



Impact of Human Action on Rapid Eutrophication of Kolasur Lake of Pauni, District- Bhandara (M.S.)

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Abstract:

Lakes are important for the aesthetic purpose and reservoir of water and play a significant role in natural functioning of ecosystem. The present investigation deals with eutrophication of Kolasur Lake situated near Pauni, district Bhandara. The eutrophication studies of Kolasur lake were undertaken to analyze different polluting agents and their sources along with trophic status of the lake, during last five years. The pollution status of the lake water was found to be increased year after year. Extensive cultivation of *Trapa* plants for its edible fruits and various anthropogenic activities on the bank as well as in the catchment area were found to be the main causes for enhancement in pollution level and subsequently the eutrophication of the lake. Huge amount mineral nutrients and organic matter added to lake water body in the form of sewage effluents, organic waste, agricultural run offs, excreta and exudates of living beings, etc. Consequently, continuous and uncontrolled disposal of these untreated wastes has altered the physiochemical properties of water. The physical properties viz., temperature, pH, turbidity, DO, BOD has exhibited seasonal variations, while the chemical content of the mineral elements like chloride, phosphate, sulphate, potassium, sodium, etc. have shown to be significantly enhanced. The enhancement in some of these elements has promoted the luxuriant growth of algae and other aquatic weeds. The disposal of wastes has also led to lake water rich in microbial community and certain species of animals, particularly the insects.

The analysis of physiochemical quality parameters of lake water indicated that the lake was mesotrophic in 2009 and transformed to eutrophic in 2014. Every year, during the month from March to April, the fishes were found to be killed due to reduction in dissolved oxygen and increase level of BOD. Increased eutrophication resulted in the production of large quantity of biomass in the form of organic matter. The deposition of this organic matter at the bottom of the lake, in the successive years has consequently led to upliftment of bottom and decrease in depth of water level that converted the lake into a shallow and muddy water body. A decade back, the lake was one of the major sources of drinking water for the domestic animals, but now the water in the lake has become highly polluted and contaminated with high degree of unwanted toxic elements and hence could not serve the function as source of drinking water for animals. The authors suggest that, if proper remedial measures are not taken immediately for the conservation of lake, the fishes and other aquatic animals will be vanished very soon.

Keywords: Kolasur, eutrophication, *Trapa*, physiochemical parameters, mesotrophic.

Introduction:

Fresh water body is the most significant source of precious water and provide necessary habitat for the survival of all forms of life and also fulfil the basic requirement of socioeconomic development. Increasing population and higher levels of human activities including effluent disposals to the surface and groundwater resources have made sustainability of resources a very complex task throughout the India. Lake receive water and pollutant inputs from diverse sources in various forms such as sewage effluents, organic waste, agricultural run offs, excreta, exudates of living being, etc. Water is known to contain a large numbers of chemical elements. Physical parameters such as temperature, turbidity, pH and flow of water current are also known to operate in lake ecosystem. The interaction





of both the physical and chemical properties of water plays a significant role in the composition, distribution and abundance of aquatic ecosystem.

The term Eutrophication can popularly be attributed by Webber (1907) who used 'eutrophic' and 'oligotrophic' to describe the conditions of water and soil solution in German bogs. Eutrophic water is nutrient rich and oligotrophic water is nutrient poor. Eutrophication can be defined as the changes caused in nutritional status of the water body by the increase in nutrients. For undisturbed lakes, eutrophication is considered by most of the authors to be a natural process, characterised by gradual filling in of the lake basin, the appearance of 'nuisance' algal blooms, discolouration of water, fish kills and with geological time, emergence of swampy or muddy land (Hasler, 1974). The excessive amount of nutrients favours the growth of algae and amphibian weeds and grasses leading to eutrophication (Thilaga *et al.*, 2005).

Kolasur lake is situated adjacent to Pauni town of Bhandara district in Maharashtra state. The lake is a shallow water lake with enough catchment area including residential locality and agricultural track. Due to various anthropogenic activities on the bank as well as in the catchment area and extensive cultivation of Trapa (water chestnut) plants for its edible fruits from last decade, there may be rapid enhancement in pollution level and subsequently the eutrophication of the lake and in turn leading to invasion of vegetative species (Gaitonde, 1995; Murugesan *et al.*, 2002). By keeping this view in mind, we started work on study of physiochemical properties of lake water and generated the data on various physicochemical properties for five successive years from 2009 to 2014. Various physiochemical parameters like alkalinity, salinity, dissolved oxygen, BOD, total hardness, calcium hardness, magnesium hardness, nitrate, sulphate and phosphate have a significant role in determining the portability of water quality (Adoni *et al.*, 1985).

