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## RESEARCH ARTICLE

### STUDIES ON THE POLLUTION STATUS OF THE FRESH WATER POND (KURICHI POND), COIMBATORE DISTRICT, TAMILNADU, INDIA

**\*Anusiyadevi, K., Dr. Lekeshmanaswamy, M. and Ramesh, J.**

Department of Zoology, Kongunadu Arts and Science College (Autonomous), Coimbatore - 641029,  
Tamilnadu, India

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#### ABSTRACT

In the present study an attempt has been made on physico - chemical characteristics of Kurichi pond, located in Coimbatore of Tamilnadu. The study was carried out for a period of 10 months (Jun 2014-Mar 2015). Monthly details have been collected and were represented. Different parameters were taken in the study were Physical parameters - Temperature, suspended solids, dissolved solids, total solids, electrical conductivity, light penetration and colour. Chemical parameters - pH, carbonates, bicarbonates, dissolved oxygen, dissolved carbon dioxide, Organic carbon, biological oxygen demand and total hardness. Dissolved Nutrients - Calcium, magnesium, nitrates, Iron, sulphates, sodium, lithium, potassium, phosphates and silicates. Heavy metals - Copper, Chromium, Nickel, Lead, Manganese and Zinc.

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#### INTRODUCTION

Water is by far the most abundant substance in biosphere. As a living medium it shows unique physical properties, which in turn endow it with a unique chemistry (Mukerjee, 1997). Fresh water ecology is otherwise called as "Limnology". It refers to the "study of Fresh water organisms in relation to their environment." It deals with the physical, chemical, geological and biological aspects of the fresh water (Kumar 1974). Ponds are small bodies of water in which the littoral zone is relatively large and limnetic and profundal regions are small or absent. Ponds may be found in most regions of adequate rainfall. Temporary ponds that are ponds that are dry for part of the year are especially interesting and support a unique community. Natural ponds are also numerous in limestone regions when depressions or "sinks" develop because of solution of the underlying strata (Odum, 1971).

Fish also contains minerals and Vitamins (Martyshhev, 1973). Fisheries occupy a major position in the national economy and fish farming becomes accepted as a branch of agriculture. The present work is one such effort of a preliminary nature.

**\*Corresponding author: Anusiyadevi, K.**

Department of Zoology, Kongunadu Arts and Science College (Autonomous), Coimbatore - 641029, Tamilnadu, India.

It is also aimed at getting some data about the extent of kurichi pond water pollution. It is hoped that the information thus collected will create awareness in the minds of people of the immense harm they do their own society by allowing pollution of their precious water resource and this awareness will lead to measure and check this hazard (Boyd, 1990).

#### MATERIALS AND METHODS

##### Details of the study area

##### Coimbatore

Coimbatore also known as Kovai is a city in India It is the second largest city and urban agglomeration in the Indian state of Tamil Nadu, after Chennai and the sixteenth largest urban agglomeration of India. It is one of the fastest growing tier-II cities in India and a major textile, industrial, commercial, educational, information technology, healthcare and manufacturing hub of Tamil Nadu. It was the capital city of the historical Kongu Nadu and is often referred to as the Manchester of South India. The city is located on the banks of the Noyyal River surrounded by the Western Ghats and is administered by the Coimbatore Municipal Corporation. Coimbatore is the 4<sup>th</sup> largest metropolis in South India and the administrative capital of Coimbatore district.

### Geographical position of kurichi kulam

Kurichi Kulam in Coimbatore is located at 10°57'55.2"N 76°57'46.3"E or 10.965335, 76.962851.

### Collection of samples

For the present study water samples were collected for a period of 10 months (Jun 2014 - Mar 2015) with 30 days interval. Every month samples were collected at the surface of the pond at 11.30 - 12.30 pm in order to maintain uniformity. Samples were collected in clean white polythene containers. Collected samples were brought to the laboratory and kept in the refrigerator for further analysis.

### Samples were analysed for

#### Physical parameters

Temperature, suspended solids, dissolved solids, total solids, electrical conductivity, light penetration and colour.

#### Chemical parameters

pH, carbonates, bicarbonates, dissolved oxygen, dissolved carbon dioxide, organic carbon, biological oxygen demand and total hardness.

#### Dissolved Nutrients

Calcium, magnesium, nitrates, Iron, sulphates, sodium, lithium, potassium, phosphates and silicates.

#### Preservation of samples

Samples for the determination of dissolved oxygen were preserved by adding 1ml of Manganous sulphate, 1ml of alkaline iodide and 1ml of concentrated sulphuric acid by anonymous (1965).

#### Analysis of water samples

##### Physical parameters

All the parameters were estimated by the methods described by APHA (1998).

##### Temperature

During the collection of water samples, the temperature of the pond water was noted by using a thermometer on the spot itself.

##### Suspended solids

A known quantity of the sample (10ml) was taken and filtered using Whatman No.1 filter paper. The residue was taken out and dried in an oven at a temperature of 105°C for an hour, cooled and weighed. This gives the amount of suspended solids in the water samples.

##### Dissolved solids

The filtrate obtained from the above process was evaporated, dried, weighed and recorded as the quantity of dissolved solids in the water samples.

### Total solids

The amount of total solids present in the water samples can be calculated by adding the suspended solids with that of the dissolved solids.

### Colour

Colour of the sample was identified visually

### Chemical parameters

#### pH

pH of the samples was determined by using Systronic Digital pH meter; No.335.

#### Dissolved oxygen

Estimation of dissolved oxygen in the water samples was analysed by the Winkler's method Anonymous (1965).

#### Dissolved CO<sub>2</sub>

The dissolved CO<sub>2</sub> in the water sample was estimated by using the method given by Lind (1974).

#### Chlorides

Chlorides in the sample was estimated by Mohr's method given by Jackson (1973).

#### Calcium and Magnesium

In the present study, calcium and magnesium was estimated by the method given by Jhingran *et al.* (1969).

