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LIMNOLOGICAL STUDIES OF THE TANK IN VEDANTHANGAL WATER-BIRD SANCTUARY, WITH SPECIAL REFERENCE TO IMPACT OF GUANO ON WATER AND SOIL QUALITY

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INTRODUCTION

Vedanthangal water-bird Sanctuary in Tamil Nadu has been a subject of study for various workers to investigate either the avian fauna (Spillett, 1968) or to record Vascular plants (Henry & Swaminathan, 1981). Recently one of us (Kumar, in press) has enlisted the Odonata fauna of the sanctuary. The sanctuary in question has been a winter home of a large number of migratory water birds, which arrive at Sanctuary in October and stay here till March. Needless to mention that here the birds find here an easy and protected sites in the form of big or small trees (particularly *Barringtonia*) growing in the midst of Vedanthangal tank. During their stay, apart from other activities, the most striking one has been their excretal droppings on the trees as well as in the tank. Spillett (1968) has rightly said that the droppings of birds nesting in the middle of tank fall into the water, most of which eventually reaches to the farmers field as there is regular practise of using the water as well as the silt from the tank for irrigation and fertilizing the adjacent fields.

The continuous addition of bird 'Guano' should definitely have its impact on the water and quality of the soil of the tank, thereby rendering the water unsuitable to a great extent, for the well being of aquatic fauna, specially the fishes, which during the preliminary observations were found to be scanty. Considering these and other related aspects it was felt desirable to investigate the tank in question from limnological point of view. Simultaneously another fresh water body, situated about 20 km N.E. of Vedanthangal tank, but not at all exploited by migratory birds, was also selected for similar studies, just to compare the water and soil quality with special reference to impact, if any, of guano.

PHYSIOGRAPHY AND CLIMATE OF THE AREA OF STUDY

1. *Vedanthangal Bird Sanctuary Tank* (VT) (12°N ; 79°E ; 120 mt msl) is about 80 km south of Madras city and 48 km inland from Bay of Bengal. The average rainfall is about 1150 mm/annum during the months of October to January under the influence of retreating NE monsoon. The Sanctuary includes a *ca* 30 hectare Vedanthangal tank. April to June (30° to 38°C) are the hottest

months, whereas December and January are regarded as the coolest months (mean temp. 18° to 26° C). The area around Vedanthangal is flat with rocky plains and scattered bushes and trees. The tank is dotted with about 500 *Barringtonia acutangula* trees, which withstand the seasonal water-logging quite well. The trees form a compact grove with almost a contiguous canopy (4 to 6 mt. high) occupying half of the area of the tank and offering a suitable nesting site for water birds (Spillett, 1968). The tanks retains water mostly during rainy months (*ca.* depth 5 mt.) but thereafter shrink gradually reaching to its minimum (*ca* depth 1 mt.) and assuming the shape of a small muddy pond during summers. The substratum is generally sandy and greyish. Aquatic weeds are generally scarce but phytoplankton blooms are of common occurrence.

2. *Chengalpattu water tank* (CT) (12°N, 79°E, ca 120 msl), is situated about 55 km south of Madras and about 20 km NE of Vedanthangal tank. The total area of the tank is about 50 hectare with average depth of about 3 mt. Rocky hillocks surround the tank on its western bank, the other sides have agricultural fields with very few trees on the bank. The pond is different from Vedanthangal in the sense that it has both inlet as well as outlet and thus water quantity does not change appreciably round the year. Human settlements are within ½ km and thus human activities in the form of washing, bathing, cattle washing and fishing are common. The bottom mud is dark and clayish, water is generally clear supporting a noxious growth of *Eichhornia.* The striking feature to note about this tank is that no migratory water birds visit this tank during winters, hence free from any fertilizing effect of bird guano whatsoever, though the addition of organic debris from human and other activities cannot be ruled out.

MATERIAL AND METHODS

Water : Monthly water sampling were conducted from both the tanks at fixed points (between 9 and 11 hrs.) with the help of a water sampler. Water temperature was measured by a mercury theremometer fitted in the Sampler. pH was determined by Universal indicator solution and Lovibond pH meter. Field estimations were made for dissolved oxygen (DO), free CO_2, total alkanity and calcium. Estimation of chlorine, sulphate, various forms of nitrogen, phosphate, silicate and electrical conductivity were made in the laboratory. All above parameters were analysed with the help of DREL-5 water analysis kit supplied by HACH & Co., Europe. Plankton samples were collected by filtering 10 litre water through a plankton net made up of bolting silk (No. 25). Samples thus collected were preserved in 4% formaldehyde for subsequent quantitative and qualitative analysis using a inverted plankton microscope. The quantitative and qualitative data regarding planktons shall be discussed separately elsewhere.

Soil : Sampling was done every month from both the tanks by collecting about 2 kg of wet soil from surface layers. The soil samples were dried under shady conditions in laboratory and then sieved sufficiently to have fine powdry soil. The total soluble salts, soluble cations, viz., calcium, magnesium, sodium ; soluble anions namely CO_3, HCO_3, chloride and sulphate were analysed by leaching method as described in Soil Analysis kit supplied by HACH & CO., Europe. pH electrical conductivity, potassium, nitrite and phosphate contents

were estimated by soil analysis Laboratory of Tamil Nadu State Government, Kanchipuram. The estimation of trace elements in soil, viz., Zn, Mn, Cu and Fe was also conducted in the same Laboratory using AAS.

PHYSIO–CHEMICAL CHARACTERISTICS OF WATER
(Table 1&2, Figs. 1 to 4)

Water temperature : At VT water temperature fluctuated between 25° to 33°C, whereas at CT the range of variation was between 22° and 32°C. Normally both the tanks recorded lowest water temperature during December (CT) and January (VT). A perusal of the trend of fluctuation indicates gradual rise from January onwards at both the tanks but VT as compared to CT registered slightly higher values in the respective months. The lower values at CT may be attributed to more open and larger area and great turbulence of water by strong winds prevalent throughout the day.

pH : Of water varied within a narrow range at both the tanks, but as compared to CT (7.9 to 9.0), the range values were quite low at VT (6.5 to 8.0). At VT the pH value goes as low as 6.5 (acidic) during September, when the water level is at the lowest and there is high decomposition activity under higher temperature. The higher pH value at CT generally coincide with overall higher alkanity values of as much as 240 mg/1.

DO : Content was fairly higher (8.8 to 22.3 mg/1) at CT than at VT (8.2 to 15.4 mg/1). Generally the concentration of DO was higher during winter in both the tanks. The maximum values are recorded during winter months of November and January. The higher values in general at CT are correlated with lower values of CO_2, which was generally higher at VT indicating high decomposition activity at the latter due to heavy induction of organic matter in the form of dead planktons and guano. Further the increase in DO value during winter monsoons and then onwards may be due to rainfall and prolific growth of phytoplanktons and macrophytes.

