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IDENTIFICATION OF TROPHIC STATUS OF 'TALAOPALI' LAKE IN THANE.

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Abstract : This study deals with the determination of phosphorus and chlorophyll levels in masunda lake of thane city. The study shows the variation of CTSI index from 25.77 to 43.89. The result proves that the lake classified as oligotrophic to mesotrophic. The lake can be prevented from getting eutrophic by stopping the process of throwing remnants offered from deities and taking some other option to throw those remnants. It may improve the status of lake.

IndexTerms **– Eutrophication, Carlson's trophic state index, Oligotrophic, Talao pali lake, Total phosphorus.**

I. INTRODUCTION

Eutrophication is the process in which lakes receive nutrients (phosphorus and nitrogen) and sediment from the surrounding watershed and become more fertile and shallow. Our paper mainly focuses on the different spots of talao pali lake, where there are the chances of eutrophication because of throwing remnants (Nirmalya) from deities and due to allowing flow of detergents. The most notable effect of eutrophication is algal blooms. When a bloom occurs, lake becomes covered with algae, which is usually bright green. It also blocks light from reaching the water. This prevents the aquatic plants from photosynthesizing, a process which provides oxygen in the water to animals that need it, like fish and crabs. In water bodies, the phosphorus may be present in various forms. All forms of phosphorus are not readily available to plants.

If an algal bloom is so bad that it causes wide-spread death in the water, the organisms that die will all sink to the bottom and start to decompose. The microbes that break down these dead organisms use oxygen to do their work. So, in addition to the lack of oxygen from photosynthesis, there is also now a lack of oxygen from the decomposition of dead organisms making Lake Environment anoxic.

There are several indicators available to assess the degree of eutrophication. They are as follows;

1) Water transparency: - This parameter indicates the amount of light that can penetrate into the water.
2) Dissolved oxygen: - The presence of sufficient dissolved oxygen in the water column is very important for all aquatic life.
3) Biological water quality: - This parameter indicates the water quality based on the present organisms (species and numbers). Fish have such a long lifetime and are an important indicator of the environmental quality of their habitat.
4) Nutrients: - Total phosphorus (P), orthophosphate, total nitrogen (N) and nitrogen in nitrate (NO_3) are the main elements that can be measured. High concentrations of nutrients will also increase the biomass of the algae.
5) Chlorophyll a: - The chlorophyll a (Chl a) concentration is a measure for the amount of algae in the water column. Algae can be compared to plants, they need light and oxygen to grow and use chlorophylls their photosynthetic pigment.

Eutrophication can be prevented by planting more trees around the lakes or ponds. Riparian buffers between agricultural area and lakes can be provided. The flow of nutrients from fertilizers during run-off should be restricted. Washing of clothes near lakes, bathing, allowing flow of detergents in lake should be avoided. Aeration or fountains should be provided at different sport of lakes, so that oxygen presence in water is maintained. Icornia plant and floating wet lands can be provided on lakes, so that they can utilise the nutrients for their growth.

II. MATERIALS AND METHODS

Location of study area:-

Thane is colloquially called Thana, is a metropolitan city in India. The city is also called "City of Lakes" as the city is surrounded by 35 lakes. The "City of Lakes", thane surrounded by 35 lakes in which 'Masunda lake' is one which popularly known as 'Talaopali lake'. This lake is located at East of Thane, in the heart of the Thane city. The coordinates of the lake are 19.11°N 72.58°E. The lake situated near the railway station of Thane and is a point of recreation and Ganesh Immersion. Perimeter of lake is around 1.4 km and total