#### Phosphates

The phosphates in the sample was estimated using spectrophotometer as per the procedure given by Strickland and parsons (1965).

#### Silicates

Silicates in the sample was analysed by using the procedure as described by Jhingran *et al.* (1969).

#### Nitrates

In the present study, the nitrates were analysed as per the procedure by Strickland and parsons (1965).

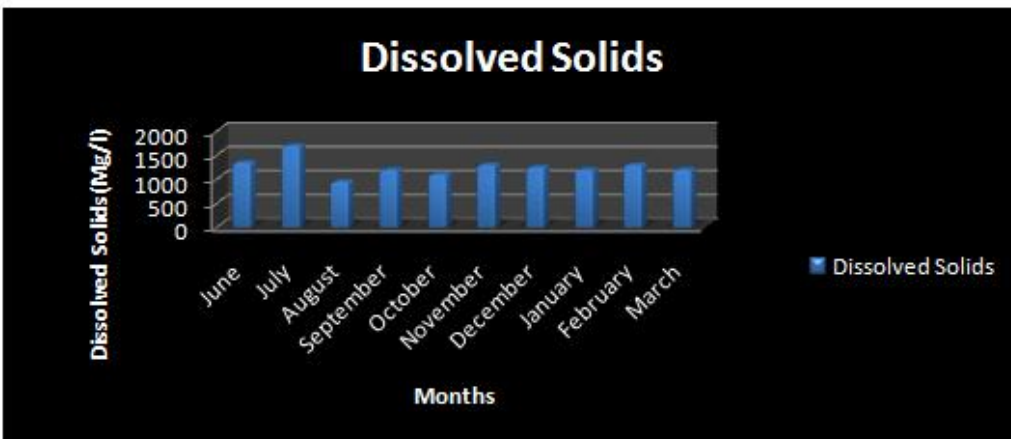
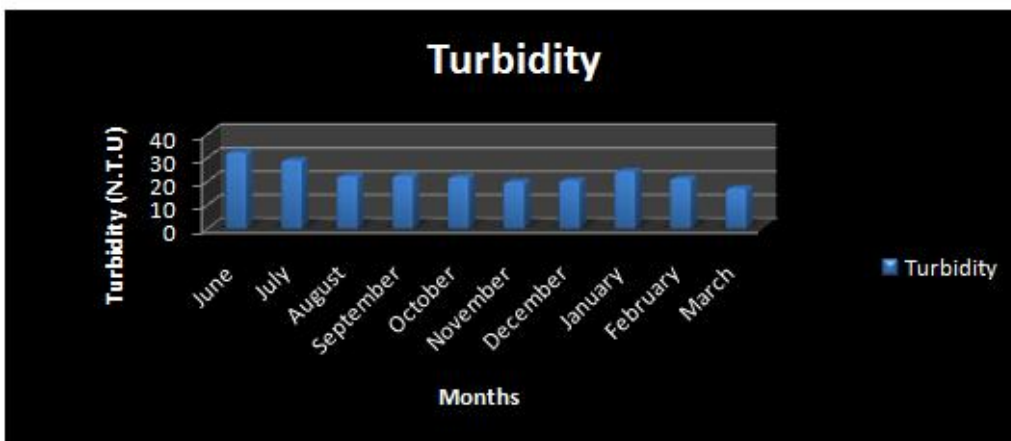
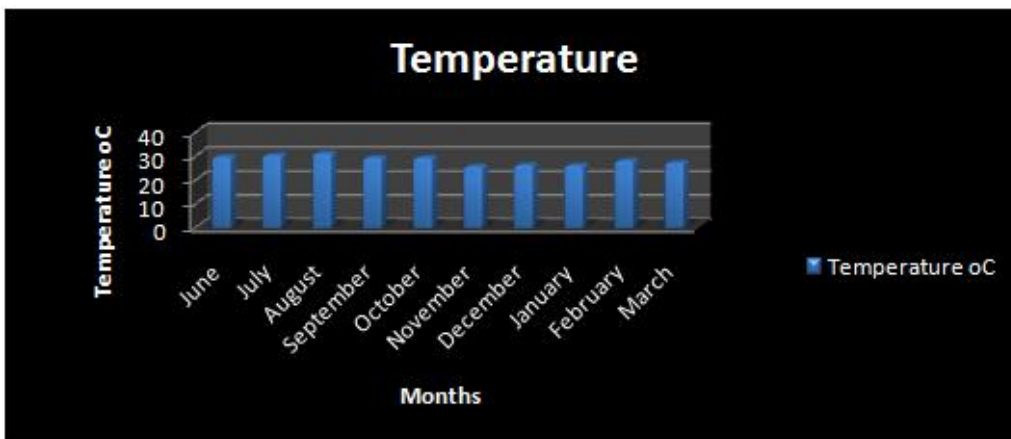
#### Alkalinity

