

# Abundance of Cladocerans related with the water quality of Chirebandi pond, Fulchur at Gondia, Dist. Gondia, Maharashtra, India

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## Abstract

In the present study, the Chirebandi pond, Fulchur at Gondia (M.S.) was selected to study abundance of cladocerans and quality status of the water. It is situated at about 3 km from the Gondia town at Fulchur village on Gondia-Nagpur State highway No.249. It is a medium size water body, surrounded by sparsely populated area and the water of which is used for washing, bathing and for other socio-cultural practices by the villagers. To study the abundance of cladocerans related with water quality, the physico-chemical parameters of Chirebandi Pond were analyzed seasonally from June 2005 to May 2006. Water temperature, transparency,  $\text{pH}$ , Dissolved oxygen, free Carbon dioxide, Alkalinity, Total hardness, Chlorides, Nitrates, Phosphates, BOD, COD. Cladocerans were recorded as 1130 ind/lit. The study reveals that the pond water is highly polluted which is leading to the stage of eutrophication due to the unplanned urbanizations, disposals of solid wastes and anthropogenic activities by the nearby people. However, there is an urgent need of an action for conservation and to reduce pollution level before it becomes unmanageable.

**Keywords:** Cladocerans abundance, Water quality, Chirebandi Pond.

## Introduction

Cladocera is one of the most important groups of fresh water zooplankton and is one of the most numerous animal groups on the earth, occurring in all the types of water bodies such as lakes, ponds, reservoirs etc. The Cladocera are an order of small crustaceans commonly called water fleas.

These utilize varieties of food items ranging from the detritus, bacteria to a wide range of unicellular and multicellular phytoplankton and themselves serve as an excellent food for fish. They are also widely used in aquaculture, and large filter-feeding planktonic species. These animals as intermediate hosts of some parasites may potentially pose a threat to human health [1]. These play vital role in energy transfer from primary producer to secondary consumer in aquatic ecosystem [2]. A high diversity of cladocerans can be found in the littoral zone of stagnant waters, as well as in temporary water bodies. These habitats are often negatively influenced by human activities, and especially the loss of temporary waters may lead to a decrease of diversity or even local extinction of some species. The cladocerans are very sensitive to changes in the water quality and acts as one of the important indicators of aquatic pollution.

## Methodology

The Chirebandi pond is located at 21° 25' and 48.97" N, 80° 11' and 43.41" E. it is about 1041 ft. above the mean sea level (MSL), with net area of 0.09 sq. km. It is an oligosaprobic in nature, but the present trend in expansion of urbanization on all sides of town may engulf this water body in very near future.

The investigations on physico-chemical and biological parameters were carried out during June 2005 to May 2006. Monthly water samples were collected and brought to the laboratory for further analysis. To check the water quality, physico-chemical parameters like temperature, transparency, pH, dissolved oxygen, free carbon dioxide, chloride, hardness and nutrients like phosphates and nitrates, BOD and COD. [3]. At the same time the plankton samples were collected by using standard nylon plankton net made by bolting silk no. 25 planktons were preserved in 4% and identified using [4] and other standard manuals.

## Results and Discussions

During the present investigation the physical parameters such as temperature, transparency and chemical parameters namely pH, dissolved oxygen, free carbon dioxide, chlorine, hardness, alkalinity, phosphate and nitrates, BOD and COD. The abundance of cladocerans were studied from June 2005 to May 2006. Table 1 shows the seasonal variations of various physico-chemical parameters of Chirebandi pond during the study period.

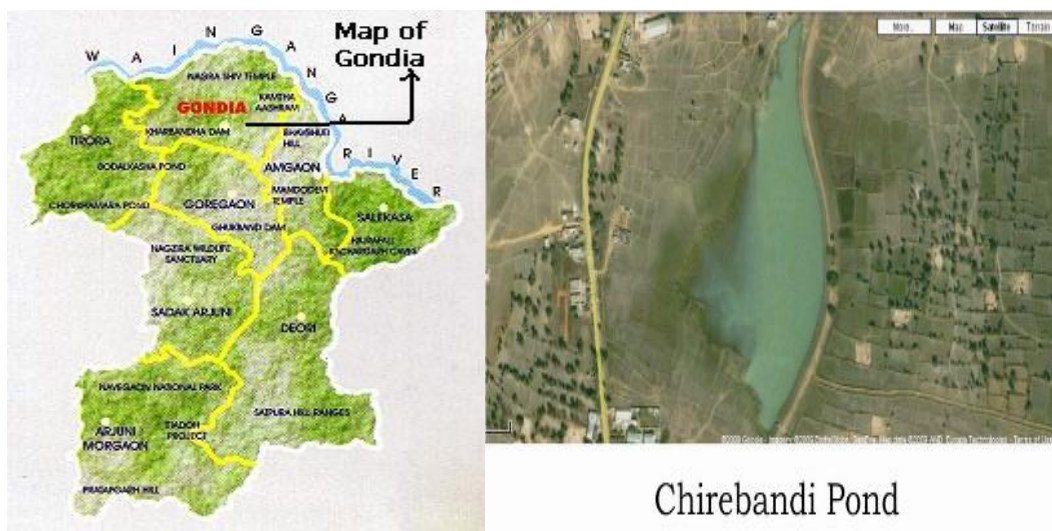
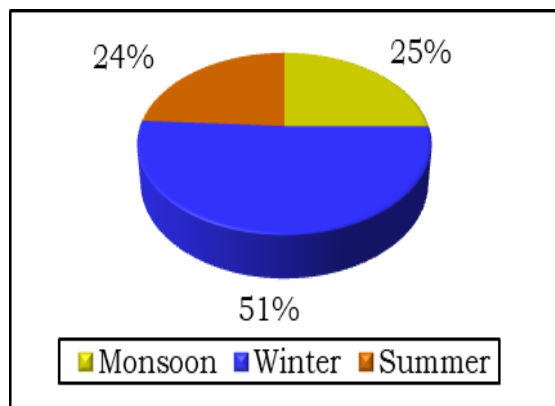


Fig.1 Map showing Gondia District and satellite view of Chirebandi Pond.

