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Analysis of Water Quality Parameters of Lakshmipuram tank, Anantapuramu (d), Andhra Pradesh, India

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Abstract

Painted Storks (Mycterialeucocephala) have been visiting Veerapuram for nearly hundred years with intermittent breaks. The main reason for non arrival of storks was due to lack of availability of food. These birds mainly feed on fish which are available in the tanks near the heronry. In the present study Assessment of water quality of Lakshmipuram tank, which is a foraging place for these storks, was made to know the impact of different parameters on fish growth and health. Water collected during 2010-11, 2011-12 and 2013-2014 were analyzed for the levels of Alkalinity, Silicates, Phosphates, Nitrates, Nitrites, Chlorides, COD, Turbidity, Sulphates, BOD and Salinity. The study gave significance as this water bodies is foraging place for Painted Stork (Mycterialeucocephala) which inhabit in a nearby Village, Veerapuram of Anantapuramu (D), A.P.

Keywords: Water quality parameters, Lakshmipuram tank, painted storks, forage.

Introduction

Water is one of the most important compounds of the ecosystem as it is necessary for the survival and existence of all living things. It is the most abundant commodity in nature and at the same time is also the most misused one. Though earth surface is covered 80% by water but only < 1% can be utilized by man for domestic, agricultural and industrial purposes. Contamination of fresh water with a wide range of pollutants has become a matter of great concern over the last few decades. In most developing countries there is indiscriminate dumping of untreated waste into nearby rivers and streams. Also it is caused by a general lack of awareness of good hygiene practices, through bathing and washing, human wastes - raw excreta (faeces) and uncontrolled waste disposal. Direct discharge of untreated or raw municipal and or industrial effluent into rivers and lakes could contribute to microbial pollution.

An analysis in India revealed that about 70% of all the available water is polluted due to discharge/ dumping of domestic wastes, agricultural drainage and Industrial effluents. Pollution due to discharge of effluents from industries, agricultural runoff and dumping of domestic waste in India has been investigation earlier[1-3] Studies carried out in different water bodies in Andhra Pradesh also revealed deterioration of water quality due to different factors[4,5]. The most common standards used to assess water quality related to drinking water, safety of human contact and for the health of ecosystems. Environmental water quality, also called ambient water quality, relates to water bodies such as lakes, rivers and oceans.

The purpose of the present study is to analyse the water quality of Lakshmipuram tank, near Veerapuram Village, Anatapuramu district Andhra Pradesh in term of Physico-chemical parameters for three years between 2010-2014. Tanks near Veerapuram are a centre of socio economics activities of a Village catering to the multifarious needs of the Village community. The most important service provided by a tank, at many scales, is the production of fish. Tanks have provided irrigation water system and storage solutions for a various utilities. Lakshmipuram Tank is one of the ten perinnial tank around Veerapuram village. Its size is 2.5 kms in lenth, its breadth from 1.5 to 2 kms and depth is little over a meter with a North to South and West to East slope. Painted Storks, which arrive in Veerapuram Village for breeding from December to June forage here. Hence the present study gives significance.

Material and Methods

Water samples were collected from Lakshmipuram tank during second week at monthly interval for a period of two consecutive years from Dec 2010-11 to 2011-12 and from 2013-14 for the analysis of physico-chemical parameters. Water samples were collected in acid washed 10 liters polythene containers below the depth of 5- 10 centimetres and collection was usually completed during morning hours between 08 AM and 10 AM for the analysis of the following parameters.

Standard methods for analysis of alkalinity[6,7]. Silicates by Ammonium molybdate method[6], phosphates by stannous chloride method[7], nitrates by brucine sulphalinic acid colorimetric test[7], nitrites by spectrophotometric method[7], chlorides by mohr's argentometric method by using potassium chromate as an indicator[8], cod by chemical digestion method using Spectroquantant, (Model TR-320), Turbidity and Sulphates by Nephlometric method[6], Typically the test for BOD

was conducted over a five-day period following the procedure described earlier[9,10], Salinity is measured with the help of electrode meter which measures the resistance offered by the water between two platinized electrodes. The instrument is standardized with known values of salinity observed with standard KCl solution[9].