Material and Methods:

Kolasur lake situated near Pauni town was selected for the present investigation. It is situated in south direction of the town at 20°47'N latitude and 79°37'E longitude at an elevation of 226 m above msl in Bhandara district of Maharashtra state. The selected lake was partly loaded by the inflow of municipal sewage and also anthropogenic activities. Present investigation was carried out to study the physiochemical parameters of Kolasur lake for five years, from 2009 to 2014. The water samples for the present study were collected periodically at an interval of month from November and April, each year. The samples were collected preferably between 11.00am to 12.00pm, from the surface of the lake. Care was taken for maintaining uniformity. Since the lake is shallow, samples were collected from surface level so as to give integrated sample (Trivedi and Goel, 1984). The analysis of some of the physical properties were carried out at the time and site of collection, while the same samples were brought immediately to the laboratory for the estimation and analysis of various elements, using standard method as described by APHA (1995 and 1998).





Result and Discussion:

Variation in the physicochemical parameter in the month of November (winter) and April (summer) are presented in Table 1 for the year 2009 to 2014 while the consequences of nutrient enrichment are presented in Table 2.

The water Kolasur lake was observed to be turbid in November and clear in April month of every year. This might be due to heavy rainy in monsoon. The colour and odour of the lake water was bluish green and muddy in the summer month (April) while yellowish green and foul in the winter month (November) of every year of study period.

Table. 1 - Variation in physicochemical parameter of lake water.

S. N.	Parameters	Nov. 2009	April. 2010	Nov. 2010	April. 2011	Nov. 2011	April. 2012	Nov. 2013	April. 2013	Nov. 2013	April. 2014
1	Temperature (°C)	18.5	28.5	19.0	28.0	20.0	29.0	19.0	29.5	18.0	31.0
2	Transparency	0.9	0.5	0.7	0.5	0.8	0.5	0.8	0.4	0.8	0.5
3	pH	7.2	7.6	7.4	7.7	7.4	7.9	7.4	7.7	7.4	7.9
4	T.D.S.	585.0	625.0	590.0	655.0	585.0	645.0	580.0	650.0	590.0	645.0
5	Chlorides	40.0	50.0	42.0	51.0	42.0	52.0	45.0	55.0	46.0	55.0
6	Total Alkalinity	310.0	342.0	309.0	348.0	310.0	352.0	316.0	354.0	320.0	356.0
7	DO	6.5	5.0	6.3	5.0	6.5	5.3	6.7	5.0	6.5	5.3
8	Nitrate	0.63	0.52	6.40	0.52	0.65	0.55	0.72	0.55	0.70	0.50
9	Phosphate	0.6	0.4	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.5

All results except Temp. and Transparency are expressed in ppm expressed.

The maximum temperature of lake water was recorded as 31°C in April month of 2014 and minimum of 18°C in Nov.-2014. Temperature play important role in seasonal variation in growth of phytoplankton. The value for transparency ranges from 0.4 to 0.9 in study span. The pH value of lake water is ranges from 7.2 to 7.9 showing alkaline nature of lake. The maximum pH value that is 7.9 recorded in April-2014. Total dissolve solids (TDS) ranges from 580 to 655 mg/l. Total dissolve solids indicate the general nature of the quality or salinity. The lake water body exhibited high value of TDS which is caused by the addition of huge quantity sewage and that reduce the potable quality of water that leading eutrophication of lake. The chloride varied from 40 to 46 mg/l in November months and 50 to 55 mg/l in April months of year from 2009 to 2014 that indicated the organic pollution in lake water. The maximum alkalinity that is 356 mg/l was obtained in April of 2014 while minimum 309 mg/l was obtained in Nov. of 2010. That means the value of alkalinity in summer month is high and that of winter month is low may because of presence of bicarbonate and hydroxide of Ca, Mg, Na, K and protein in lake water.

The maximum DO of lake water was recorded as 6.7 mg/l in the Nov. Month of 2013 and minimum was 5.00 mg/l in April month of 2010 and 2011. Dissolve oxygen (DO) one of the important parameters in water quality assessment. DO is regulator of metabolic activities of organisms and thus governs metabolism of the





biological community as a whole and also acts as an indicator of trophic status of the water body (Saksena and Kaushik, 1994). In April month of every year, low value of DO may be due to increase in the population of phytoplankton or decrease of photosynthetic activity. The nitrate value is ranges from 0.52 to 7.2 mg/l and that phosphate are from 0.4 to 0.6 mg/l in five year study period. Nitrate and phosphate are better indicator of eutrophication (George, 1962) and are responsible for proper growth of water plants.

The above observations on physiochemical parameters of lake water showed the rapid eutrophication during the five year period from 2009 to 2014.

Table 2. - Consequences of nutrient enrichment

S.No.	Consequences	Summer (April)	Winter (November)
1	Water Bloom	Maximum	Medium
2	Fish Mortality	occurred	not seen
3	Colour	Blue Green	Yellowish
4	Turbidity	Less	More
5	Odour	Muddy	foul
6	Mosquito Production	Frequent	Medium
7	Recreation value	Nil	Nil

In the aquatic habitat, enormous growth of phytoplankton disrupts the normal functioning of ecosystem, causing a variety of problems. Due to extensive cultivation of Trapa plant in the lake water body, domestic waste, keeping of death bodies of animals on the bank of lake and part of effluents of sewage, etc. lead to rapid eutrophication of lake. Due to eutrophication, the resource value of lake such as fishing, hunting, recreation and aesthetic enjoyment are hindered.

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