Journal of Global Biosciences ISSN 2320-1355
Vol. 2(6), 2013, pp. 192-198 http://mutagens.co.in

LIMNOLOGICAL STUDY OF MALAPRABHA RIVER NEAR GANGAMBIKA TEMPLE, M.K.HUBLI, KARNATAKA

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Abstract

The influence of physico-chemical properties of Malaprabha river on its zooplankton composition abundance were investigated at three sites for one year from June 2001 to May 2012.Analysis of physico-chemical parameters like water temperature, pH, rainfall, DO, BOD, EC, Total alkalinity, Total hardness, chloride, SO4, Fe has been made during the investigation period. Results reveal all parameters are within the permissible limits. It was quite evident from the findings that the quality of river water near Gangambika temple was suitable for drinking, agriculture purposes.

Key words: Physico-chemical factors, Gangambika temple, malaprabha river.

Date of Online: 09-11-2013

INTRODUCTION

Water is a basic and most essential life sustaining substance. Rivers are large natural stream of water emptying into the ocean and they considered important fresh water resource for human beings. However, since many years, they have also been utilized for many activities of the human beings. River water contain only about 0.0001% of the total amount of water in this world .The river water generally collected from precipitation through surface runoff.

In recent years because of continuous population growth, rapid urbanization, load of wastes from industries, domestic sewage, and agricultural waste leading to deterioration of water quality. . Water quality assessment is critical for pollution control and the protection of surface and ground waters leading to the outbreak of water borne diseases such as cholera, paratyphoid, diarrhea, amoebic dysentery and hepatitis .Biodegradable organic matter is the contamination is concern for dissolved oxygen concentration which is the principal indicator of pollution of surface water.

In many places , both surface and ground waters are fouled with industrial, agricultural and municipal wastes and according to the World commission on water for the 21st century, more than half of the World, major rivers are so depleted and polluted that they endanger human health and poison surrounding ecosystems[1].There is progressive deterioration of water quality throughout the world. The causative factors responsible for degrading water quality need to be evaluated so as to take proper steps before the situation becomes worst.

MATERIALS AND METHODS:

River Malaprabha is one of the prominent river of Krishna basin. River originates in the Western Ghat at Kanakumbi village which lies between 15^0 42" 20' North latitude and 74^0 13" 9' East longitude. The assessment of physic-chemical factors was carried out for one year i.e,. from June 2011 to May 2012.

Sampling site was selected near Gangambika temple of Malaprabha river near M.K.Hubli located between 15^0 42' 19.2" North latitude and 74^0 42' 26.7" east longitude. Samples were collected monthly during 7.30 am to 9.00 am and this was uniformly maintained throughout the study period. Collected water samples were brought to the laboratory for analysis of physico-chemical factors and biological factors following the procedures of standard methods APHA[2] and methods for Pollution studies[3]. Physico-chemical parameters such as temperature, pH were measured at site only. Remaining parameters such as dissolved oxygen, biochemical oxygen demand, EC, total solids, sodium , potassium, total hardness, calcium, magnesium nitrate iron and fluoride were analyzed in

the laboratory. Data for rainfall obtained from District Statistical Office. After analysis statistical application such as standard deviation, simple correlation coefficient test was used.

RESULTS AND DISCUSSION

The data on physico-chemical analysis has been presented in Table 1.,.Seasonal variations of Physico-chemical parameters were presented in Table 2 & Simple correlation test was presented in Table 3.

The physico-chemical factors of natural water body may vary substantially at different seasons of the study period. The factors contributing to such changes include topography of the area, atmospheric precipitation by rain and other meteorological forces in and around water body.

Temperature is an important physical parameter of the water body which regulates natural process within the environment and governs physiological function in organism [4]. According to Mishra and Tripaty [5] fast microbial decomposition followed by release of energy could one of the reasons for increased temperature. In the present study temperature fluctuate between 21 ^{0}C to 30 ^{0}C. Maximum temperature was recorded in the month of April and May. Minimum temperature was observed in June August and September. Temperature is an important physical parameter of the water body which regulates natural process within the environment and governs physiological function in organism[4]. Seasonally as usual maximum in summer and minimum in monsoon. Temperature is significantly correlated with BOD, TDS, EC, Sodium, Total hardness and iron. It is also negatively correlated with rainfall, pH and nitrate

Rain is a type of precipitation, a product of the condensation of atmospheric water vapour that is released on the earth's surface. Rainfall can be a significant source of variation in surface water quality. Runoff can improve, degrade or not alter the water quality of streams depending on the land use, slope, soil type. Rainfall in both the sites was ranged between 30 mm to 745.7 mm. Maximum rainfall observed in the month of August and minimum rainfall 30 mm in May. There was no rainfall from December to April..

pH is a variable parameter which serves as an important index for the degree of pollution. In the present investigation the pH was alkaline throughout the study period and values ranged between 7 and 8.1. Similar values recorded in Perumal lake of Cuddalore[6]. Maximum pH recorded in November and lowest value recorded in February. Seasonally maximum pH is recorded in monsoon and minimum was in summer.

