*International Research Journal of Environment Sciences*_____ ISSN 2319–1414
Vol. **2(4),** 56-58, April **(2013)** *Int. Res. J. Environment Sci.*

Short Communication

Evaluation of Current Environment Status of *Kottayam Chira*

Rakesh V.B., Adhem Shahin, Amarnath A. and Rojith G.
School of Environmental Studies, Cochin University of Science and Technology, Kochi, Kerala, INDIA

Available online at: www.isca.in
Received 2nd November 2012, revised 31th December 2012, accepted 16th January 2013

Abstract

Kottayam Chira is a significant water body with a total area of around 11 acres at present. It is located about 1.5 kms away from Kuthuparamba town of Kannur district, northern part of the 'State of Kerala'. The coordinates of the study area $11^0 49'$ N and $75^0 33'$ E. The Kottayam chira is environmentally, historically and culturally of no match and is of utmost significance. Additionally it was part of the livelihood of the native population as it acted as reservoir to supply water for irrigation into the adjoining paddy fields and also people were dependent on it for its fish wealth. This significant wetland is now in an environmentally neglected and degraded form mainly due to eutrophication, weeding, siltation, etc. Due to excessive siltation it is seen that stagnant pools have formed in the water body; this may act as a threat zone to yield various water borne disease. This study deals with the estimation of essential water quality parameters of the study area. The various parameters were calibrated and it is compared with the international standards. The obtained values were matched with WHO drinking water standards and ISO standards. The study revealed that due to the neglected state of the Chira, various parameters are far beyond permissible limits. It is a clearcut example of how anthropogenic over-exploitation and negligence can deteriorate a well-established ancient aquatic ecosystem.

Keywords: *Kottayam Chira*, reservoir, eutrophication, water quality parameters.

Introduction

Water is one of the most common but the most important resource on earth without which no life can ever exist on this earth. The significance of water has often been overlooked by needs of human requirements such as population growth, progressive industrialisation, enhanced food production and recreation. In short, water is one of the most substantial resources which upkeep both human needs and economic development[1].Streams, Rivers, Ponds, Lakes, Glaciers and Sea are the major sources of water that the life really depends upon. The quality of water scientifically implies the physical, chemical and biological characteristics of water[2]. A healthy aquatic environment is one in which the water quality supports a rich and varied community of organisms and protects public health[3]. The water chemistry of densely populated sectors of the world has been undergoing tremendous deterioration in the past four to five decades due to uncontrolled discharge of contaminants from both point and non-point sources and other human interference[4]. The scenario of almost 70% of India's surface water resources and its ground water reserves are polluted by biological, organic and inorganic pollutants[5]. According to the World Health Organization (WHO) reports approximately 36% of urban and 65% of rural Indian's were without access to safe drinking water[6]. Increase in human population, rapid industrialisation, tourism activity etc., exert vast pressure on the availability of safe drinking water especially in developing countries[7].

The over-exploitation along with high pollution rate makes the conservation strategies of water significant. The difference between rate of utilisation and replenishment or recharge plays a key role in overall eminence of water. The main foundation of ground water recharge is wetlands, which is known as the kidneys of earth. Wetlands receive water from catchment areas as surface run off and allow them to percolate into the earth and recharge the water table ofthat area. Wetlands have significant environmental, socio economic and cultural functions. Apart from groundwater recharge, they acts as source for irrigational and potable water, hosts as habitat for variety of flora and fauna, accepts religious performances, upholds aesthetic values, supports tourism and recreational facilities, provides aquaculture potential, etc. Wetland ecosystems thus promises to be a valuable asset with multiple roles essential to human needs.

The wetlands of the nation are being under threats of various origins like shrinkage, encroachment, siltation and polluted water influx. As the wetlands hold utmost potential to serving the livelihood, enough care must be taken for conserving them. The wetlands which is under degradation or likely to attain the symptoms of degradation should be restored immediately. Here we are giving a brief account of a socially significant wetland and its present scenario of its environmental status as a pilot study for its restoration and conservation.

