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ORIGINAL ARTICLE

Seasonal Variations in Sediment Parameters of Veeranam Lake, Cuddalore District, Tamil Nadu, India

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ABSTRACT
Bottom sediment plays an important role in monitoring the aquatic environment especially evaluating the contamination levels and ecological risk assessment. Additionally, sediments are important for the cycling of nutrients including nitrogen, phosphorus and carbon within a wetland ecosystem. The key to effective environmental quality management is the ability to continuously monitor the concentration of various pollutants in the sample of interest. The significance of various substances in sediment is obvious and it is their level that gives measure of the quality of the water. The current study looks at how the sediment quality of Veeranam Lake is impacted by human activity. The green revolution, industry, urbanisation, and population increase have all contributed to today's fresh water supply. The current study aims to investigate the impact of human activity on the sediment in Veeranam Lake. For this investigation, five sample sites were selected. Stations I, II, III, IV, and V represent the lake's northern, eastern, middle, upper, and southern portions, respectively. The current study was carried out during a 24-month period, from June 2021 to May 2023. The pH varied during the study, from 7.73 in the monsoon season of 2021–2022 to 8.5 in the pre-monsoon season of 2022–2023. In the post-monsoon season of 2022–2023, Station I had the lowest water conductivity (430 µSie), whereas in the pre-monsoon season, it had the highest (907 µSie). Both locations saw a decrease in total nitrogen concentration as the monsoon season gave way to summer. The sulphate levels at Stations II and III throughout the same season in 2022–2023. In order to reduce anthropogenic stresses and protect Veeranam Lake biodiversity and ecological functions, comparisons with prior research confirm the need for continuous ecological evaluations and sustainable management techniques. As a result, lakes and other water sources utilised for irrigation, drinking, and other uses must have their hydrological conditions and sediment quality routinely assessed.
Key words: *Veeranam Lake, Sediment parameters, pH, Conductivity and sulphate.*

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INTRODUCTION

Water occupies about 70% of the earth's surface and yet it is one of the scarcest commodities especially in the developing countries of the world. It is one of the most demanded of all urban and rural amenities and it is indispensable for man's activities. Water needs have had serious socio-economic and health influences on urban environment in developing countries where population concentrations have put serious strains on available resources. Amongst the serious environmental problems are waste accumulation and lack of adequate and safe water supply (1,2).

As this water runs across the ground surface, it picks up microorganisms, organic matter and mineral. Sediment is matter (sand, dirt, gravel) that settles to the bottom of water. Waters serve various purposes ranging from drinking, sources of fish, irrigation to recreation but frequently these waters are polluted. Water pollution is one of the most important environmental problems faced by third world countries (3)

Reservoirs play important roles in water supply, irrigation, power generation and flood control. However, dam construction changes the hydrological regime and sediment transport (4,5,6). The suspended

sediments are stored in the reservoir and with them pollutants including heavy metals (HMs) (7). Bottom sediment plays an important role in monitoring the aquatic environment (8), especially evaluating the contamination levels (1,2) , and ecological risk assessment (3).
India is rich in several diverse inland water resources including several large and small rivers, numerous natural and manmade standing waters like, lakes, reservoirs, tanks etc. The sediments act as the store house of nutrients in aquatic ecosystems. Their nutrients are utilized for the production of biomass in the ponds. The replenishment of these nutrients during need and their consequent removal for biogeochemical cycles in the pond ecosystem. The productivity of a pond or lake depends upon the quality of soil as it controls pond bottom stability, pH of overlaying water and concentrations of plant nutrients necessary for growth of phytoplankton. The major function of pond soil is water maintenance.
Sediments play an important role in maintaining the productivity of water body and has the ability to store the nutrients and release them into waters through different mechanisms under different conditions (9).
Sediments of water bodies are supposed to be a kind of "memory" of natural and anthropogenic processes affecting these waters. Additionally, sediments are important for the cycling of nutrients including nitrogen, phosphorus and carbon within a wetland ecosystem (10).
Assessing sediment quality can help us better understand historic, ongoing, and potential stress to lake ecosystems In India, lakes provide sustenance and strength to the people of the concerned regions as these are used for fishing, drinking, irrigation, recreation, and other basic needs. The exact information of sedimentation rate and the factors responsible for it; can assist in the preservation and future planning of lakes (11, 12)
The key to effective environmental quality management is the ability to continuously monitor the concentration of various pollutants in the sample of interest. The significance of various substances in sediment is obvious and it is their level that gives measure of the quality of the water.