Dissolved oxygen is required for living organisms to maintain their biological process. Dissolved oxygen has been attributed a great significance as an indicator of water quality. DO concentration in water is mainly dependent upon temperature, dissolved salts velocity of wind, pollution load etc[7]. In the present study, DO values were recorded 6.3 mg/l to 8.7 mg/l. Maximum Do was recorded in October where temperature was less and minimum Do was 6.3 mg/l recorded in May where the temperature was highest. Seasonally it is less values recorded in summer, solubility of oxygen decreases with increase in temperature. Similar observation recorded in river Mosam[8]. Dissolved oxygen is essential for sustaining the plant and animal life any aquatic system. If Do level drops below the level necessary to sustain normal life then the aquatic system is classified as polluted .Dissolved oxygen is negatively correlated with BOD.

Biochemical oxygen demand is an indicator parameter to know the presence of biodegradable matter and express the degree of contamination.BOD values ranged from 0.4 to 1.00 mg/l. Higher values of BOD were noted during summer months due to favorable environmental conditions for microbial activities at higher temperature. This is in concurrence with the findings of Halali reservoir[9]. An inverse correlation relationship occur with DO.

Total dissolved solid is a measure of the solid materials dissolved in the river water. This includes salts, some organic materials .Waters with higher solids content have laxative and sometimes the reverse effect upon people whose bodies are not adjusted to them. TDS consist of oxygen demanding wastes, disease causing agents, which can cause immense harm to public health. TDS values are ranged between 100 mg/l to 312 mg/l. Higher values are recorded from January to May. According to various workers, in many natural water bodies of India, TDS is proportional to the degree of pollution([10]. High values of TDS in drinking water are generally not harmful to human beings but high concentration of these may affect persons suffering from kidney and heart diseases. TDS values

in the study area are well within the limits of drinking water standards. Thus, water is potable and may be utilized for human and animal consumption.

Electrical conductivity is a numerical expression of the ability of an aqueous solution to carry an electric current. As most of the salts in the water are present in the ionic form, are responsible to conduct electrical current. EC values are ranged from 162 to 480 µ mhos/cm. Maximum value 480 µ mhos/cm and minimum value 162 µ mhos/cm recorded. The higher value was recorded during summer and lower during monsoon. Similar findings recorded in Mula dam of Rahuri[11].

Chlorides are generally present in natural waters. The presence of chloride in natural waters attributed to dissolution of salt deposits. Chloride values are ranged from 36 to 86 mg/l . Maximum values of chloride observed in summer (March) and minimum values recorded in post monsoon (December). Munawar[12] has suggested that the higher value is an indication of animal origin pollution. High values of chloride may be associated with high temperature and less DO. Seasonally high values of chloride recorded in summer and associated with high temperature. In the present study values are well below the permission limits. Chloride is negatively correlated with pH and positively correlated with BOD.

Sodium in fresh waters occurs through weathering of rocks. Sodium quantities varied between 6 mg/l to 41 mg/l .High quantity of sodium makes the salty taste of water making unfit for human consumption but in the present study values are below the permissible limit. Potassium is a cation which occurs in natural waters in low quantity and play important role in the metabolism of fresh water environments and considered to be important macronutrient. Values varied between 1 to 6.00 mg/l .

Sulphate itself has never been a limiting factor in aquatic ecosystems. Sulphate ion is one of the important anion present in natural water and produce cathartic effect on human beings when present in excess amount [13] . In the present study sulphate value was 6 to 45 mg/l . Lower values observed in monsoon season. This may be due to the dilution of river water and higher values because of runoff water from agricultural lands. Seasonally higher values recorded in summer , this may be due to the mixing of effluents from the surrounding villages.

Total hardness of the river water fluctuated between 30 mg/l to 120 mg/l The trend of variation was non-uniform in all the seasons but values increased in summer season. The results indicate that values are below the permissible limits, showing their suitability for drinking .

Calcium is found in great abundance in all natural waters as its main source is weathering of rocks from which it leaches out. Values of calcium are varied between 10.1 mg/l to 26 mg/l .The present findings reveal that calcium content was higher in summer and lower in monsoon months. Similar findings recorded in Almatti reservoir [14]. Magnesium values are very less compared with the calcium. Calcium and magnesium play an important role in antagonizing the toxic effects of various ions. Similar observations recorded in temple pond of Kerala[15].

Domestic sewage contains very high amount of nitrogenous compounds, runoff from agricultural fields is also contain nitrate. Unpolluted natural water contains usually only minute amount of nitrate. The main source of the nitrate is the decomposition and biodegradation of organic matter. The nitrate level was from 2 to 14 mg/l. In monsoon values are more due to excessive rainfall. Similar results are noticed in Muvathupuzha river, Kottayam(Dist) Kerala[16]. Such lower quantities also observed in Almatti reservoir of Karnataka[14].

Presence of iron in considerable amounts in water imparts colour and develops turbidity when exposed to air, consequently water becomes unacceptable for drinking. Iron values in the present study were 0.2 to 1.00 mg/l. Values were found below the permissible limits for drinking water.

Fluoride and chromium are totally below the detectable limits.

