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Comparative Study of Physico-Chemical Parameters and Zooplankton Bio Diversity Between Twolakes (Pathipaka and Chinnakodepaka) at Jayashankar Bhupal Pally District

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ABSTRACT

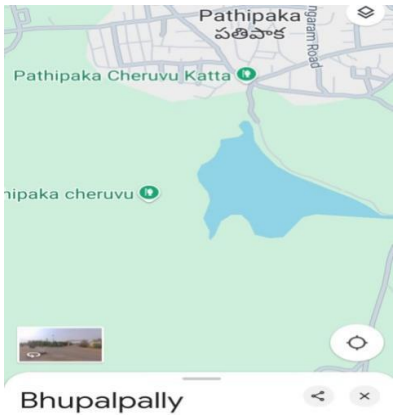
Water is essential for living organisms especially like Flora and Fauna. The presented study deals with comparative study of the periodic and aperiodic variations of Physico-chemical status of two lakes belongs of Pathipaka Lake and chinnakodepakaLake of Bhupal pally Jayashnkar District,in Telangana. Both lakes having natural freshwater body. Different data are collected and observed through various field trips. A comparative study of the periodic and aperiodic variations of the Physico-chemical status of two lakes were studied in year 2023-2024. Both the lakes are biotically affected by various anthropogenic activities. In the present study water characteristics of two lakes have been compared the water quality. Different Parameters like Temperature, pH, conductivity, COD, BOD and also Zooplankton diversity. Both lakes are suitable for Fish culture and they are not polluted ponds.

Keywords: *Physico-chemical parameters, Aquatic systems, Lentic systems*

1. INTRODUCTION

Fresh water habitats occupy a relatively small portion of the earth surface as compared to marine and terrestrial habitats, but their importance to man is far greater than their areas. Fresh water are the most suitable and cheapest source for domestic and industrial needs and they provide convenient waste disposal systems. The increased demand of water as a consequence of population growth, agriculture and industrial development building construction has forced environmentalists to determine the chemical, physical and biological characteristics of natural water resources (Regina & Nabi, 2003) Temporary ponds are found throughout the world. Though, there are considerable regional differences in their type and method of formation, many physical, chemical and biological properties are quite similar. The worldwide distribution of water body type leads to a large variety of temporary pond type due to climate and geological differences (Solanki et al., 2007) Stagnant water bodies have more complex and fragile ecosystems in comparison to running water bodies as they lack self cleaning ability and hence, readily accumulate greater quantities of populations. Increased anthropogenic activities in and around the water bodies damage the aquatic systems and ultimately the physicochemical properties of water. The man is abusing water resources at a large scale. The effort to conserve these resources is present need. Factors that influence the sustainability of such lentic systems are temperature, transparency, salinity, biogenic salts, dissolved gases etc. (Munawar, 1970; Misra and Yadav, 1978) Since, ponds are favourable habitants for a variety of flora-fauna and anthropogenic society, so its regular monitoring is necessary for control. Recently, lot of work has been done on changing ecological behavior of ponds(Mahananda et al., 2005; Kanungo et al., 2006; Gupta et al., 2008; Banerjee and Mandal, 2009) In the present study, two important ponds of different lakeswere chosen for comparing the impact of biotic activities on physicochemical characteristics of pond's water. The study was performed during 2024-2025.

Study area: Pathipaka Lake is located between 18’12’47’Nto 79 55’38’’E latitude and longitude. and chinnakodepaka lake is located between 18 25’45’’N to 79 51’49’’E Latitude and longitude. A study of the water quality of the Pathipaka and chinnakodepaka Lake, which is man-made water body. The Pathipaka Lake situated in Shayampet mondal and ChinnakodepakaLake situated in Shayampet, Dist: Jayaashankar Bhupalpally, Telangana, India. The studies on physico-chemical and biological examinations of the water of both Lakes were carried out in Jan to June 2011. Analysis of water chemistry was carried out with changes in water chemistry. Sites were selected for sampling Water samples, were examined for various physico-chemical parameters as pH, Temperature, BOD and COD Bicarbonates, Calcium and Electric Conductivity (EC) etc by standard APHA (2005) methods. Both lakes are having natural freshwater body.



