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Hydrobiological studies of alsund wetland, Tal. Khanapur, Dist. Sangli. Maharashtra - 415 311. India

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Abstract
The present investigation describes the Hydrobiological profile of Alsand lake of Sangli district in Maharashtra. The studies were conducted from 2024 to 2025. The Hydrobiological parameters show site wise variations. The pH ranges from 8.19 to 8.27. The electrical conductivity varies from 0.470 to 0.500 mS/cm. The TDS varies is from 298 to 318 Mg/l. In the present data the value of DO is as high as 6.2 and as low as 5.2. In the present study the highest BOD values observed is 4.7 and lowest value recorded is 3.5. The total hardness varies from 92 to 103 Mg/l. The carbonates are absent. The bicarbonates are varies from 219.6 to 317.2 Mg/l. The Calcium varies from 57 to 63 Mg/l. The Magnesium varies from 35 to 40 Mg/l. The Sodium varies from 47.5 to 58.5 Mg/l. The Potassium value in the samples is 0.1 Mg/l. The Chloride value varies from 57 to 92 Mg/l. The Sulphatevalues vary from 16.5 to 21.0 Mg/l. The nitrates vary from 3.26 to5.12 Mg/l. The Sodium absorption ratio (SAR) varies from 1.22 to 1.44. The percentage of soluble sodium is varies from 26.47 to 28.86 %. The Magnesium to Calcium ratio is varies from 1.03 to 1.07. The permeability index is varies from 69.80 to 92.97 respectively.

Keywords: Fresh water wetlands, hydrobiology, alsand, Khanapur District Sangli, Maharashtra, India

Introduction
Fresh water resources are in the form of lentic and lotic ecosystems. The lentic ecosystems are ponds, lakes, tanks and reservoirs. These reservoirs play an important role as aimportant resource for domestic, agriculture and aquaculture. The lentic ecosystems has an importance as a source of drinking water and the fisheries. Notable work has been carried out by Bhosale *et al* (1994) [2], Inamdr (2020) [7], Kamat (1965) [10], and Goel *et al* (1988) [6]. These water bodies are from parts of rural area. The present attempt has been made to understand the hydrobiological features of reservoir, to assess water quality for suitability for fish culture and irrigation purpose.

Material and Methods
Study Area
Alsund wetland is situated at 17^0 12^l 08^{ll} N 74^0 29^l 35^{ll} E. The total geographical area of village is 2631 hectares.
The Alsund sand dam has been commissioned on 1993. The length of the Alsund sand dam wall is 4.48 kms. The Alsund wetland has an irrigation capacity of 165 ha. The reserve storage capacity is 114 ha. The water storage capacity is 49.00 TMC. There are 106 individual beneficiaries/farmers of the water for agriculture. Total of 34.20 ha. Land has been benefitted for agricultural water. The benefitted villages by the dam are Alsund, Khambale and Kalambi. The crops in and around the dam are 30% Kharip and 70% Rubbi type. Water of the dam is also used for drinking purpose.

Methodology
The surface water samples were collected from six sites from I to VI. The sites are selected on the basis of topography, water influx and neighboring anthropogenic factors. The pH was determined by using pH meter. The water samples were analyzed by Standard methods as described by APHA, AWWA WPCF (1985) and Trivedy *et al* (1998) [17] were followed for various physico chemical parameters.

Results and Discussion
The present investigation describes the Hydrobiological profile of Alsand lake of Sangli district in Maharashtra. The studies were conducted from 2024 to 2025. The Hydrobiological parameters show site wise variations. The results are shown in Table.1.

Table 1: Hydrobiological parameters at six sites of Alsund lake

Sr.No.	Parameters	Unit	Standard Values	Sites					
				I	II	III	IV	V	VI
1	pH	--	6.5 -8.2	8.19	8.27	8.16	8.19	8.03	8.12
2	Electrical Conductivity (EC)	mS/m	<0.750	0.500	0.470	0.470	0.470	0.470	0.470
3	TotalDissolved Solids (TDS)	Mg/l	<700	318	298	302	300	299	302
4	DO	Mg/l	5	5.2	5.4	5.7	5.8	6	6.2
5	BOD	Mg/l	5	3.5	3.8	4.0	4.1	4.3	4.7
4	Total Hardness	ppm	<200	99	97	103	93	100	92
5	Carbonates	Mg/l	Nil	0.00	0.00	0.00	0.00	0.00	0.00
6	Bicarbonates	Mg/l	<150	292.8	219.6	268.4	292.8	292.8	317.2
7	Calcium (Ca)	Mg/l	<120	61	60	63	58	61	57
8	Magnesium (Mg)	Mg/l	<50	39	38	40	36	39	35
9	Sodium (Na)	Mg/l	<50	58.5	50.5	57.5	50.5	53.0	47.5

