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**ISSN 2348-0416**
**USA CODEN: JASRHB**

**Journal of Applied Science And Research, 2016, 4 (1):30-37**

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# ZOOPLANKTON DIVERSITY IN SOME PONDS OF CHIKKBALLPUR DISTRICT KARNATAKA, INDIA

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## ABSTRACT

*The studies on diversity of Zooplankton were carried out in four water bodies of Chikkballapur district. Samples were collected from four sites of each water. Every month sampling was done throughout the study period.The present study 22 species of Rotifera, Cladocera, copepod and ostracoda zooplankton communities are recorded, of them 16 species recoded in Chitravati dam, 13 species in Jakalmadagu, 14 species in Kandvar kere and 16 species in Gudibande kere.. Along with zooplankton Physico-chemical parameters were subjected to analysis and values presented are within the permissible limit. Heavy metals Pb, Cu, Fe and Zn analysis were done, Data subjected to statistical analysis.*

**Key words:** Zooplankton, Rotifera, Cladocera, Copepoda, Physico-chemical parameters and Heavy Metals.

## INTRODUCTION

Water occurrence in chemically pure form is very rare. It is a good solvent and found to carry wide variety of constituents. This has given rise to the term quality of water. The quality of water depends on a large number of individual hydrological, physical, chemical and biological factors. Chemical parameters are the most important indices, which characterize the quality of water. Some chemical substances, if present more than the permissible limit in drinking water may constitute danger to the health.

The demand of the freshwater is rising exponentially over the years to meet the ever increasing human needs for drinking agriculture and industries. Among the various natural agents at work rivers are the most important sources of drinking water in tropics and subtropics. But in the past four to five decades, there has been a drastic reduction in the quality of water in many rivers of world consequent to various kinds'anthropogenic activities. Padmalal *etal*2012.

Physico-chemical properties of soils depend on both natural and anthropogenic factors together acting over different spatial and temporal scales (Vandana Etal 2011). Some of the metals are essential for metabolic activity in organisms to sustaining aquatic biodiversity but there is a narrow gap between their essentially and toxicity. Toxic heavy metals can accumulate in the bodies of aquatic organisms including fish, making them unfit for the human consumption. Karbassi 2004

and Khan *etal* 2008.There is pressing need to deal with excess metals present in sediments and water bodies so to protect the water bodies from contamination.

## MATERIALS AND METHODS

### Study Area.

Chikkballapur district falls under 13º-26' N latitude and 77º-43' E longitudes. 56 km away from Bangalore city. The Chikkballapur District include six taluks. We have selected four water bodies . The present work has been carried out for one year from January 2011 to December 2011, every month water samples of water bodies were collected are subjected to analysis according to APHA (1985).

### Heavy metal analysis

The samples (one liter) were filtered in the laboratory and preserved by adding 5 ml concentrated $HNO_3$ by which pH was lowered to 1-2. Preserved samples were determined by using AAS (Model iCE3xxx C093300198 v1.30). The procedures followed to analyze the heavy metals concentration were taken from Standard Methods (APHA).

### Zooplankton analysis

For qualitative analysis of zooplankton, collections were made employing a modified Haron-Trantor net with a square metallic frame of $0.0625m^2$ area. The filtering cone was made up of nylon bolting silk plankton net (No. 25 mesh size 50µ) was used for collection of zooplankton. The net was hauled for a distance of 10 meters. Collected samples were transferred to labeled vial bottles containing 4% formalin. Identification was carried out using (Needham and Needham, 1962; Battish 1992; Patil and Goudar, 1985). The data will be used only to express the relative abundance of the principle zooplankton groups. The same species were confirmed by ZSI, Kolkata.