2. MATERIALS AND METHODS

Frequent field trips were carried out during November to May in 2024-2025. In Pathipaka and Chinnakodepaka lakes were selected because they are affected by domestic purposes, sewage, cleaning clothes by local people, bathing of cattles by rural communities, small scale industrial effluents and worshiping activities. The water sample were collected from surface near the margins of the pond between 9-00 A.M. to 11-00 AM. The analysis of physicochemical parameters was done by following the standard methods (APHA,2005). The plate 1 shows Pathipaka lake in different views, Table 2 shows Chinnakodepaka lake in different views. Table 1, is shown various parameters of Pathipaka lake and Table 2, is shown various parameters of Chinnakodepaka lake.

Table 1: Mean temperature (in ^{0}C) with standard deviations.

	Nov	Dec	Jan	Feb	Mar	Apr	May
Air (Pathipaka lake)	35.0±0.5	31.5±0.6	30.0±2.1	30.5±0.9	31.3±0.8	33.9±1.3	35.9±1.0
Water(Pathipaka lake)	32.0±0.4	28.0±0.7	30.0±1.4	29.3±0.8	32.4±0.4	33.2±1.0	34.1±1.1
(Chinnakodepaka lake)							
Air (Chinnakodepaka lake	31.5±0.9	32.1±0.6	31.1±1.2	29.6±0.7	30.6±0.7	34.0±1.5	34.7±1.6
Water (Chinnakodepaka lake	32.5±0.5	29.7±0.4	29.5±2.6	27.3±0.4	28.1±0.2	32.2±1.1	32.3±0.3

Table 2: Mean pH of with standard deviations.

	Nov	Dec	Jan	Feb	Mar	Apr	May
Pathipaka lake	7.34±0.14	7.49±0.03	7.46±0.04	7.40±0.02	7.48±0.05	7.57±0.02	7.44±0.11
Chinnakodepaka lake	6.91±0.05	6.93±0.07	6.76±0.02	6.81±0.02	6.83±0.02	6.87±0.04	6.96±0.01

Table 3: Mean salinity (in ppm) with standard deviations.

	Nov	Dec	Jan	Feb	Mar	Apr	May
Pathipaka lake	233.0±5.6	248.5±7.6	227.8±2.5	244.3±4.5	238.5±1.0	195.2±2.4	195.7±2.7
Chinnakodepaka lake	174.5±1.9	170.8±1.7	175.2±2.5	172.3±3.3	172.2±0.8	177.7±2.7	178.5±1.0

Table 4: Mean conductivity (µmhos/cm) with standard deviations

	Nov	Dec	Jan	Feb	Mar	Apr	May
Pathipaka lake	435.3±9.5	419.5±22.5	385.7±10.2	387.8±2.8	377.3±4.2	386.8±21.4	400.5±36.0
Chinnakodepaka lake	157.7±5.2	169.7±3.7	166.7±2.3	162.0±3.7	165.5±3.8	159.3±2.1	169.7±3.6

Table 5: Mean BOD (in mg/l) with standard deviations

	Nov	Dec	Jan	Feb	Mar	Apr	May
Pathipaka lake	39.5±2.6	42.9±2.7	42.8±3.8	41.2±2.3	43.2±2.7	43.2±2.8	45.4±2.7
Chinnakodepaka lake	21.4±0.2	28.8±0.1	39.2±0.2	34.3±0.2	39.4±0.3	36.6±0.5	42.5±0.6

Table 6: Mean COD (in mg/l) with standard deviations

	Nov	Dec	Jan	Feb	Mar	Apr	May
Pathipaka lake	87.8±4.3	84.1±4.5	87.5±2.4	79.7±5.0	81.9±6.5	82.0±5.5	81.7±5.1
Chinnakodepaka lake	61.7±0.9	74.1±0.9	86.4±1.0	81.6±1.1	75.9±1.4	88.4±1.9	77.8±2.7

