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SOME HYDROGRAPHICAL PARAMETERS OF PARAVUR LAKE IN KOLLAM DISTRICT, INDIA

J. SREEJA AND S. GEETHA
PG & RESEARCH DEPARTMENT OF ZOOLOGY
S.N. COLLEGE, KOLLAM-691 001, INDIA
(e-mail : sreejapvr@gmail.com)

The present investigation deals with the distribution and monthly variation of certain hydrographical parameters of Paravur Lake in Kollam District, Kerala during the year January to December 2005. The water quality is not in a desirable level because of the discharging of domestic sewage, industrial waste, sand mining and brick manufacturing industries which directly or indirectly effects serious threat to the aquatic life in this backwater.

Key words : Hydrographical, physico-chemical factors, Paravur lake, Spillway shutter, Ithikkara river.

INTRODUCTION

The various environmental and biological characteristics in a water body have a dynamic equilibrium with one another, while the physical and chemical parameters in themselves determine the favorability of the water course for fish and other aquatic organisms. Environmental conditions play a vital role in governing the life history, behaviour, distribution and abundance of organisms particularly in the aquatic environments. Knowledge of the environmental feature is highly essential for understanding the occurrence and abundance of aquatic organisms. It also provides valuable information for suitable management practices to be taken for their sustainability. Thus regular monitoring of different environmental parameter is a prerequisite for the proper evaluation of the ecosystem.

Physico-chemical factors of the estuarine environment also influence the abundance and diversity of biotic communities and they have an important role on productivity potential. Hence, an investigation on the distribution, seasonal variation and utilization of nutrients assumes exceptional significance. Some of the important works are reported by Menon *et al.* (2000), Allason (2001), Batè *et al.* (2002), Anilkumar & Dinesh Kumar (2002), Ananthan *et al.* (2004), Deepmala *et al.* (2006) and Manishi *et al.* (2009).

The Study Area (Paravur Lake Fig. 1)

The Paravur lake (Lat. $8^0$41'-$8^0$46' N; Long. $76^0$44'-$76^0$48' E) is a comparatively shallow estuary of Kollam district, Kerala. The lake is connected to the adjoining Lakshadweep Sea by a narrow flood water outlet channel of 40 m bottom width with a regulator constructed by the irrigation department, Government of Kerala, with a view to controlling the flood water and preventing the intrusion of neritic water into it.

Station I (Pozhikkara) : The lake joins the sea at Pozhikkara. This is the deepest part of the Lake. Being very close to the sea and profoundly influenced by it, this is a transitional zone having widely varying hydrographical features.

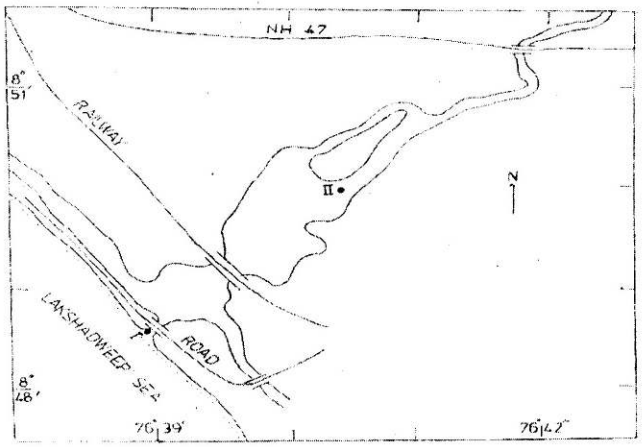

Fig. 1 : Map showing the study area-Paravur Lake

Station II (Kallumkunnu) : This is the portion where the Ithikkara River joins with the backwater. Water is highly turbid, soil is muddy in nature, salinity is low when compared with station I and the depth is above 1.5m. Reclamation of the areas for prawn culture reduces water front areas to a considerable extent causing ecological problems.

MATERIALS AND METHODS

Monthly physicochemical parameters of Paravur Lake have been investigated on all seasons during the year January to December 2005. Air, water temperature were measured with the help of centigrade thermometer pH by digital pH meter and other parameters were analyzed using standards methods of APHA 1998. Simple correlation matrices between various water quality parameters were analyzed. Strickland & Parsons (1972), Grasshoff (1983), Trivedy & Goel (1986).