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#### Sulphates

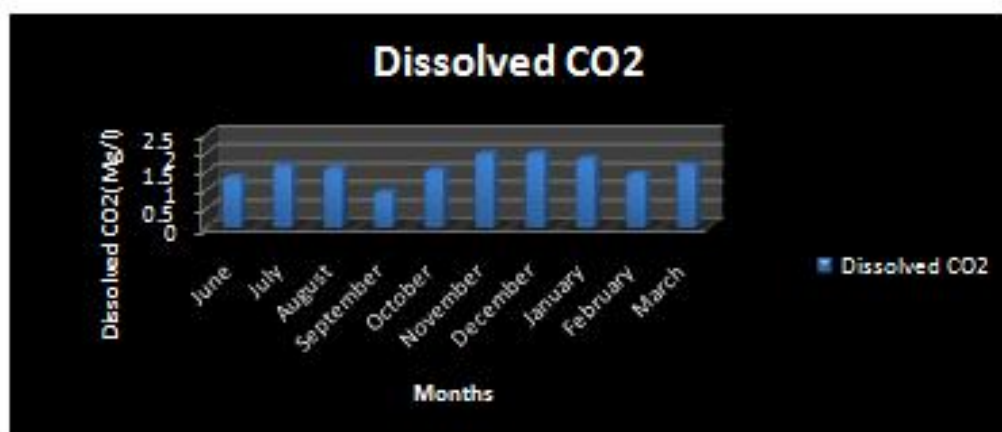
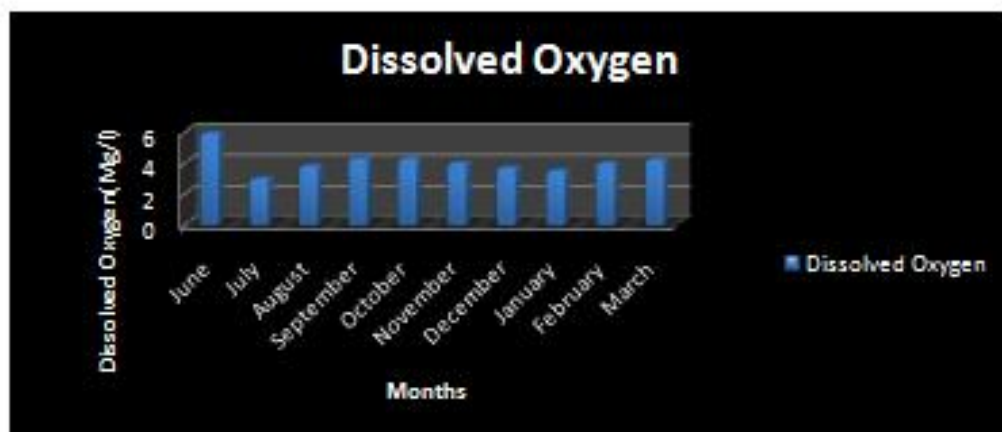
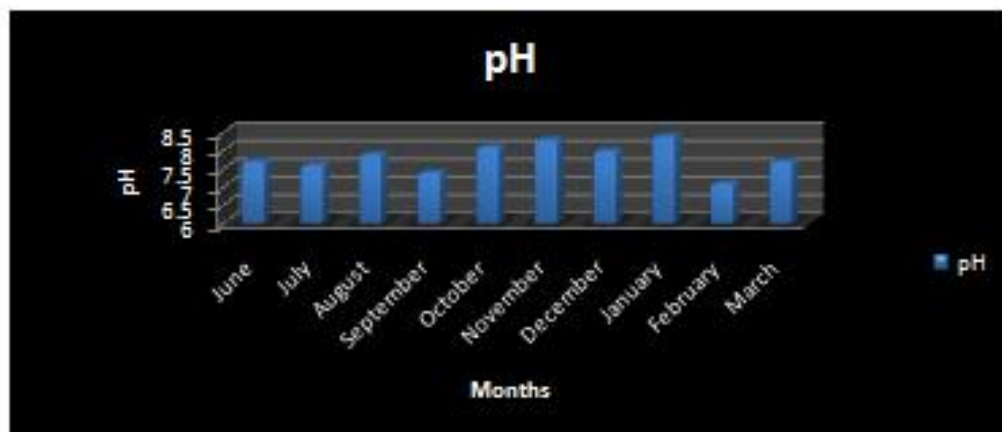
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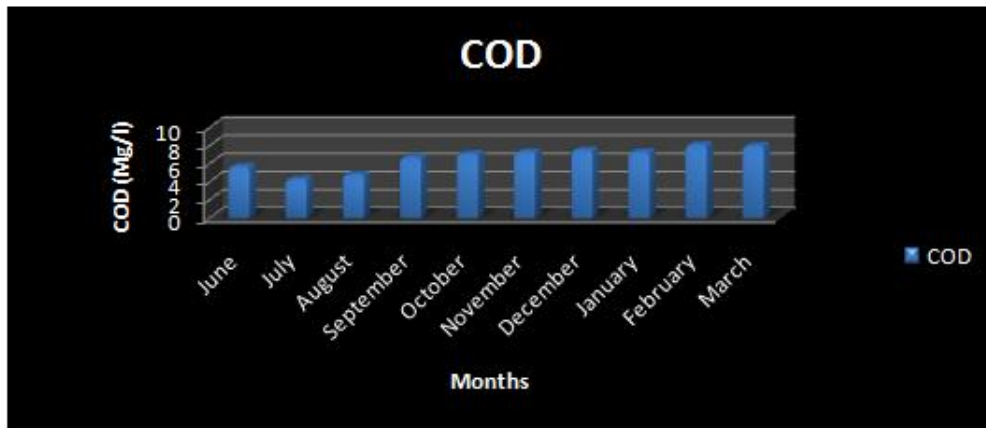
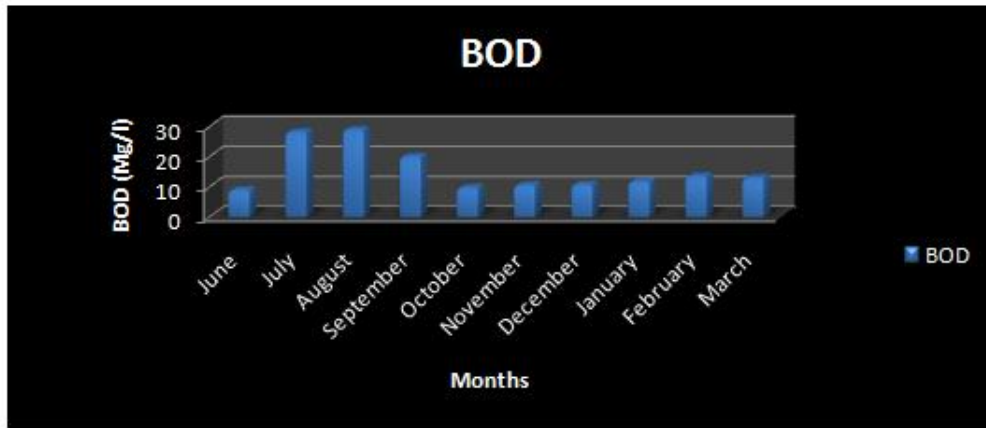
I Figures for physical parameters