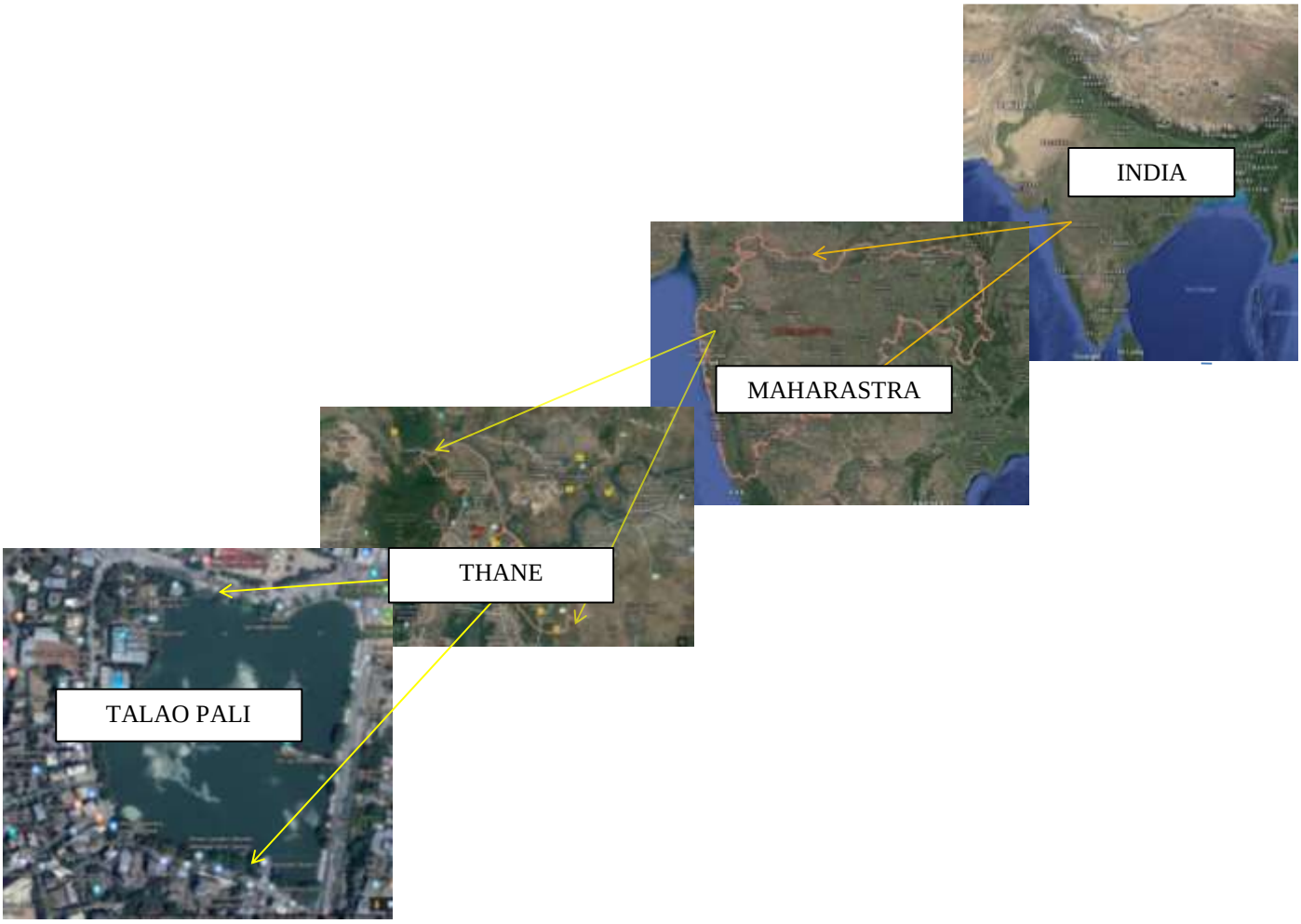


Fig 1 : Location of study area

area of Masunda lake is about 7.2 hectares appx. Boating is main attraction here. The lake is surrounded by This lake is also subjected to pollution throwing of garbage. This lake is also suffering from Eutrophication due to pollution. Water analysis of talao Pali lake is carried out the by selecting 5 spots of the lake which is given below:

Water sampling:-

The water samples were collected twice in a month for the analysis of total phosphorus and chlorophyll-tests over periods of 4 months, During October, 2018 to January 2019. The glass bottles (500ml) were dipped into the lake water and after being filled, they were capped tightly, inside the lake water itself. On the Same time transparency of the water was measured by Secchi's disc of 30×30cm in size and the values are expressed in meters. When the disc was lowered in to the water, the maximum depth of which the disc can be seen was marked and measured.