Results and Discussion

The environment plays a significant role on life and activities of aquatic organisms. Environmental factors such as temperature, dissolved oxygen, light penetration, turbidity, density, etc. are responsible for distribution of organisms in different freshwater habitats according to their adaptations, which allow them to survive in that specific habitat[11]. Hence we evaluated Physico-Chemical Parameters of Lakshmipuram tank where Painted Stork forage for fish during their stay at Veerapuram Village.

Alkalinity acts as a stabilizer for pH. Alkalinity of surface water is primarily a function of carbonate, hydroxide content and also includes the contributions from borates, phosphates, silicates and other bases. Total alkalinity is the sum of hydroxides, carbonates and bicarbonates. Permissible limit of alkalinity is 200-600 units as per IS: 10500. In the present study the Alkalinity of water fluctuated between 64.67±1.96 mg/L (November 2011) and 229±0.89 mg/L (December 2010) during 2010-11 (table-1), fluctuated between 19.49±25.33 mg/L (December 2012) and 75.33± 0.51mg/L (September 2012) during 2011-12 (table-2) and fluctuated between 0.01±35.0 mg/L (October 2013) and 25.5±19.3 mg/L (April 2014) during 2013-14 (table-3). High alkalinity in December may be attributed to increase in the rate of organic decomposition during which CO_2 is liberated, which reacts with water to form HCO_3, thereby increasing the total alkalinity. Alkalinity was inversely related to the water level.

Alkalinity analyzed in water collected from Chandola Lake, Nambul river, Nagachoon pond, Madikoppa pond[12-14] also showed high amount of 309.98 mg/L.

Salinity is the natural property of sea water. This specific parameter is of interest only in tidal waters or in other surface waters where there may be infiltration of sea water. Salinity is among the most important factors that exerts effects on the vitality of marine organisms. But fresh water should not become saline due to any factors. Hence measurement of salinity in fresh water is also important. The seasonal fluctuation in the Salinity values ranged from 1443.3±5.1 mg/L (March 2011) and 3676.6±48.8 mg/L (November 2011) during 2010-11 (table-1), fluctuation in the Salinity values ranged from 628.6±10.25 mg/L (January 2012) and 2818.3± mg/L (June 2012) during 2011-12 (table-2) and fluctuation in the Salinity values ranged from 280.0±3.0 mg/L (March 2014) and 2718.3±146.3 mg/L (January 2014) during 2013-14 (table-3). The Salinity values were more or less same with minor fluctuations. The differences in the salinity are attributed to the increase in the evaporation rate.

Suspension of particles in water interfering with the passage of light is called Turbidity. The turbidity of water is actually the expression of optical property in which the light is scattered by the particles present in the water[15]. According to WHO the turbidity permissible limit is up to 5 NTU and Indian Standards up to 10 NTU for drinking water. The monthly fluctuation of Turbidity of water varied between 1.02±0.17 mg/L (November 2011) and 11.28±0.81 mg/L (January 2011) during 2010-11 (table-1), varied between 2.61±0.12 mg/L (March 2012) and 6.5±0.059 mg/L (January 2012) during 2011-12 (table-2) and varied between 0.20±0.07 mg/L (April 2014) and 5.75±0.054 mg/L (August 2013) during 2013-14 (table-3). High values of turbidity in January may be due to influx of rain water from catchment area, cloudiness, less penetration of light, silts, sand, high organic matter and low transparency due to suspended inert particulate matter.

The values obtained in the Lakshmipuram tank are in close conformity with the findings of other researchers who analysed turbidity in Bhamika pond[16], in Imphal river[17], in Lower manair reservoir[5], in Chandola Lake[12] and in Madikoppa pond[14].

Biological Oxygen Demand is defined as the amount of oxygen required by the bacteria while stabilizing decomposable organic matter under aerobic conditions. A quantitative relationship exists between the amounts of oxygen required to convert a definite amount of any organic matter to CO_2, water and ammonia. Typically the test for BOD is conducted over a five – day period[18,19]. According to APHA, 1992 the permissible value of BOD is 4 mg/L. In present study the monthly variation of Biological Oxygen Demand (BOD) of water was low in December 2010 (3.0±0.3 mg/L) and high in February 2011 (11.16±0.9 mg/L) during 2010-11 (table-1), variation of Biological Oxygen Demand (BOD) of water was low in November 2012 (4.2±0.4 mg/L) and high in January 2012 (12.8±0.8 mg/L) during 2011-12 (table-2) and variation of Biological Oxygen Demand (BOD) of water was low in September 2013 (4.0±0.4 mg/L) and high in May 2014 (6.5±0.6 mg/L) during 2013-14 (table-3). The BOD values are within permissible limits. From the values can be said water of Lakshmipuram cannot be said as polluted on BOD level indicates the pollution load.