10	Potassium (K)	Mg/l	<10	0.1	0.1	0.1	0.1	0.1	0.1
11	Chlorides (Cl-)	Mg/l	<140	92	57	85	71	50	71
12	Sulphate	Mg/l	<200	21.0	17.5	19.0	16.5	17.5	16.0
13	Nitrate (NO3-)	Mg/l	<45	5.12	3.53	3.53	3.53	4.15	3.26
14	ResidualSodium Carbonate (RSC)	meq/L	<1.25	-1.46	-2.51	-2.06	-1.04	-1.50	-0.55
15	SodiumAbsorpion Ration (SAR)	--	<10	1.44	1.26	1.39	1.29	1.30	1.22
16	SolubleSodium%	%	<20	28.86	26.47	27.9	27.36	26.74	26.47
17	Magnesium: CalciumRatio (Mg: Ca)	--	<1.50	1.05	1.05	1.06	1.03	1.07	1.03
18	PermeabilityIndex	--	<60	83.41	69.80	77.01	87.06	82.56	92.97

pH

pH is the measurement of the intensity of acidity or alkalinity or measurements of the concentration of hydrogen ions in water. According to WHO (1993) [18] the desirable pH of drinking water is between 7.0 and 8.5. According to Jhingran and Sugunan, (1990) the pH range from 6.00 to 8.50 indicate medium productive nature of reservoir. Most of the aquatic animals prefer a pH range of 6.5 to 8.0. When pH is outside this range, diversity within the water body may decrease due to physiological stresses and reproduction (Raveen and Danil, 2010) [14]. The pH in Alsand Lakeranges from 8.19 to 8.27. The surface runoff from adjoining areas carry heavy silt load which may cause the slightly alkaline nature of the Lake water.

Electrical Conductivity (EC)

Electrical conductivity (EC) is an index of the amount of water-soluble salts present in water indicating the state of mineralization in an ecosystem (Das, 2000) [4]. In Alsand Lake the electrical conductivity had a minimum of 0.470 mS/cm in and maximum was 0.500 mS/cm. Krishnamurti and Selvakumar (2010) found EC maximum in summer season (160 to 210 µmho/cm) and minimum in rainy season (76 to 160 µmho/cm).

DO

DO is essential to all living organisms. Wetlands receive oxygen mainly from atmosphere and by photosynthesis in plants. In the present data the value of DO is as high as 6.2 and as low as 5.2. DO increases in winter due to result of runoff accounted for by winter rains. Kalbage (2021) [9] have recorded similar range of DO.

BOD

BOD is the amount of DO needed by aerobic biological organisms in a body of water to breakdown organic material present in given water sample at certain temperature over a specific time period considered as an important water quality indicator. In the present study the highest BOD values observed is 4.7 and lowest value recorded is 3.5. Similar range is observed was made by Khare *et al* (2007) [11]

TDS

The TDS varies is from 298 to 318 Mg/l. Total Dissolved Solids (TDS) denote mainly the various kinds of minerals present in the water. Welch (1952) [19] stated that dissolved solids vary qualitatively and quantitatively in different waters depending upon the seasons, locations and other factors.

Total hardness

The range of total hardness ranges from 92 to 103 Mg/l respectively. The limits prescribed by both WHO (1993) [18] and Bureau of Indian Standards (1991) [3] is 300 mg/l. Khabade and Mule (2005) reported similar pattern of variations.

Bicarbonates

Bicarbonates in water refer to the presence of hydrogen carbonate ions which are a type of alkalinity contributor. Alsand Lake varies from 219.6 to 317.2 Mg/l.

