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Studies on the hydrobiological parameters and the distribution of nutrients in (grand anaicut and lower anaicut) the river cauvery, thanjavur, Tamil nadu, India

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ABSTRACT

The present investigation on the hydrobiological and distribution of nutrients in various seasons at Grand Anaicut and Lower Anaicut (Stations I and II) reservoir of River Cauvery were thoroughly studied during July 2010 to June 2012. The physico-chemical parameters such as atmospheric and water temperature, pH, DO, alkalinity, nitrate, phosphate, turbidity, humidity and rainfall were showed significant seasonal variation, rainfall and humidity were found to be high during north east monsoon and low during summer. There was a slight seasonal variation noticed between atmospheric and water temperature, pH showed alkaline range throughout the study period. DO, alkalinity and humidity showed significant variation. The data were statistically analysed with one way ANOVA are presented.

Keywords: River Cauvery hydrobiology, Nutrients, Humidity, Alkalinity.

INTRODUCTION

The hydrobiological parameters and distribution of nutrients influence the aquatic organisms. The physico-chemical parameters of riverine ecosystem have been reported by many workers (Abraham, 1979; Mishra and Yadav, 1978; Jhingran, 1969; Srikanth, 1992; Singh and Singh, 1995; Thirumurugan, 2000; Raju et al., 2008; Basu and Lokesh, 2012 and Vijayalakshmi et al., 2013).

The temperature and rainfall are an important abiotic factors which alter other physico-chemical

parameters (Thirumurugan, 2000; Pazhanisamy and Ebanasar, 2008; Umamaheswari and Anbu Saravanan, 2009). The pH of the river water is measures of how acidic or basic, the water is an scale of limits minimum to maximum and the normal range (Begum and Harikrishna, 2008). Oxygen in the most important constituent of surface water, as all aerobic organisms require for survival. The level of dissolved oxygen return in the water due to its continuous diffusion on the surface of water influenced by the

temperature of the surrounding (Devaraj et al., 1998). Alkalinity is another important measure of the water is due to the presence of minerals in the water and its range of productivity of water varies from season to season and it present in the permissible limits the river Cauvery, which reveal the polluted condition (Srinivasan et al., 1980; and Somasekar, 1985). Turbidity is another measure of the water and abiotic factor of aquatic ecosystem which is mainly due to the dissolved oxygen and suspended salt particulate material and plankton of water (Mangayarkarasi, 1996).

Though the informations are available on physicochemical parameters of river Cauvery comparison of reservoir is meagre. Hence the present study is aimed to study hydrobiological parameters and distribution of nutrients in Grand Anaicut and Lower Anaicut (Stations I and II) at river Cauvery, Thanjavur district, Tamil Nadu, India.

MATERIALS AND METHOD

The Grand Anaicut (Station I) and Lowe Anaicut (Station-II) of Cauvery is in the deltaic region of Tamil Nadu Lat.10°48' N and Long.78°42'E (Station I) and 11°15' N and 79°30'E (Station II). The water samples were collected in a clean polythene containers. The samples were made from 8 to 9 am for two years and brought to the laboratory for further analysis by using standard methods (APHA, 1986).

Atmospheric and water temperature were recorded by mercury filled thermometer, pH was measured with the help of Elico-Model L¹-10^T pH meter. DO (Dissolved Oxygen) of the water samples were estimated by Winkler's method (Winkler, 1988), alkalinity by Stumm and Morgan (1981) method, nitrate by Mullen and Riley (1995) method, turbidity meter was used for the turbidity of the sample. The atmospheric, humidity and rainfall data recorded at the sites were obtained from the Meteorological Departments. The mean values of hydrobiological parameters of the stations I and II were statistically substantiated with analysis of Covariance (ANCOVA).

RESULTS AND DISCUSSION

The spectacular region of the study areas were influenced by the seasonal variations in all

characteristics of physico-chemical parameters and it bringing out changes primary producers and distribution of nutrients. The hydrobiological parameters of the station I and II were carried out for two years from July 2010 to June 2012. The atmospheric temperature ranged from 27.3 to 34.16 and 27.4 to 33.2°C at stations I and II respectively. The water temperature varied from 26.4 to 32.7°C and 25.7 to 32.1°C at stations I and II respectively. The temperature was found to be high during summer and low during monsoon months. The pH was ranged from 7.27 to 7.83 and 7.30 to 7.76 at station I and II respectively. The pH showed alkaline range throughout the study period. The DO was found to be maximum (6.03 mg/l) in premonsoon and minimum (4.11 mg/l) in summer at station I and higher value (4.85 mg/l) in summer were noticed at station II. The alkalinity of water ranged from 183 to 232 and 170 to 235 (mg/l) at station I and II respectively. The nitrate concentration of water ranged from 0.71 to 1.91 (mg/l) and 0.52 to 2.37 (mg/l) at station I and II respectively. The phosphate was higher (1.15 mg/l) in summer and lower (0.25 mg/l) in monsoon. The mean turbidity ranged from 4.75 to 6.63 NTU and 4.83 to 7.20 NTU at station I and II respectively. The humidity was found to be maximum 74 to 83 and 70 to 84% at station I and II respectively. The monthly rainfall ranged from 44.2 – 378 mm and 43 to 390 mm at station I and II respectively in the river Cauvery (Table 1).