Several investigators who carried out analysis of BOD in water samples collected from different sources also reported similar range observed in the present study[2,5,12,14,17]. Chemical oxygen demand is a measure of oxygen required to oxidize the organic matter by a strong chemical oxidant. It is used to measure the pollution strength of domestic and industrial wastes. COD gives an idea of concentrations of substances, which may undergo immediate chemical oxidation. COD is an indicator of both sewage and industrial pollution[20]. The ideal value of COD should be <50 mg/L. In the present study COD value is ranged between 49.5-837.7 mg/L. In the present study monthly variation of Chemical Oxygen Demand (COD) of water was low in April 2011 (6.34±1.2 mg/L) and high in November 2011

(286.3±5.1 mg/L) during 2010-11 (table-1), variation of Chemical Oxygen Demand (COD) of water was low in March 2012 (18.92±4.8 mg/L) and high in may 2012 (481.4± mg/L) during 2011-12 (table-2) and variation of Chemical Oxygen Demand (COD) of water was low in March 2014 (262.3±11.9 mg/L) and high in July 2014 (418.2±5.8 mg/L) during 2013 (table-3). The COD values observed are above the permissible limits of 3 mg/L. Maximum COD was recorded during the month of December. The higher values may be due to higher decomposition activities. COD measured in water samples by other researchers also reported almost same range noticed in the water of Lakshmipuram tank[2,14,21].

Silica is released as a result of chemical breakdown of silicate minerals in rocks and sediments by chemical weathering thereby is acquired by circulating ground water. Therefore the source of silica (SiO_2) in ground water is almost exclusively and unequivocally a result of water- rock interaction[22]. In present study the fluctuation in the silicate concentration of water was between 0.001±0.0001 mg/L (July 2011) and 0.003±0.0003 mg/L (August 2011) during 2010-11 (table-1), fluctuation in the silicate concentration of water was between 0.001±0.0004 mg/L (August 2012) and 0.005±0.008 mg/L (December 2012) during 2011-12 (table-2) and fluctuation in the silicate concentration of water was between 0.001±2.7 mg/L (October, November 2013) and 1.70±4.16 mg/L (January 2014) during 2013-14 (table-3). silicate values are within permissible limits[23] noticed that the average value of silicate ranged from 0.2 to 0.75 mg/L in pond water of Thiruchunapalli.

Sulphur is one of the widely occurring elements and constitutes nearly 0.1% in earth crust. It occurs as hydrogen sulphide in spring waters, coal, gas, sewage gas etc. In natural water, sulphide is the second most common anion, leaching from sedimentary rocks. Sulphur plays an important role in soft water systems where complex metal ions prevent reacting with other substances. As per BIS[24] standard, drinking water permissible limit is between 0.005-0.5 mg/L. In the present study we observed that sulphate content of water was minimum in November (0.01±0.001 mg/L) and maximum in April 2011 (0.04±0.004 mg/L) during 2010-11 (table-1). The data on temporal variation in sulphate content of water was minimum in March and June (0.01±0.001 mg/L) and maximum in April 2012 (0.03±0.002 mg/L) during 2011-12 (table-2) and the data on temporal variation in sulphate content of water was minimum in July to February (0.01±0.001 mg/L) and maximum in May 2014 (0.03±0.003 mg/L) during 2013-14 (table-3). sulphate values are within permissible limits.

Higher levels noticed in Lakshmipuram tank were also reported from other water bodies like Kotur lake, Karnataka[2] and Nagachoon pond[13].

Chloride is one of the common inorganic anions generally considered as a major factor to equalize cations and plays active role in the photolysis of water and photo phosphorylation reactions in autotrophs[25]. Large content of chlorides in fresh water is an indicator of organic pollution[26]. According to BIS IS: 10500 desirable limit of chloride is 250-1000mg/L. In present study the variation in the Chloride content of the water had a low level of 45.3± 1.0mg/L in January 2011 and high level of 99.9±1.9 mg/L in March and June 2011 during 2010-11 (table-1). The Chloride content of the water had a low level of 44.3±1.0 mg/L in March 2012 and high level of 99.8±0.01 mg/L in June and September 2012 during 2011-12 (table-2) and variation in the Chloride content of the water had a low level of 24.99±1.09 mg/L in September 2013 and high level of 99.9±5.96 mg/L in June 2014 during 2013-14 (table-3).

