



*Research Paper*

**STUDIES ON THE PRESENT STATUS OF MITHI RIVER, MUMBAI**

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**Abstract**

Present paper deals with the assessment of water quality of Mithi river of Mumbai. The study was carried out over a period of one year. Water Samples were collected from four locations, each with ecological importance and geographical variation. The results obtained from different parameters studied were pH (7.5-7.28), Sodium (12mg/l - 4080mg/l), Potassium (07mg/l - 792.6mg/l), Magnesium (140mg/l - 3000mg/l), Total Phosphorous (0.0004 mg/l - 2.30 mg/l), Total Kjeldahl Nitrogen (0.8 mg/l - 3.5 mg/l) and Chloride (1.775 mg/l - 3.25 mg/l), Dissolved Oxygen (1.2mg/l - 4mg/l), Biological Oxygen Demand(0.0mg/l - 3.4mg/l), Chemical Oxygen demand(8mg/l - 44mg/l), MPN(4.0 - 400 MPN/100ml), Heavy Metals - Zinc (0.0087, 0.0519), Copper (#,0.052) and Cadmium (#,0.037). Each of which less or greater in quantity, plays a vital in development of the ecosystem significantly. Majority of the parameters exhibited higher levels at sampling stations 2,3 and 4 indicating pollution load due to domestic sewage discharge and addition of effluents from nearby industries.

Key words: Mithi River, Water samples, Physico-Chemical parameters, Heavy Metals, Fecal coliform, pollution.

**INTRODUCTION**

Rivers as a source of fresh water, have always been used as a source for drinking, irrigation, obtaining food, for bathing etc. They are a major source of fresh water. Rivers are used as an easy means of disposing of waste-water and, in much of the lesser developed world, other wastes too. Water pollution is one of the main reasons why freshwater resources are constantly in decline [27] . It has been estimated that up to 80 % of India's urban waste ends up in its rivers. The Mithi River (also known as Mahim River) is a river in salesette island, the island of the city of Mumbai. It is a point where the water discharges from Powai and Vihar lakes unite. The river is mostly seasonal and rises during the monsoons. The overflowing lakes also contribute to the river flow which is stopped by a dam in other times. The river measures a total of 15 kms which further meets the Arabian Sea at Mahim Creek flowing through residential and industrial complexes. The river has an average width of 5 m in the upper reaches, 25 m wide in the middle and lower reach measures up to 70 m. Mahim bay area is also nominated as bird sanctuary where migratory birds come for nesting. This part is dominated by mangroves vegetation. When the river was not as polluted as it is today, it used to serve as an important storm water drain for Mumbai but as it is been used as a sewer over the years, its importance as a storm water drainage system has reduced and it poses as a hazard during high tide bringing polluted water into the city. Very often, and this continues to happen, citizens dump

raw sewage, industrial waste and municipal waste into the river, unchecked. The water with mixture of sewage and industrial waste has developed a threat to marine life.

In the present investigation an attempt was made to study the current health status of Mithi river by analyzing some important Heavy Metals like Zinc, Copper and Cadmium, Physico chemical parameters like pH, temperature, sodium, potassium, total kjeldahl nitrogen, chloride, phosphorous, TDS, hardness, DO, BOD and COD. As the presence of fecal coliform bacteria indicates contamination of water with fecal matter and determines the potability of water, experiment was performed to study MPN count at every selected site.

## MATERIALS AND METHODS

Four sampling stations were considered along the flow of the Mithi river namely S1- National park, S2- Goregaon, S3- Jogeshwari, S4- Bandra Kalanagar. These sampling stations selected according to their nature of diversities. National park is the nearest point from the source and was considered as control amongst the other three sampling sites. Goregaon is surrounded by the domestic population, Jogeshwari site is surrounded by Domestic as well as industrial establishments in small pockets. The significance of the Bandra kalanagar sampling site is that its runs through industrial estate, as well as domestic pockets and has a very rich variety of mangroves covering its borders, thus indicating the presence of organic and industrial waste.

The surface water samples were collected from 1m to 2m depth from the water surface. The water temperature and pH were measured at the sampling site using standard mercury thermometer and pocket pH meter. For analysis of dissolved oxygen (D.O) water samples were fixed at the sampling locations. Conductivity of the water sample was analyzed immediately after the samples were brought to the laboratory with the help of digital conductivity meter. For the study of nitrate, phosphorous, sodium, potassium, chloride, total hardness, calcium and magnesium, TDS, BOD, COD, MPN count water samples were analyzed in the laboratory following standard methods. [24] and [2].