RESULTS

The data obtained on physicochemical parameters of two stations of Paravur Lake were presented in Table 1 and 2. The correlation tables were represented in Table III & IV.

Atmospheric temperature varied from 26^{0}c to 30^{0}c in both the stations (March, April & September in Station I) and (February, June & December in Station II). Water temperature showed temperature variations from 26^{0}C-28^{0}C in both the stations (February & April in Station I and June, March & September in Station II). pH variation noted during all the months were less and ranged between 6.8 (March) to 7.8 (July) in station I and 6.8 (June) to 8.5 (July) in station II. Salinity ranged between 27 $^0/_{00}$ (June in station I) to 33 $^0/_{00}$ (February in Station I). In station II the variations were 6 $^0/_{00}$ (August) to 28 $^0/_{00}$ (January). Dissolved Oxygen in station I ranged from 3.12 mg/l (September) to 5.34mg/l (February) and in station II 4.01mg/l (March) to 6.58 mg/l (July).

Nitrite-Nitrogen : It was varied from 0.01 µg.at./l (August in Station I) to 0.38µg.at./l (September in Station I). In station II, it ranged from 0.008 µg.at./l (August) to 0.51µg at./l.

Table I : Variation in hydrographical parameters at Station I during Jan to Dec 2005.

Months/Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Atm.temp (^{0}C)	28	26	30	30	29	26	28	28	30	29	29	26
Water temp (^{0}C)	24	22	26	28	25	24	25	24	25	24	25	23
pH	7.5	7.4	6.8	7.3	7.3	7.5	7.8	7.4	7.5	7.2	7.3	7.1
Salinity ($^0/_{00}$)	30	33	32	32	31	27	28	28	28	29	30	30
DO (mg/l)	5.32	5.34	3.24	3.96	3.24	4.18	4.84	4.21	3.12	4.36	3.32	3.96
Nitrate(μ g at.//l)	0.89	0.75	0.54	0.18	0.06	0.02	0.17	0.11	0.34	0.65	0.38	0.43
Nitrite (μ g at.//l)	0.02	0.03	0.03	0.02	0.02	0.11	0.11	0.01	0.38	0.03	0.18	0.02
Phosphate (μ g at.//l)	0.04	0.04	0.03	0.04	0.08	0.10	0.01	0.20	0.06	0.02	0.02	0.04

Table II : Variation in hydrographical parameters at Station II during Jan to Dec 2005.

Months/Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Atm temp(^{0}C)	28	26	30	30	29	26	28	28	30	29	29	27
Water temp (^{0}C)	25	24	28	27	26	22	26	27	28	26	26	25
pH	7.7	7.7	7.4	7.6	7.8	6.8	8.5	7.2	8.1	8.1	8.1	7.9
Salinity ($^0/_{00}$)	28	20	15	17	15	10	9	6	15	12	14	16
DO (mg/l)	4.81	4.33	4.01	4.33	4.58	5.21	6.58	5.82	4.83	5.81	4.58	5.62
Nitrate(μ g at.//l)	0.02	0.02	0.02	0.01	0.02	0.11	0.14	0.008	0.64	0.04	0.54	0.04
Nitrite (μ g at.//l)	0.04	0.04	0.04	0.02	0.14	0.10	0.04	0.008	0.47	0.02	0.51	0.47
Phosphate (μ g.at./l)	0.15	0.05	0.04	0.03	0.13	0.19	0.10	0.32	0.24	0.01	0.05	0.26

Nitrate-Nitrogen : In station I, it ranged between 0.02 µg.at./l (June) to 0.89 µg.at./l. In station II, 0.008 µg.at./l (August)-0.64 µg.at./l.

Phosphate-Phosphorus : In station I, it ranged between 0.01µg.at/l (July)-0.20 µg.at./l (August) and in Station II, 0.01µg.at/l (October)-0.32µg.at./l (August).

Simple correlation coefficient analysis in station I showed positive correlation of air and water temperatures were found to be highly significant at 1% level and atmospheric temperature was positively correlated with oxygen at 5% significant level. In station II air and water temperature showed a positive correlation at 1% level. Nitrate and nitrite showed a positive correlation at 1% significant level.