MATERIAL AND METHODS

Location of study and description of study sites

Veeranam Lake is located 14 km SSW of Nattarmangalam in Cuddalore district in the state of Tamil Nadu in South India (11°15' N and 79° 30'E) is selected for the present study. The lake located 235 km (146 mi) from Chennai, India, is one of the water reservoirs from where water is planned to be supplied to Chennai. It was impossible to use any water from the lake since it had run dry, and the face-saving proposal adopted by the authorities was to dig 45 deep bore wells around the area and pump the resulting water 235 km (146 mi) to Chennai via the pipeline. As the length is 14 km this is the longest manmade lake in the world. The credit goes to ancient people who have done this job with ordinary handmade tools. Veeranam Lake was built in the Tenth Century during the time of Greater Cholas, from 907–955 AD and is an 16-kilometre (9.9 mi) long dam in northern Tamil Nadu. It was created by Rajaditya Chola. This veeranam lake gets water from Kollidam via Vadavaru River. Five stations selected for the present study.

Station I-Northern side of the Lake
Station II -Eastern side of the Lake
Station III -Middle region of Lake
Station IV -Upper reaches of Lake
Station V -Southern part of Lake

Rainfall during southwest monsoon as well as the surplus water from the Kaveri River also reaches this location via Coleroon river. It is a source to supply water to Veeranam Lake which is the source of drinking water to Chennai city.

Sampling and analysis of soil

The present study was carried out for a period of 24 months from June 2021 – May 2023. Collection of water samples were made at regular fortnight intervals from each sampling station using a clean plastic bucket. The soil samples collected from five stations of the reservoir during the study period, June 2021 – May 2023, were used for analyses by following the standard methodology [13] .
All the analyses were repeated five times and the concordant values were taken into account. The methodology adopted for characterization of sediment quality is presented in table 1. Sediment samples were collected at regular fortnight intervals using Ekman dredge from the water bodies.

Table.1 Methods adopted for analyses of sediment characteristics.

Sl.No	Parameters	Method/Instrument
1	pH	pH meter (Hanna Pen type) pH ep® made in Portugal
2	Conductivity	Conductivity meter (Henna pen type) made in Portugal
3	Acidity	Titrimetry
4	Alkalinity	Titrimetry (EDTA method)
5	Carbonates	Calculation from alkalinity
6	Bicarbonates	Calculation from alkalinity
7	Chlorides	Titration
8	Sulphates	Colorimetry (Turbidometric) at 420 nm
9	Available Phosphorus	Colorimetry at 690 nm
10	Nitrogen	Colorimetry (Phenoldisulphonic)
11	Carbon	Walkley and Black (modified)
12	Organic matter	Walkley and Black (modified)
13	Calcium	EDTA method
14	Magnesium	EDTA method
15	Moisture	Mobile Burner Drying Method

RESULTS

The sediment for Veeranam Lake was calculated over a 24-month period, In order to provide a good image of how the sediment characteristics varied across the seasons.

pH

The table's mean sediment pH value shows that, for the most part, the pH was higher than 7.7 during the study.

The pH ranged from a low of 7.77 to a high of 8.13 during 2021 and 2022. The average pH for each of these locations ranged from 7.87 to 8.25. The pH ranges from 8.13 to 8.33 during the pre-monsoon season. The pH ranges from 7.73 to 7.9 during the monsoon season. During the post-monsoon season, the pH fluctuates from 7.77 to 7.93. The July high is between 8.03 and 8.33. The mean ± standard deviation falls between 7.87±0.08 and 8.25±0.09, as Table 2 illustrates.

The pH ranged from a low of 7.77 to a maximum of 8.5 in 2022–2023. The average pH at each of these locations ranged from 7.93 to 8.19. The pH ranges from 7.93 to 8.5 during the pre-monsoon season. The pH ranges from 7.83 to 8.4 during the monsoon season. In the post-monsoon season, the pH varies between 7.77 and 8. The midsummer high is between 8.03 and 8.17. The mean ± standard deviation falls between 7.93±0.19 and 8.19±0.26, as Table 3 demonstrates.

Station II had the greatest pH (8.5) during the pre-monsoon period in 2022–2023, while it had the lowest pH (7.73) during the monsoon season in 2021–2022.

Conductivity

During the two years, station I had the lowest conductivity (430 µSie) in the post-monsoon of 2022–2023 and the highest (907 µSie) in the pre-monsoon season of 2022–2023. The mean ± standard deviation falls between 602 ±96.9 and 733 ±113.