## RESULTS AND DISCUSSION

Temperature of the water on the surface ranged from 20 °C - 24°C showing minimum and maximum values during summer, monsoon and winter seasons at all the sites.

pH was found in the range of 6.75 – 7.17 which is well within the standard limits as per BIS standards.

Conductivity value was minimum at site 1 in winter and maximum at site 3 (Table) during summer season which might be due to the input of various elements like Na and K due to several domestic activities.

[17] while analyzing physico-chemical properties of water collected from dharma estuary found results in the similar range showing maximum conductance upto (46.03 mΩ) during summer as compared to monsoon and winter. [21] also found similar values far less while studying the physico-chemical properties of water samples from Manipur River system.

The investigated result shows the dissolved solids from 9252mg/l to 360 mg/l respectively. TDS values were less in summer indicating settling of the dissolved particles [3] while studying Mahanadi River delta at Odhisha found similar results ranging from 4510mg/l – 11900 mg/l indicating the pollution of the water which are mostly due to the mixing of sea water with the river water. TDS values were less in summer indicating settling of the dissolved particles. While studying seasonal variation of river Ganga, [9] obtained similar variance in readings with maximum TDS in monsoon than in winter season. TDS also varies with geological factor and is a good indicator of the degree of dissolved substances.

Total Hardness of water analyzed was maximum 4600mg/l at Jogeshwari and least at 176mg/l at site 1 during summer. Higher level of total hardness of water can be attributed to the presence of higher Mg content at almost all the sites. [8] while studying physico chemical parameters of river Ganga in haridwar district found seasonal variation of hardness showing lowest concentration during the winter season (87.55mg/l). While Studying seasonal variation [22] found results with higher concentration in summer than in winter during assessment of Ramganga River at Moradabad.

Chlorine content analyzed, showed maximum value during summer at site 3 when the water level was considerably low and reached minimum during the monsoon season at most of the sites with high water levels. [12] while studying the Ulhas river obtained similar results with high values during monsoon than in winter. [7] while assessing Yamuna river [26] and while monitoring water quality of Kosi River in Rampur district found the chlorine levels with similar range of observations which stay under the permissible limits of standards of BIS.

The minimum and maximum values of potassium observed at site 1 and site 2 in summer season (Table) show bacterial activities on the higher sides as compared to monsoon and winter season which occurs due to the weathering of rocks or disposal of wastes in water [16] observed potassium level minimum 1.12 mg/l and maximum 16.10 mg/l at sampling stations both in summer.

In the present investigation magnesium concentration was found to be in the range of 140mg /l to 3000mg/l in the summer season at site 1 and site 3 respectively which shows higher concentrations and thus unpalatable. Higher values of Magnesium might be due to sewage and industrial wastes.

kjeldahl nitrogen observed exhibited maximum concentration levels during summer in the river water (Table). [21] also found the results within permissible limits ranging from 0.03-0.63mg/l while studying physico-chemical properties of water collected from Dhamra estuary, Odhisha.

Dissolved oxygen (DO) is one of the most important parameters in water quality assessment reflecting the physical and biological processes prevailing in the water. In the present study DO ranged from as 1.2mg/l to 06.2 mg/l. [4] while monitoring water quality of Indian rivers (river Sabarmati, Brahmaputra, Mahanadi) also found results in the similar range.

Biological Oxygen Demand (BOD) is the amount of oxygen utilized by the microorganisms in stabilizing the organic matter. In the present study BOD was negligible (Table). [20] reported BOD values in the range between 2.7 mg/l to 5.9 mg/l while evaluating water quality index of Mahanadi and Atharabanki Rivers.

Chemical Oxygen Demand (COD) chemical oxygen demand is the oxygen required by the organic substance in water to oxidize them by a strong chemical oxidant. COD was found within the standard limits (Table) prescribed by BIS. While monitoring water quality parameters of Karola River, West Bengal, [14] found results ranging from (4 mg/l to 38.2mg/l) within the permissible limits. [10] during their studies on the physico-chemical and bacteriological characteristics of water from rivers of Uttarakhand have also found the results in the similar range.