Table.1: Different spots of the lake.

# Code	Location in lake	Latitude	Longitude
S1	South east corner of the lake	N 19°11'30.552"	E 72°58'38.805"
S2	At the Centre of the lake	N 19°11'35.837"	E 72°58'31.328"
S3	North east corner of the lake	N 19°11'39.415"	E 72°58'35.021"
S4	North west corner of the lake	N 19°11'39.732"	E 72°58'29.308"
S5	South west corner of the lake	N 19°11'33.158"	E 72°58'26.522"

Fig 2 :- Showing the different spots of the lake Talao pali.

Water analysis:-

Carlson's trophic state index (CTSI) was used to check the eutrophication of different spots of talao pali lake. Trophic State Index (TSI) given by Carlson's, is a classification system designed to rate bodies of water based on the amount of biological activity they sustain. The TSI of a body of water is rated on a scale from zero to one hundred. CTSI is a good measure to identify status of lakes in early eutrophication and treat them accordingly; before it's too late.

Table.2: Carlson's trophic state index values and classification of lakes

TSI values	Trophic status	Attributes
<30	Oligotrophic	Clear water, oxygen throughout the year in the hypolimnion
30-40	Oligotrophic	A lake will still exhibit oligotrophy, but some shallower lakes will become anoxic during the summer
40-50	Mesotrophic	Water moderately clear, but increasing probability of anoxia during the summer.
50-60	Eutrophic	Lower boundary of classical eutrophy: Decreased transparency, warm water fisheries only
60-70	Eutrophic	Dominance of blue green algae, algal scum probable extensive macrophyte problems
70-80	Eutrophic	Heavy algal blooms possible throughout the summer, often hypereutrophic
>80	Eutrophic	Algal scum, summer fish kills, few macrophytes

Carlson's Trophic State Index (TSI) is a common method for characterizing a lake's trophic state or overall health. This method uses Secchi's disc (SD) transparency, chlorophyll-a (CA), and phosphorus (PT) measurements.
Total phosphorus was analysed by the method prescribed in 4500-P; APHA, 1995. Chlorophyll a was estimated by Acetone method and measured using a spectrometer. Chlorophyll was extracted in 80% acetone and the absorption at 660nm and 620nm were read in a spectrophotometer. The amount of chlorophyll was calculated using the absorption co-efficient. Chlorophyll present in the extract, mg of chlorophyll per gram tissue was calculated using the following equation.

$$\text{Mgchla/g tissue} = 12.7(A660) - 2.69(A620) \times \frac{10}{1000 \times 10}$$

The trophic state index (TSI) of Carlson was calculated using the following formulae
TSI for Chlorophyll-a (CA) TSI = 9.81 In Chlorophyll-a (ug/l**)** +30.6
TSI for Secchi depth (SD) TSI= 60 – 14.41 In Secchi depth (Meters)
TSI for Total phosphorous (TP) TSI = 14.42 In Total phosphorous (ug/l) + 4.15

Where TSI is Carlson trophic state index and 'In' is Natural logarithm.

Carlson's trophic state index (CTSI) = [TSI (TP**)** +TSI (CA) +TSI (SD)]/3

Based on the values of CTSI the lakes are classified as oligotrophic (low productive), mesotrophic (moderately productive) and eutrophic (highly productive). The range of the Carlson's trophic state index values and classification of lakes are represented in table .1