Free CO_2 : Was detected almost in all the months at VT except December and January, whereas its presence from March to October was noticed at CT but to a lesser extent than VT The higher CO_2 values at VT are inversely correlated with low alkanity (18.4 to 97 mg/1) at VT Simultaneously lower CO_2 values at CT coincide with comparatively higher alkanity (17 to 240 mg/1) at CT

Total alkanity : I's generally lower at VT (18.4 to 97 mg/1), which show that water is generally softer in nature and not condusive for fish and other aquatic biota. At CT the mean values of total alkanity are generally higher above 86 mg/1, varying from 86 to 240 mg/1. This shows that water body is hard water type and such waters are often the best fish producers (Barett, 1953). The latter fact is correlated with regular fishing activity at CT. The highest values of total alkanity are recorded in the pre-monsoon months and with the advent of rains at water bodies dilution of alkanity occurs.

Table 1 · Range of fluctuations in physico-chemical characteristics of water in Vedanthangal tank (VT) in different months of the year.

Character	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Water temperature (°C)	25.0	28.0	33.0	30.0	32.0	32.0	32.0	30.0	32.0	29.0	28.0	26.0
pH	7.5	8.0	7.5	8.0	7.9	7.5	8.0	7.5	6.5	7.0	7.0	7.05
EC mmhos/cm	5.80	6.00	6.80	5.60	11.00	13.40	6.00	6.00	7.60	6.20	4.20	5.00
Free CO_2 (mg/l)	0.0	0.2	1.2	2.3	4.2	5.5	3.0	1.4	2.5	1.9	2.2	0.0
Total alkanity (mg/l)	30.0	24.0	26.0	97.0	38	87	61	42	18.4	45	54	40
Dissolved oxygen (mg/l)	18.0	11.4	8.2	10.6	9.9	9.9	10.0	12.4	10.5	15.4	12.5	14.5
Calcium (mg/l)	18.0	22.0	20.0	62.0	74.0	82.0	96.0	54.0	75.0	45.0	38.0	32.0
Chlorine (mg/l)	0.03	0.03	0.28	0.05	0.11	0.07	0.19	0.12	0.75	0.35	0.04	0.05
SO_4 (mg/l)	10.0	8.0	10.0	11.5	60.0	39.0	40.0	22.0	38.0	55.0	22.0	13.0
Nutrients												
NH_3—N (mg/l)	0.80	0.70	0.63	0.70	0.82	0.87	0.95	1.03	2.19	1.4	1.8	1.1
NO_3—N (mg/l)	2.0	2.3	4.0	4.2	6.9	8.2	8.0	7.8	8.5	9.68	4.40	1.02
NO_2—N (mg/l)	0.01	0.02	0.05	0.09	0.022	0.030	0.050	0.030	0.150	0.060	0.035	0.00
PO_4 (mg/l)	0.8	0.6	1.4	1.6	1.8	3.4	3.2	3.2	3.0	3.2	1.0	0.9
SiO_2 (mg/l)	9.60	7.40	6.84	5.04	6.60	4.80	5.20	3.80	4.80	8.00	4.50	6.60

Table 2 : Range of fluctions in physico-chemical characteristics of water in Chengalpattu tank (CT) in different months of the year.

Characters	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Water temperature (°C)	24.0	26.0	26.0	28.0	30.0	31.0	32.0	32.0	30.0	30.0	25.5	22.0
pH	8.0	8.0	7.9	7.9	8.0	9.0	8.5	8.5	8.0	8.0	8.5	8.0
EC (mmhos/cm)	6.00	7.20	8.80	8.80	13.40	21.00	16.00	20.00	14.40	6.00	6.00	6.00
Free CO_2 (mg/l)	0.0	0.0	2.3	4.6	3.6	1.4	1.2	1.4	1.2	0.2	0.0	0.0
Total alkanity (mg/l)	86	89	67	115	150	178	227	240	156	117	86	93
Dissolved oxygen (mg/l)	19.5	14.3	15.7	10.5	9.9	8.8	11.5	11.0	15.0	18.2	21.0	22.3
Calcium (mg/l)	22.0	35.0	39.0	54.0	63.0	70.0	71.0	132.0	124.0	128.0	53.0	9.0
Chlorine (mg/l)	0.04	0.05	0.05	0.07	0.06	0.07	0.04	0.05	0.08	0.03	0.25	0.01
SO_4 (mg/l)	2.0	2.0	2.0	35.0	7.0	4.0	6.0	20.0	0.0	0.0	18.5	2.0
Nutrients												
NH_3—N (mg/l)	0.30	0.41	0.00	0.52	0.65	0.72	0.82	1.22	0.50	0.60	0.00	0.20
NO_3—N (mg/l)	1.00	0.09	1.00	0.80	2.20	5.60	6.36	4.80	5.60	5.90	4.40	3.00
NO_2—N (mg/l)	0.004	0.009	0.012	0.012	0.010	0.010	0.015	0.010	0.025	0.020	0.010	0.010
PO_4 (mg/l)	0.40	0.52	0.70	1.30	1.70	2.00	2.30	1.90	1.60	1.60	0.80	0.70
SiO_2 (mg/l)	5.50	4.88	6.60	7.20	7.00	5.40	7.20	5.60	7.20	6.40	6.40	7.20

