

## RESEARCH ARTICLE

## Seasonal Diversity of Copepods in Relation with Physico-Chemical Status of Devtaki Pond, Distt. Gondia, Gondia (M.S.), India

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**ABSTRACT**

The present study is focused on the seasonal variations of copepods in relation with the physico-chemical parameters of a Devtaki pond, Gondia, Gondia District, Maharashtra. The pond is surrounded by slums of Govindpur and Chhota Gondia areas in the town. Seasonal changes in physico-chemical parameters such as water temperature, P<sup>H</sup>, Dissolved Oxygen and inorganic contents were studied month wise from June 2006 to May 2007. Studies showed the seasonal fluctuations in water temperature (25°C-35°C), Transparency (13-20 cm), P<sup>H</sup> (7.1-8.3), Dissolved Oxygen (3.4-10.5 mg/l), Free Carbon Dioxide (6.0-17.5 mg/l), Total alkalinity (103-309mg/l), Chlorides (15.6-72.0 mg/l), Total Hardness (475-830 mg/l), Phosphate (2.07-7.15 mg/l), Nitrates (2.09-4.06 mg/l), Copepods were recorded as 1430 ind/lit. The study revealed that there is an indication of pollution in the pond due to anthropogenic activities, rapid encroachments of the area, domestic sewage, the pond water is being polluted. Hence preventive measures are required to avoid further deterioration of the pond water quality.

**Keywords :** Devtaki pond, physico-chemical parameters, copepods.

**INTRODUCTION**

Water is essential for the existence of life on the earth. No wonder that water is aptly said the 'Liquid of Life' or 'The Universal Solvent' or the 'Elixir of Life'. The physico-chemical characteristics of pond water have direct impact on aquatic organisms as well as on human being using such water. The quality of water is getting deteriorated due to the industrialization, urbanization and pesticides use which run off with water and contaminate the water bodies. The quality of water is assessed on the basis of physico-chemical and biological parameters in order to complete set of information. Copepoda is one of the important groups of zooplankton in aquatic ecosystem. Copepods are found almost universally in freshwater habitat. They provide food for fishes in fresh water ponds, lakes and play a major role in fish growth and their production.

Seasonal variations with reference to physico-chemical factors was undertaken to study the pond ecosystem with seasonal changes in response to physico-chemical and biological factors during different seasons of the year.

**MATERIALS AND METHODS**

Devtaki pond is located at 21° 27' and 13.62" N, 80° 12' and 38.51" E. It is about 1032 ft. above the mean sea level (MSL), with net area of 0.06 sq.km. It is surrounded by the dense populated slum areas of Gondia town. It is called as Devtaki, meaning God's pond, because of Lord Shiva and Vithal- Rukhmini temples on its bank.

The investigations on physico-chemical and biological parameters were carried out during June 2006 to May 2007. Monthly water samples were collected and brought to the laboratory for further analysis. Physico-chemical parameters like temperature, transparency, pH, dissolved oxygen, free carbon dioxide, chloride, hardness and nutrients like phosphates and nitrates. (APHA, 1975). 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 (Edmondson 1959) and other standard manuals.



Devtaki Pond

Fig.1 : Map showing Devtaki pond in Gondia District and satellite view of Devtaki pond.

**RESULTS AND DISCUSSION**

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. The density and diversity of copepods were studied from June 2006 to May 2007. Table no. 1 shows the seasonal variations of various physico-chemical parameters of Devtaki pond during the study period.

Parameters like water temperature (32.12 °C), free carbon dioxide (13.72 mg/l), total alkalinity (279.5 mg/l), nitrates (3.46 mg/l) and phosphates (5.99 mg/l) were maximum during summer while transparency (18.25 cm), pH (7.92), dissolved oxygen (8.48 mg/l) showed its peak in winter and total hardness (715.25 mg/l) and chloride (56.3 mg/l) were recorded maximum during monsoon season.



Table 1: Annual range, Seasonal variations in Physico-chemical Parameters of Devtaki Pond during 2006-2007.

Parameters	Range	Monsoon	Winter	Summer
Water Temperature ( °C)	25-35	31.05 ± 2.209	25.88±0.829	32.12±2.236
Transparency (cm)	13-20	15± 0.935	18.25 ± 1.145	14.63 ± 1.92
pH	7.1-8.3	7.43 ± 0.294	7.92 ± 0.238	7.9 ± 0.316
Dissolved oxygen (mg/l)	3.4-10.5	6.25 ± 1.581	8.48 ± 1.645	4.6 ± 0.948
Free Carbon dioxide(mg/l)	6-17.5	12.35 ± 2.546	7.1 ± 0.821	13.72 ± 2.64
Total Alkalinity (mg/l)	103-309	154.5 ± 46.241	192.25 ±35.891	279.5 ± 19.241
Total Hardness (mg/l)	475-830	715.25 ± 100.686	699.25 ± 30.727	541.25 ± 52.227
Chloride (mg/l)	15.6-72.0	56.3 ± 11.091	37.05 ± 7.437	20.85 ± 4.049
Nitrate (mg/l)	2.09-4.06	3.39 ± 0.321	2.26 ± 1.191	3.46 ± 0.458
Phosphate (mg/l)	2.07-7.15	4.42 ± 1.330	3.25 ± 0.803	5.99 ± 0.908

Total 5 species of copepods were recorded during the study period. The most diversified species was Cyclops (325 ind/lit.), Diaptomus spp.(279 ind/lit.), Macrocylops (226 ind/lit.), Mesocylops (300 ind/lit.) and Eucyclops (300 ind/lit.). Total population of copepods was recorded as 1430 ind/lit.). Seasonal population density of copepods recorded its peak during winter (728 ind/lit.i.e 49%), during summer (372 ind/lit.i.e 28%) while least during monsoon (330 ind/lit.i.e 23%)

Copepodes build up their population taking more time than rotifers and other zooplanktons. However, once they become dominant, they continue to dominate the habitat till the hydrobiological condition favour their existence. Prabhavathy and Sreenivasan (1977).

The seasonal study of copepods biodiversity of Devtaki 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 during winter season which may result into the increased population of copepods during the season while lower population was recorded during summer and monsoon season.

Similar results recorded by Kamble et al. (2005) in Khatijapur Tank, Achalpur have reported the pollution indicator species like Cyclops were recorded more during the winter season. It might be due to the abundance of diatoms and blue green algae (Meshram, 1996). This pattern of distribution may be due to the interaction of biotic and abiotic components of water. Choubey (1997) found high density of copepod during October. Water temperature and availability of food organisms affect the copepod population. Rao et al. (2001) has reported maximum count of zooplankton during summer while among this Copepodes during winter. Least count of both reported during monsoon season.

Kumar (2001) has also reported maximum number of Copepodes 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 (1952) also reported quantitatively less plankton in tropical inland waters. Sharma et al.

(2007) in urban lake, Udaipur has reported the dominance of crustacean zooplanktons quantitatively. This is also supported by Bohra (1976), Govind (1978) and Sumitra (2001) also found dominance of copepods in stagnant 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 have the direct impact on occurrence, density and diversity of copepods in Devtaki pond. Occurrence of these bio indicator species at higher rate indicates the mesosaprobic nature of this pond.

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