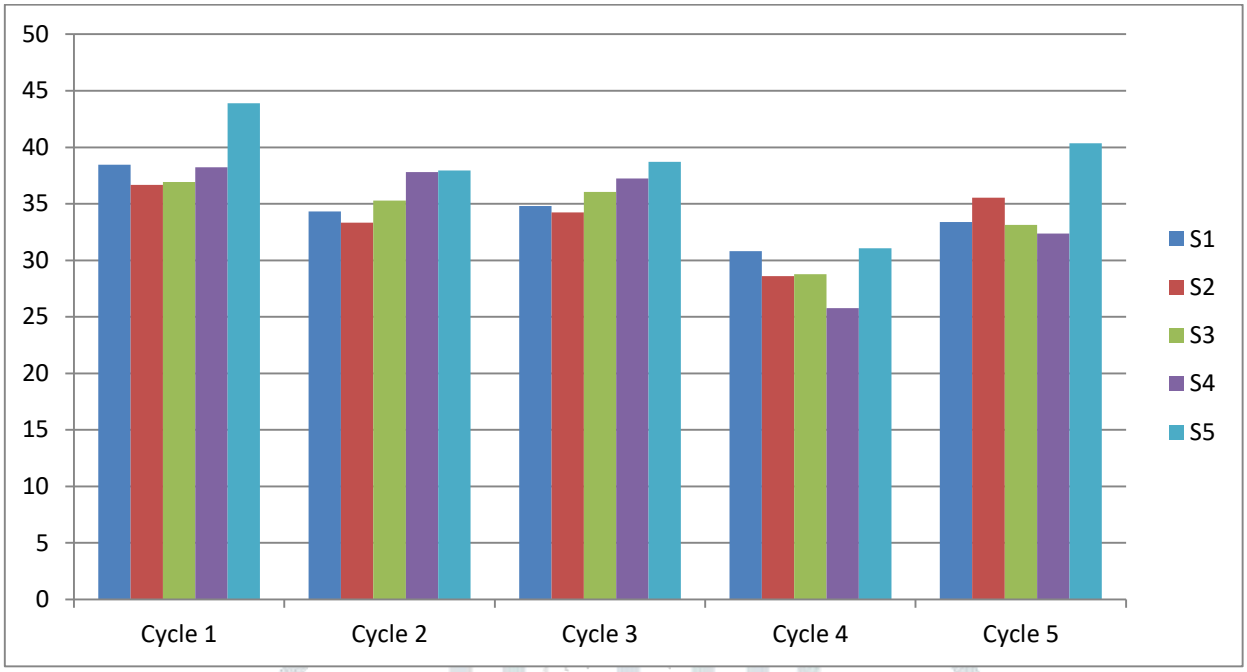
III. RESULTS AND DISCUSSION

The result of all three parameters for Talaopali lake over a period of 4 months are presented in the table no.2, Graphical representation of the Carlson's trophic state index of the lake is given in figure no.3. Carlson's trophic state index values of the Talaopali lake recorded in between 30 to 45. Mostly, our water tests were done during winter season, and our study revealed the fact that CTSI values were moderate during winter season. The average CTSI has shown that Talaopali lake is oligotrophic during winter season. It has a tendency of becoming anoxic during October month. The main parameter in deciding the trophic state of an aquatic water body is its phosphorus concentration. Any change in phosphorus concentration of fresh water ecosystem can also alter its trophic status.

Table.3: Carlson's trophic state index, Talao Pali lake (Oct2018-Jan2019)

MONTH	OCT	DEC	DEC	JAN	JAN	Average
DATE	27/10/18	4/12/2018	21/12/18	5/1/2019	25/1/19	
S1	38.46	34.32	34.81	30.8	33.4	34.300
S2	36.68	33.34	34.23	28.61	35.55	33.682
S3	36.94	35.28	36.05	28.76	33.12	34.030
S4	38.22	37.8	37.25	25.77	32.37	34.282
S5	43.89	37.94	38.7	31.07	40.36	38.392

Figure no. 3 Graphical representation of CTSI of talaopali lake (Oct 2018- Jan2019)



IV. CONCLUSION

From this research we can conclude that spot no. 2 has minimum CTSI & spot no. 5 has maximum CTSI. We observed that the aeration system has been provided near to spot no. 2. Hence the growth of nutrients is not much higher at spot no. 2. Near spot no.5 there is a ditch where people throw remnants from an offering of deities (Nirmalya). Therefore the growth of nutrients on spot no.5 is maximum. We found that there is fluctuation in trophic index in every spot monthly. Hence we calculated the average of each spot's result for the conclusion. All the spots showing that the lake is on higher stage of Oligotrophic; but the spot 5 is changing toward Mesotrophic. So to control that we can provide one more aeration system at spot 5 or we can use various other methods such as using artificial floating wetland.

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