Table 1:Mean Temperature in (c) with standard deviations

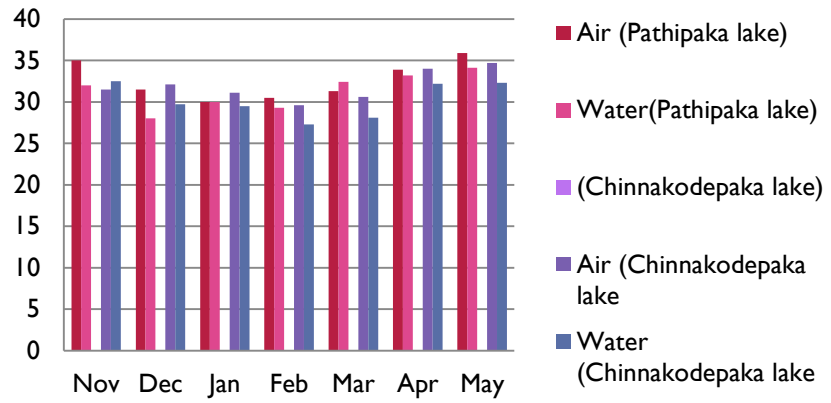


Table 2: Mean pH of with standard deviations

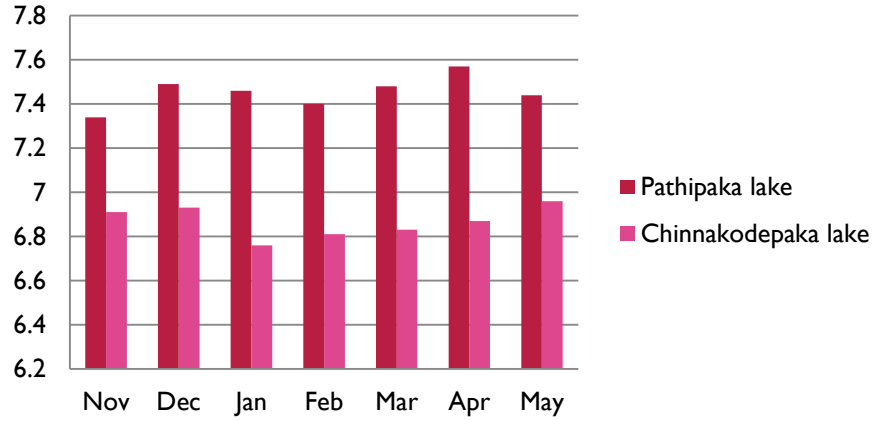
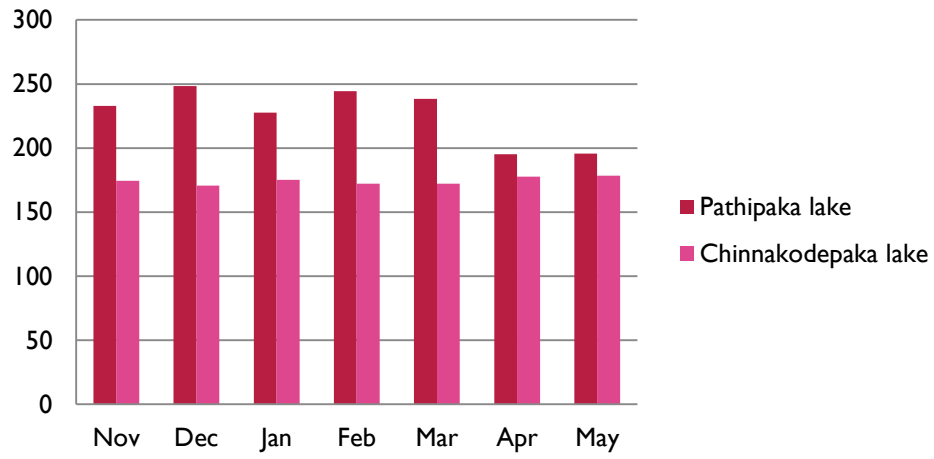
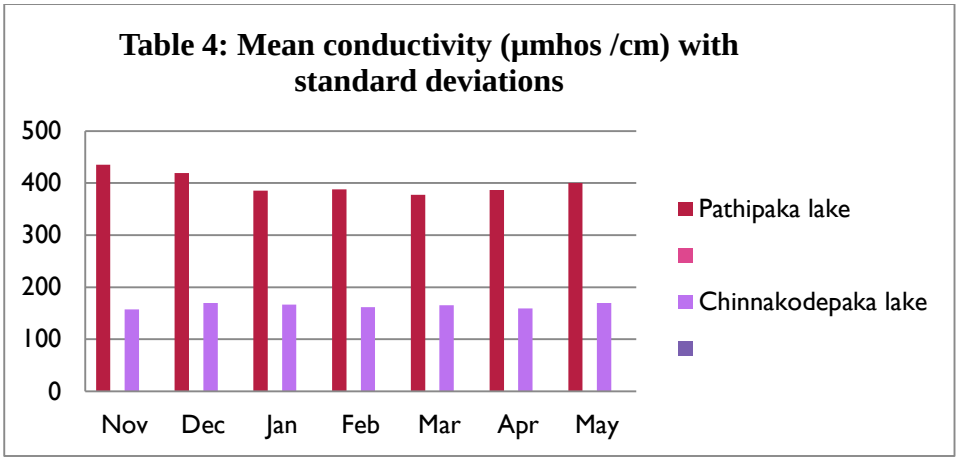
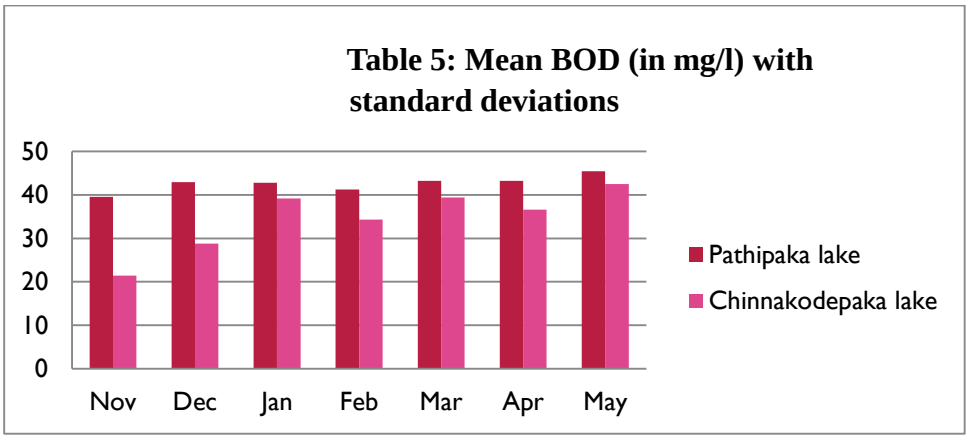
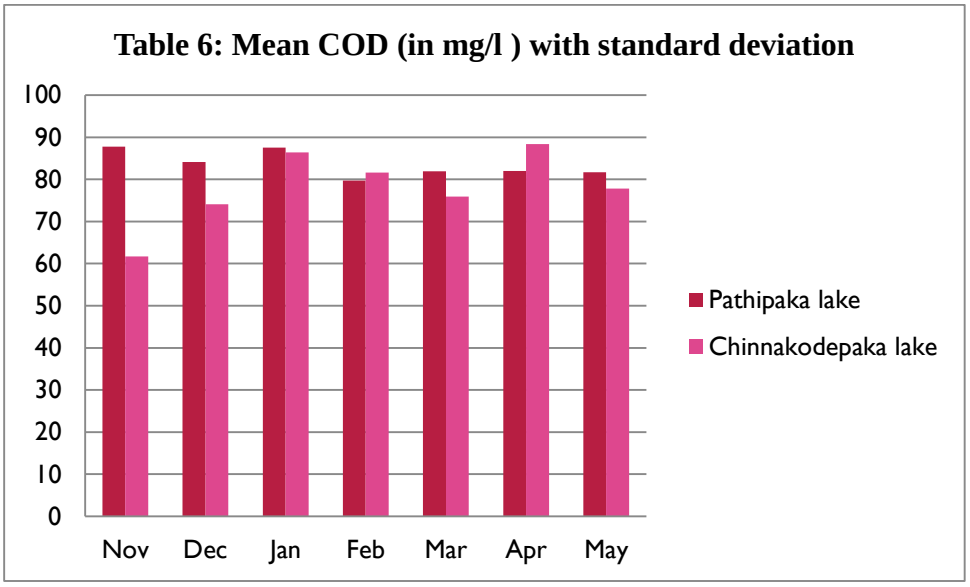


Table 3: Mean salinity (in ppm) with standard deviations









The zooplanktons were identified from Pathipaka and Chinnakodepaka lakes (table 7 and) and their comparative graphical representation is given in graph 7 to 10.

Table 7: List of zooplanktonic species identified from Pathipaka lake.(+ sign indicates presence; whereas – sign indicates absence of that species in the sample).

