RESEARCH ARTICLE

Studies on certain physico-chemical parameters of some freshwater bodies in & around Pauni Town of Dist. Bhandara (M.S.) India.

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Manuscript details:	ABSTRACT
   	Fresh water is one of the abundantly available abiotic components in nature that exploited more than any other resources by man for the sustenance of life. Moreover, the uncontrolled use of natural resources has put enormous strain on the quality of freshwater. In the backdrop of above information, the present study was undertaken to determine the trophic status of the five freshwater resources/lakes in and around Pauni town of Bhandara District of the central India. The trophic status assessment of the five collected water samples from lakes was assessed phosphorous, nitrogen, chlorophyll-*a* content and transparency. The results revealed variation in concentration of phosphorous from 1.3±0.5 to 3.1±1.1 mg/L and nitrogen from 3.4±1.3 to 8.1±2.2 mg/L. The transparency in majority of lakes was less than 1.9 meters, whereas the chlorophyll-a varied from 3.9 to 8.3 mg/L. Majority ($P<0.05$) of freshwater resources in & around Pauni town are reported mesotrophic. It may be concluded that freshwater resources of the region are severely under nutrient pollution threat and demand that better practices be followed to restore the water quality.

Keywords: *Freshwater, phosphorous, nitrogen, chlorophyll a, trophic status*. |

INTRODUCTION

Water is one of the abundantly available substances in nature, which man has exploited more than any other resources for the sustenance of life. Safe water is need of hours for survival of living organisms. However, most water bodies have become contaminated due to incorporation of untreated solid and liquid waste. Moreover, smaller as well as larger towns in India are situated near the lakes, and dams, their run off and those from agricultural lands find their way to these water bodies and makes them unfit for human use. Presently due to increased human population and man-made conditions, the water quality is deteriorating everywhere (Jayabhaye *et al*., 2008). The contents of growth – the composition of inputs (including ecological resources) and outputs (including waste products)—determined by, among other things, the economic institutions within which human activities are conducted, is critical for human development. These institutions need to be understood to appreciate the correct incentives for providing and protecting the resilience of aquatic ecological systems. Protecting the precious aquatic ecological systems to sustain welfare is of as much importance to poor countries as it is to the rich (Khanna *et al*., 1999).

The importance of aquatic ecosystem health lies in the fact that where an ecosystem is out of balance, humans suffer as well. Human health and many of the activities are dependent on the health of aquatic ecosystems. Most of the drinking water is taken from lakes or rivers.

If the lake or river system is unhealthy, the water may be unsafe to drink or unsuitable for industry, agriculture, or recreation. Uses of aquatic ecosystems are thus impaired when these systems are unhealthy. Healthy aquatic ecosystems are those where anthropogenic disturbances have not impaired the natural functioning (e.g., nutrient cycling) nor appreciably altered the structure (e.g., species composition) of the system. These disturbances can be *physical* (e.g., injection of abnormally hot water into a stream), *chemical* (e.g., introduction of toxic wastes at concentrations harmful to the organisms), or *biological* (e.g., introduction and propagation of non-native or exotic animal or plant species). Symptoms of poor ecosystem health include loss of species (loss of biodiversity), accelerated proliferation of organisms (algae blooms caused by an excess of phosphorous and nitrogen compounds in the water i.e. eutrophication), change in chemical properties (like pH) and presence of certain unwanted organisms (like coliform bacteria). Environmental pollution may change the composition, function, and trophic status of ecosystems in reversible or irreversible ways by affecting their biotic or abiotic components. Aquatic pollution comprises all allochthonous inputs and stresses that are in contrast to natural allochthonous input directly or indirectly caused by anthropogenic activities. Possible pathways for aquatic contamination are treated or untreated domestic/ municipal wastewater, surface runoff and industrial wastes (Heininger *et al.*, 1998; Tariq *et al.*, 1996; Moll and Mansfield, 1991). Pollution of water, soil, sediment or atmosphere proceeds essentially unabated, and the ecosystems serve as repositories for numerous pollutants.

Eutrophication refers to the continuous enrichment of waters by the addition of substances that provide for the increasing growth of aquatic life. Natural eutrophication tends to occur regularly but very slowly, often over a period of hundreds of years. Human activity is generally responsible for rapid eutrophication as household wastes, agricultural land drainage, and organic industrial wastes or their decomposition products reach the lakes and reservoirs. When gross eutrophication is reached, large, visible aggregations of floating algae bloom extensively, particularly blue-green forms which develop during the late summer. *Anacystis (Microcystis)*, and *Anabaena* are the most common algae to bloom but others such as *Aphanizomenon, Gomphosphaeria, Rivularia*, and *Oscillatoria* may also produce blooms. Less often *Spirulina* or *Arthrospira* may be responsible. The blooms may cause unusually severe problems of tastes and odors, filter and screen clogging, and slime accumulation in pipes; some may be toxic, and all may cause fish kills when large numbers of the algae die at about the same time. In the backdrop of above information, this study was carried out to determine the trophic status of the freshwater resources in & around Pauni town of Bhandara District of the central India. This district was selected as it is known as the district of lakes and there is abundant water availability.