Moisture content

Over the course of the two years, the moisture content fluctuated. During the summer of 2021–2022, station I showed a higher moisture content of about 40.6%. The lower range in station V during the 2022–2023 monsoon seasons was 23.2%. The mean ± standard deviation falls between 29.1 ± 5.49 and 35 ± 5.11.

Alkalinity

Station II reported the lowest alkalinity at 1.27 g/Kg during the monsoon season of 2021–2022, whereas station I recorded the greatest acidity at 2.17 g/Kg during the pre-monsoon of 2022–2023. The mean ± standard deviation falls between 1.39±0.19 and 1.91±0.09.

Acidity

Station VI reported the highest acidity at 0.34 mg/100g during the post-monsoon of 2022–2023, whereas station II recorded the lowest acidity at 0.03 mg/100g during the monsoon season of 2022–2023. The range of the mean ± standard deviation is 0.07 ±0.02 to 0.13 ±0.12.

Carbonates

Every site recorded carbonate levels of 0 mg/100g for the two years.

Bicarbonate

Station III monsoon in 2021–2022 exhibited increased Bicarbonate levels of around 293 mg/100g. During the 2021–2022 monsoon, stations II's lower range was 24.7 mg/100g. The range of the mean ± standard deviation is 75.6 ± 4.58 to 145 ± 64.2.

Available Phosphorus

The post monsoon Available Phosphate levels at Station I was higher in 2022–2023; at around 0.06 g/Kg. In monsoon Station III, in summer Station III and V lower range during the of 2021–2022 was 0 g/kg and same result was station III pre-monsoon in 2022-2023 The mean ± standard deviation ranges from 0.01±0 to 0.02±0.01

Sulphate

The post pre-monsoon Sulphate levels at Station II were higher in 2022–2023; at around 0.86g/100g. Station III lower range during the pre-monsoon of 2022–2023 was 0.34g/100g. The mean ± standard deviation ranges from 0.51 ±0.05to 0.71 ±0.05.

Chloride

Over the course of the two years, the range of chloride altered. Summer chloride levels at Station III were higher in 2022–2023, at around 15.6 mg/100g. The lower range for station VI during the 2021–2022 monsoons was 8.99 mg/100g. The mean ± standard deviation ranges from 10.7±0.92 to 16.5±1.4.

Calcium

In 2022–2023, Station II's pre-monsoon calcium level was higher, at about 168 mg/100g. Station I's lower range during the 2021–2022 post-monsoon was 37.4 mg/100g. The mean ± standard deviation falls between 61.9±12.8 and 123±33.2.

Magnesium

The pre-monsoon magnesium levels at Station II were higher in 2022–2023, at around 146 mg/100 g. During the 2021–2022 monsoons, Station II's lower range was 48 mg/100g. The range of the mean ± standard deviation is 57.4±7.07 to 144±4.89.

Nitrogen

The range of nitrogen changed throughout the two years. Station I had higher pre-monsoon nitrogen levels in 2022–2023, at about 4.61%. During the summers of 2021–2022, station III's lower range was 0.33%. The range of the mean ± standard deviation is 1.54±0.33 to 2.31±1.32.

Organic Carbon

The pre-monsoon Organic Carbon level at Station I was higher in 2022–2023, at around 1.83%. During the pre-monsoon of 2022–2023, Station III's lower range was 0.54%. The range of the mean ± standard deviation is 0.97±0.34 to 1.18±0.21.

Organic matter

Over the course of the two years, the range of organic matter altered. Summer organic matter levels at Station I was higher in 2022–2023, at around 3.41%. The lower range for station III during the 2022–2023 pre-monsoons was 0.87%. The mean ± standard deviation ranges from 1.46±0.6 to 2.05±0.53.

DISCUSSION

The soil-water interface, sediment pH affects the inorganic transformation of soluble phosphate and regulates the uptake and release of vital nutrient ions (13). Similar to the water that covers it, the pH of the sediment is influenced by a variety of environmental factors and varies based on the kind of soil.

During the research, the pH ranged from 7.73 during the monsoon season in 2021–2022 to 8.5 during the pre-monsoon season in 2022–2023. The lower pH limit found during certain examination times was consistent with the Singh *et al.* (14) study. Optimum pH range for sustainable aquatic life is 6.5 to 8.5.

