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A study of Seasonal Variations of Physico-chemical parameters in Mama lake, Sonapur, Tahsil Chamorshi, Dist. Gadchiroli (MS, India.

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Abstract: A study was conducted to explore the seasonal change of physico-chemical characteristics in Mama lake, which is located in the region of Gadchiroli. In addition to shedding light on the water temperature, conductivity, total dissolved solid, turbidity, pH, and total alkalinity in Mama lake, present study also show the significance of having a comprehensive understanding of the physico-chemical phenomenon that occurs in freshwater ecology. From one season to the next, every single parameter that was considered exhibited considerable variations. It is important to note that this study makes a contribution to the conservation and management efforts of Mama lake.

Keywords: *Mama lake, freshwater ecology, variations, conservation*.

Introduction

Water is regarded as one of the most distinctive natural substances present on our planet and serves as a crucial element for the existence of all living organisms, given that life on the planet originated in the oceans. Water plays a significant role in soil formation and acts as a medium for a variety of ecosystems. Lakes deliver vital services including water purification through nutrient cycling and pollutant filtration by aquatic vegetation, carbon sequestration and flood mitigation by buffering river flows (Tranvik et al., 2009 and Schallenberg et al., 2013). Lakes constitute essential standing freshwater ecosystems formed in natural depressions, capable of thermal stratification that supports diverse biotic communities critical for regional ecology and human livelihoods (Welch, 1952). Freshwater environments, such as rivers and lakes, are essential to the world's ecosystem because they provide vital ecosystem services and support a diverse array of aquatic life (Dudgeon et al., 2006). Gadchiroli district lakes in Maharashtra's forested Vidarbha region exhibit moderate pollution primarily from agricultural runoff, domestic effluents, livestock activities, and proximity to mining operations, transitioning from mesotrophic to eutrophic conditions as indicated by MPCB monitoring of Wainganga river stretches (MPCB, 2025).

Materials and Methods

The location of Mama Lake is in the village of Sonapur, which is close to Chamorshi (19.899412^0 N 79.887492^0 E). On average, it is about forty kilometers away from the research center. There are 0.1620 hector of water dispersed across the entire area of Mama Lake. The physico-chemical parameters of Mama lake, including water temperature, conductivity, total dissolved solid, turbidity, pH, and total alkalinity, were analyzed at three different stations namely M1, M2 and M3, that were chosen for use in the study between the year of February 2022 and January 2023. Water samples were collected in airtight containers and sent to the laboratory for examination. The study was conducted between the hours of 8:30 and 10:30 in the morning. Summer season (February to May), monsoon season (June to September), and winter season (October to January) are the names given to the three distinct seasons. The results were calculated as per standard formulas and methods (APHA 2005).

Results and Discussion

Most of the physico-chemical parameters such as water temperature, turbidity, pH, and total alkalinity maximum during summer season and minimum during winter season. In contrast conductivity and total dissolved solid, peaks during monsoon season. Water temperature in Mama Lake exhibited pronounced seasonal fluctuations, ranging from 21.73°C, at station – M1 and 28.20°C, at station – M2 (table no. 1, 3 and figure no. 1). The values were corroborated with the findings of Nagpurkar et al., (2023) from five designated lakes in the Bhandara region of Maharashtra, India. Conductivity exhibited pronounced seasonal fluctuations, ranging from 324.25 µmhos/cm at station – M1 and 443.00 µmhos/cm at station – M2 (table no. 1, 3 and figure no. 2). Congenial observations on the testimony of Shende and Maryam (2023) from Saikheda dam dist. Yavatmal. T.D.S. exhibited pronounced seasonal fluctuations, ranging from 257.75 mg/L at station – M1 and 354.50 mg/L at station – M2 (table no. 1, 3 and figure no. 3). Analogous reports were published in agreement with Sargar and Thakare (2024) from Niwali Reservoir, Tahsil Jintur, dist. Parbhani. Turbidity exhibited pronounced seasonal fluctuations, ranging from 5.68 NTU at station – M1 and 6.33 NTU at station – M2 (table no. 1, 3 and figure no. 4). Ramesh and Rajashekhar (2018) have documented analogous findings from the Upper Manair reservoir. pH exhibited pronounced seasonal fluctuations, ranging from 7.95 at station – M1 and 8.45 at station – M2 (table no. 1, 3 and figure no. 5). Approximating findings were recorded as maintained by Chavhan (2024) from Pardi Lake, Gadchiroli district. Total alkalinity exhibited pronounced seasonal fluctuations, ranging from 84.00 mg/L at station – M1 and 140.50 mg/L at station – M (table no. 1, 3 and figure no. 6). Related investigation were observed in consonance with Tijare and Kunghadkar (2020) from Kunghadabandh Lake and Chamorshi Lake, dist. Gadchiroli.

Conclusion

This study establishes Mama Lake as sentinel system for Gadchiroli district, where seasonal physico-chemical variation govern biodiversity-productivity equilibria. Findings deliver actionable baseline catalyzing sustainable water ensuring Mama Lake all the studied parameters within permissible limits. Mama lake is viable Gadchiroli lentic archetype for future generations.