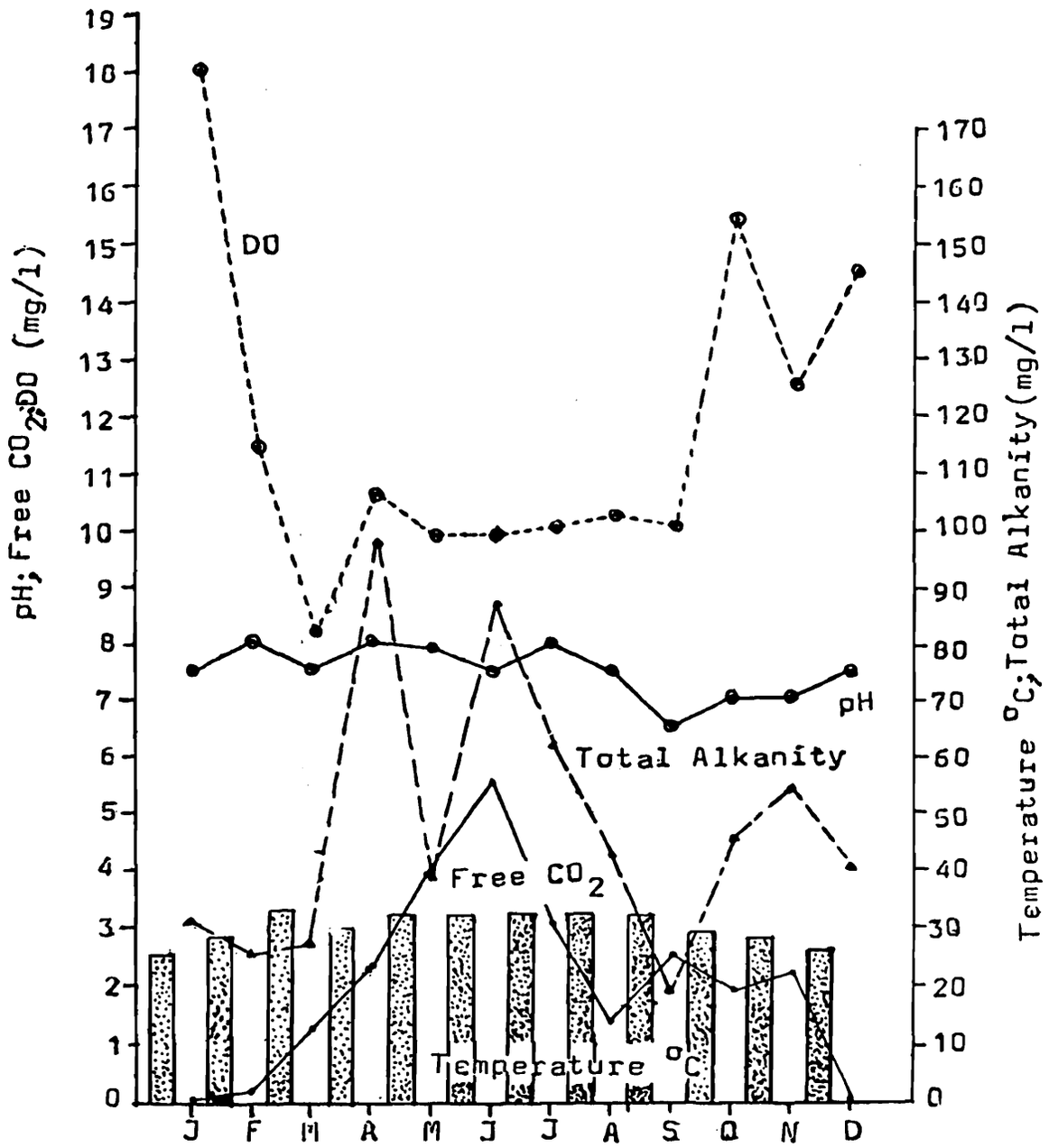

Fig. 1. Monthly fluctuations in water at VT : pH, temperature, free CO_2, DO and total alkanity.

Calcium (Ca+) : Contents in CT exhibited fairly higher values and fluctuated within a range of 90 to 132.0 mg/1. The value at VT ranged between 18.0 to 96.0 mg/1. The rise and fall in values of Ca contents was more or less similar at both the tanks. The values gradually rise in summer months due to rapid oxidation of the organic matter in the substrate. The decline in values from September onwards may be due to dilution by rain water and/or its utilization by phyto and zooplanktons (at VT) and macrophytes (at CT).

Total chlorine (Cl) : Content in VT was fairly higher than at CT ; in the former it ranged between 0.03 to 0.75 mg/1 whereas in the latter from 0.01 to 0.08 mg/1. No definite pattern of seasonal fluctuation could be deduced from the data but as stated by Thresh, *et. al* (1944), higher chloride content of the water is an index of pollution of animal origin (either by guano or by death and decay of zooplanktons which, it is assessed in the preliminary findings, exhibit population explosion in the warmer months. The low chlorine values at CT are because of insignificant animal pollution (guano or death decay) and also due to its large size.

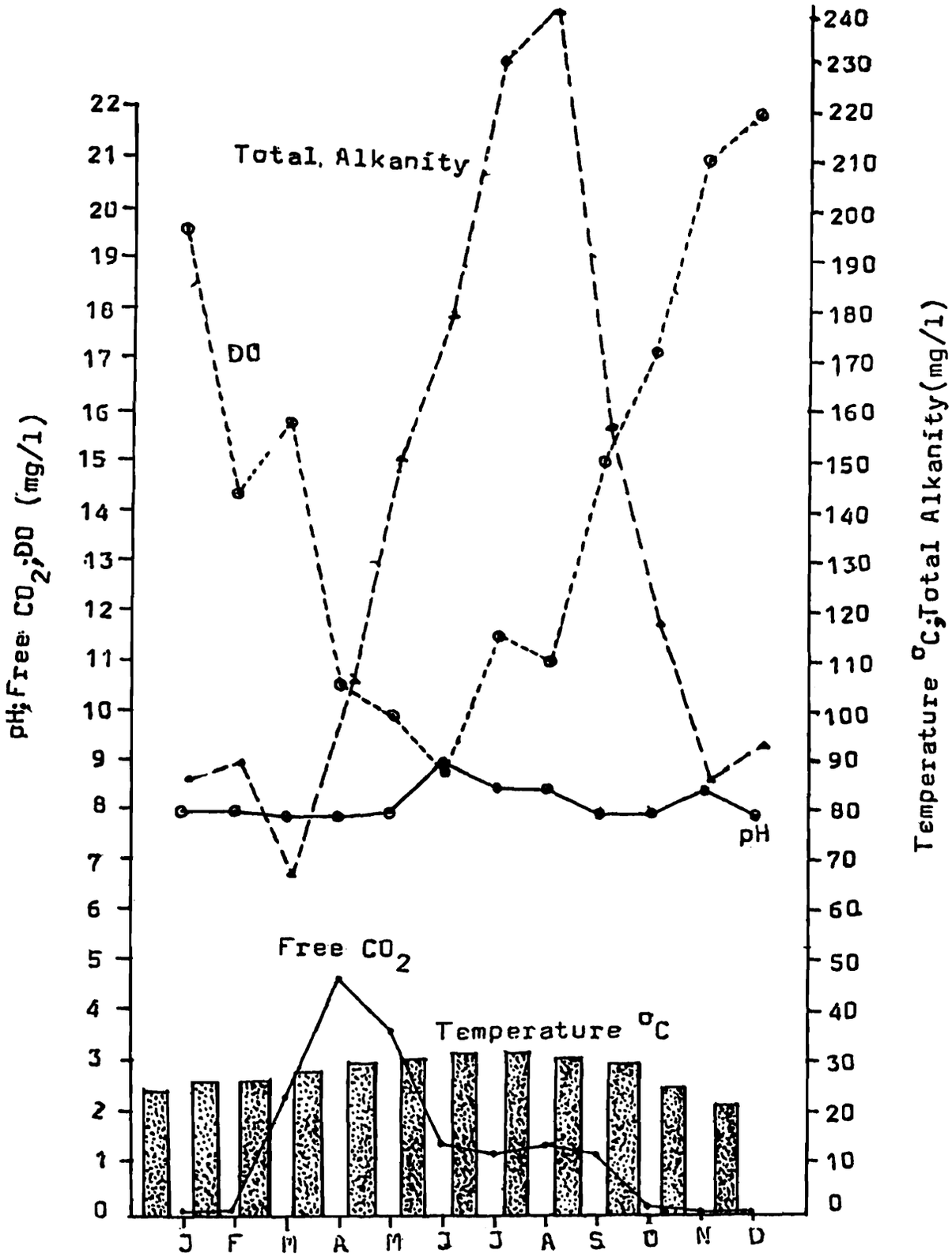

Fig. 2. Monthly fluctuations in water at CT : pH, temperature, Free CO_2, DO and total alryanity.