Similar to the results of Krishna et al. (15), the conductivity values collected in this study indicate varying ionic concentrations. Station I had the lowest water conductivity (430 μSie) in the post-monsoon season of 2022–2023 and the highest (907 μSie) in the pre-monsoon season of 2022–2023.

From 0.06 g/kg at Station I in 2022–2023 to 0 g/kg at Station III, the concentrations of accessible phosphate levels drastically decreased. The lower range at Stations III and V was 0 g/kg in the summer of 2021–2022, and the same result was seen at Station III before the monsoon in 2022–2023. Paulose and Indira's (16) findings are comparable.

During the monsoon season to summer season, a decline in total nitrogen content was observed in both regions, with values dropping. In the same season in 2022–2023, the sulphate levels at Station II and Station III. Comparable to the findings of Adeyemo *et al.* (2008). With readings ranging from 1.83% to 0.54%, organic carbon levels significantly decreased, indicating dilution of organic matter as a result of increasing rainfall and runoff, similarly organic matter decreased around 3.41% to0.87% (17).

Table.2 Seasonal Variations of Sediment Parameters in the Study Sites (2021-2022)

Parameters	Seasons	Station I	Station II	Station III	Station IV	Station V	Mean	SD
pH	pre monsoon21-22	8.2	8.13	8.33	8.23	8.33	8.25	0.09
	monsoon21-22	7.93	7.73	7.9	7.9	7.9	7.87	0.08
	post monsoon21-22	7.93	7.9	7.77	7.97	7.77	7.87	0.09
	Summer21-22	8.03	8.23	8.23	8.33	8.23	8.21	0.11
Conductivity (µSie)	pre monsoon21-22	673	657	717	610	717	675	44.8
	monsoon21-22	443	613	680	593	680	602	96.9
	post monsoon21-22	460	670	710	600	710	630	105
	Summer21-22	653	730	733	627	733	695	51.3
Moisture (%)	pre monsoon21-22	34.4	34.5	25.9	34.5	25.8	31	4.69
	monsoon21-22	31.5	34.9	27	31.9	27	30.5	3.4
	post monsoon21-22	36.7	37.1	27.4	38.3	27.4	33.4	5.51
	Summer21-22	40.6	39.5	29.8	35.3	29.8	35	5.11
Alkalinity ($CaCO_3$ g/Kg)	pre monsoon21-22	1.87	1.8	2	1.87	2	1.91	0.09
	monsoon21-22	1.53	1.27	1.47	1.47	1.47	1.44	0.1
	post monsoon21-22	1.53	1.47	1.47	1.53	1.47	1.49	0.04
	Summer21-22	1.63	1.77	1.73	1.9	1.73	1.75	0.1
Acidity ($CaCO_3$ mg/100g)	pre monsoon21-22	0.07	0.09	0.04	0.07	0.04	0.06	0.02
	monsoon21-22	0.09	0.13	0.06	0.09	0.06	0.09	0.03
	post monsoon21-22	0.08	0.06	0.14	0.2	0.14	0.13	0.06
	Summer21-22	0.05	0.04	0.09	0.08	0.09	0.07	0.02
Carbonates (mg/100g)	pre monsoon21-22	0	0	0	0	0	0	0
	monsoon21-22	0	0	0	0	0	0	0
	post monsoon21-22	0	0	0	0	0	0	0
	Summer21-22	0	0	0	0	0	0	0
Bicarbonates (mg/100g)	pre monsoon21-22	118	105	122	260	122	145	64.2
	monsoon21-22	81.5	24.7	293	73.2	73.3	109	105
	post monsoon21-22	81.4	73.2	77.1	69.3	77.1	75.6	4.58
	Summer21-22	104	120	91.5	88.1	91.5	98.9	13.1
Available Phosphorus (g/Kg)	pre monsoon21-22	0.04	0.03	0.01	0.01	0.01	0.02	0.01
	monsoon21-22	0.03	0	0.01	0.01	0.01	0.01	0.01
	post monsoon21-22	0.03	0.01	0.01	0.01	0.01	0.01	0.01
	Summer21-22	0.03	0.01	0	0.01	0	0.01	0.01
Sulphate (g/100g)	pre monsoon21-22	0.65	0.79	0.69	0.73	0.69	0.71	0.05
	monsoon21-22	0.66	0.41	0.52	0.59	0.52	0.54	0.09
	post monsoon21-22	0.51	0.51	0.46	0.58	0.46	0.51	0.05
	Summer21-22	0.55	0.72	0.43	0.61	0.43	0.55	0.12
Chloride (mg/100g)	pre monsoon21-22	15.6	15.1	18	15.6	18	16.5	1.4
	monsoon21-22	12.8	8.99	11.4	10.4	11.4	11	1.4
	post monsoon21-22	12.3	11.8	11.4	11.8	11.4	11.7	0.39
	Summer21-22	15.2	15.8	14	13.4	14	14.5	0.99