Table no. 1: Table Shows Seasonal Average Mean Values of Physico-chemical parameters at station - M1 of Mama lake during Feb. 2022 - Jan. 2023.

Sr. no.	Parameters↓ Seasons →	Summer		Monsoon		Winter	
1	**Water temperature**	26.98	1.86	25.95	1.75	21.73	0.93
2	**Conductivity**	331.00	5.64	391.25	16.57	324.25	10.59
3	**T.D.S.**	269.00	19.14	337.75	19.14	257.75	16.29
4	**Turbidity**	6.63	0.37	6.78	0.19	5.68	0.31
5	**pH**	8.55	0.14	8.10	0.04	7.95	0.09
6	**Total alkalinity**	120.75	11.46	115.00	9.18	84.00	2.68

Table no. 2: Table Shows Seasonal Average Mean Values of Physico-chemical parameters at station – M2 of Mama lake during Feb. 2022 - Jan. 2023.

Sr. no.	Parameters↓ Seasons →	Summer		Monsoon		Winter	
1	**Water temperature**	28.20	1.81	27.09	1.78	22.99	1.01

2	**Conductivity**	361.25	6.25	443.00	21.67	373.25	13.58
3	**T.D.S.**	285.25	18.09	354.50	18.09	277.25	16.10
4	**Turbidity**	7.10	0.36	7.43	0.19	6.33	0.28
5	**pH**	8.83	0.13	8.50	0.04	8.45	0.18
6	**Total alkalinity**	140.50	9.54	137.50	8.86	102.00	3.76

Table no. 3: Table Shows Seasonal Average Mean Values of Physico-chemical parameters at station – M3 of Mama lake during Feb. 2022 - Jan. 2023.

Sr. no.	**Parameters↓ Seasons →**	**Summer**		**Monsoon**		**Winter**	
1	**Water temperature**	27.29	1.87	26.44	1.77	22.39	0.97
2	**Conductivity**	352.00	6.61	425.75	19.37	358.75	14.18
3	**T.D.S.**	278.25	18.09	347.50	18.09	270.25	16.10
4	**Turbidity**	6.85	0.34	7.20	0.18	6.08	0.29
5	**pH**	8.65	0.13	8.38	0.02	8.30	0.17
6	**Total alkalinity**	130.75	8.91	129.50	8.91	94.00	3.76

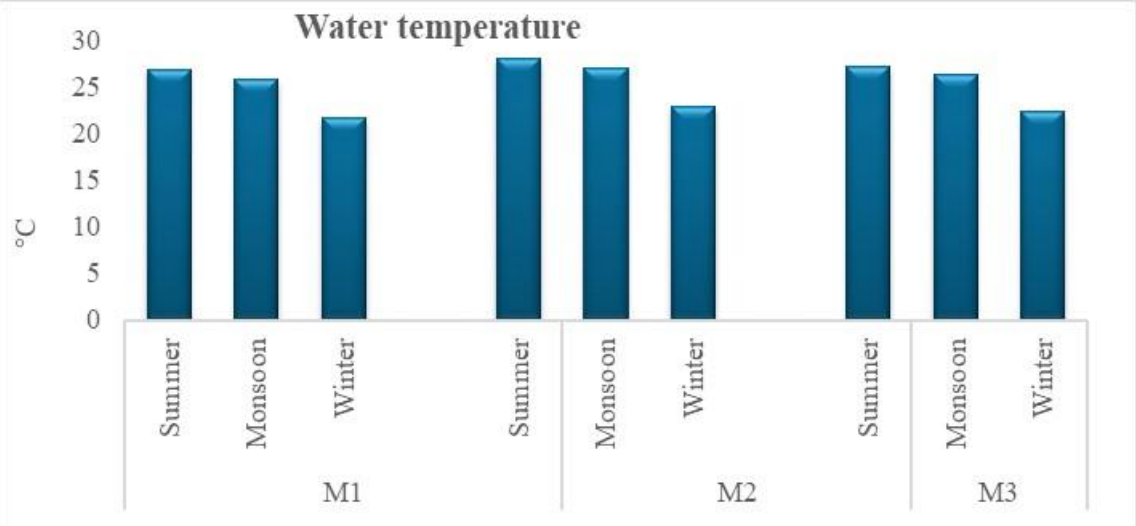

Figure no. 1: Graph Shows Seasonal Average Mean Values of Water temperature at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023

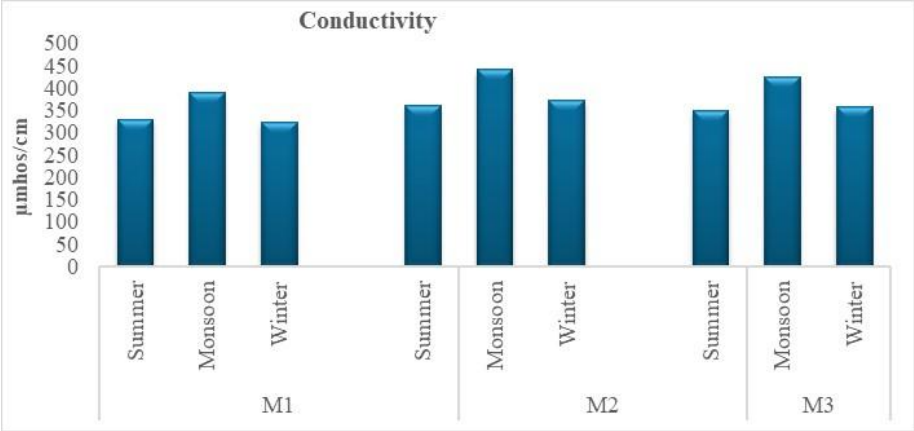

Figure no. 2: Graph Shows Seasonal Average Mean Values of Conductivity at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023.