Order	species	Nov	Dec	Jan	Feb	Mar	Apr	May
Rotifers	**Anuraeopsisfissa**	+	-	+	-	-	-	-
	Anuraeopsis sp.	+	+	-	-	+	-	-
	Asplanchnabrightwelli	-	+	-	+	+	+	+
	Brachionusangularis	+	-	+	-	+	-	-
	Brachionuscalyciflorus	+	-	+	-	-	+	+
	Brachionusdiversicornis	-	+	-	-	+	-	-
	Brachionusforficula	-	+	-	+	-	+	-
	Brachionusquadridentata	-	+	-	-	-	-	-
	Filinialongiseta	+	-	-	+	+	+	+
	Keratellacochlearis	+	+	+	+	+	+	+
	Keratellatropica	+	-	+	-	+	-	+
	Lecanelunaris	-	-	-	-	-	-	-
	Testudinella patina	+	-	+	+	-	-	-
	Trichocercasimilis	-	-	-	-	-	-	+
	Trichocerca sp.	-	-	+	+	-	+	-
	TOTAL	8	6	7	6	7	6	6
Copepods	**Cyclops sp.**	+	-	+	+	-	-	+
	Cyclops vicinus	-	+	+	+	-	+	+
	Diaptomusnudus	-	+	-	-	+	+	-
	Eucyclops sp.	+	-	+	-	-	+	+
	Heliodiaptomuscontortus	-	-	-	+	-	-	-
	Mesocyclopsleuckarti	-	+	-	+	-	-	+
	Mesocyclops sp.	+	+		+	+	+	-
	Thermocyclopshylinus	+		+		+	+	+
	Thermocyclops sp.		+	+	+	-	-	+
	TOTAL	4	5	5	6	3	5	6
Cladocerans	**Alona sp.**	+	+	+	-	+	-	-
	Bosminalongirostris	-	+	-	+	-	+	-

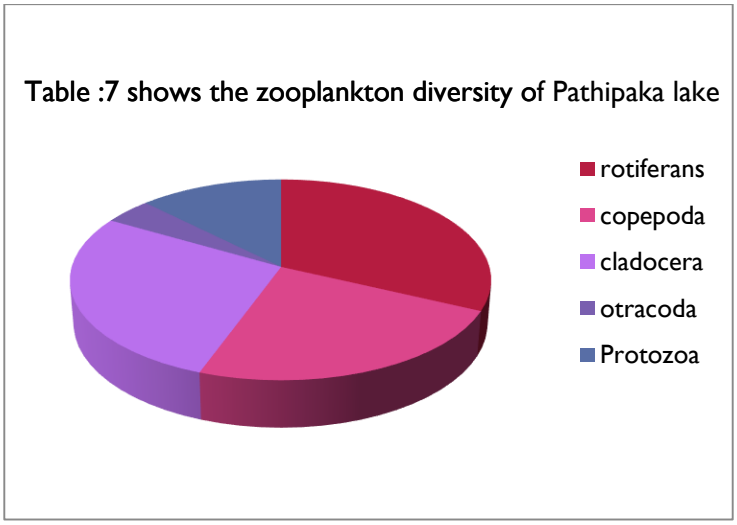
	Chydorussphaericus	+	-	-	-	-	-	-
	Daphnia lumholtzi	+	-	+	-	+	+	+
	Daphnia pulex	-	+	-	-	-	-	-
	Daphnia similis	+	+	+	+	+	-	+
	Diaphanosomaexcisum	+	-	+	+	-	+	-
	Diaphanosoma sp.	+	-	-	-	+	+	-
	Leydigiaacanthocercoids	-	+	-	-	-	-	-
	Macrothrix sp.	-	-	-	+	-	-	+
	Moinabrachiata	-	-	+	-	-	-	-
	Moinamicrura	+	-	-	+	-	+	-
	Pseudochydorusglobosus	+	-	-	-	+	-	-
	Simocephalusexpinosus	-	+	-	+	-	-	+
	Simocephalusvetulus	+	+	-	-	-	-	-
	TOTAL	9	7	4	6	5	5	4
Ostracoda	**Eucyprissp**	+	-	+	-	-	+	-
	Stenocyprismalcolmsoni	-	+	-	-	+	-	+
	TOTAL	1	1	1	0	1	1	1
Protozoa	**Arcelladiscoides**	+	-	+	-	+	+	-
	Arcella vulgaris	-	-	-	-	-	-	+
	Astramoebaradiosa	-	+	-	+	+	-	-
	Centropyxisecornis	-	-	-	-	-	+	+
	Centropyxisaculeata	-	+	-	+	-	-	-
	Difflugiarubsence	+	-	+	-	+	-	-
	Paramecium caudatum	-	+	-	-	+	-	+
	TOTAL	2	3	2	2	4	2	3