Concentration of higher chloride in March and June could be due to sewage mixing and increased temperature and evaporation of water[27]. High chloride content could also be attributed to the tendency of salt content. The presence of chloride, where it does not occur naturally, indicates possible water pollution. Chloride does not affect algal growth to a significant level.

Chloride concentration observed in Lakshmipuram was also noticed by other researcher who estimated Chloride concentration in Pindavani tank[2], Iril river and Imphal river[17], Lower manair reservoir water of Karimnagar district[5], Ujjain reservoir of Solapur district[21], Chandola Lake[12], Harsool-Savangi dam of Aurangabad district[13], Nagachoon pond[13] and Madikoppa pond[14].

Almost all of the phosphorus (P) in water is in the form of phosphate (PO_4). Much of the phosphorus in surface water is bound to living or dead particulate matter. Phosphorus is an essential plant nutrient and because it is often in limited supply adding phosphorus to water will stimulate plant growth. The typical range for surface water is 0.005 to 0.5 mg/L[28]. Phosphate value obtained in this study ranged between 0.020±0.009 mg/L (April 2011) and 0.267±0.3mg/L (July 2011) during 2010-11 (table-1) sequential variation in the phosphate content of water values ranged between 0.02±0.007 mg/L (April 2012) and 0.53±0.14 mg/L (December 2012) during 2011-12 (table-2) and sequential variation in the phosphate content of water values ranged between 0.026±0.009 mg/L (July 2013) and 0.54±0.14 mg/L (March 2014) during 2013-14 (table-3). The high values of phosphate are mainly due to rain, surface water runoff, agriculture runoff, washer man activity, leaching of phosphate fertilizer[23].

Phosphate concentration observed in Lakshmipuram was also noticed by other researcher who estimated phosphate concentration in Koture lake[2], Iril river and Imphal river[17], Lower manair reservoir water of Karimnagar district[5], Ujjain reservoir of Solapur district[21], Chandola Lake[12] Nagachoon pond[14] and Madikoppa pond[16].

Nitrate is the most highly oxidized form of nitrogen compounds commonly present in natural waters, because it is a product of

aerobic decomposition of organic nitrogenous matter. Significant sources of nitrate are fertilizers, decayed vegetable and animal matter, domestic and industrial effluents and atmospheric washouts. Unpolluted natural water contain usually only minute amount of nitrate drinking water[24] standards for nitrate is 0.05-0.5 mg/L. In present study the seasonal variability in the Nitrate concentration was as low as 0.025±0.01 mg/L in May 2011 and as high as 0.601±0.1 mg/L in November 2011 during 2010-11 (table-1) concentration was as low as 0.025± 0.1mg/L in April 2012 and as high as 0.57±0.04 mg/L in June 2012 during 2011-12 (table-2) and variability in the Nitrate concentration was as low as 0.04±0.03 mg/L in October 2013 and as high as 0.79±0.02 mg/L in July 2013 during 2013-14 (table-3). Higher values nitrates are due to surface runoff and domestic sewage and specially washing activities.

Nitrates concentration observed in Lakshmipuram was also noticed by other researcher who estimated Nitrates concentration in ground water at Shahjahanpur city, UP[29] Iril River and Imphal river[17], Ujjain reservoir of Solapur district[21], Chandola Lake[12], Lower manair reservoir water of Karimnagar district[5], Nagachoon pond[13], Madikoppa pond[14].

Nitrite is another form of nitrogenous waste product that can be found in water body. Typical concentrations range from 0.005 to 0.5 mg/L. Ammonia can be transformed into nitrite and nitrite into nitrate by certain bacteria[28]. Monthly variation of nitrites content of water in the present study ranged between 0.031±0.001 mg/L (March 2011) and 0.585±0.3 mg/L (August 2011) during 2010-11 (table-1) variation of nitrites content of water ranged between 0.03±0.002 mg/L (September 2012) and 1.51±0.001 mg/L (August 2012) during 2011-12 (table-2) and variation of nitrites content of water ranged between 0.12±0.01 mg/L (August 2013) and 4.4 ±mg/L (March 2014) during 2013-14 (table-3). Similar trend of nitrites in respective months was also noticed earlier by Stone and Thomforde[28] who measured nitrites in fish pond.