Sulphate (SO_4) : Strikingly the sulphate appeared higher at VT (8.0 to 60.0 mg/1) than at CT (Nil to 35.0 mg/1). The highest concentration of sulphate at VT is recorded during summers. This coincides with higher suspended solids imparting turbidity to the water. It is indispensable to mention here that due to high nutrient status (in term of nitrate and phosphate) VT exhibit lower transparency values due to round the year presence of planktonic dispersons as against the CT, where the water remains mostly transparent due to heavy growth of *Eichhornia* and other macrophytes.

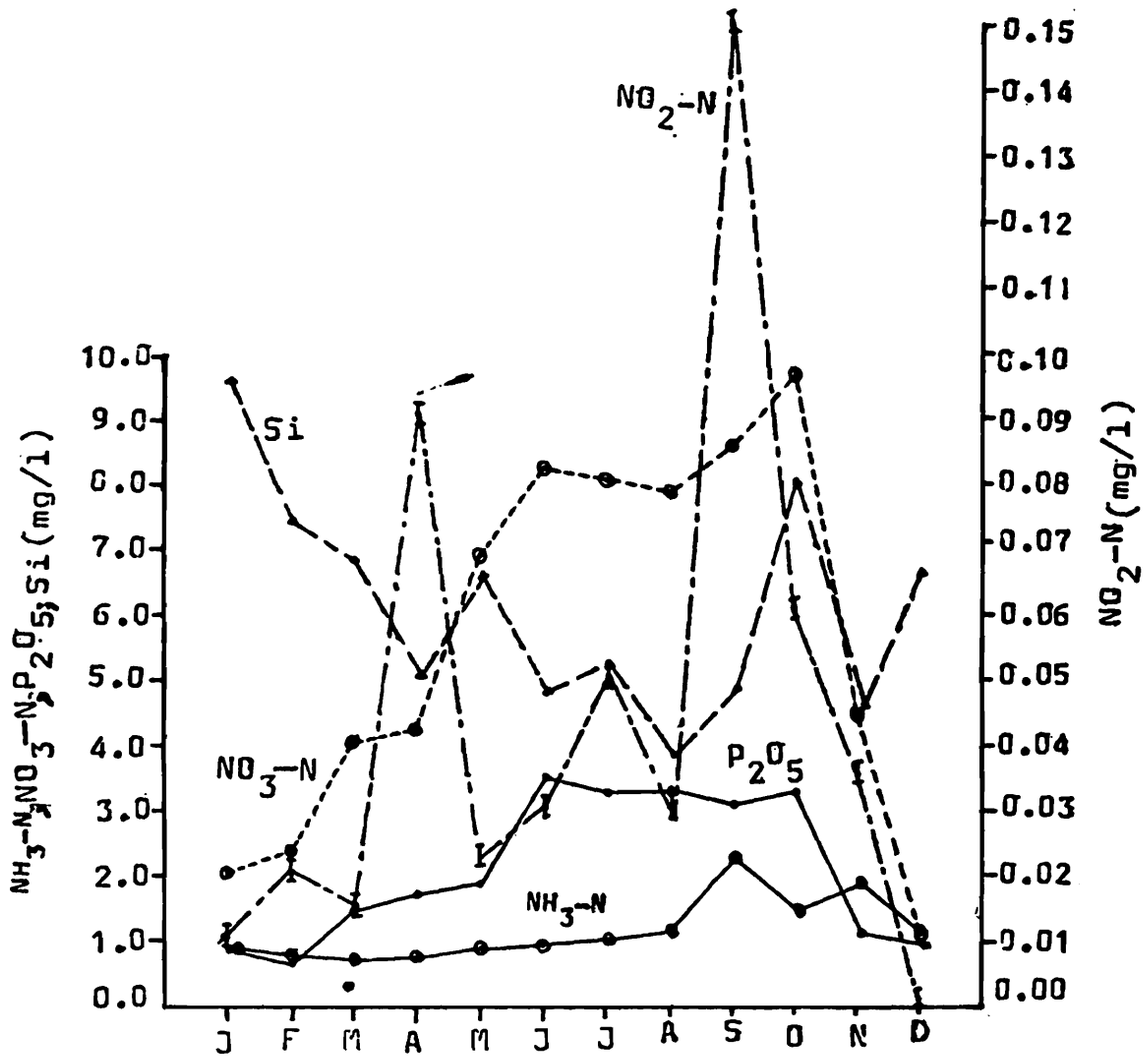

Fig. 3. Monthly fluntuations in nutrients in water at VT : NH_3 — N, NO_3 — N, NO_2 —. N, PO_4 and Si.

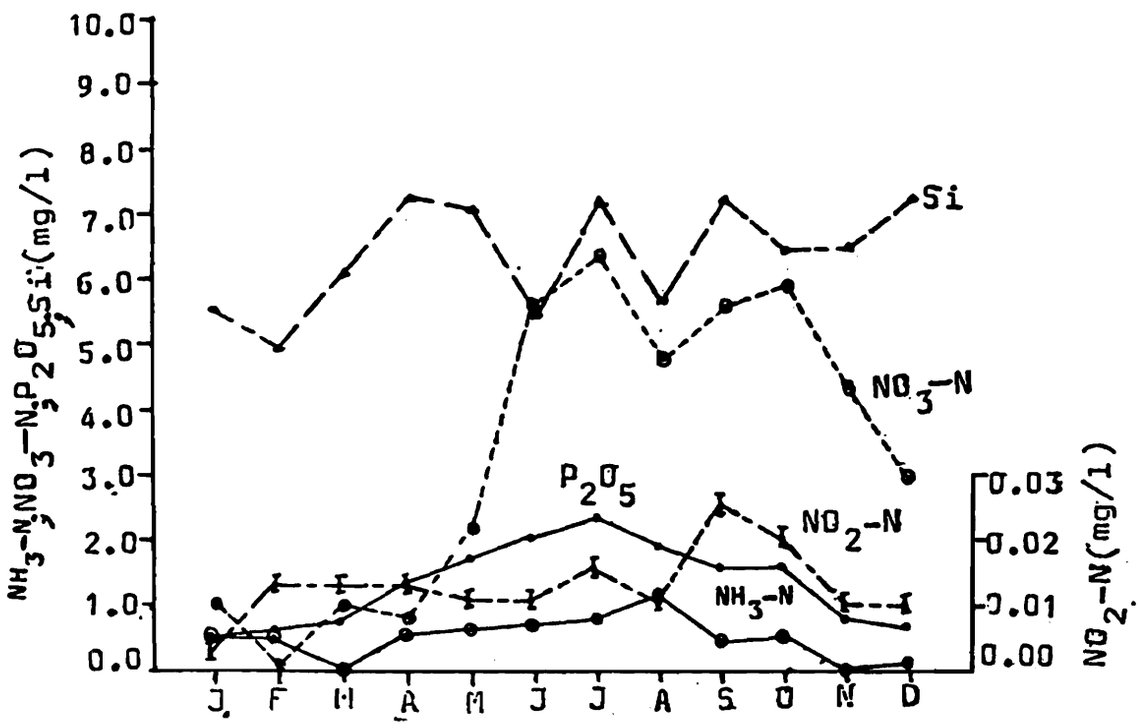

Fig. 4. Monthly fluctuations in nutrients in water at CT : NH_3 — N, NO_3 — N, NO_2 — N, PO_4 and Si.