Calcium

In AlsandLake the calcium content varies from 57 to 63 Mg/l. The maximum desirable limit of calcium in drinking water is 75 mg/l (WHO, 1993 & BIS, 1991) [18]. The calcium content in the study are in the desirable limit. Subhashini and Saradhamani (2005) [16] have recorded similar calcium content. The calcium content varied between 12.49 to 31.3 mg/ liter from Kunjwani Pond, JammuKumar (1997) which are very much less than the present observations.

Magnesium

The Magnesium values remained from 35 to 40 Mg/l. According to WHO (1993) [18] and BIS (1991), the permissible limit of magnesium for drinking water is 50 mg/l. The magnesium levels ranged from 14.31 to 17.81 mg/ liter Deshmukh & Pingale (2007) [5] have reported higher values in April and lowest during December.

Sodium

Alsand Lake varies from 47.5 to 58.5 Mg /l. Sodium salts are generally highly soluble in water and are leached from the terrestrial environment to groundwater and surface water. They are nonvolatile and will thus be found in the atmosphere only in association with particulate matter (WHO 2003) [18].

The sodium ion is ubiquitous in water. Most water supplies contain less than 20 mg of sodium per liter, but in some countries, levels can exceed 250 mg/lit. Sewage effluents can contribute significant quantities of sodium to water. In addition, water-treatment chemicals, such as sodium fluoride, sodium bicarbonate, and sodium hypochlorite, can together result in sodium levels as high as 30 mg/lit. Domestic water softeners can give levels of over 300 mg/lit, but much lower ones are usually found (WHO 2003) [18].

Potassium

Alsand Lake is 0.1 Mg /l. Potassium intoxication by ingestion is rare, because potassium is rapidly excreted in the absence of pre-existing kidney damage and because large single doses usually induce vomiting. In our case Potassium is recorded consistently low (0.1 mg/L) at all sites.

Chloride

The Chloride value in Alsand Lake varies from 57 to 92 Mg/l. WHO (1993) [18] and BIS (1991) permissible limit of chloride is 200 mg/l for drinking water. The water from the selected reservoirs is below limit. Similar condition was observed by Sawant & Telave (2009) [15]. It is found that the concentration of chlorides is affected by several anthropogenic factors.

Sulphate

The extent and effects of increased sulphate concentrations in freshwater and terrestrial ecosystems remain less understood in ecosystem studies. Natural sources of dissolved sulphates in freshwater ecosystems include weathering, decomposition and combustion of organic matter. Sulphates show toxic effects on aquatic plants and animal organisms, including, fishes, invertebrates and amphibians. The Sulphate values in the samples show minimum of 16.5 and maximum of 21.0 Mg/l.

Nitrates

The major causes of Nitrates mixing in the fresh is due to agricultural runoff in the form of nitrogen-based fertilizers, wastewater disposal systems, industrial discharge and atmospheric causes. It is an essential nutrient that results in enrichment of natural water. Fertilizers containing nitrate, along with ammonia, urea and amines were noted as chief source of the nitrate concentration in to the freshwater (Mandalet.al. 2012) [13]. The minimum nitrate value recorded is 3.26 and the maximum nitrate value recorded is 5.12 Mg/l. Vijaykumar et.al. (2024) have reported comparatively lower nitrate value than the present results.

Sodium absorption ratio (SAR) / Soluble sodium / Magnesium to Calcium ratio

Sodium is a key parameter used to evaluate the suitability of water (especially irrigation water) for agricultural purposes. The Sodium absorption ratio (SAR) varies from 1.22 to 1.44. The percentage of soluble sodium is varies from 26.47 to 28.86 %.The Magnesium to Calcium ratio is varies from 1.03 to 1.07.

Permeability index

The permeability index indicates the impact of the water's chemical contents like sodium, calcium, magnesium and bicarbonates. The permeability index in the present samples varies from minimum of 69.80 to maximum of 92.97 respectively. High values, exceeding the standard limit of 60%, which could indicate potential irrigation issues.

CONCLUSION:

The study of Alsand Lake of Khanapur of Sangli district reveals that these man-made wetlands are potentially important with respect to the agriculture, grazing animals, drinking water, industries, fishing and avifauna of the region. Most of the parameters show normal range when compared with other fresh water wetland studies. Study also found that these water bodies should be assessed periodically for the efficient and sustainable use. The joint forest management schemes should be developed around these water bodies to fulfill the forest-based needs of the neighboring people.

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