Table-1
Physico - Chemical parameters of water sample collected from Lakshmipuram tank during 2010 – 2011

Parameters	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	IS: 10500 Desirable Limit
Alkalinity (mg/l)	229.0 ± 0.89	182.6 ± 0.48	210.8 ± 71.4	75.33 ± 0.51	137.5 ± 2.25	90.0 ± 0.001	54.33 ± 0.51	159.0 ± 0.51	184.1 ± 0.75	265.5 ± 0.83	90.0 ± 0.001	64.67 ± 1.96	200
Salinity (mg/l)	3295.0 ± 5.4	4263.3 ± 34.4	5603.3 ± 46.83	1443.3 ± 5.1	3880.0 ± 61.9	3010. ± 43.5	3056.6 ± 32.6	4103.3 ± 18.6	4481.6 ± 27.8	7493. ± 27.3	2076.6 ± 28.0	3676.6 ± 48.8	-
Turbidity (mg/l)	110.5 ± 6.59	112.8 ± 0.81	25.6 ± 0.81	25.5 ± 0.8	12.6 ± 0.51	30.66 ± 0.51	43.0 ± 0.89	54.0 ± 2.96	58.3 ± 1.5	111.0 ± 0.00	0.585 ± 0.14	1.02 ± 0.17	5
BOD (mg/l)	3.0 ± 0.3	11.0 ± 0.9	11.16 ± 0.9	5.3 ± 0.5	6.0 ± 0.6	6.0 ± 0.6	5.0 ± 0.5	5.0 ± 0.5	6.0 ± 0.6	5.0 ± 0.5	6.0 ± 0.6	6.0 ± 0.6	3
COD (mg/l)	118.4 ± 116.0	25.86 ± 24.0	18.93 ± 4.9	7.84 ± 2.6	6.34 ± 1.2	418.1 ± 5.9	262.3 ± 119	247.9.0 ± 107	285 ± 9.2	287.6 ± 7.7	283.0 ± 3.0	286.3 ± 5.1	3
Silicates (mg/l)	0.003 ± 0.0003	0.002 ± 0.0002	0.002 ± 0.0002	0.001 ± 0.0001	0.003 ± 0.0003	0.002 ± 0.0002	0.002 ± 0.0002	0.001 ± 0.0001	0.003 ± 0.0003	0.002 ± 0.0002	0.002 ± 8.07	0.002 ± 0.0002	-
Sulphates (mg/l)	0.02 ± 0.002	0.02 ± 0.002	0.02 ± 0.002	0.03 ± 0.003	0.04 ± 0.004	0.03 ± 0.003	0.02 ± 0.002	0.02 ± 0.002	0.03 ± 0.003	0.03 ± 0.003	0.02 ± 0.002	0.01 ± 0.001	200
Chlorides (mg/l)	53.6 ± 0.5	45.3 ± 1.0	70.6 ± 1.0	99.9 ± 1..9	89.9 ± 1.7	99.9 ± 1.9	89.97 ± 0.9	88.64 ± 1.0	81.97 ± 1.6	79.98 ± 1.5	79.95 ± 1.5	71.31 ± 1.1	250
Phosphates (mg/l)	0.072 ± 0.03	0.063 ± 0.02	0.027 ± 0.009	0.020 ± 0.005	0.020 ± 0.009	0.156 ± 0.2	0.159 ± 0.2	0.267 ± 0.3	0.091 ± 0.05	0.051 ± 0.02	0.120 ± 0.1	0.098 ± 0.04	12.38
Nitrites (mg/l)	0.178 ± 0.2	0.035 ± 0.001	0.051 ± 0.002	0.031 ± 0.001	0.411 ± 0.5	0.198 ± 0.3	0.306 ± 0.4	0.075 ± 0.003	0.585 ± 0.3	0.579 ± 0.4	0.358 ± 0.5	0.132 ± 0.1	45
Nitrates (mg/l)	0.208 ± 0.2	0.376 ± 0.4	0.161 ± 0.1	0.245 ± 0.12	0.262 ± 0.1	0.025 ± 0.01	0.417 ± 0.5	0.225 ± 0.1	0.248 ± 0.12	0.236 ± 0.11	0.644 ± 0.1	0.601 ± 0.1	45

Note: Values are Mean ± S.D (N=6).