In this study the station I and II experienced heavy rainfall during monsoon period from October to December and minimum during summer months (May and June). This is an agreement with earlier workers (Abraham, 1979; Mishra and Yadav, 1978; Jhingran et al., 1969; Srikanth, 1992; Singh and Singh, 1995; Thirumurugan, 2000; Raja et al., 2008; Basu and Lokesh, 2012; Vijayalakshmi et al., 2013). Thirumurugan (2000) was observed a significant fluctuation in seasonal rainfall at Lower Anaicut area. Pazhanisamy and Ebanasar (2008), Umamaheswari and Anbu Saravanan (2009) had been reported that highest peaks of rainfall was observed in monsoon and lowest in summer. There was an indirect relationship noticed between temperature and humidity (Jeralad, 1994; Pazhanisamy and Ebanasar, 2008). Temperature is another important abiotic

factor which is influence the biota. In the present investigation, the study areas experienced the maximum temperature during summer period and minimum temperature during monsoon period (Jhingran et al., 1969; Prakash et al., 2009; Gupta and Deshpande, 2004). Begum and Harikrishna (2008) have been reported that the water temperature at some streams of Cauvery river ranging from 24 to 28°C. In the river Cauvery, the minimum temperature in monsoon and maximum in summer months were observed by several workers (Patra et al., 2011; Annalakshmi and Amsath, 2012). The hydrogen ion concentration is an important hydrobiological parameter which influences the feeding, growth and nutritive value of aquatic organisms (Ganesh et al., 2002). The variation in pH of the water is less pronounced throughout the study period as slight seasonal fluctuation in pH was observed in both the stations I and II as reported by earlier workers (Chakrabarthy et al., 1959; Mangayarkarsi, 1966; Raj et al., 2008).

Dissolved oxygen is an another important factor in this study, DO value were found to be maximum during winter and minimum during summer, which might be due to the natural turbulence and autotrophic producers by photosynthesis (Rajkumar et al., 2004). The range of DO at Lower Anaicut reservoir varied from 6.0 mg/l to 10.89 mg/l. Further, DO level in Cauvery ranging from 4.3 to 7.8 mg/l (Annalakshmi and Amsath, 2012). The alkalinity of river water is mainly due to the salts of weak acids, or strong bases. Bicarbonates and carbonates represents major form of alkalinity along with hydroxide alkalinity. The premonsoon had the peak value of total alkalinity followed by postmonsoon and monsoon in Lower Anaicut at river Cauvery

(Jeralad, 1994). In the river Cauvery, the alkaline ranged from 190-260 mg/l with seasonal fluctuation has been reported by Kalavathy et al. (2011). The nitrate content of the river is mainly due to the additions of nitrogenous compounds, decomposed biological materials. The most important source of nitrate is biological oxidation of organic nitrogenous substances.

According to Mangayarkarsi (1996), the seasonal changes in nitrate content were not highly significant, Pazhanisamy and Ebanasar (2008) observed a variation in nitrate content (0.1 – 0.23 mg/l) in Lower Anaicut reservoir. Phosphate is present in natural water as soluble phosphate and organic phosphates. It may enter in surface water as a result of anthropogenic wastes and runoff. The high total organic phosphate was found in waste water canal as reported by Bagjola from Calcutta (Saha et al., 2000). Baskar et al. (2013) have recorded a range of phosphate from 0.22 to 1.82 mg/l in the river Cauvery at Thanjavur district with slight seasonal fluctuation.

A decreased trend in the turbidity was noticed seasonally from monsoon to postmonsoon and to premonsoon in Lower Anaicut reservoir (Jerald, 1994). Amanullah (1994) reported that a maximum turbidity during premonsoon and minimum in postmonsoon period has been largely attributed due to suspended particles of various industrial effluent and washes of sewage (Umamaheswari and Anbu Saravanan, 2009) recorded a lower value during the monsoon period in the river Cauvery. The turbidity may cause large amounts of silt, microorganisms, plant fibres, saw dusts, wood ashes, chemical and coal dust (Patra et al., 2011).

TABLE 1: Seasonal average physico-chemical parameter at station I and II

(Grand Anaicut and Lower Anaicut) from the river Cauvery during 2010-2012

Season 2010-2012	Atmospheric temperature (°C)		Water temperature (°C)		pH		Dissolved oxygen (DO) (mg/l)		Alakalinity (mg/l)		Nitrate (mg/l)		Phosphate (mg/l)		Turbidity (NTU)		Humidity (%)		Rainfall (mm)	
	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂
Premonsoon	31.6	30.7	29.8	29.8	7.43	7.46	5.66	4.95	231	234	1.73	1.10	0.54	0.47	6.36	6.20	67	74	124	127
Monsoon	27.6	27.4	26.4	26.5	7.32	7.30	4.85	4.73	182	196	0.78	0.50	0.36	0.27	6.63	7.20	82	84	378	390
Postmonsoon	29.9	30.5	28.5	28.5	7.58	7.51	4.85	4.73	191	171	1.91	2.07	0.47	0.29	5.96	6.60	83	81	44.2	43.0
Summer	33.8	33.1	32.6	31.4	7.83	7.73	4.11	4.69	189	190	0.71	0.52	0.49	0.56	4.75	4.83	74	71	56.6	59.9
Premonsoon	31.3	31.2	29.7	28.0	7.51	7.54	6.03	4.10	232	235	1.83	2.37	0.61	0.38	6.43	6.10	77	70	114.6	124
Monsoon	27.3	27.4	27.4	25.7	7.27	7.48	4.74	5.61	183	186	0.78	0.54	0.34	0.25	6.23	7.13	81	84	373.3	372
Postmonsoon	30.7	30.6	30.6	28.7	7.57	7.69	4.70	4.85	192	170	1.18	1.63	0.41	0.29	6.00	6.00	82	79	51.6	53.3
Summer	34.16	33.2	32.7	32.1	7.26	7.76	4.44	4.51	221	189	1.07	0.56	1.15	0.45	4.78	5.20	75	74	53.3	64.4

CONCLUSION

In the present investigation reveals that the hydrobiological parameters and the distribution of

nutrients in the river Cauvery were within the permissible limit, which promotes aquaculture and irrigation.

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