. and J.S. Pule. 2005. Qualitative and quantitative study of zooplankton in Pethwadaj dam, Nandel district (Maharashtra) *India. J. Agro.Biol.* Vol. 20 (2) : 53-57.
18. Sharma, B.K., 1983. The Indian species of the genus *Brachionus* (Eurotatoria Monogonta, Brachionidae). *Hydrobiologia* Vol. 104 : 31-39.
19. Shivshankar S. Abbai. 2017. A Study on Zooplankton Diversity of Sogal pond in Belagavi District, North Karnataka. *International Journal of Innovative Research in Science, Engineering and Technology* Vol. 6, Issue 9.;19071-19074.
20. Singh, D.N. 2000. Seasonal variation of zooplankton in a tropical lake. *Geobios.* Vol. 27 : 92-100.
21. Somani, V. And M. Pejavar. 2004. Crustacean zooplankton population of lake Masunda, Thane, Maharashtra. *J. Aqua. Biol.* Vol. 19(1) : 57-60.
22. Subbamma, D.V. 1992. Plankton of a temple pond near Machili Patnam, Andhra Pradesh. *J. Aqua. Biol.* Vol. 17 (12) : 17-21.
23. Sunkad and Patil, 2004. Water quality assessment of Fort Lake of Belgaum (Karnataka) with special reference to zooplankton, *J. Envi. Biol.* 25(1), 99-102.

Table 1: Occurrence of Zooplankton in the Lentic water bodies of Chikmagalur & Shivamogga districts, Karnataka

	Lakkavalli Tank	Rangena-halli Tank	Sidukana-halli Tank	Tarikere Tank	Basavana-halla	Tunga dam	Bhadra reservoir
Rotifers							
<i>Brachionus falcatus</i>	-	+	-	-	+	+	+
<i>B. Caudatus</i>	+	+	+	+	+	+	+
<i>B. Calciflorus</i>	-	-	-	+	+	+	+
<i>Filinia longiseta</i>	+	-	-	+	-	-	-
<i>Keratella tropica</i>	+	-	+	-	+	+	+
<i>Lopadella ovalis</i>	-	-	-	-	+	+	+
Cladocera							
<i>Daphnia carinata</i>	+	+	+	+	-	-	+
<i>Diaphanosoma sarsi</i>	-	-	-	-	+	+	-
<i>D. excism</i>	+	-	-	+	+	-	+
<i>Moina daphnia</i>	+	+	+	+	-	-	-
<i>Macrothrix laticornis</i>	-	+	-	-	-	-	-
<i>Bosmina sp</i>	-	-	-	-	+	+	+
Copepoda							
<i>Cyclops sp</i>	+	+	+	+	+	+	+
<i>Mesocyclops leuckarti</i>	+	-	-	+	-	-	+
<i>Paracyclops fimbriatus</i>	+	-	-	+	-	-	-
<i>Heliodiaptous Viduus</i>	-	-	+	-	+	+	+
Protozoans							
<i>Paramecium sp</i>	+	-	-	+	-	-	-
<i>Vorticella sp</i>	+	+	+	+	-	-	-

+= Present - = Absent

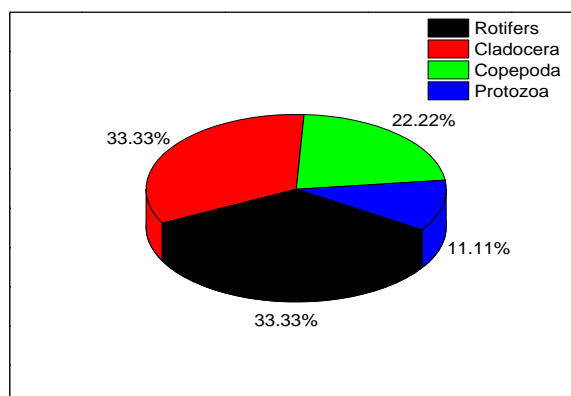


Figure 2: Percentage occurrence of Zooplankton in the lentic water bodies of the present study