Table-2
Physico - Chemical parameters of water sample collected from Lakshmipuram tank during 2011–2012

Parameters	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	IS: 10500 Desirable Limit
Alkalinity (mg/l)	39.49 ± 25.33	64.67 ± 1.96	74..34 ± 0.68	63.65 ± 1.85	64.57 ± 1.84	73.45 ± 0.069	64..67 ± 1.96	63.57 ± 1.84	54.43 ± 0.51	75.33 ± 0.51	64.57 ± 1.84	75.33 ± 0.51	200
Salinity (mg/l)	805 ± 20.7	628.6 ± 1025	696.6 ± 81.7	1274 ± 16.49	1406 ± 72.88	1878 ± 421.3	2818.3 ± 147.4	1574 ± 81.6	915 ± 21.8	638.7 ± 1028	1286 ± 17.46	1678 ± 91.7	-
Turbidity (mg/l)	2.89 ± 0.07	6.15 ± 0.059	6.14 ± 0.061	2.61 ± 0.12	4.71 ± 0.12	2.71 ± 0.11	1.719 ± 0.05	2.614 ± 0.09	2.984 ± 0.18	3.10 ± 0.10	3.19 ± 0.13	3.82 ± 0.14	5
BOD (mg/l)	3.1 ± 0.02	10.8 ± 0.08	11.0 ± 0.01	5.3 ± 0.05	5.9 ± 0.04	6.0 ± 0.5	5.0 ± .0.4	5.0 ± 0.4	5.0 ± 0.4	5.0 ± 0.4	5.0 ± 0.4	5.0 ± 0.4	3
COD (mg/l)	24.74. ± 23.02	24.79 ± 23.09	19.93 ± 5.9	18.92 ± 4.8	6.55 ± 103	481.4 ± 7.6	294 ± 10.2	297 ± 8.1	264.9 ± 119	286.9 ± 9.3	28.4 ± 3.0	262.3 ± 119	3
Silicates (mg/l)	0.005 ± 0.0008	0.003 ± 0.0006	0.003 ± 0.0006	0.003 ± 0.0006	0.002 ± 0.0005	0.002 ± 0.0005	0.002 ± 0.0005	0.002 ± 0.0005	0.001 ± 0.0004	0.002 ± 0.0005	0.002 ± 0.0005	0.002 ± 0.0005	-
Phosphates (mg/l)	0.53 ± 0.14	0.07 ± 0.01	0.45 ± 0.01	0.06 ± 0.01	0.02 ± 0.007	0.026 ± 0.009	0.05 ± 0.01	0.06 ± 0.01	0.05 ± 0.01	0.07 ± 0.01	0.13 ± 0.09	0.04 ± 0.1	12.38
Chlorides (mg/l)	51.6 ± 03	52.9 ± 0.3	45.4 ± 1.0	45.3 ± 1.0	46.7 ± 1.01	69.9 ± 1.0	99.8 ± 0.01	82.2 ± 1.9	81.02 ± 0.01	99.8 ± 0.1	77.81 ± 1.3	78.75 ± 1.3	250
Sulphates (mg/l)	0.01 ± 0.002	0.02 ± 0.001	0.02 ± 0.005	0.01 ± 0.003	0.03 ± 0.002	0.02 ± 0.001	0.01 ± 0.0001	0.01 ± 0.0001	0.02 ± 0.005	0.02 ± 0.001	0.02 ± 0.005	0.02 ± 0.001	200
Nitrates (mg/l)	0.09 ± 0.02	0.37 ± 0.4	0.22 ± 0.1	0.23 ± 0.01	0.025 ± 0.1	0.08 ± 0.06	0.57 ± 0.04	0.16 ± 0.1	0.22 ± 0.1	0.29 ± 0.01	0.41 ± 0.03	0.22 ± 0.1	45
Nitrites (mg/l)	0.36 ± 0.07	1.32 ± 0.001	0.031 ± 0.002	1.33 ± 0.03	0026 ± 0.01	0.12 ± 0.01	0.198 ± 0.3	0.25 ± 0.03	1.51 ± 0.001	0.03 ± 0.002	0.075 ± 0.005	0.35 ± 0.5	45

Note: Values are Mean ± S.D (N=6).

