

## Zooplanktonic Diversity and Trophic Status of Pashupatinath Pond in Relation To Physico-Chemical Characteristics of Its Water

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**Abstract:** Present investigation were carried out to physico chemical characteristics and trophic status of Pashupatinath pond Mandasour (M.P.). water sample were collected seasonal basis for a period of December 2008 to September 2010 using plastic container. standard procedure were followed during collection, preservation and analysis of water sample for various physicochemical and biological parameter. The water quality is remained moderately alkaline PH (8.11) while electrical conductivity (0.2176 ms/cm), TDS (187ppm) chloride (22.123ppm), Hardness(139.166ppm) and alkalinity (75.33ppm) show low mean value. Average dissolve oxygen levels were at (7.771 ppm), while average nitrate and phosphate The water remained moderately alkaline PH (7.95) while electrical conductance (0.2165ms/cm), TDS (153.66ppm) chloride (22.83ppm) hardness (138.66ppm) and alkalinity (62.166 ppm) showed low mean values. Average dissolved oxygen level were at (7.58 ppm) while average nitrate and phosphate level were (0.2126ppm) and (0.5868 ppm) respectively. On the basis of water quality parameter. Mirzapur dam was found to be oligotrophic. A low density of Zooplankton were also observed during the study period.

**KeyWords:** oligotrophic lake, Physico chemical, primary production, Water-quality and Zooplanktonic diversity

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### I. Introduction

Water is the most vital resources for all kinds of life on the earth and sustainability of the earth ecosystem (UNESCO 2003) any physical, chemical and biological change in water

Quality that makes water unsuitable for desired use is water pollution (Millar, 2002) Fresh water is essential to human health; agriculture, natural ecosystem and industry. Water covers 71% of earth surface. The utilize of Fresh water bodies for stocking of fishes, domestic and drinking, irrigation also. The biota in the surface water is governed by various environmental condition. The quality of aquatic life depends on the water quality and fresh water bodies utilize successfully for fish production, it is very important to study physicochemical factor, which influence the biological productivity of water body. The present study an attempt has been made to assess certain physico-chemical feature of Pashupatinath pond in relation to its primary productivity and zooplanktonic diversity.

### II. Materials And Methods

Pashupatinath pond was constructed in 1995. The river Shivna is the main source of water for the pond. Morphometric features of Pashupatinath pond is given in table 1. During the study water sample were collected at seasonal basis from December 2008 to September 2010. using bucket from three pre selected station of the pond. The water quality parameter such as air and water temperature, Ph, depth of visibility alkalinity dissolve oxygen and primary productivity were measured in the field itself. However for the electrical conductivity chloride, nitrate and phosphate sample were brought to laboratory in plastic bottles of 500ml capacity and analysed within 24 hours. prior to this sample were secured in refrigerator primary productivity was estimated using light and dark bottles method. Method stated by APHA (1989) and Pandey and Sharma(2003) were followed for water

### III. Results And Discussion

Observation pertaining to different Physicochemical parameter of Pashupatinath pond are given in table 2. During the study period there was a marked variation in different water quality characteristics. Hutchinson (1957) stated that temperature is important in controlling both the quality and quantity of plankton. In the present study. The recorded surface water temperature is 22°C to 31°C. The statistical computation indicated that water

temperature had positive significant relationship with depth of visibility, alkalinity, total hardness and total dissolve solid. Whereas the relationship was negative with dissolve oxygen, nitrate, NPP, GPP and respiration. The variation in depth of visibility ranged from a minimum of 22 c.m to maximum 34 c.m. the statistical computation indicated positive significant correlation of water clarity with, phosphate, chloride, dissolve oxygen, total hardness, total dissolve solid, conductivity, alkalinity and PH. The PH of water was always on moderately alkaline side and varied from 7.9 to 8.4 during present study. GPP, NPP, respiration, phosphate, conductivity, total hardness and depth of visibility show positive significant relation however a significant negative relationship with alkalinity, total dissolve solid, chloride and nitrate as indicated in the table no. The value of total alkalinity varied between 64 to 88 ppm the statistical computation indicated a positive significant correlation of total alkalinity with depth of visibility, PH, total hardness, total dissolve solid, chloride and nitrate. An increase in total alkalinity may be related with increase in PH of pashupatinath pond as suggested by Wetzel. Dissolve oxygen is an important limnological parameter indicating level of water quality and organic production in the lake Wetzel (1983). As regards relationship, dissolve oxygen showed a negative correlation with total hardness, total dissolve solid, chloride, nitrate and phosphate. The Electrical conductivity which represents total ionic load of water had the average value 0.2176 ms.cm. The electrical conductance depicted positive significant relationship with dissolve oxygen, total hardness, phosphate, primary conductivity, GPP and respiration. The total hardness of water is the sum of cations present in it. This parameter ranged between the lowest value of 128 ppm and the highest value of 150 ppm. The average value of hardness is 139.166 ppm during the study. Total hardness showed positive relationship with depth of visibility, PH, alkalinity, tds, conductivity, chloride and phosphate however the negative relationship with nitrate, NPP, GPP and respiration. Chloride content in water may indicate the level of pollution (Goel et al, 1980); Domestic and industrial pollutants tend to increase chloride content of receiving water bodies (Palariya and Rana 1985). Chloride may occur in fresh water as a result of dissolution of salts deposited in the soil (Michael 1986). As depicted chloride concentration varied between 18.81-25.32 ppm with average value of 22.123 ppm. Water with high dissolved solids is of inferior potability and may induce an unfavourable physiological response in the body of consumer (Bhanja and Patra 2000) in the present study this parameter ranged between 178-200 ppm with an average value of 194 ppm. TDS shows a positive relationship with chloride, nitrate, total hardness and alkalinity. Phosphate are essential nutrients which are known to contribute in the process of eutrophication when present in excessive concentration. Whereas moderate presence of these nutrient makes the water bodies suitable for growth of plankton and other fresh water communities. Ambient nutrient concentration particularly phosphorus is used as criteria in lake eutrophication models (Vollenwider, 1968).