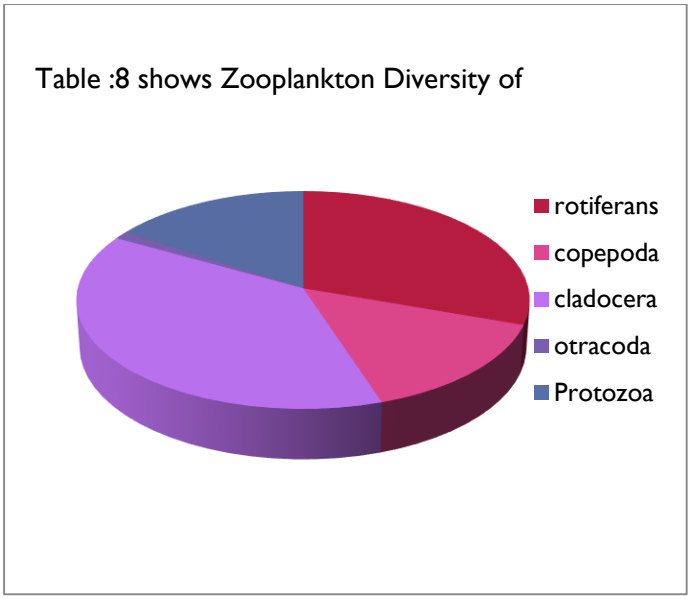
Table 8: List of zooplankton species identified from Chinnakodepaka lake. (+ sign indicates presence; whereas – sign indicates absence of that species in the sample).

order	species	Nov	Dec	Jan	Feb	Mar	Apr	May
Rotifers	**Anuraeopsisfissa**	+	-	-	-	-	-	-
	Anuraeopsis sp.	-	+	-	+	+	-	+
	Asplanchnabrightwelli	-	-	-	-	-	-	-

	Brachionusangularis	-	-	+	-	-	+	-
	Brachionuscalyciflorus	-	-	-	+	-	-	+
	Brachionusdiversicornis	+	-	+	-	-	-	-
	Brachionusforficula	-	+	-	-	-	+	-
	Brachionusquadridentata	-	-	-	-	-	-	-
	Filinialongiseta	+	-	-	+	-	+	-
	Keratellacochlearis	-	+	-	-	-	-	-
	Keratellatropica	-	-	-	-	-	-	+
	Lecanelunaris	-	+	-	+	-	-	-
	Testudinella patina	-	-	-	-	-	-	+
	Trichocercasimilis	+	-	+	-	+	-	-
	Trichocerca sp.	-	+	-	+	-	-	+
	TOTAL	*4*	5	3	5	2	3	5
	Cyclops sp.	+	-	+	-	-	-	-
	Cyclops vicinus	-	-	-	-	-	-	+
	Diaptomusnudus	-	-	+	-	-	-	-
	Eucyclops sp.	+	-	-	-	-	-	-
	Heliodiaptomuscontortus	-	-	-	-	+	-	+
	Mesocyclopsleuckarti	-	-	-	+	-	+	-
	Mesocyclops sp.	-	-	+	-	-	-	-
	Thermocyclopshylinus	-	-	-	-	+	-	-
	Thermocyclops sp.	-	+	-	-	-	-	-
	TOTAL	*2*	+1	3	+1	2	2	2
	Alona sp.	+	-	-	-	+	-	-
	Bosminalongirostris	-	-	-	+	-	-	+
	Chydorussphaericus	+	+	-	-	-	+	-
	Daphnia lumholtzi	-	-	-	+	-	-	+
	Daphnia pulex	-	-	+	-	+	-	-
	Daphnia similis	+	-	-	-	-	+	-
	Diaphanosomaexcisum	-	-	+	-	+	-	+
	Diaphanosoma sp.	+	-	-	+	-	-	-