Conclusion

Analysis of Physico- chemical Parameters of Lakshmipuram tank indicate the water for now is not very much polluted. It may not have direct impact on fish of the tank and as such may not be affecting Painted Stork. But care should be taken to protect the tank from being used for dumping and washing clothes.

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Table-3
Physico - Chemical parameters of water sample collected from Lakshmipuram tank during 2013 – 2014

Parameters	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	IS: 10500 Desirable Limit
Alkalinity (mg/l)	225 ± 22.67	224 ± 22.20	265.4 ± 0.88	184.3 ± 35.00	94 ± 0.02	75.24. ± 0.50	63.52 ± 1.84	74.36 ± 0.68	64.67 ± 1.92	64.66 ± 1.92	250 ± 19.3	253 ± 19.3	200
Salinity (mg/l)	800 ± 0.97	616.6 ± 1032	646.6 ± 71.7	1170 ± 1 5.49	1408 ± 71.88	1858 ± 421.3	2718.3 ± 146.3	1742 ± 399.4	280.0 ± 0.0	341.6 ± 4.0	376.6 ± 8.1	416.6 ± 8.1	-
Turbidity (NTV)	2.76 ± 0.05	5.75 ± 0.054	16 ± 0.00	1.25 ± 0.083	1.216 ± 0.512	2.6 ± 0.126	3.9 ± 0.126	2.8 ± 0.125	0.173 ± 0.002	0.20 ± 0.07	0.58 ± 0.09	0.76 ± 0.1	5
BOD (mg/l)	4.0 ± 0.4	6.0 ± 0.6	4.0 ± 0.4	5.0 ± 0.5	6.0 ± 0.6	5.0 ± 0.5	6.0 ± 0.6	5.0 ± 0.5	6.0 ± 0.6	4.0 ± 0.4	6.0 ± 0.6	5.0 ± 0.5	3
COD (mg/l)	418.2 ± 5.8	285 ± 9.2	283 ± 9.1	263.3 ± 11.5	416.1 ± 5.4	417.5 ± 5.5	285 ± 9.2	418.2 ± 5.8	262.3 ± 11.9	264.4 ± 11.8	416.1 ± 5.4	416.1 ± 5.4	3
Silicates (mg/l)	1.70 ± 4.16	0.001 ± 0.0001	0.002 ± 0.0001	0.0001 ± 2.27	0.0001 ± 2.9	0.001 ± 0.0002	0.005 ± 0.0008	0.001 ± 2.8	0.003 ± 0.0003	0.002 ± 0.01	0.003 ± 0.0003	0.001 ± 0.0002	-
Phosphates (mg/l)	0.026 ± 0.009	0.13 ± 0.09	0.45 ± 0.01	0.07 ± 0.01	0.04 ± 0.1	0.38 ± 0.11	0.53 ± 0.14	0.37 ± 0.10	0.54 ± 0.14	0.063 ± 0.006	0.027 ± 0.009	0.120 ± 0.008	12.38
Chlorides (mg/l)	89.64 ± 4.96	84.64 ± 3.50	24.99 ± 1.09	39.99 ± 7.78E-15	27.99 ± 1.78	79.98 ± 1.56E-14	79.98 ± 1.56E-14	78.96 ± 1.46E-14	88.64 ± 1.0	89.97 ± 0.9	84.64 ± 3.50	99.9 ± 5.96	250
Sulphates	0.01 ± 0.001	0.01 ± 0.001	0.01 ± 0.001	0.01 ± 0.001	0.01 ± 0.00	0.01 ± 0.001	0.01 ± 0.001	0.01 ± 0.001	0.44 ± 0.04	0.02 ± 0.002	0.03 ± 0.003	0.02 ± 0.002	200
Nitrates (mg/l)	0.079 ± 0.02	0.09 ± 0.020	0.57 ± 0.04	0.04 ± 0.03	0.29 ± 0.01	0.08 ± 0.06	0.97 ± 0.05	0.07 ± 0.05	0.67 ± 0.04	0.58 ± 0.3	0.57 ± 0.4	0.35 ± 0.5	45
Nitrites (mg/l)	0.25 ± 0.03	0.12 ± 0.01	0.36 ± 0.07	1.32 ± 0.0	1.32 ± 0.00	1.33 ± 0.03	1.51 ± 0.00	1.31 ± 0.02	4.4 ± 0.1	1.31 ± 0.02	1.51 ± 0.03	1.32 ± 0.02	45

Note: Values are Mean ± S.D (N=6).

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