During the present study Phosphate ranged between 0.48-0.8432 ppm with average value of 0.6327 ppm. Value of orthophosphate above 0.5 mg/l is a sign of organic pollution. Phosphate showed a positive correlation with respiration, chloride, conductivity, tds, total hardness and a negative relationship with NPP, GPP, nitrate and dissolved oxygen. Nitrate is the highest oxidized form of nitrogen (Goldman and Horne 1983) in present study the value of nitrate varied between 0.18 to 0.482 ppm with average value 0.2736 ppm the statistical computation indicated a positive correlation of nitrates with phosphate, temperature, depth of visibility, PH, alkalinity, total hardness, total dissolve solid.

During the present study GPP and NPP along with rate of respiration have been estimated by light and dark bottles method. GPP of Pashupatinath pond is 170-205 ppm with an average 197.83 ppm and NPP range 80.2-127 ppm with an average of 98.7 ppm. The overall mean value of respiration for Pashupatinath pond comes to 99.3 (mgc/m<sup>2</sup>/hr). In Pashupatinath pond the fresh water Zooplankton consist mainly of 4 major group i.e. Protozoa represented by forms. Rotifers by forms (fig 1 and table 3). The average density of Zooplankton in pashupatinath was (no./l). In the group Protozoa Volvox sps., Phacus sps., Diffugia sps. And Arcella sps. were dominant. Brachionus caliciflorus, Keratella tropica, Heterospina, Polyarthra vulgaris were dominant in the group Rotifera. In the group Cladocera Diphnosoma brchyurum, Ceriodophenia rigaudi, Daphnia ambigua, Bosminidae sps., Alonella nana were dominant. In the group Copepoda was dominated by Heliodyptomus viddus, Cyclops levckarti, Mesocyclops hyalinus. In the group Ostracoda Heterocypris, Cyclocypris.

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TABLE- 1. : Morphometric features of Pashupatinath pond

Water spread area	463296cu.m.
Catchment area	6.7cu.m
Length	1000m
Width	152.4m.
Depth	3.04
Maximum capacity of reservoir	10mcft
Year of construction	1995
Type of Dam	Masonary

TABLE-2. Range and mean value of physico-chemical and biological parameter of Pashupatinath pond and required desirable limit of ISST

S.No.	Parameters	Range	Average	Required desirable limit of ISS
1	Water temperature (°c)	22-31.4	26.38	
2.	Depth of visibility (cm)	22-34	27.83	
3.	Hydrogen ion concentration (pH)	7.9-8.4	8.11	6.5-8.5
4.	Dissolved oxygen (ppm)	7.1-8.3	7.71	
5.	Total alkalinity (ppm)	64-88	75.33	200mg/l maximum
6.	Total hardness (ppm)	128-150	139.166	300mg/l maximum
7.	Chlorides (ppm)	0.149-0.261	0.2176	250mg/l maximum
8.	Electrical conductance (ms/cm)	178-200	194	
9.	Total dissolved solids (ppm)	18.81-25.32	22.123	500mg/l maximum
10.	Phosphates (ppm)	0.18-0.482	0.2736	
11.	Nitrates (ppm)	0.48-0.8432	0.6327	45mg/l maximum
B.	Biological Parameters			
12.	Primary productivity (mgc/m <sup>2</sup> /hr)			
	i) Gross primary productivity	170-250	197.83	
	ii) Net primary productivity	80.2-127	98.7	
	iii) Respiration	82-123	99.13	