Phosphate : With regard to its mode of fluctuation, the phosphate contents show more or less close relationship with nitrate and nitrite contents. On the whole, the mean value of Phosphates were higher in VT (0.6 to 3.4 mg/1), while these varied from 0.4 to 2.3 mg/1 in CT Higher values at both the tanks were obtained during summer months and a declining trend was apparent from November onwards till February. The higher contents of phosphate at VT may safely be attributed to excessive addition of guano and decomposition of dead organic matter.

Nitrate (NO_3-N) : As stated above with reference to phosphate, nitrate showed similar trend of fluctuation in both the tanks. Higher values were recorded at VT (1.0 to 8.68 mg/1) than at CT (0.80 to 5.90 mg/1). The value of nitrate start rising appreciably from October which coincide with the arrival of migratory birds at the tank. Generally, the values of nitrate are higher during summer months both at VT and CT The decline in nitrate contents is possibly due to their utilization by phytoplanktons.

Nitrite (NO_2-N) : Contents of VT are strikingly more : (nil to 0.15 mg/1) than CT (0.004 to 0.025 mg/1). Like nitrate the nitrite contents in VT show two well defined peaks in the year, but at CT the nitrite show only one peak of lower megnitude in the month of September.

Ammonia nitrogen (NH_3-N) : Contents are quite high in VT (0.63 to 2.19 mg/1) than in CT (nil to 1.22 mg/1)• At VT the highest value of ammonia nitrogen is recorded during the month of September, it rises again from October onwards. No set pattern of fluctuation was recorded at CT except that it showed only one peak in the month of August.

A perusal of the foregoing account of different forms of nitrogen contents (NO_3-N, NO_2-N, NH_3 N) indicates overall nitrogen richness at VT than at CT This nitrogen richness at VT can be safely attributed to the organic pollution of animal origin (bird guano or death and decay of tank biota). Thresh, *et al.* (1944) ; Swarup & Singh (1979) have also expressed the same views. Zaffar (1964) emphasized that when the dead organic matter decomposes in water, it forms complex proteins which get converted into nitrogenous organic matter and finally into nitrates by the bacterial activity. This condition seems to be prevalent at VT The CT, which is not polluted by bird droppings, the pressence of different forms of nitrogen can be on account of decomposition activity only. The other possible reason of lower nitrogen values than VT can be due to rapid consumption and storage by macrophytic vegetation.

Silica (Si—) : The silicate contents though slightly lower at Ct (4.88 to 7.2 mg/1) do not show a regular trend of distribution possibly due to the fact that submerged vegetation (which aids quick settlement of silt) is altogether wiped out by the surface growth of *Eichhormia.* At VT the silica contents varied between 4.8 and 9.6 mg/1. It showed the peak during winter monsoon, which is due to freshets and affluents from surroundings.

PHYSICO–CHEMICAL CHARACTERS OF THE SOIL
(Tables 3 & 4 ; Figs. 5 to 10)

pH : Of the soil in both the tanks ranged from acidic to alkaline, the range being 5.6 to 8.0 at VT and 6.0 to 8.0 at CT. A comparison of the pH values clearly indicates acidic nature of the soil in six months at VT than at CT where the high acidic reaction was evident in September and October (6.1 & 6.0 respectively). Besides nearly neutral (6.8 & 6.9) reaction was noticed in the months of March and April at CT Conclusively it is apparent that the soil pH registers below neutral values in four months at CT as against six months at VT The possible explanation of lower pH values in most of the months at VT can be given on the basis of the fact that the addition of guano besides affecting the pH of water also affects the pH of soil.

Soluble cations (Ca++, Mg++, Na+, K+) : The cationic composition of the soil of both the tanks indicates K+ as the predominent cation. The other cations to follow can be represented in the following order K+ > Na+ > Ca++ > Mg++. In general, the fluctuation pattern of cations is more or less uniform exhibiting higher values during summer months (February to September). In monsoon a general decline is observed which is obviously due to dilution effect. At both the tanks the K+ values are appreciably high, in VT the single peak is during the month of June while at CT the value is recorded during the month of January with sharp decline, than onwards upto October.

Soluble anions (HCO_3^- , Cl^- , SO_4^{-2}) : The concentration of anions show the following order $Cl^- > SO_4^- > HCO_3^-$ at CT but the changes to $Cl^- > HCO_3^- > SO_4$ at VT

The value of it in general was distinctly higher throughout the year (15 to 50 mg/l) at VT than at CT (15 to 30 mg/l). The higher values at VT can be attributed to the higher pollutional status imparted by dead settled organic matter of animal origin. Concurrently the Cl^- values of water are also significantly higher at Vt. The average values of soil SO_4^{-2} are higher at Ct than at VT, a feature opposite to that of water. Higher values at CT can be attributed to their settling down in soil due to quick settlement of aquatic angiospermic vegetation. On the other hand, there are less chances for the SO_4^{-2} to settle down at VT because the water remains mostly turbid due to suspended solids. As is evident from the total alkanity status of water of CT, the HCO_3 are mostly in soluble state and are not expected to settle in quantities on the bottom soil, hence the HCO_3 values at CT are found to be lesser. Another reason for less HCO_3 in the CT soil is that most of the HCO_3 settle in the form of marl on the vegetation thriving in the tank. The high HCO_3 concentration in VT soil is explainable on the basis of the process just reverse to that of CT as there is no appreciable aquatic vegetation at VT Additionally the purification of guano at VT is also responsible for formation of HCO_3

Sodium Adsorption Ratio (SAR) : SAR values varied from 16.66 to 50.35 at VT and 7.56 to 22.99 at CT The higher values of SAR at VT are correlated with the higher values of Na+ and Cl at VT

Table 3 : Range of fluctuations in physico-chemical characteristics of soil in Vedanthangal Tank (VT) in different months of the year.