Calcium (mg/100g)	pre monsoon21-22	124	122	120	125	120	122	2.17
	monsoon21-22	81.8	37.4	71.5	67.1	68.5	65.3	16.6
	post monsoon21-22	82.5	73.8	77.8	68.5	77.8	76.1	5.26
	Summer21-22	100	124	121	95	121	112	13.6
Magnesium (mg/100g)	pre monsoon21-22	111	107	118	116	118	114	4.89
	monsoon21-22	75.7	48	63.2	62.2	63.2	62.5	9.8
	post monsoon21-22	73.5	59.3	66.9	60.1	66.9	65.3	5.79
	Summer21-22	90.5	105	86.4	92.3	86	92	7.64
Nitrogen (%)	pre monsoon21-22	3.48	1.74	1.82	2.55	1.82	2.28	0.74
	monsoon21-22	1.49	0.89	2.67	2.23	2.6	1.97	0.76
	post monsoon21-22	1.7	1.55	1.22	2	1.22	1.54	0.33
	Summer21-22	2.5	1.84	0.33	3.47	0.34	1.7	1.37
Organic Carbon (%)	pre monsoon21-22	0.87	1.43	1.09	0.68	1.09	1.03	0.28
	monsoon21-22	1.14	1.57	0.97	0.98	0.97	1.13	0.26
	post monsoon21-22	1.14	0.83	0.83	1.28	0.83	0.98	0.21
	Summer21-22	1.52	1.42	0.77	1.01	0.77	1.1	0.35
Organic matter (%)	pre monsoon21-22	1.87	2.47	1.88	1.05	1.88	1.83	0.5
	monsoon21-22	1.95	2.27	2.34	1.69	2.01	2.05	0.26
	post monsoon21-22	3.42	1.42	1.43	2.21	1.43	1.98	0.87
	Summer21-22	2.8	2.32	1.26	1.48	1.26	1.82	0.7

Table.3 Seasonal Variations of Sediment Parameters in the Study Sites (2022-2023)

Parameters	Seasons	Station I	Station II	Station III	Station IV	Station V	Mean	SD
pH	pre monsoon22-23	8.4	8.5	7.93	8.2	7.93	8.19	0.26
	monsoon22-23	8.4	7.83	8.27	7.93	8.37	8.16	0.26
	post monsoon22-23	8.2	7.77	7.77	8.03	7.87	7.93	0.19
	Summer22-23	8.03	8.03	8.17	8.1	8.17	8.1	0.07
Conductivity (µSie)	pre monsoon22-23	907	770	693	603	693	733	113
	monsoon22-23	530	610	710	587	710	629	79.2
	post monsoon22-23	430	620	700	597	700	609	111
	Summer22-23	493	690	717	607	717	645	95.9
Moisture (%)	pre monsoon22-23	38.8	37.2	29.6	34.2	29.6	33.9	4.23
	monsoon22-23	31.8	34.8	23.3	32.5	23.2	29.1	5.49
	post monsoon22-23	32.8	34.9	28.1	35.6	28.1	31.9	3.63
	Summer22-23	39.2	38.8	27.9	38.7	27.9	34.5	5.99
Alkalinity ($CaCO_3$ mg/100g)	pre monsoon22-23	2.17	2.1	1.53	1.83	1.53	1.83	0.3
	monsoon22-23	1.67	1.4	1.8	1.47	1.8	1.63	0.19
	post monsoon22-23	1.4	1.33	1.33	1.53	1.33	1.39	0.09
	Summer22-23	1.67	1.6	1.67	1.67	1.67	1.65	0.03
Acidity ($CaCO_3$ mg/100g)	pre monsoon22-23	0.14	0.03	0.14	0.12	0.14	0.11	0.05
	monsoon22-23	0.08	0.13	0.05	0.12	0.05	0.08	0.04