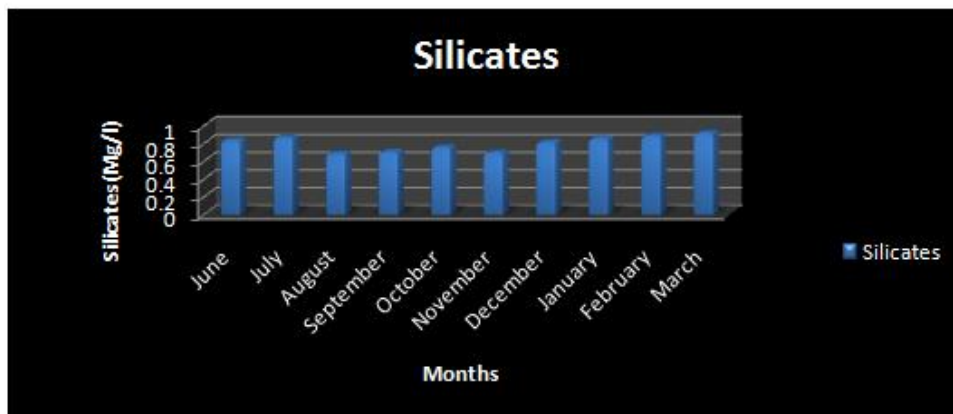
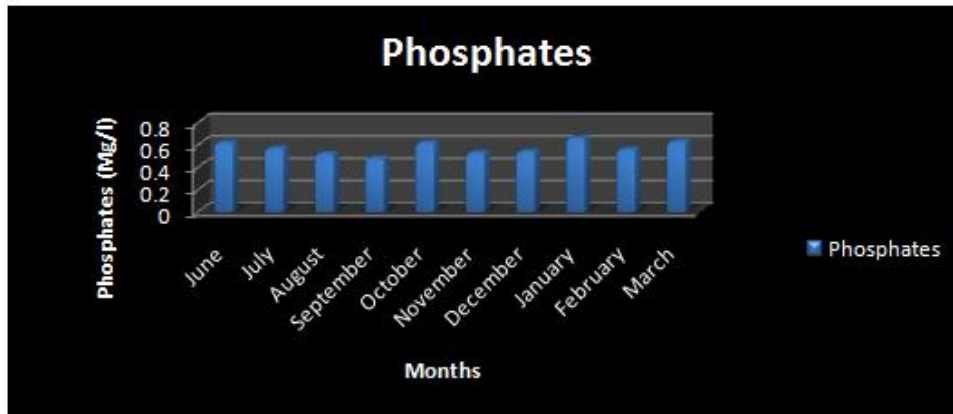


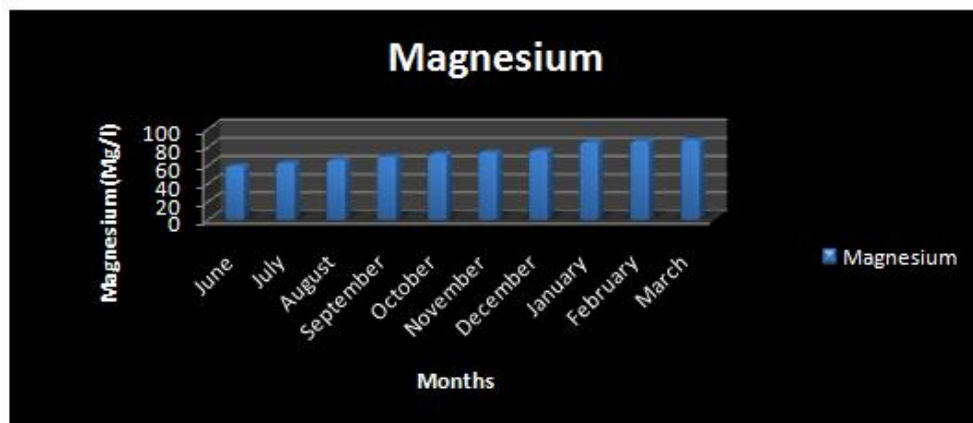
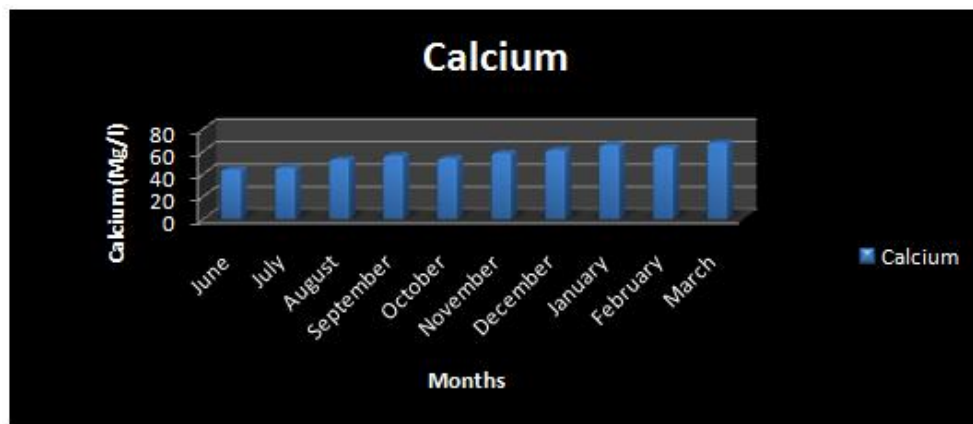
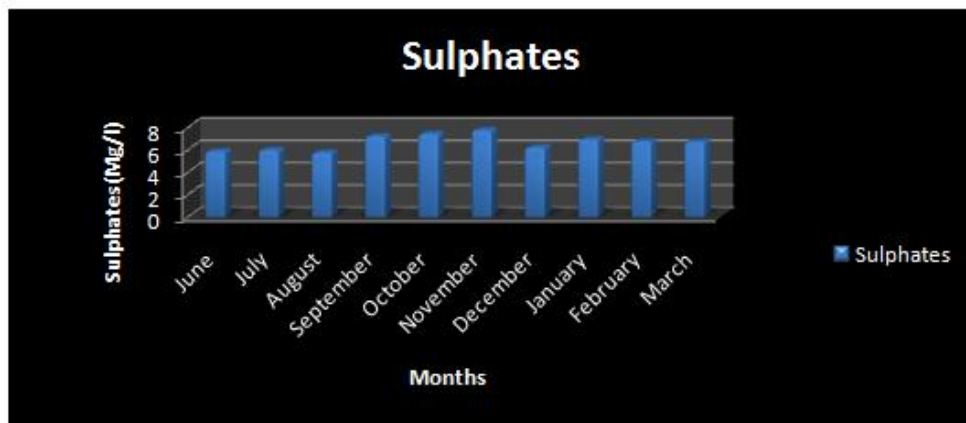
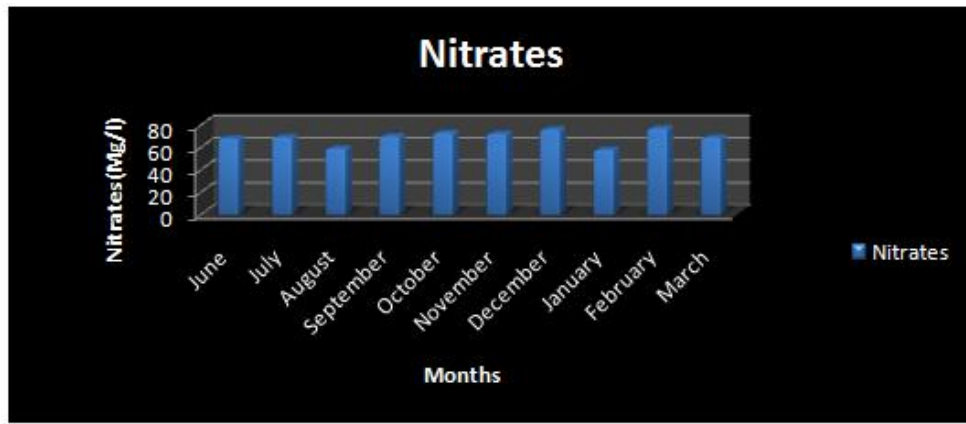
II Figures for chemical parameters