## RESULT AND DISCUSSION

**Table: 1** Physico-chemical parameters of Chitravati Dam

| Months | At. Temp. | Water temp. | Hardness | Ca Hardness | Mg | DO | Chloride | Total Alkal. | Free CO2 | pH | Fluoride | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30 | 23 | 230 | 152 | 66 | 7.7 | 128 | 250 | 2.8 | 7.9 | 0.9 | 960 |
| February | 31 | 24 | 245 | 164 | 72 | 7.3 | 160 | 130 | 1.1 | 7.8 | 0.8 | 623 |
| March | 32 | 24 | 286 | 186 | 70 | 6.8 | 162 | 140 | 1.3 | 8.1 | 0.9 | 654 |
| April | 33 | 25 | 292 | 172 | 84 | 6.2 | 178 | 145 | 1.5 | 8.2 | 0.8 | 628 |
| May | 35 | 27 | 302 | 194 | 92 | 6.4 | 194 | 170 | 2.2 | 8.3 | 0.8 | 965 |
| June | 34 | 26 | 250 | 170 | 74 | 7.6 | 182 | 165 | 2.8 | 7.2 | 0.8 | 1255 |
| July | 26 | 18 | 222 | 150 | 68 | 7.8 | 142 | 170 | 2.8 | 7.0 | 0.7 | 1123 |
| August | 27 | 19 | 198 | 110 | 54 | 8.6 | 146 | 180 | 2.9 | 7.1 | 0.7 | 1167 |
| September | 26 | 18 | 186 | 102 | 46 | 8.2 | 134 | 190 | 2.1 | 7.2 | 0.7 | 1060 |
| October | 30 | 22 | 196 | 106 | 44 | 8.4 | 128 | 235 | 3.2 | 7.6 | 0.8 | 1002 |
| November | 31 | 23 | 222 | 138 | 36 | 9.1 | 130 | 240 | 3.0 | 7.8 | 0.8 | 726 |
| December | 30 | 25 | 226 | 164 | 38 | 9.2 | 122 | 290 | 3.2 | 7.6 | 0.8 | 996 |

Table: 2 Physico-chemical parameters of Jakkal Madagu dam

| Months | At. Temp. | Water temp. | Hardness | Ca Hardness | Mg | DO | Chloride | Total Alkal. | Free CO2 | pH | Fluoride | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30 | 23 | 156 | 108 | 42 | 9.0 | 105 | 110 | 1.1 | 7.4 | 0.7 | 420 |
| February | 31 | 24 | 194 | 142 | 56 | 9.0 | 120 | 120 | 1.1 | 7.3 | 0.5 | 410 |
| March | 32 | 25 | 208 | 150 | 64 | 8.2 | 128 | 130 | 0.3 | 8.1 | 0.7 | 520 |
| April | 34 | 25 | 232 | 162 | 52 | 8.3 | 132 | 150 | 0.3 | 8.5 | 0.8 | 600 |
| May | 35 | 27 | 212 | 150 | 68 | 8.4 | 130 | 180 | 0.5 | 8.4 | 0.8 | 610 |
| June | 34 | 26 | 298 | 185 | 72 | 7.2 | 138 | 145 | 0.9 | 8.9 | 0.8 | 600 |
| July | 26 | 18 | 216 | 175 | 54 | 6.6 | 120 | 120 | 1.4 | 8.1 | 0.6 | 450 |
| August | 27 | 19 | 194 | 164 | 58 | 6.5 | 98 | 105 | 1.6 | 7.2 | 0.7 | 430 |
| September | 26 | 18 | 186 | 120 | 38 | 6.8 | 85 | 110 | 1.3 | 7.4 | 0.7 | 300 |
| October | 30 | 22 | 134 | 76 | 36 | 8.6 | 80 | 95 | 1.3 | 7.3 | 0.7 | 350 |
| November | 31 | 23 | 156 | 82 | 40 | 8.2 | 110 | 120 | 1.1 | 7.6 | 0.7 | 360 |
| December | 31 | 24 | 142 | 62 | 32 | 9.2 | 120 | 115 | 1.2 | 7.5 | 0.7 | 400 |