	post monsoon22-23	0.1	0.1	0.11	0.06	0.11	0.09	0.02
	Summer22-23	0.07	0.05	0.09	0.34	0.09	0.13	0.12
Carbonates (mg/100 mg)	pre monsoon22-23	0	0	0	0	0	0	0
	monsoon22-23	0	0	0	0	0	0	0
	post monsoon22-23	0	0	0	0	0	0	0
	Summer22-23	0	0	0	0	0	0	0
Bicarbonates (mg/100 mg)	pre monsoon22-23	152	156	79.2	79.5	79.2	109	41.2
	monsoon22-23	93.6	58.4	102	219	102	115	60.8
	post monsoon22-23	73.3	35.1	281	77.4	61	105	99.3
	Summer22-23	93.6	89.5	95.6	85.4	95.6	91.9	4.43
Available Phosphorus (g/kg)	pre monsoon22-23	0.01	0.02	0	0.01	0.01	0.01	0
	monsoon22-23	0.06	0.03	0.01	0.01	0.01	0.02	0.01
	post monsoon22-23	0.01	0.01	0.01	0.01	0.01	0.01	0
	Summer22-23	0.03	0.01	0.01	0.01	0.01	0.01	0.01
Sulphate (g/100 mg)	pre monsoon22-23	0.77	0.86	0.34	0.51	0.34	0.56	0.24
	monsoon22-23	0.65	0.51	0.65	0.58	0.65	0.61	0.06
	post monsoon22-23	0.6	0.54	0.44	0.61	0.44	0.53	0.08
	Summer22-23	0.54	0.61	0.61	0.59	0.61	0.59	0.03
Chloride (mg/100 mg)	pre monsoon22-23	20	19.6	12.1	12.9	12.1	15.3	4.06
	monsoon22-23	14.2	11.4	15.1	11.4	15.1	13.4	1.94
	post monsoon22-23	11.3	9.47	10.4	11.8	10.4	10.7	0.92
	Summer22-23	13.7	12.8	15.6	12.8	15.6	14.1	1.42
Calcium (mg/100 mg)	pre monsoon22-23	150	168	98.5	101	98.5	123	33.2
	monsoon22-23	101	76.3	96.5	77.2	96.5	89.5	11.8
	post monsoon22-23	72.1	40.4	64.5	71.1	61.5	61.9	12.8
	Summer22-23	95.5	88.2	133	83.5	133	106	24.2
Magnesium (mg/100g)	pre monsoon22-23	138	146	62.1	85.6	62.1	98.7	40.7
	monsoon22-23	93.8	68	94.6	76.7	94.5	85.5	12.4
	post monsoon22-23	64.1	48	55	64.9	55	57.4	7.07
	Summer22-23	87.5	73.5	106	78.6	106	90.5	15.4
Nitrogen (%)	pre monsoon22-23	4.61	2.25	1.55	1.6	1.55	2.31	1.32
	monsoon22-23	2.21	1.08	1.19	2.03	1.19	1.54	0.53
	post monsoon 22-23	1.42	1.11	2.67	2.24	2.59	2.01	0.7
	Summer22-23	2.84	1.68	1.7	4.02	2.13	2.47	0.98
Organic Carbon (%)	pre monsoon22-23	1.83	1.38	0.54	1.09	0.54	1.08	0.55
	monsoon22-23	0.96	1.54	0.86	0.64	0.86	0.97	0.34
	post monsoon22-23	0.92	1.13	1.39	1.05	1.39	1.18	0.21
	Summer22-23	1.5	1.24	0.71	1.35	0.71	1.1	0.37
Organic matter (%)	pre monsoon22-23	1.69	2.26	0.87	1.61	0.87	1.46	0.6
	monsoon22-23	2.01	2.21	1.82	0.99	1.81	1.77	0.47
	post monsoon22-23	1.35	1.94	2.72	1.82	2.4	2.05	0.53
	Summer22-23	3.41	2.14	1.23	1.88	1.23	1.98	0.9

CONCLUSION

The present study highlights significant seasonal variations in physicochemical in Veeranam Lake, Monitoring sediment quality is crucial for determining long-term trends and present circumstances for efficient management. The results of the two separate studies showed that the physico-chemical parameters at each of the five locations varied seasonally. One of the most significant micronutrients influencing aquatic habitats' productivity is available phosphorus. The sediment quality of Veeranam Lake decreases during the monsoon season compared to other seasons, according to an analysis of the physicochemical characteristics. Local drainage into the lake might be the culprit.

In order to reduce anthropogenic stresses and protect Veeranam Lake biodiversity and ecological functions, comparisons with prior research confirm the need for continuous ecological evaluations and sustainable management techniques. As a result, lakes and other water sources utilised for irrigation, drinking, and other uses must have their hydrological conditions and sediment quality routinely assessed.

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