	Leydigiaacanthocercoids	-	-	-	-	-	+	+
	Macrothrix sp.	-	-	+	-	+	+	-
	Moinabrachiata	-	+	-	-	-	-	-
	Moinamicrura	+	-	-	-	+	-	+
	Pseudochydorusglobosus	-	-	-	+	-	+	-
	Simocephalusexpinosus	+	-	-	-	-	+	+
	Simocephalusvetulus	-	+	-	+	-	-	-
	TOTAL	6	3	3	5	5	6	6
Ostracoda	**Eucyprissp**	-	-	-	-	-	-	-
	Stenocyprismalcolmsoni	-	-	-	+	-	-	-
	TOTAL	0	0	0	1	0	0	0
Protozoa	**Arcelladiscoides**	+	-	-	+	-	-	+
	Arcella vulgaris	-	-	-	-	+	-	-
	Astramoebaradiosa	-	+	+	-	-	-	-
	Centropyxisecornis	+	-	-	-	-	+	+
	Centropyxisaculeata	-	-	-	+	-	-	+
	Difflugiarubsence	+	-	-	-	-	+	-
	Paramecium caudatum	-	-	+	-	-	-	-
	TOTAL	3	1	2	2	1	2	3





3. RESULTS AND DISCUSSIONS:

The physico-chemical properties of Pathipaka and Chinnakodepaka lake gave important insights into variation due to seasonal changes affect these parameters. Correlation of these physico- chemical parameters with the number of zooplanktons proves that the zooplankton biodiversity is largely controlled by these parameters. In comparison the air and water temperature of Pathipaka and Chinnakodepaka lake does not vary significantly as these lake are located close to each other. Other water parameter like pH of water shows significant difference in Pathipaka and Chinnakodepaka lake.

The water of Pathipaka lake is more alkaline (pH ranging from 7.40 to 7.70) whereas the pH of chinnakodepaka lake is below 7.00, these both pH falls in normal range

Salinity of water body is due to presence of chloride salts; as the salinity increases the number of freshwater organisms find it difficult to tolerate it (Jeppesen *et. al.* 2002). The salinity of Pathipakalake is more than three times to that of chinnakodepaka lake. Thus high salinity may one of the factor which makes the Pathipaka water more suitable for the survival of zooplanktons.

Water conductivity is determined by the presence of number of ions Na^+, K^+, $HCO3^-$, $Mg2^+$, Cl^- etc. These ions interfere with the survival of zooplanktons (Thirumala *et. al.* 2007). Comparatively the conductivity of Pathipaka lake is more than two fold than Chinnakodepaka lake. Thus the Pathipaka lake water becomes more suitable for the survival of zooplanktons.

Biological oxygen demand (BOD) and chemical oxygen demand (COD) are interlinked parameters. It is well known that higher the organic waste, higher would be the BOD and COD (Kumar 2001). The COD values comprises of BOD and non-biological oxidisable organic material (Saksena *et. al.* 2008). The ratio of BOD to COD says a lot about the water quality, according to standards of WHO, BOD/COD for fresh water lies below 0.3, whereas as for sewage mixed high organic contaminated water has this ratio >0.3. The comparative analysis of Pathipaka and Chinnakodepaka water shows this phenomenon clearly. The BOD and COD of Pathipaka lake is many times higher than that of chinnakodepaka lake. This property also makes the Pathipaka water unfit for the survival of zooplanktons.

Zooplanktons are small microscopic organisms, typically 100 to 500 um (microns) in length, with two distinctive features. First, they have a ciliated region at the apical or head end called a corona. This is used for locomotion and for gathering of food particles from the water. In both the water samples, we found the representatives of four classes zooplanktons. Though the number of species found in Pathipaka water are less than the chinnakodepaka lake.

List of zooplanktons identified from Chinnkodepaka and Pathipaka lake has proved that chinnakodepaka lake has many more species of zooplanktons due to the good water quality. We believe that, various factors like high values of conductivity, salinity, BOD and COD in Pathipaka water interferes with the survival of zooplanktons.

4. CONCLUSION:

Limnology of studied the Pathipaka and chinnakodepaka lakes gave important insights into the correlation of physico-chemical parameter and zooplankton biodiversity. We believe that, due to high organic content of Powai lake, the low zooplankton biodiversity was seen.

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