**Table: 3** Physico-chemical parameters of Kandvar kere

| Months | At. Temp. | Water temp | Hardness | Ca Hardness | Mg | DO | Chloride | Total Alkal. | Free CO2 | pH | Fluoride | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30 | 23 | 92 | 38 | 18 | 7.4 | 52 | 82 | 0.7 | 7.1 | 0.6 | 450 |
| February | 31 | 24 | 98 | 42 | 22 | 5.2 | 40 | 78 | 0.6 | 7.2 | 0.5 | 400 |
| March | 32 | 24 | 112 | 50 | 20 | 5.1 | 36 | 88 | 0.7 | 7.1 | 0.6 | 430 |
| April | 33 | 25 | 118 | 62 | 26 | 5.2 | 32 | 102 | 0.8 | 8.3 | 0.7 | 580 |
| May | 35 | 27 | 130 | 68 | 32 | 5.0 | 30 | 108 | 0.7 | 8.1 | 0.7 | 600 |
| June | 34 | 26 | 150 | 78 | 34 | 4.8 | 38 | 122 | 0.9 | 8.3 | 0.6 | 610 |
| July | 26 | 18 | 152 | 72 | 38 | 5.2 | 42 | 120 | 0.4 | 8.7 | 0.6 | 510 |
| August | 27 | 19 | 110 | 48 | 18 | 6.0 | 48 | 106 | 0.5 | 7.6 | 0.5 | 490 |
| September | 26 | 18 | 102 | 38 | 16 | 6.8 | 62 | 110 | 0.4 | 7.5 | 0.5 | 450 |
| October | 30 | 22 | 78 | 34 | 20 | 6.9 | 68 | 60 | 0.5 | 7.4 | 0.6 | 400 |
| November | 31 | 23 | 70 | 32 | 16 | 7.0 | 62 | 58 | 0.7 | 7.3 | 0.6 | 350 |
| December | 32 | 25 | 90 | 40 | 18 | 6.8 | 58 | 85 | 0.8 | 7.2 | 0.6 | 380 |

**Table: 4** Physico-chemical parameters of Gudibande Kere

| Months | At. Temp. | Water temp. | Hardness | Ca Hardness | Mg | DO | Chloride | Total Alkal. | Free CO2 | pH | Fluoride | TDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30 | 23 | 200 | 145 | 32 | 8.2 | 56 | 140 | 1.1 | 7.2 | 0.4 | 350 |
| February | 31 | 24 | 210 | 142 | 36 | 8.0 | 62 | 135 | 1.2 | 7.1 | 0.3 | 340 |
| March | 32 | 24 | 195 | 138 | 38 | 6.8 | 76 | 150 | 1.5 | 7.4 | 0.5 | 400 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | 33 | 25 | 250 | 185 | 72 | 6.6 | 88 | 220 | 2.2 | 8.1 | 0.4 | 420 |
| May | 35 | 27 | 260 | 184 | 68 | 6.2 | 78 | 230 | 2.3 | 8.0 | 0.4 | 425 |
| June | 34 | 26 | 280 | 192 | 66 | 7.2 | 96 | 210 | 2.5 | 7.9 | 0.4 | 410 |
| July | 26 | 18 | 260 | 188 | 76 | 7.8 | 102 | 180 | 2.9 | 7.8 | 0.3 | 360 |
| August | 27 | 19 | 210 | 162 | 30 | 8.0 | 98 | 190 | 1.9 | 7.6 | 0.3 | 350 |
| September | 26 | 18 | 180 | 128 | 42 | 9.2 | 86 | 165 | 1.6 | 7.2 | 0.3 | 340 |
| October | 30 | 22 | 164 | 120 | 50 | 9.0 | 74 | 155 | 1.5 | 7.2 | 0.3 | 320 |
| November | 31 | 23 | 168 | 118 | 44 | 9.2 | 58 | 130 | 1.2 | 7.4 | 0.3 | 310 |
| December | 32 | 25 | 170 | 120 | 36 | 9.1 | 54 | 150 | 1.2 | 7.3 | 0.3 | 330 |

**Zooplankton:**

In The present study shows the 22 species of zooplankton communities of them 16 species recorded in Chitravati dam, 13 species in Jakalmadagu, 14 species in Kandvar kere and 16 species in Gudibande kere. The detailed species distribution of all rotifer, clodocera, copepod and ostracode are depicted in table (Table No. 5.)