MATERIALS AND METHODS

Study Area – Pauni Town:
A Pauni town in the District of Bhandara situated in 20 48' North and 79 39' East, on the Wainganga river. A town is surrounded by many water bodies of which Khurada & Balsamudra are the larger one. Geographically, the district lies entirely within the Wainganga basin. Three major tributaries of the Wainganga—the Bagh, the Bawanthari and the Chulband drain the district. The district covers an area of 9280.0 km^2 and often called the 'Lake District' of Maharashtra as it is well justified by existence of 580 large, 13758 medium and few small sized tanks.

To the collection of data for some parameters, water samples were obtained from five different lakes and processed by standard methods.

(a) Analytical Methods Used: *Conc. of Phosphorous* was determined by Stannous Chloride method and Nitrogen conc. by UV Spectrophotometric method.

(b) Trophic Status of the Water bodies in & arround Pauni Town: Three trophic state categories were used to describe lakes as they grow progressively greener: *oligotrophic, mesotrophic*, and *eutrophic*. Trophic state was assessed by: (1) measuring nutrients level and chlorophyll-a content in the lake and (2) measuring lake water clarity using a Secchi disk. By using these measurements, classification of lake based on typical ranges for phosphorus, nitrogen, chlorophyll a and Secchi depth values reported in the lake's lifecycle. Chlorophyll *a* was determined by using a handheld fluorometer manuf.

(c) Statistical Analysis of Data and Significance Level: Data was analyzed by applying statistical tests and with the aid of PASW 18.0 software.

RESULTS AND DISCUSSION

Table 1: Trophic Status of the different water bodies in & around Pauni Town

	Total Phosphorus		Total Nitrogen		Chlorophyll *a*		Secchi Depth (m)		Trophic Status
Gosekhurd	2.77	±0.72	3.00	±0.46	8.20	±1.20	3.20	±0.28	Mesotrophic
Wahi Lake	1.50	±0.38	5.33	±0.25	11.82	±3.38	2.87	±0.44	Mesotrophic
Pauni-Near Bridge	1.57	±0.25	1.20	±0.56	7.45	±2.48	4.86	±0.27	Mesotrophic
Khurada Lake	1.77	±0.45	5.20	±0.17	9.47	±2.62	4.27	±0.54	Mesotrophic
Balsamudra Lake	1.43	±0.06	4.37	±1.16	12.56	±3.31	2.18	±0.19	Eutrophic

Trophic Status of the Water bodies in & around Pauni Town:

The determination of lake trophic state is usually made by measuring several diverse criteria, none of which are direct measures of trophic state per se, but rather are indicators of it. Erroneous conclusions may be drawn if only single or few indicators are used, and it is therefore useful to consider an array of different methods. Hence, it is important that the trophic status assessment be carried out with utmost care. Besides, the trophic status knowledge for a particular lake or group of lakes in a geographical area indicates the possible risk of good quality water availability or unavailability. Hence, in this investigation the trophic status of five different water bodies in & around Pauni Town of Bhandara District of central India was carried out. The results of the study are presented in Table 1.

On the basis of results obtained for total phosphorous, total nitrogen, Chlorophyll *a* and Secchi depth, the trophic status of Gosekhurd, Wahi Lake, Pauni-Near Bridge and Khurada Lake is mesotrophic whereas Balsamudra Lake was eutrophic. Thus, it may be concluded from the study results that majority (P<0.05) of water bodies in & around Pauni Town are mesotrophic.

CONCLUSION

The impact of human activity on water resources and the need for the rehabilitation of watersheds, watershed ecosystems needs an in depth understanding of the limnology. Water is necessary for the survival of all biotic components. Moreover, clean freshwater is needed by humans for personal hygiene, irrigation, industry and recreation. With all of the demands humans place on the hydrosphere, as well as climate changes which have led to droughts, the quantity of available freshwater is decreasing at an alarming rate. The human civilization has been blessed with the abundance of freshwater; however, the demographic growth of civilization has put a lot of pressure on the aquatic resources, which collectively experience deteriorating quality since last many years. In view of this, present study focused on the assessment of trophic status of the selected water bodies in & around Pauni Town of Bhandara District of Maharashtra. On the basis of results obtained in the present study, it may be concluded that majority (P<0.05) of water bodies in study area are of mesotrophic trophic status. Since good quality freshwater is important for health, economic prosperity, and personal enjoyment, it needs to be preserved, however, the mesotrophic status of majority of lakes indicated that the risk of these lakes becoming eutrophic is very high.

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