In the present investigation MPN count was found to be 400 coliform /ml indicating water unfit for consumption, which might be caused by the mixing of sewage into the reservoirs or directly into the rivers. As the drinking water quality standard's permissible limits of coliform count is '0', all the readings obtained, exceeded the limit. Site 4 showed the maximum number of Coliform - 258.0/100ml, therefore all the four sites fail the microbiological tests for Most Probable Number (MPN) i.e. coliform count.

The investigated heavy metals at all the sampling locations along the Mithi river were found within the standard limits as per MPCB board . However, other parameters and further studies of the river need to be carried out to obtain present status of Mithi river water quality.

In the present study most of the water quality parameters at all the sampling locations were within the standard limits by BIS. However, MPN count indicates that the water is not potable. Assessment of heavy metal analysis needs to be done as it will help to evaluate the present water quality status of the river.

Table.

SAMPLING SITES												
Parameters	Summer				Monsoon				Winter			
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 1	SITE 2	SITE 3	SITE 4	SITE 1	SITE 2	SITE 3	SITE 4
pH	7.17	7.11	7.28	6.75	7.20	7.03	6.92	7.12	7.2	7.1	7.1	6.8
Temperature	22.5	23.4	23.5	24.6	20	22.3	21.5	22	22	24	21	23
Conductivity	0.48	23.6	36.1	0.85	0.127	14.82	11.65	8.022	0.346	8.21	0.746	18.54
Total Dissolved Solids (mg/l)	360	17880	307600	600	1202	9252	2502	9000	1040	7920	1040	17040
Hardness (mg/l)	176	3200	4600	4000	1280	2400	1040	4800	1112	2500	2800	4000
Chloride (mg/l)	3.55	Negligible	1.775	Negligible	3.55	Negligible	Negligible	Negligible	3.25	Negligible	Negligible	Negligible
Sodium (mg/l)	27.5	2301	4080	60	0.00	680	53.33	2133	12	1311	573.2	619
Potassium (mg/l)	07	498.2	792.6	61.5	9.142	173.71	57.14	434.2	3.1	229.1	531.2	218.1
Magnesium (mg/l)	140	2200	3000	300	1079.84	918.82	279.41	2158.17	675	1118.0	1115.7	822.1
Phosphorous (mg/l)	2.30	1.25	0.9	0.5	0.004	0.035	0.014	0.00045	1.9	1.5	0.7	0.5
Total Nitrogen(TKL) (mg/l)	1.6	2.6	3.5	1.8	0.91	1.6	1.2	0.8	0.81	1.2	2.1	1.1
Dissolved Oxygen (mg/l)	4	Negligible	1.2	Negligible	6.2	Negligible	Negligible	1.4	Negligible	Negligible	2.8	Negligible
Biological Oxygen Demand (mg/l)	0.4	Negligible	0.0	Negligible	3.4	Negligible	Negligible	Negligible	3.1	Negligible	0.1	Negligible
Chemical Oxygen Demand (mg/l)	8	Negligible	Negligible	24	24	12	28	44	18	11	20	24
MPN (coliform/100ml)	10.0	80.0	195	400	4.0	33.0	140.0	258.0	6.0	50.0	98.0	100.0

Zinc (Heavy Metal)	0.00 87	0.00 99	0.017 2	0.050 3	0.018 2	0.020 5	0.020 5	0.051 9	0.012 7	0.017 3	0.018 8	0.044 1
Copper (Heavy Metal)	#	0.00 2	0.008	0.047	0.001	0.008	0.011	0.052	0.003	0.008	0.013	0.037
Cadmium (Heavy Metal)	#	0.00 0	#	0.035	0.000	0.001	0.000	0.037	0.002	0.002	0.003	0.026

### CONCLUSION

In the present study at all the sampling location most of the water quality parameters were within the standard limits by BIS. However MPN count indicates that the water is non potable and Cadmium concentration is found to be in higher concentration beyond permissible range in all the seasons. However Zinc and Copper concentration for all the water samples are within the permissible range.

Problems related to the environment and its ecosystem need to be discussed seriously. People should be educated about their activities which affect the natural ecosystem with a different approach. Proper policies and programmes towards solving problems should be implemented the present data on the mithi river's status also points out to the need for regular monitoring of water resources.

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