**Table No 5:** List of Zooplankton form Chikkballapur district

| Species/Group | Chitravati dam | Jakkalmadagu dam | Kandvar kere | Gudibende kere |
|---|---|---|---|---|
| *Asplancha britiwelli* | + | - | + | + |
| *Brachionus angularis* | + | + | + | + |
| *B. caudatus* | + | + | + | + |
| *B. falcatus* | + | - | + | + |
| *B. rubens* | + | + | + | + |
| *Filina longiseta* | + | + | + | + |
| *Keratella tropica* | - | + | - | - |
| *Lecane luna* | - | + | - | - |
| *Rotaria species* | + | + | + | + |
| **Caldocera** | + | + | + | + |
| *Alona pulchella* | - | - | + | - |
| *Diaphanosoma excisum* | + | + | + | + |
| *D. sarsi* | - | - | + | - |
| *Daphnia carinata* | - | - | - | + |
| *D. logispina* | + | - | + | + |
| *D.pulex* | + | - | + | + |
| *Macrothrix laticornis* | + | + | - | - |

| | | | | |
|---|---|---|---|---|
| *Moina brachiata* | + | + | - | - |
| *M. macrocopa* | - | - | - | + |
| **Copepoda** | | | | |
| *Mesocyclops hyalinus* | + | + | + | + |
| *Neodiaptomus strigilipes* | + | - | - | + |
| **Ostracoda** | | | | |
| *Cypris subglobosa* | + | + | - | + |
| *Hemicypris fossulate* | - | - | - | - |

**Discussion:**

The temperature is one of the physical parameters which is directly related with chemical reaction in the water and biochemical reaction in the living organisms. It is very important in the determination of solubility of dissolved oxygen CO2 and determination of pH and conductivity. The higher air and water temperature observed during summer and SWM (South West Monsoon) Season. It must be due to the presence of cloudy weather according to Uyeno (1966).

Hardness of water is not a specific constituents but is variable and complex mixture of cations and anions. It is caused by dissolved polyvalent metallic ions dissolved in water. The calcium is the essential nutrient for animal life and in maintain the structure of plant cells. Calcium is also found in abundance in all natural waters and its source s limestone from where it is leeched. Like wise magnesium is the important source of the water like calcium, it generally occurs lower than the calcium ions. The maximum values of total hardness, calcium and magnesium recorded during summer and minimum values observed in SWM during the study period. The higher values during summer are probably due to the regular addition of quantities of sewage detergent and large scale of human use. Similar observations are made by Koshy and Nayar (1999) Mishra and Tripathy (2001). Hiware and Jadhav (2001). The present study results agreeable with earlier reports.

Dissolved oxygen content of the water body is an important parameter to be determined since the existence of aquatic bodies and intimately linked with the availability of oxygen for their survival. In the present study (Chitrvati dam) dissolved oxygen values are observed higher during summer. Lower values recorded during SWM season. The higher values during summer and moderate in NEM season may be due to luxuriant growth of phytoplankton was also observed by Rao (1975) Sreenivas (1976). Sreenivas etal. (2001) and Pejavar etal (2002) are who reported higher values during summer and they attributes may be due to increased solar radiation. In other water bodies Dissolved oxygen is recorded lower during summer and moderate in SWM season higher in NEM season.