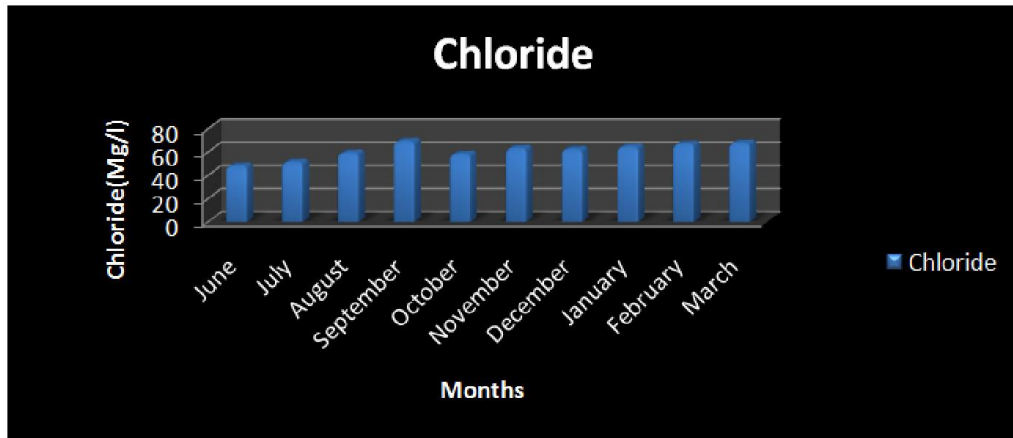




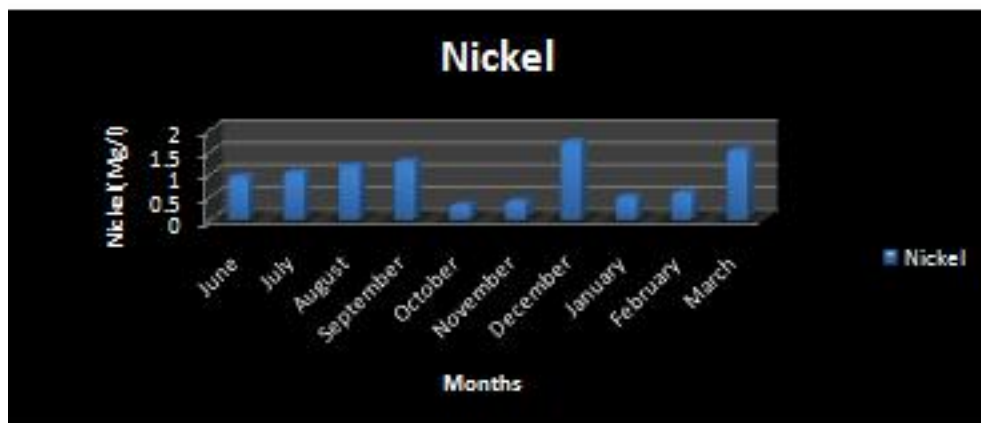
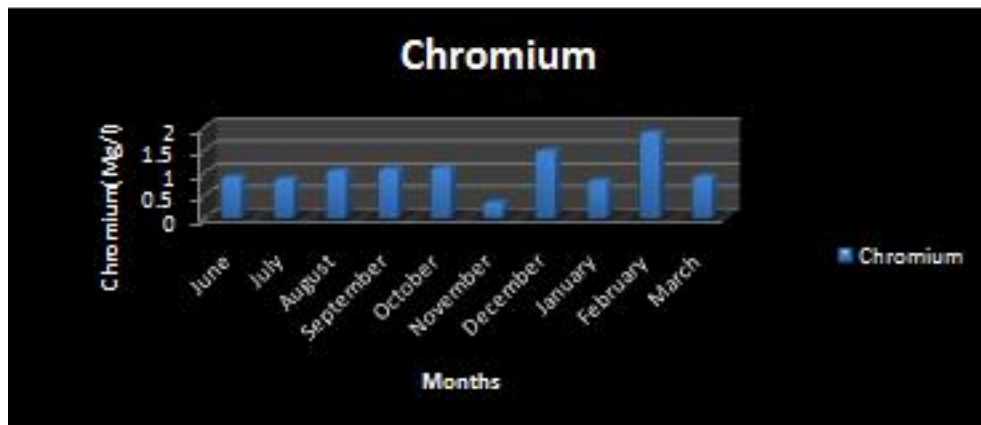
III Figures for nutrient content