Character	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
pH	7.5	6.4	6.4	8.0	7.2	7.4	5.6	5.6	7.3	6.8	7.8	6.7
EC (mmhos/cm)	0.1	0.1	0.36	0.70	0.73	0.11	0.10	0.15	0.20	0.10	0.10	0.10
Total soluble salts *(meq/l)*	55	45	60	130	75	50	60	70	75	75	40	40
Soluble cations (meq/l)												
Ca	5	4	8	32	15	2	3	3	2	2	4	4
Mg	2	5	5	5	6	8	2	3	3	2	0	2
Na	48	39	47	93	54	40	55	64	70	71	36	34
K	34	38	67	85	118	125	65	27	36	29	10	11
Soluble anions (meq/l)												
CO_3^{-2}	00	00	00	00	00	090	00	00	00	00	00	00
HCO_3	20	20	20	40	15	20	10	10	10	10	00	10
Cl^-	20	15	30	50	35	20	30	40	45	50	20	15
SO_4^{-2}	15	10	10	40	25	10	20	20	20	15	20	15
SAR	28.20	18.39	18.50	21.62	16.16	17.93	34.81	36.99	44.30	50.35	25.53	19.65
Nutrients (mg/100 gm)												
N	84	118	115	64	101	137	105	50	59	95	53	54
P_2O_5	30	15	55	'3	Tr.	105	68	5	10	47	45	45
Trace elements (ppm)												
Zn	1.00	0.82	1.52	0.50	5.22	1.32	1.02	0.56	0.40	0.84	0.36	1.24
Mn	5.28	1.80	7.10	4.38	8.32	9.80	7.32	2.94	2.30	3.10	1.10	3.32
Cu	1.60	1.70	1.64	0.86	4.40	2.06	1.75	1.42	1.14	1.78	1.16	1.54
Fe	35.00	40.00	40.00	12.72	40.00	40.00	32.00	30.60	20.22	21.36	10.00	30.70

Table 4 : Range of fluctuations in physico-chemical characteristics of soil in Chenglepattu Tank (CT) in different months of the year.

Characters	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
pH	7.0	7.9	6.8	6.9	7.5	7.7	8.0	7.2	6.1	6.0	8.0	7.9
EC (mmhos/cm)	0.15	0.10	0.12	0.17	0.40	0.56	0.40	0.18	0.05	0.15	0.10	0.10
Total soluble salts (meq/l)	50	35	40	50	70	140	70	80	40	50	60	45
Soluble cations (meq/l)												
Ca	4	4	3	4	8	31	21	24	12	4	6	7
Mg	4	5	2	5	10	22	13	14	5	3	4	4
Na	42	26	35	41	52	87	36	42	22	43	50	34
K	147	143	137	67	84	78	65	52	6	10	16	22
Soluble anions (meq/l)												
CO_3 [2]	00	00	00	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HCO_3	20	10	10	20	10	30	10	10	10	10	20	20
Cl	20	15	20	20	25	30	25	30	20	30	20	15
SO_4	10	10	10	10	20	50	30	30	10	10	20	20
SAR	21.00	12.26	22.15	19.33	17.33	16.92	8.73	9.65	7.56	22.99	22.42	15.24
Nutrients (mg/100 gm)												
N	61	53	48	98	64	76	72	70	64	50	42	28
P_2O_5	10	15	100	Tr.	Tr.	10	12	17	36	10	30	5
Trace elements (ppm)												
Zn	2.56	3.34	2.26	2.26	3.46	5.76	4.32	2.34	0.92	0.85	0.80	0.96
Mn	12.00	8.50	13.00	3.50	5.20	10.40	13.52	15.02	17.72	7.52	2.36	9.34
Cu	1.50	1.62	1.94	1.44	1.82	4.06	3.25	2.62	1.96	2.02	2.12	1.34
Fe	26.00	30.00	40.00	40.00	40.00	40.00	38.00	35.00	32.52	25.25	19.92	21.54

Nutrients (P_2O_5, N) : The mean monthly values of N vary from 50 to 137 at VT, while from 28 to 98 at CT The mean monthly value of P_2O_5 vary from (T to 105) at VT and from (T to 100) at CT The nutrients of the soil of both the tanks clearly illustrate that it is of higher order at VT corresponding with the high nutrient status of the water as well. Needless to emphasize that the high nutrient status of the water and soil of VT is as a result of high guano dropping during winter.

Trace elements : The mean monthly values of the concentration of trace elements, i.e. Zn, Mn, Fe and Cu are also given in Tables 3 & 4, Figs. 9 & 10.

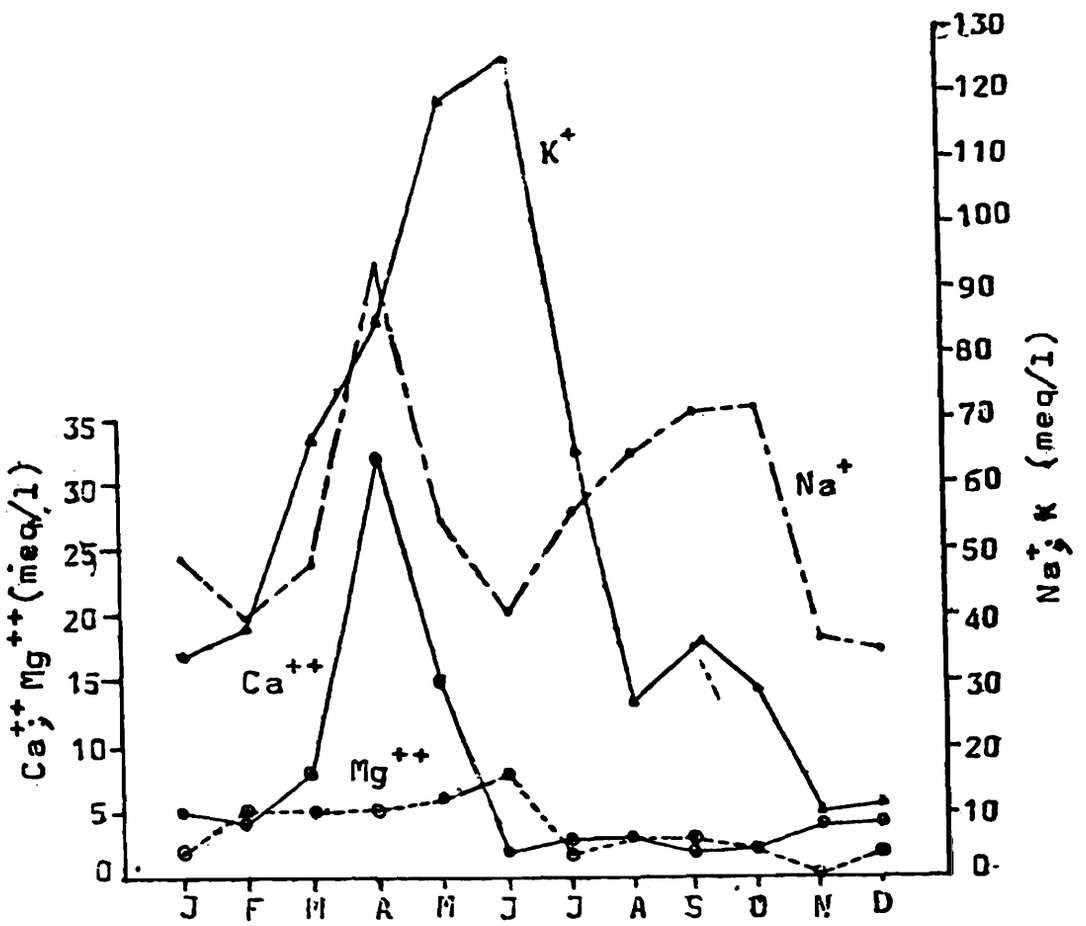

Fig. 5. Monthly fluctuations in cations in soil at VT : Ca++, Mg++, Na+ and K+.