CONCLUSION

Most of the parameters analysed in the Malaprabha river near M.K.Hubli were in acceptable range. The river at this point is suitable for drinking , bathing, recreation, irrigation purposes. Thus, it can be concluded that the river water is within the safe limits and is fit for consumption. People, particularly those living along the banks of river, should realize that the river is for them and they are for the river and not a waste disposal site. Anthropogenic activities must be reduced.

ACKNOWLEDGEMENT

Author is grateful to University Grants Commission, New Delhi for awarding Major Research Project and Financial assistance. He is also thankful to the Principal and staff of Zoology, R.L.Science Institute, Belgaum for their continuous encouragements throughout the study period.

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Table 1: Monthly variations in Physico-chemical factors of Malaprabha river at Gangaambika site near M.K.Hubli

	Temp	Rain fall	pH	BOD	DO	TDS	EC	Cl	Na	K	SO_4	TH	Ca	Mg	Nitrate as NO3	Iron
June 2011	21	123.7	7.7	.8	8	120	180	40	6	2.0	10	55	10.1	3.59	4.8	.24
July	22	85.8	7.9	.72	6.8	142	200	50	17.1	2.1	20	101	15.6	4.15	8	0.16
August	21	81.7	7.6	.6	7.8	144	210	56	16.0	1.8	22	30	8.8	1.95	10	0.20
September	21	82.5	7.4	.7	7.4	120	180	72	18.0	2.0	24	62	16	5.34	14	0.80
October	23	119.9	7.2	.4	8.7	126	190	58	18.0	1.9	20	46	10.1	5.04	6	0.10
November	23	00	8.1	.34	7.6	100	162	40	26.6	6.0	17	92	16.4	9.47	8	0.2
December	25	00	7.2	.44	7.3	152	210	36	25	1.8	20	90	18.2	8.86	4	0.16
January 2012	28	00	7.3	.62	8.2	312	480	44	34	6.0	16	78	13	6.19	2	0.2
February	28	00	7	.92	7.4	310	460	80	20	2.0	12	120	26	13.36	4	0.17
March	29	00	7.1	1.0	7.1	260	380	86	25	3.0	6	94	24	6.07	7.1	0.8
April	30	16.2	7.16	1.0	6.8	230	340	68	30	1.0	18	104	22	6.07	8	0.9
May 2012	30	4.6	7.5	.9	6.3	290	440	52	41.0	4.5	45	110	24	4.86	2	1.0

All are average values, expressed in mg/l except temp(C^0), pH and Conductivity (µ mhos/cm), Rainfall in mm, BDL=Below Detectable Limit)

Table 2: Average seasonal variations in Physico-chemical factors in Gangambika Temple of Malaprabha river during 2011-12

	Monsoon	**Winter**	**Summer**
Temp	21.5	24.7	29.25
Rainfall	93.45	29.97	5.2
pH	7.65	7.45	7.19
BOD	0.70	0.45	0.95
DO	7.5	7.95	6.9
TDS	131.5	172.5	272.5
EC	192.5	260.5	405
Cl	54.5	44.5	71.5
Na	14.27	25.9	29
K	1.97	3.92	2.62
SO4	19	18.25	20.25
TH	62	76.5	107
Ca	12.62	14.42	24
Mg	3.75	7.39	7.29
NO3	9.2	5	5.27
Fe	0.35	0.16	0.71

Table 3 : Simple correlation coefficient test between physico-chemical factors of Malaprabha river near Gangambika temple

	Temp	RF	pH	BOD	DO	TDS	EC	Cl	Na	K	SO4	TH	Ca	Mg	NO3	Fe
Temp	1.000	-.767*	-.577*	.577	-.465	.876**	.870**	.362	.782**	.223	.117	.702**	.777**	.376	.522*	.552*
RF		1.000	.280	-.201	.455	-.652*	-.650*	.128	-.772**	- .478	-.043	-.725**	-.734**	-.635*	.396	-.274
pH			1.000	-.400	-.046	-.584*	-.555*	-.592*	-.194	.371	.177	-.166	-.429	-.318	.236	-.240
BOD				1.000	-.583*	.617*	.594*	.640*	.140	-.276	-.054	.461	.624*	-.022	-.079	.657*
DO					1.000	-.313	-.285	-.220	-.460	.064	-.432	-.709**	-.731**	-.072	-.014	-.660*
TDS						1.000	.997**	.401	.631*	.264	..070	.578*	.642*	.337	-.592*	.338
Ec							1.000	.380	.648*	.317	.085	.562*	.620*	.334	-.597*	.338
Cl								1.000	-.008	-.355	-.233	.214	.540*	.118	.337	.479
Na									1.000	.569*	.521*	.552*	.540*	.214	-.426	.490
K										1.000	.169	.192	.026	.166	-.372	-.033
SO4											1.000	.086	.098	-.259	-.099	.394
TH												1.000	.884**	.639*	-.384	.316
Ca													1.000	.601*	-.227	.564*
Mg														1.000	-.287	-.180
NO3															1.000	.183
Fe																1.000

** Correlation is significant at the 0.01 level
* Correlation is significant at the 0.05 level