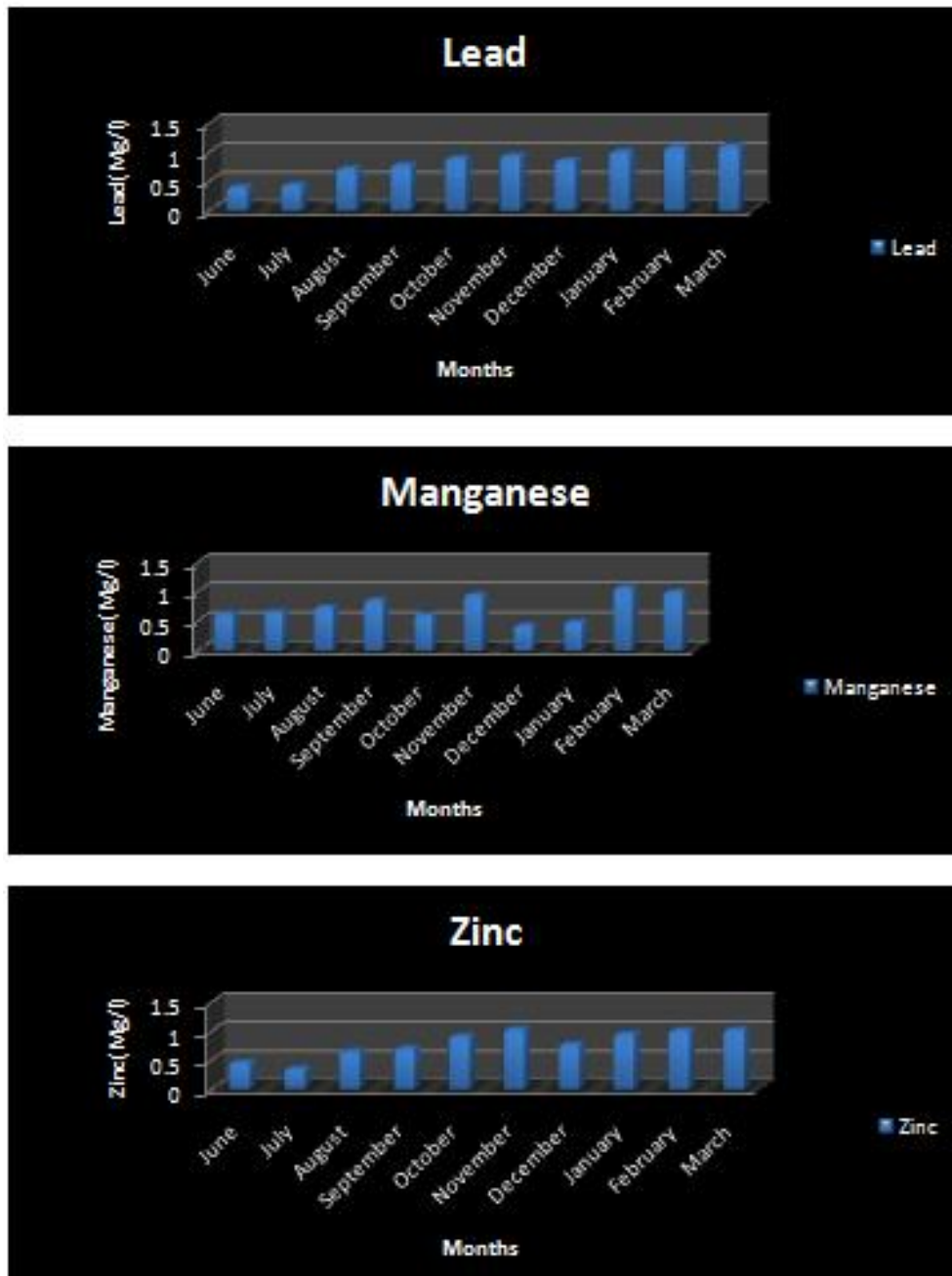






IV Figures for heavy metal





## FISH

Four species of fishes were identified in the kurichi pond.

1. *Catla catla* (Hamilton,1822)
2. *Labeo rohita* (Hamilton,1822)
3. *Tilapia mossambica* (Peters,1952)
4. *Channa punctatus* (Bloch)

## RESULTS

Data on the seasonal variations in the physico-chemical parameters, nutrients and fishes of the Kurichi pond, Coimbatore, Tamilnadu for a period of Ten months are presented in the tables (1-4) and figs (I - IV) and plate (I).

## Physical parameters (Table 1)

During the study period of Ten months, the values of water temperature was ranged from 25.7°C to 31.2°C during the months of June 2014 to Mar 2015. The colour of the pond water recorded as brownish during the months of June, July and Aug 2014. The minimum temperature of (25.7°C) was recorded in the month of Nov 2014. The maximum temperature of (31.2°C) was recorded in the month of Aug 2014.

