

# Status of Water Quality of Powai Lake

Chhaya Mitter

Head and Associate Professor, Department of Zoology, Sathaye College, Mumbai, Maharashtra, India  
Chhayamitter[at]yahoo.co.in  
Chhayamitter[at]gmail.com

**Abstract:** Water supply has been a serious problem ever since people started living in towns and cities. Human activities near aquatic bodies bring changes in the quality of water. Improper management of water system may cause serious problem in availability of quality water. Powai Lake is an artificial lake situated in the heart of Mumbai and was built by British rulers in 1891. The city is over populated, and demand for potable water is increasing day by day. Present investigation is focused on various physicochemical parameters and the study of these parameters is useful to determine the quality of water. Analysis indicated that Powai Lake is highly polluted due to domestic and industrial waste. Immediate plan of action for cleaning is necessary with other precautionary measures.

**Keywords:** Physicochemical, investigation, Powai Lake, precautionary measures.

## 1. Introduction and Literature Survey

In all corners of the world, human race faces scarcity of potable water. Water is major environmental factor in man's well being. As per recent survey it is apparent that future cause of wars will be for water availability. Worldwide, more than 4500 people including children die every day from lack of clean water [1]. This number is more than the deaths caused by HIV, AIDS, malaria and tuberculosis combined. Enormous industrial growth has taken place throughout the world in the past few decades to fulfil the increased demand of over populated civilisation [2]. This industrial effluence enter in water bodies causing pollution of water and make it unfit for human consumption. Great care should be taken to keep them clean to get potable water continuously [3].

South Asian countries including India receive over 70% of world's annual rainfall during monsoon season. In spite of this, we Indians face the scarcity of potable water.

Mumbai is the financial, commercial and over populated metro city of India and it is in dire need of additional supply of [4].

The Powai water works were designed and carried out in 1890 by Mr. Tomlinson, Water Engineer, Bombay Municipality, as an emergency to mitigate an anticipated water famine in 1891 before Tansa water could be introduced in the city. The work began at the end of 1889 and completed in June 1890 [4].

In the year 1995 under "National Conservation Plan of India", Powai Lake of MCBM was identified as one of the ten major lakes in the country for revival and improvement.

A high level committee was formed to check the pollution level of the lake and steps were taken to create public awareness for saving the lake. Detailed Feasibility Report (DFR) prepared by consultant M/S Wochardt Limed, was approved by Ministry of Environment and Forest (MOEF) government and sanctioned Rs. 6.62 crore as grant to MCGM for implementation of the scheme on priority basis.

Deterioration of water quality, loss of biodiversity and fast depletion of water resources are the main challenges which need urgent attention [5]. Extensive limnological work of Powai Lake was carried by number of workers with respect to the challenges mentioned. [6] [7] [8]

The water of Powai Lake is unfit for bathing because water borne infections were revealed in a quality test conducted by city-based NGO [9]. Water quality of Powai Lake is not potable. It is used for recreation, gardening, cattle washing and fishing. Lake water has got highly polluted due to untreated disposable of sewage and garbage from nearby residential hotels complexes and slums. So to save the lake, it is necessary to revive and rehabilitation should be done urgently.

All these aspects prompted to estimate physico-chemical parameters of Powai Lake.

## 2. Methodology

Sample water was collected from the month of September 2016 to June 2017. All the samples were collected from approximately ten feet depth for analysis of various physicochemical parameters. On every visit samples were collected from three places namely Boat club, IIT garden and Koldongri. Collection was done between 8.00 AM to 10.00 AM. Sample water was collected in clean laboratory BOD brown colour glass bottle with 250 ml capacity. Physical parameters like temperature, taste, odour and pH were measured at the site of collection. Samples were brought to the laboratory to analyse turbidity, total solids (TS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) by APHA 2005 [10] and Trivedi and Goel 1986 [11].

## 3. Results and Discussion

**Temperature:** Ambient temperature and water temperature measured by calibrated digital thermometer. Temperature variations were not seen greatly, since lake is situated near the coastal area where humid condition are observed (Table-I).