DISCUSSION

Earlier workers have investigated the ecology of backwater systems (Azis, 1978 & Santhosh, 2002). The present condition is totally changed because the spillway shutter is not functioning from 1990 onwards. Spillway without shutter allows free flow of neritic water into Paravur Lake. Thus the salinity of the lake increased many folds which entirely alter the hydrobiological conditions of the lake. Now the hydro-chemistry of Paravur backwater is mainly controlled by tidal action from the sea, through the spillway shutter and the fresh water discharge from the Ithikkara River.

Minimum water temperature at station I and II may be due to the dense vegetation growing along the banks. Mean season wise values were computed; a low temperature was noticed almost at the two stations during monsoon. This may be due to the South-West monsoon. But both stations also showed maximum value recorded during pre monsoon. Rao & Umamaheshwara Rao (2002) also observed a similar temperature variation during monsoon and premonsoon season South-West monsoon has an important role in Kerala coast. This brings marked changes in physicochemical properties of estuarine water. Shibu (1991) recorded a temperature fluctuation from 24.7°C to 31.3°C at Paravur backwater system. This value is within the range of present data.

The normal pH of freshwater ranged between 7.0 and 8.5. Maximum hydrogen ion concentration values may be due to climatological and vegetational factors as pointed out by Kant & Kachroo (1975).

Table III: Correlation coefficient between the various physico-chemical parameters of station-I.

Parameters	Air	Water	pH	Salinity	Oxygen	Nitrate	Nitrite
Air Temperature (^{0}C)	-						
Water Temperature (^{0}C)	792**	-					
pH	-.227	-.147					
Salinity ($^0/_{00}$)	-.134	.296	-.273				
Dissolved Oxygen (mg/l)	-.577*	-.496	.443	-.071	-		
Nitrate (μ g/l)	-.070	-.388	-.237	.026	.469	-	
Nitrite (μ g/l)	.281	.101	.400	-.288	-.409	-.153	-
Phosphate (μ g/l)	-.156	-.133	.093	.110	-.064	-.458	-.145

** : Correlation is significant the 0.01 level (2-tailed); * : Correlation is significant at the 0.05 level (2-tailed).

Table IV : Correlation coefficient between the various physico-chemical Parameters of station-II.

Parameters	Air	Water	pH	Salinity	Oxygen	Nitrate	Nitrite
Air Temperature (^{0}C)	-						
Water Temperature (^{0}C)	883**	-					
pH	.323	.361	-				
Salinity ($^0/_{00}$)	.000	-.109	.096	-			
Dissolved Oxygen (mg/l)	-.292	-.140	.303	-.551	-		
Nitrate (μ g/l)	.316	.257	.399	-.099	-.072	-	
Nitrite (μ g/l)	.109	.093	.350	.029	-.080	.757**	-
Phosphate (μ g/l)	-.275	-.041	.281	-.251	.376	.098	.282

** : Correlation is significant the 0.01 level (2-tailed); * : Correlation is significant at the 0.05 level (2-tailed).

pH showed the production nature of backwater, maintaining the pH of the water on most of the occasion to the attractive side. The pH values of the present investigation were slightly higher than that of earlier studies made by Shibu (1991) in Paravur backwater system which may be due to the intrusion of high saline water into the backwater system (Sunilkumar, 2002).

The mean season wise variation showed a minimum concentration of dissolved oxygen at pre monsoon in station I and II and maximum during post monsoon at both the stations. This may due to the increasing river discharge during monsoon (Madhukumar and Anirudhan, 1996). Trivedi and Goel (1986) also noticed that the oxygen depletion may be due to the accumulation of organic wastes and stratification of water.

A salinity fluctuation was mainly due to seasonal variations. At station I, the mixing up of backwater and seawater was high during post monsoon due to high tidal cycles so that the salt-water intrusion was high in this area. Seasonal mean values showed minimum concentration of salinity during monsoon and post monsoon season. This may be due to the effect of southwest monsoon (Sunilkumar, 2002).

When compared with the earlier data of Shibu (1991), the present observation of nitrite – nitrogen, nitrate – nitrogen and phosphate-phosphorus is higher than the earlier observations. This may be due to the sand deposition and shallowness of the Paravur backwater systems. The nitrite – nitrogen, nitrate – nitrogen and phosphate-phosphorous concentration of riverine zone showed an increasing pattern, when compared with the data of Sheeba (1999).

Major factors affecting the integrity of aquatic organism have been studied with view to indicating the natural conditions. It also provides valuable information for suitable management practices to be taken for their sustainability.

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