During the study period of Ten months, the values of turbidity of the pond water was ranged between 17.13 to 32.32 Mg/l. The minimum value of (17.13 Mg/l) was recorded in the month of Mar 2015. The maximum value of (32.32) was recorded in the month of Jun 2014.



During the study period of Ten months, the values of the value of total solids (Suspended and dissolved) was ranged between 2450.17 to 3500.14 Mg/l. The minimum value of (2450.17 Mg/l) was recorded in the month of Aug 2014. The maximum value (3500.14 Mg/l) was recorded in the month of Jul 2014.

The minimum dissolved oxygen value (3.02 mg/l) was recorded during the month of Jul 2014. During the study period of Ten months, the values of dissolved carbon dioxide ranged from 0.97 to 2.02 Mg/l. Minimum value of (0.97 Mg/l) was recorded during the month of Sep 2014.

**Table 1. Data on the Monthly Variations in the Physical Characters of the Kurichi Pond, Coimbatore for the Months June 2014 - March 2015**

Month/Parameter	Temperature °C	Turbidity N.T.U	Colour	Odour	Suspended Solids (Mg/l)	Dissolved Solids (Mg/l)	Total Solids (Mg/l)
June	29.7	32.32	Brownish	Foul	1170.03	1350.08	2520.11
July	30.4	28.97	Brownish	Foul	1800.02	1700.12	3500.14
August	31.2	22.23	Brownish	Foul	1500.05	950.12	2450.17
September	29.4	22.43	Greenish	Algal	1415.01	1200.09	2615.10
October	29.3	21.87	Greenish	Algal	1800.03	1100.01	2900.04
November	25.7	19.90	Greenish	Algal	1400.09	1300.02	2700.11
December	26.3	20.41	Greenish	Algal	1600.04	1250.03	2850.07
January	26.1	24.32	Greenish	Algal	1800.01	1200.05	3000.06
February	28.1	21.23	Greenish	Algal	1400.03	1300.02	2700.05
March	27.3	17.13	Greenish	Algal	1300.05	1200.02	2500.07

**Table 2. Data on the Monthly Variations in the Chemical Characters of the Kurichi Pond, Coimbatore for the Months June 2014 - March 2015**

Month/Parameter	pH	Dissolved Oxygen (Mg/l)	Dissolved Carbon Di Oxide (Mg/l)	Total Hardness (Mg/l)	BOD (Mg/l)	COD (Mg/l)
June	7.7	5.94	1.38	39.35	9.07	5.7
July	7.6	3.02	1.67	40.75	28.26	4.3
August	7.9	3.82	1.61	42.20	29.01	4.8
September	7.4	4.32	0.97	54.90	20.09	6.7
October	8.1	4.27	1.57	32.00	9.82	7.1
November	8.3	4.01	2.01	32.00	10.66	7.3
December	8.0	3.71	2.02	60.80	10.82	7.5
January	8.4	3.52	1.88	41.00	11.79	7.3
February	7.1	4.01	1.47	30.50	13.62	8.1
March	7.7	4.24	1.71	36.50	13.01	8.0

**Table 3. Data on the Monthly Variations in the Nutrient Contents of the Kurichi Pond, Coimbatore for the Months June 2014 - March 2015**

Month/Parameter	Phosphates (Mg/l)	Silicates (Mg/l)	Nitrates (Mg/l)	Sulphates (Mg/l)	Calcium (Mg/l)	Magnesium (Mg/l)	Chloride (Mg/l)
June	0.62	0.84	68.12	5.87	43.81	58.92	48.11
July	0.57	0.87	69.24	5.98	45.58	62.43	51.41
August	0.52	0.69	59.12	5.76	52.87	65.58	59.26
September	0.48	0.71	70.04	7.22	56.28	69.26	69.17
October	0.62	0.76	73.14	7.43	53.79	72.23	58.21
November	0.53	0.70	72.25	7.76	58.54	74.11	63.11
December	0.54	0.82	76.30	6.22	61.24	76.19	62.18
January	0.66	0.86	58.11	6.93	65.61	85.23	64.27
February	0.56	0.89	77.19	6.74	63.46	86.37	66.87
March	0.63	0.92	68.87	6.71	67.59	87.48	67.79

#### Chemical parameters: (Table 2)

During the study period of Ten months, the values of pH were ranged between 7.1 to 8.4. The pond was found to be alkaline in nature throughout the study period. The minimum pH value was noticed as (7.1) during the month of Feb 2015. The maximum pH value was noticed as (8.4) during the month of Jan 2015.

During the study period of Ten months, the values of dissolved oxygen was found to range from 3.02 to 5.94 Mg/l. The amount of dissolved oxygen was found to be maximum (5.94 Mg/l) during the month of Jun 2014.

The maximum value of (2.02 Mg/l) was recorded during the month of Dec 2014.

During the study period of Ten months, the values of total hardness ranged from 30.50-60.80 Mg/l. Minimum value of (30.50 Mg/l) was recorded during the month of Feb 2015. The maximum value of (60.80 Mg/l) was recorded during the month of Dec 2014.

During the study period of Ten months, the B.O.D values were ranging from 9.07 to 29.01 Mg/l. An increase in the B.O.D values (29.01 Mg/l) was recorded in the month of Aug 2014. A decrease in the B.O.D value (9.07 Mg/l) was recorded in the month of Jun 2014.

**Nutrient contents: (Table 3)**

During the study period of Ten months, the values of phosphates were ranged between 0.48 to 0.66 Mg/l. Maximum phosphate value of (0.66 Mg/l) recorded during the month of Jan 2015. Minimum phosphate value of (0.48 Mg/l) was recorded during the month of Sep 2014.

During the study period of Ten months, the values of silicate were ranged between (0.69 to 0.92 Mg/l). The silicate value was found to be maximum (0.92 Mg/l) during the month of Mar 2015. The silicate value was found to be minimum (0.69 Mg/l) during the month of Aug 2014.