The presence of chloride in natural water can be attributed to dissolution of salt deposits discharges of effluents from refuse leechates of the some may result in local contamination of surface waters. In the present study higher values noticed in summer and lower values in NEM season. The Gonzalves and Joshi (1946) considered chloride occurrence in tank water and according them chloride level increase in the summer when the water is low. The present investigation too the chloride level showed the greater periodicity being higher in summer when there is high rate of evaporation.

The total Alkalinity of water is a measure of its capacity to neutralize acids. Major portions of the alkalinity in natural waters is caused by hydroxide, carbonate and bicarbonate which may be ranked in order their association with pH values. The values tended to increase in the NEM and summer season, in SWM season lower values may be due to influx of rain water. higher values during summer season have been directly circulated with the productivity of the water body. Similar observation made by Ayyappan and Gupta (1981) Deshmukh and Kanchan (2004).

In aquatic ecosystems sources of CO2 are commonly respiration and decomposition while it is consumed in the photosynthesis. Depending on the pH and other biological conditions the CO2 is found in any of the form is free CO2, carbonic acid and bicarbonates. In the present study the free CO2 is considerably more during NEM season. Whereas the free CO2 declined in summer and moderate in SWM season. The higher values in summer and SWM is probably because CO2 could not be utilized completely due to less photosynthetic activity.

The hydrogen ion concentration expresses the intensity of the acid or alkaline conditions of solution . Normally pH of the water body is strongly influenced by the nature of terrain of the water body. It is observed that hydrogen concentration is followed a seasonal trend and showed higher pH value in summer and followed by NEM and lower values in SWM season. Higher values during summer could be attributed to enhance the rate of evaporation coupled with human interference are partly to enhanced photosynthetic activity. Similar observation noticed by Mishra and Yadav 1978, Mushigeri etal (2003).

Most of the salts and variety of organic substance are soluble in water thus, water sample in the form of surface, ground and marine sources contain appreciable quantities of dissolved solids which normally confer a degree of hardness to it. The higher values recorded during SWM season and lower in summer season. Similar results were obtained by Wagh (1998) and Balerao etal (2000).

Zooplankton population of four water bodies of Chikkballpur district comprised generally Rotifera, Cladocera, Copepoda and Ostracods and Protozoans. All dominant groups of Zooplankton are present throughout the year. Zooplankton showed variations in their abundance during different months of the year. Maximum occurrence of zooplankton population was done in summer and minimum in rainy season.

The Zooplankton population showed distinct seasonal variations. Each group has their own maximal and minimal peaks. Zooplankton fauna was abundant during summer (March-June) and during post-rainy season (winter), the observation was in agreement with Singh e*t al.,* (1987), Srivastav *et al.,* (1990).

The present temporary water habitat showed temperature is determining factor distributions of organisms and changes of physic-chemical properties of water. Water temperature affects the metabolic rate of living organisms (Gupta *et al.,* 2008). pH of the water bodies showed alkaline of nature of the system. The wide variations of dissolved oxygen content reflect biological and physic-chemical changes occurring in water. Besides Dissolved oxygen wide variation may be due to over loaded with submerged macrophytes, high temperature decomposition and perishing of decaying materials in water bodies. The similar observations made by Rutner (1974). The wide variation of DO in a pond was also observed in Tamil Nadu (Raghunathan 1991). Total hardness indicates hard water characteristic of water bodies it was evident by Calcium and Magnesium contents. The wide variation of physic-chemical parameters also due to surface runoff from outside, during rainy season. The high values may be due to accumulation of ions owing to evaporation biological turnover and interaction with sediments (Devi Anandhi 2009).

Finally the present study concludes that the zooplankton community fluctuates according to

physico-chemical parameters of environment. The study made an attempt and it may help to further monitoring of zooplankton community and its uniqueness of species in temporary/permanent water habitats.

## CONCLUSION

The present investigation of status of water bodies of Chikballapur district has provided a base line data of water quality, heavy metal concentrations, productivity and biological diversity.