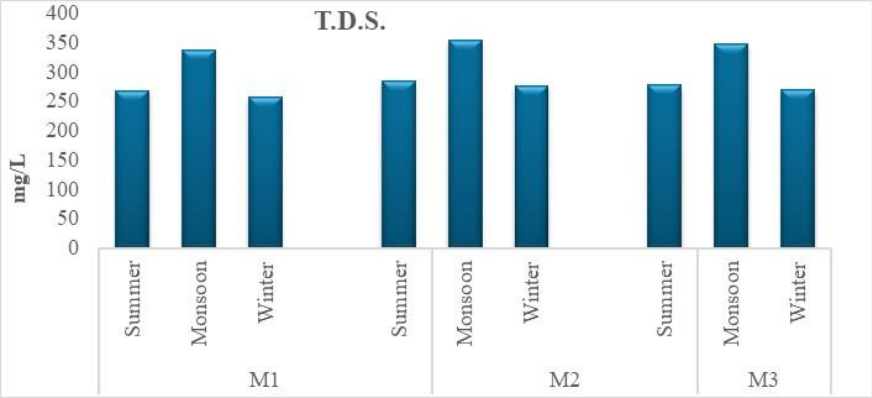

Figure no. 3: Graph Shows Seasonal Average Mean Values of T.D.S. at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023.

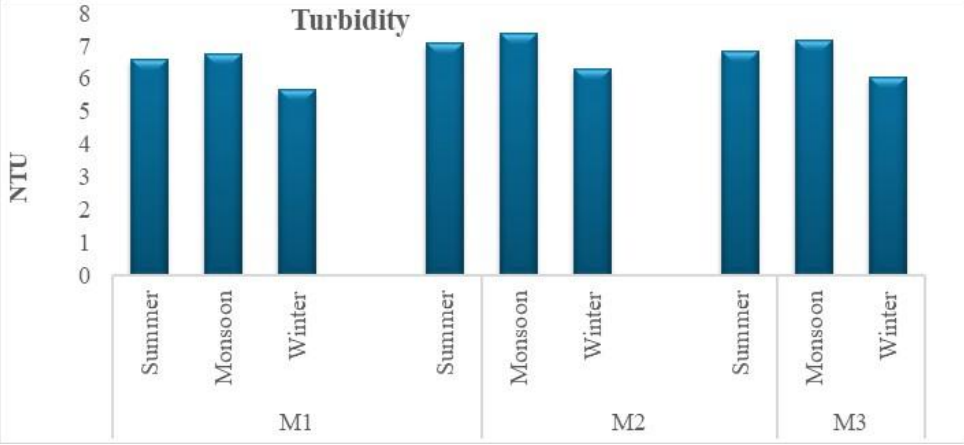

Figure no. 4: Graph Shows Seasonal Average Mean Values of Turbidity at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023.

Figure no. 5: Graph Shows Seasonal Average Mean Values of pH at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023.

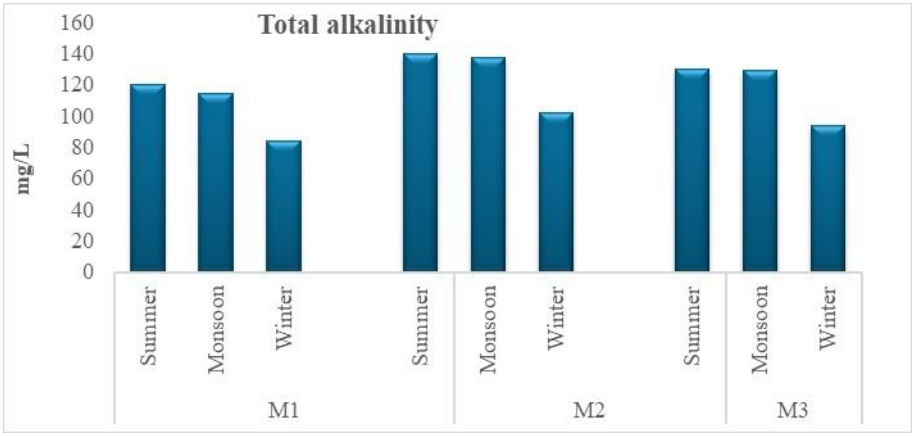

Figure no. 6: Graph Shows Seasonal Average Mean Values of Total alkalinity at station - M1, M2 and M3 of Mama lake during Feb. 2022- Jan. 2023

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