**Table 1:** Annual range, Seasonal variations in Physico-chemical Parameters of Chirebandi pond during 2005-2006.

Parameters	Range	Monsoon	Winter	Summer
Water Temperature ( ° C)	22-33	28.25±1.920	23.5±1.118	30±2.36
Transparency (cm)	16-26	19.75±1.677	25±0.790	18.25±5.123
pH	7.3-8.3	7.47±0.192	7.82±0.147	7.75±0.35
Dissolved oxygen (mg/l)	5.5-15.5	12.2±2.406	12.6±2.442	6.58±1.169
Free Carbon dioxide (mg/l)	2.7-7.2	4.9±0.982	3.07±0.258	5.85±0.944
Total Alkalinity (mg/l)	58-132	70.5±9.759	92±12.247	123.75±6.179
Total Hardness (mg/l)	248-680	544±112.143	489.75±19.677	369.25±70.856
Chloride (mg/l)	2.49-60.48	37.22±16.794	23.6±7.444	9.04±4.065
Nitrate (mg/l)	1.33-3.65	2.66±0.375	1.77±0.278	2.75±0.615
Phosphate (mg/l)	1.02-5.89	2.28 ±0.669	1.52±0.419	4.53±0.833
Sulphates (mg/l)	12.0-40.32	25.06±4.759	14.71±1.960	30.81±5.801
BOD	1.2-18.3	10.4±4.468	15.4±2.516	4.98±3.059
COD	19.2-110.5	61.55±25.891	81.13±21.482	25.08±4.237

**Fig.2 :** Seasonal Abundance of Cladocera in Chirebandi Pond during 2005-2006.

Parameters like water temperature (33 °C), free carbon dioxide (5.85 mg/l), total alkalinity (123.75 mg/l), nitrates (2.75 mg/l) and phosphates (4.53 mg/l) were maximum during summer while transparency (25 cm), pH (7.82), dissolved oxygen (12.6 mg/l), BOD (15.4 mg/l) and COD (81.13 mg/l) showed its peak in winter and total hardness (544 mg/l) and chloride (37.22 mg/l) were recorded maximum during monsoon season.

Total 4 species of cladocerans were recorded during the study period. The most diversified species was *Moina* spp. (354 ind/lit.), *Ceriodaphnia* spp. (287 ind/lit.), *Diaphanosoma* spp. (281 ind/lit.), and *Alona* spp. (208 ind/lit.). Total population of Cladocerans was recorded as 1130 ind/lit.). Seasonal population density of

Cladocerans recorded its peak during winter (580 ind/lit. i.e. 51.33%), during summer (273 ind/lit. i.e. 24.15%) while least during monsoon (277 ind/lit. i.e. 24.51%).

## Discussion

The seasonal study of cladocerans diversity of Chirebandi pond showed the peak in density and diversity during winter indicating the influence of various physico-chemical factors. In the present investigations, the nutrients such as nitrates, phosphates etc. were recorded in lower concentration while peak in pH and dissolved oxygen, BOD and COD during winter

season which may result into the increased population of cladocerans during this season while lower population was recorded during summer and monsoon season. This minimum density during summer and monsoon season also recorded by Krishnamurthy [5]. He stated that *Moina micrura* appeared to be most common in eutrophic ponds. Murugan [6] studied the population ecology and population dynamic of *Moina micrura*.

Cladoceran diversity presumably due to important bio-ecological relationship between macrophytes and zooplankton and is in conformity with Venkataraman et al [7]; Proctor et al [8]. The least diversity in Chiebandi pond might be due to predation pressure by fishes [9, 10].

Quadri and Yousuf [11] investigated the influence of some physico-chemical factors on the seasonal abundance of Cladocera. The maximum population of Cladocera in winter may be attributed to favourable temperature and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus. Jayabhaye et al [12] has also reported similar observations. Patil et al [13] has reported minimum Cladocerans during monsoon months and attributed to the low water temperature, dissolved oxygen, and transparency play an important role in controlling the diversity and density of Cladocera.

Siva Kumar [14] has reported maximum number of Cladocerans species during winter than summer season. The less number of these species during summer might be attributed to the higher temperature, evaporation of water or might be due to the depletion of the important factors such as Dissolved oxygen. The reduction in the number of species may also be due to predation. Welch [15] also reported quantitatively less plankton in tropical inland waters.

## Conclusion

Having a glimpse of observations on physico-chemical parameters, such as temperature, transparency, P<sup>H</sup>,

dissolved oxygen, free carbon dioxide, total alkalinity, total hardness, nitrates and phosphates, BOD and COD have the direct impact on abundance of cladocerans in Chiebandi pond. Occurrence of these bio indicator species at higher rate indicates the mesosaprobic nature of this pond in future.

**Conflicts of interest:** The authors stated that no conflicts of interest.

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