During the study period of Ten months, the values of nitrate were ranged from 58.11 to 77.19 Mg/l. The amount of nitrate was found to be maximum (77.19 Mg/l) during the month of Feb 2015. The amount of nitrate was found to be minimum (58.11 Mg/l) during the month of Jan 2015.

During the study period of Ten months, the values of sulphates were ranged between 5.76 to 7.76 Mg/l. The values of sulphates were showed no higher variations during the study period. The sulphate value was found to be maximum (7.76 Mg/l) during the month of Nov 2014. The sulphate value was found to be minimum (5.76) during the month of Aug 2014.

During the study period of Ten months, the values of calcium was ranged from 43.81 to 67.59 Mg/l. The amount of calcium (67.59 Mg/l) was recorded as maximum during the month of Mar 2015. The amount of calcium (43.81 Mg/l) was recorded as minimum during the month of Jun 2014.

During the study period of Ten months, the values of chloride was ranged between 51.41 to 69.17 Mg/l. The highest value of (69.17 Mg/l) chloride was recorded as maximum during the month of Sep 2014. The lowest value of (51.41Mg/l) chloride as minimum during the month of Jul 2014.

**Heavy metals (Table 4)**

During the study period of Ten months, the values of Copper was ranged between 0.98 to 1.93 Mg/l. The highest value of (1.93 Mg/l) Copper was recorded as maximum during the month of Dec 2014. The lowest value of (0.98 Mg/l) Copper as minimum during the month of Jul 2014.

During the study period of Ten months, the values of Chromium was ranged between 0.34 to 1.89 Mg/l. The highest value of (1.89 Mg/l) Chromium was recorded as maximum during the month of Feb 2015. The lowest value of (0.34 Mg/l) Chromium as minimum during the month of Nov 2014.

During the study period of Ten months, the values of Nickel was ranged between 0.34 to 1.75 Mg/l. The highest value of (1.75 Mg/l) Nickel was recorded as maximum during the month of Dec 2014. The lowest value of (0.34 Mg/l) Nickel as minimum during the month of Oct 2014.

During the study period of Ten months, the values of Lead was ranged between 0.41 to 1.12 Mg/l. The highest value of (1.12 Mg/l) Lead was recorded as maximum during the month of Mar 2014. The lowest value of (0.41 Mg/l) Lead as minimum during the month of Jun 2014.

**Table 4. Data on the Monthly Variations in the Heavy metal Contamination of the Kurichi Pond, Coimbatore for the Months June 2014 - March 2015**

Month/Parameter	Copper (Mg/l)	Chromium (Mg/l)	Nickel (Mg/l)	Lead (Mg/l)	Manganese (Mg/l)	Zinc (Mg/l)
June	1.35	0.91	0.97	0.41	0.63	0.47
July	0.98	0.87	1.07	0.45	0.66	0.36
August	1.21	1.05	1.21	0.73	0.74	0.66
September	1.55	1.08	1.31	0.79	0.86	0.71
October	1.71	1.11	0.34	0.91	0.61	0.92
November	1.83	0.34	0.42	0.95	0.95	1.04
December	1.93	1.49	1.75	0.87	0.43	0.78
January	1.76	0.83	0.52	1.02	0.49	0.96
February	1.90	1.89	0.61	1.09	1.07	1.02
March	1.63	0.92	1.56	1.12	1.00	1.03

**Table 5. Data on the Fish Population of the Kurichi Pond, Coimbatore for the Months June 2014 - March 2015**

Order	Family	Species
Cypriniformes	Cyprinidae	<i>Catla catla</i> (Hamilton,1822)
Cypriniformes	Cyprinidae	<i>Labeo rohita</i> (Hamilton,1822)
Perciformes	Cichlidae	<i>Tilapia mosambica</i> (Peters,1952)
Perciformes	Channidae	<i>Channa punctatus</i> (Bloch)

During the study period of Ten months, the values of magnesium was ranged between 58.92 to 87.48 Mg/l. The highest value of (87.48 Mg/l) magnesium was recorded as maximum during the month of Mar 2015. The lowest value of (58.92mg/l) magnesium as minimum during the month of Jun 2014.

During the study period of Ten months, the values of Manganese was ranged between 0.43 to 1.07 Mg/l. The highest value of (1.07 Mg/l) nickel was recorded as maximum during the month of Feb 2015. The lowest value of (0.43 Mg/l) nickel as minimum during the month of Dec 2014.

During the study period of Ten months, the values of Zinc was ranged between 0.36-1.04 Mg/l. The highest value of (1.04 Mg/l) Zinc was recorded as maximum during the month of Nov 2014. The lowest value of (0.36 Mg/l) Zinc as minimum during the month of Jul 2014.

#### Fish: (Table 5)

Four species of fish were identified namely *Catla catla*, *Labeo rohita*, *Tilapia mosambica*, *Channa punctatus*.

#### DISCUSSION

The rapid increased in the rate of human population and industrialization in India, has created problems of disposal of waste products which are indiscriminately discharged into the nearby ponds, reservoirs, lakes and tanks and even in the adjoining fields with almost no pre-treatment (Jhingran, 1971). The present investigation has been undertaken to study the nature along with the environmental parameters in order to elucidate their interrelationship in a lentic water body (Prasannakumari *et al.*, 2000). Due to the lack of treatment and improper mode of disposal of the industrial wastes, municipal sewage and domestic wastes the ponds are polluted. This impairs the water quality and the suitability for domestic purpose, recreation, irrigation, aquaculture, etc. The physico-chemical and biological characteristics of the pond get altered.

The Kurichi pond, receives more amount of water during monsoon periods. The water samples collected from the pond were analysed for nutrients and the results were discussed with the physico-chemical parameters. Totally four species of fishes were identified namely, *Catla catla* (Halmilton), *Cyprinus carpio* (Linnaeus), *Tilapia mossambica* (Peters), and *Channa punctatus* (Bloch). The fish population was very less due to the mixing of effluents from the small scale industries, boating, fishing, continuous disturbances by the man, bathing and washing of vehicles.

#### Acknowledgement

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