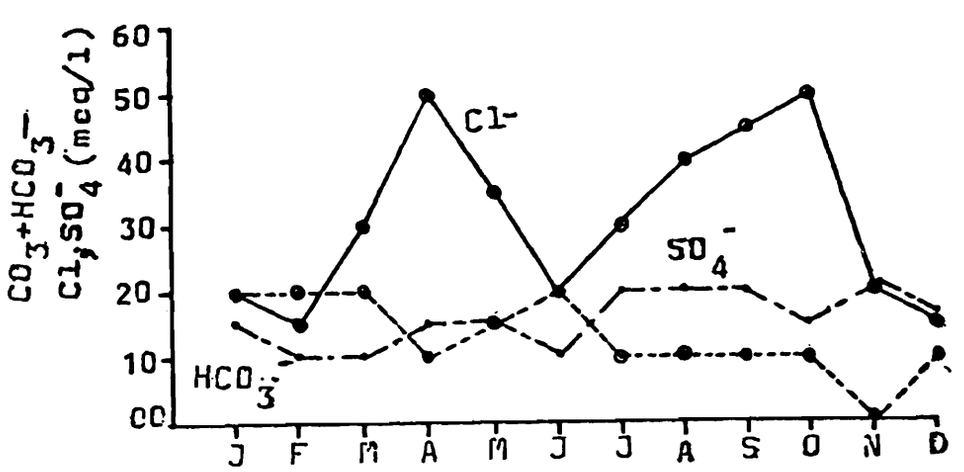

Fig. 6. Monthly fluctuations in anions in soil at VT : HCO_3 Cl and SO_4.

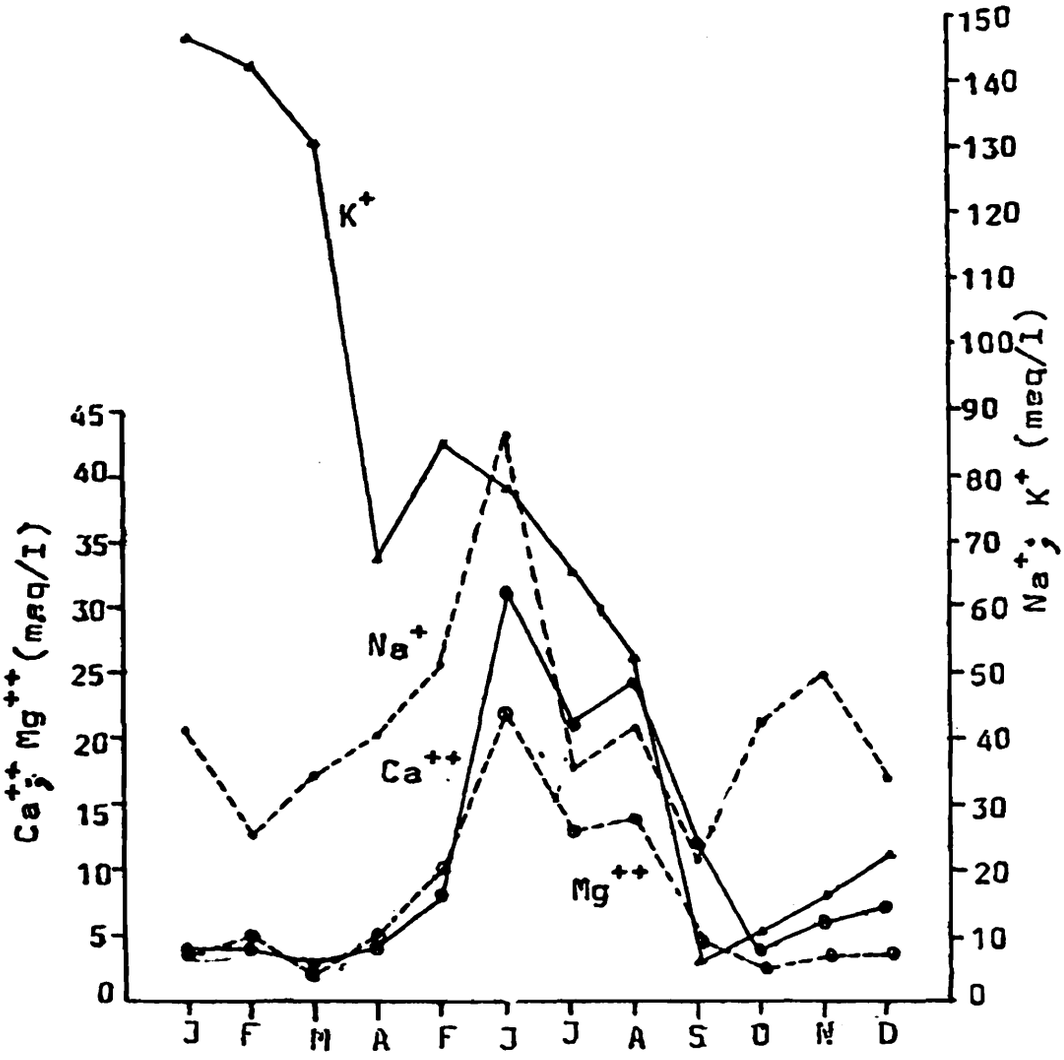

Fig. 7. Monthly fluctuations in cations in Soil at CT : Ca++, Mg++, Na+ and K+.