Based on the findings, all the water bodies' water quality parameters and heavy metals concentrations are within the permissible limits with some exception. The productivity results are indication of their trophic status of the water bodies. This investigation also reflects the presence of biological diversity of water bodies. And also further detail research work is needed for understanding the ecological structure and function of this fragile aquatic ecosystem.

## ACKNOWLEDGEMENTS

University Grants Commission, South Western Regional office, Bangalore for Providing financial assistance for Minor research project.

## REFERENCES

[1] Ayyappan, S. and T. R. C. Gupta. Limnology of Ramasamudra tank, Mysore. *J. Agri. Sci.* **1981**. 15: 305-312.

[2] Battish, S. K. Freshwater zooplankton of India. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. **1992**. Pp. 130.

[3] Battish ,Character of Ganga water. *Asian Journal of Microbial Biotech. And Env. Sci.*,**1992**, Vol. 3. No. 333-338.

[4] D. Padmalal S. I. Remya S. Jissy Jothi D. Baijulal, K. N. Babu and R.S. Baiju ,Water quality and dissolved organic fluxes of N.P. SO4 and K of a small catchment river in Southwestern coast of India. Env. Mon. and Assessment, **2012**(184), 1541-1557.

[5] Deshmukh, M. A. and M. C. Kanchan. Studies on physico-chemical variation in Pani ki Dharmashala reservoir Jhansi, India. *Eco. Env. & Cons* , **2004**, 10 (3) : 287-294.

[6] Devi, D and Anandhi, D.U. Assessment of water quality for aquaculture- A case study of Madavara lake in Bangalore. *Nat. Env. & Poll. Tech.*, **2009**, 8(4): 755-760.

[7] Gonzalves, E. V. and D. R. Joshi. Freshwater algae near Bombay I. The seasonal succession of the algae in tank in Banda. *J. Bomb. Nat. Hist. Soc*. **1946**, 46: 154-176.

[8] Hiware C. J. and Jadhav B. V. Biological studies of Manjera river near Kallurdistrict, Osmanabad, Maharashtra, *India. J. Aqua. Biol.* , **2001**,16 (2) P 11-13.

[9] Karbassi A. R. and Amirnezhad R. Geochemistry of heavy metals and sedimentation rate in a bay adjacent to the Capsian Sea. *Int. J. Environ. Sci. Tech* ,**2004**.1(3).

[10] Khan R., Israili S.H., Ahmad H. and Mohan A. Heavy metal pollution. Assessment in surface water bodies and its suitability for irrigation around the Neyveli Lignite mines and Associated Industrial complex. Tamilnadu India. *Mine Water Envir.* **2005** ,24 (3).

[11] Mishra and Tripathi: Impacts of city sewage discharges on physic-chemical, **2001**.

[12] Needham, J. G. and P. R. Needham. A guide to the study of Fresh Water Biology Holden day Ins. San-Francisco, U.S.A. **1962** Pp.108.

[13] Raghunathan, M. B. Cladoceran investigation in a pond with macrophytes and algal blooms. *Rec. Zool. Surv. of India*, **1991**,88(1): 81-85.

[14] Rutner, W.S. Fundamentals of Limnology, Academic Press. London. 1974, 295.

[15] Uyeno. Nutrient and energy cycle in an estuarine oyster area M. P. *Proc. Nat. Acad. Sci. India*. **1966**, 52 (B): IV Pp. 189.

[16] Vandana P., N. N. Murty and P. R. Saxena Assessment of Heavy metal contamination in soil around hazards waste disposal sites in Hyderabad city (India).: Natural and anthropogenic implications E3 Journal of Environmental research and Management ,**2011**, 2(2) ,027-034.

[17] Wagh, N. S. Hydrobiological parameters of Harsul dam in relation to pollution. Ph.D. Thesis. Dr. B. A. M. U. Aurangabad, **1998**, 154.