**pH:** pH is one the most important parameters in the chemistry of water. The relative acidic or basic level of a solution is measured by pH. In 1995 before revival of lake water pH level was 7.2 [12] Polluted water has pH value low but it depends upon nature of pollutants. Throughout the investigation, pH of the sample ranged between 7.4 - 7.8 (Table-I).

**Turbidity:** Suspended material in water gives cloudy appearance to water. Insoluble sediment particles increase turbidity. It can be measured by different optical systems. It is considered as a good measure of the quality of water. High turbidity in water affects its hardness [13]. It causes bacterial growth. Turbidity affects light scattering absorption properties of water. It also affects waters aesthetic look in a lake. Turbidity is measured by an instrument called nephelometer {Nephelometric Turbidity Unit (NTU)}. Turbidity was more or less similar throughout the study, but comparatively more during September, March, April and May. Results are mentioned in the (Table-I).

**Total Solids:** Total Solids (TS) is the sum of Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). TS Range 95- 400 mg/L was observed by [14]. In this work TS is calculated by drying and weighing the residue. Results of this study are mentioned in the Table-I.

**Dissolved Oxygen (DO):** DO is a very important parameter in water analysis since it acts as an indicator of

physical and biological activity of water resources. Dissolved oxygen is measured by Winkler's method. Throughout the study, dissolved oxygen level was very less indicating large amount of domestic effluents are present in the water. A low DO (less than 2 mg/L) would indicate poor water quality [2]. In 1995 before revival of lake, DO level at the bottom had gone low as 0. 71 mg/L [12]. Results are given in the (Table-I).

**Biochemical Oxygen Demand (BOD):** BOD indicates organic quality of water. Higher BOD value indicates less oxygen available in the water body. In 1995 status of lake was transformed by "aeration and bioremediation technique from hypertrophic to mesotrophic level [12]. Biological oxidation process is capable of oxidising natural detritus organic waste in the water, which gives unpleasant taste and odour to water. The permissible limit of BOD is 30 mg/L [15]. BOD value during study indicates water is heavily polluted (Table-I).

**Chemical Oxygen Demand (COD):** It means the total measurement of all chemicals in water that can be oxidised by strong oxidants. According to WHO standards, COD value is 10 mg/L. In 1995 before revival of lake, COD at the top was 42.70 mg/l and at the bottom was 119mg/L [12]. COD was very high throughout the year indicates water is highly pollutants. COD value was more than BOD. So it revealed that water is not fit for dairy and bathing without treatment (Table-I).

**Table I: Physico-chemical Parameters of Powai Lake water**

Parameters	October	November	December	January	February	March	April	May
Temperature (Degree Celsius)	34.5	29.7	28.7	29.5	30.5	34.7	34.8	34.8
Turbidity (NTU)	5.3	4.3	3.9	4.7	4.2	3.8	4.9	2.9
pH	8.1	7.9	8.2	7.8	8.2	8.4	8.3	8.7
Total Solids (TS) mg/L	490	407	369	370	395	341	369	390
Dissolved Oxygen (DO)	1.6	2.5	1.7	3.1	4.7	4.2	2.9	3.2
Biochemical Oxygen Demand (BOD) mg/L	57	49.3	45.7	44.1	45.0	47	41.5	42
Chemical Oxygen Demand (COD) mg/L	80.2	76.4	70.9	65.6	66.3	61.9	69.1	72.3

#### 4. Conclusion and Future Scope

The results of this assessment indicated aquatic parameters are more than permissible limits. Water quality Powai of Lake is deteriorating since long. It is necessary to clean water immediately.

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**Authors Short Profile:**



**Dr. (Mrs.) Mitter Chhaya Saroj Kumar**

Associate Professor. (Head of the Zoology Department.)

Sathaye College, Vile- Parle (E), Mumbai-400057.

Experience: 30 years.

Research- 22 Published papers in National and International Journals.

Contact no: 9773415469.