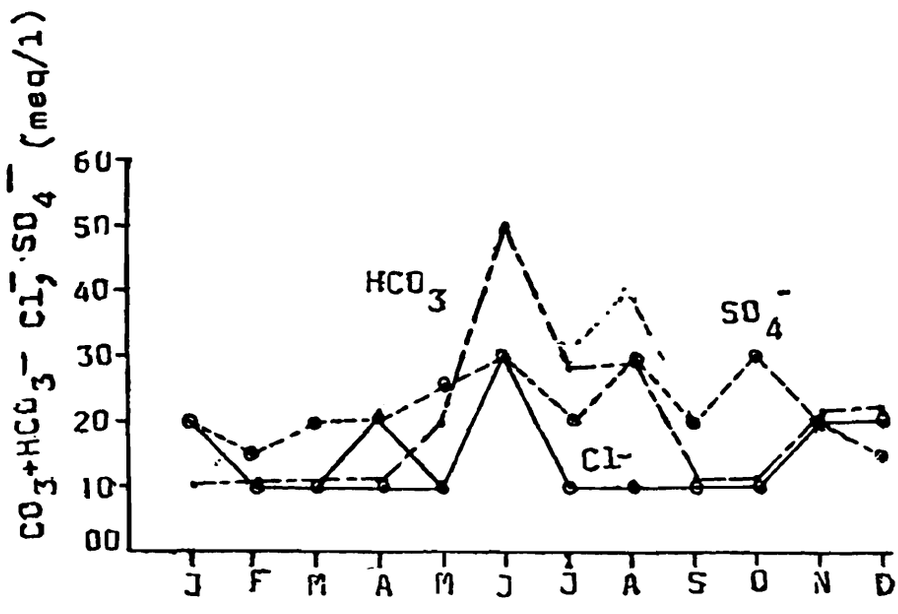

Fig. 8. Monthly fluctuations in anions in soil at CT : HCO_3 , Cl and SO_4

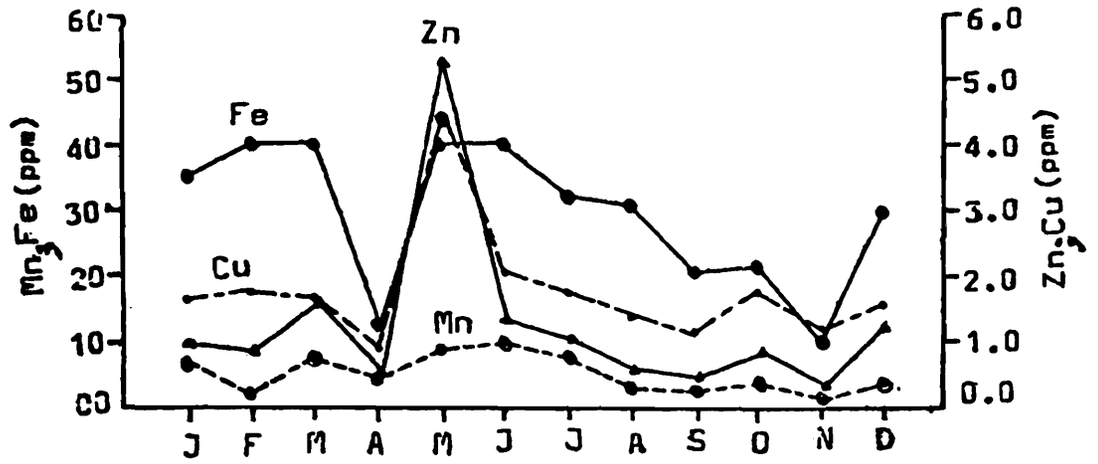

Fig. 9. Monthly fluctuations in trace elements in soil at VT : Zn, Mn, Fe and Cu.

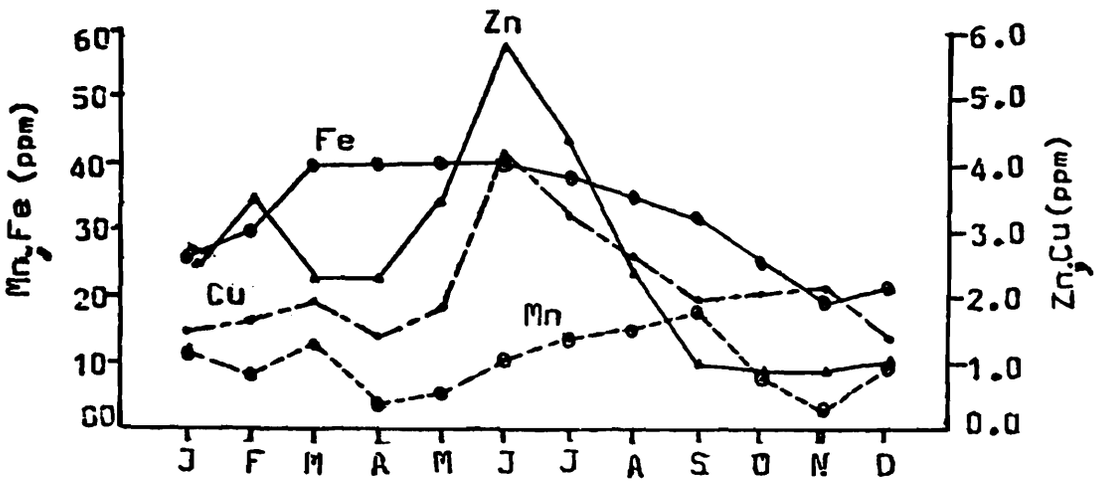

Fig. 10. Monthly fluctuations in trace elements in soil at CT : Zn, Mn, Fe and Cu.

GENERAL CONCLUSIONS

The present Investigations demonstrate that the water and soil characteristics of two selected tanks have striking differences. The overall assessment of the conditions prevalent at VT has clearly shown that water and soil characteristics are to a great extent affected by the bird droppings. Simultaneously it is worthwhile to classify the two tanks on the basis of water and soil characteristics. Though the biological analysis is under process, it has apparently exhibited striking difference in the two tanks, at VT in the form of chiefly planktons and at CT in the form of macrophytes. It is an established fact that the enhanced growth of either planktons or weeds is the outcome of high nutrient status of a water body. Therefore, on the basis of the soil and water data computed herein and the biological data being processed, the two tanks can be safely put into the category of Eutrophic nature.

The eutrophication criteria at both the tanks is strikingly different, at VT the high nutrients supply being utilized by planktonic blooms and swarms and at CT by macrophytes.

SUMMARY

Seasonal variations of the physico-chemical conditions of water and soil in relation to bird guano were carried out in 30 hectare Vedanthangal water-bird Sanctuary tank, Tamil Nadu, during the years 1986 and 1987. This tank is visited by a large number of migratory birds during NE monsoon period of mild winter. The physico-chemical conditions prevalent here were compared With the seasonal variations of these conditions in a nearby 50 hectare Chengalpattu tank, which is not at all exploited by the birds.

The water quality of Vedanthangal tank differed appreciably in the values of total alkalinity, chlorine, sulphate, phosphate and various nitrogen contents, which showed higher values due to organic wastes of animal origin. Similarly the soil quality also varied in reference to nutrients, i.e. P_2O_5 and N. The SAR was much higher in Vedanthangal tank soil. The trace elements, namely, Zn, Mn, Fe and Cu were also analyzed from the soil of both the tanks. Both the tanks are of eutophic nature.

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