Study Site Description: The Kottayam chira is a significant water body located about 1.5 kms away from Kuthuparamba town of Kannur district, northern part of the Kerala State.The geographical co-ordinates are $11^0 49'$ N and $75^0 33'$ E. The total area of the chira calculated as around 11 acres at present. The

water body enhances the water percolation to the soil and recharge water table. So to a large extent it can influence the subsurface water level and thereby the water level of surrounding wells. At present the Kottayam chira is in a neglected state. The water is murky and the surface is covered with weeds and algal biomass. An excessive growth of water hyacinth is also visible there. In some regions, there is foul smell evolving, making the life of neighbourhood difficult.

Material and Methods

Samples of water were collected randomly from nine points across the water body. The water samples were collected using a Van Dorn Sampler and soon transferred to sterilised pet jar. The water quality parameters such as pH, dissolved oxygen (DO), chemical oxygen demand (COD), total organic carbon (TOC), alkalinity, sodium (Na^+), potassium (K^+), total iron, total phosphorus (TP), nitrites (NO_2), nitrates (NO_3) and ammonia-nitrogen (NH_3-N) were analysed. The pH was measured in situ using a digital pH meter. DO was measured using Winkler's method, COD measured using open reflux method, Na^+ and K^+ measured using flame photometer. Iron was measured using *Phenanthroline method,* TOC was estimated using TOC analyser, TP, nitrogen and Ammonia was measured using standard photometric method[8]. All chemicals used for the chemical estimation was of AnalaR grade.Global Positioning System (Garmin GPS) was used to take the co -ordinates of the study site.

Results and Discussion

The pH is found to be between 6.52 to 7.73, which is in the alkaline range. According to Indian standard specifications for drinking water IS: 10500, the required pH value range is between 6.5 to 8.5[9]. The B.I.S. (ISI) standard for pH of inland surface waters for use as raw water, water supply and for bathing is 7.9[10]. The Indian Council of Medical Research (I.C.M.R) standard for the pH is 7.0 to 8.5[11]. Hence the pH values in the study area remains within the permissible limit (table-1).

The localized production, diffusion, exchange between surface and biochemical utilisation is the controlling factors of oxygen availability in many aquatic ecosystems [12]. The DO of the study area ranged between 0 mg/L to 5.90 mg/L. The B.I.S standard for the same is 3 mg/L for inland surface water. In two samples the DO value was zero. Thus, it is seen that the DO values at different points within the water body is highly variable which indicates that the mixing within the chira is absent (table-1).

Similarly, COD values also is found to be highly variable between the sampling points, the values ranging between 54 to 1317 mg/ L. Even the maximum limit for COD, for the discharge to the inland surface water is 250 mg/L. Here in eight sampling points out of nine, COD is higher than the permissible limit. This higher value indicate pollution from sewage influx[2].TOC ranged between 3.59 to 25.34 mg/L. TOC in source waters comes from decaying natural organic matter(NOM) and from synthetic sources like detergents, pesticides, fertilizers, herbicides, industrial chemicals, and chlorin at edorganics (table-1).

In the case of alkalinity, the value ranged from 22 mg/L to 48 mg/L. Alkalinity is a function of carbonates and bicarbonates. From the earlier studies alkalinity value less than 50 mg/ L is considered to be oligotrophic[4]. Here the average value of alkalinity lies below 50 mg/L. The individual values of each sampling point also lies below 50 mg/L (table 1).

Sodium is ranged between 25 to 78.3 mg/ L. For Potassium the lowest and highest values obtained was 0.3 and 4.1 respectively. High amount of sodium and potassium is not desirable in potable water (table 1).

The total Iron here varies between 0.1 to 8.7 mg/L. according to the IS: 10500 the permissible limit of Iron is 0.3 mg/L. Here in this study area eight sampling points out of nine exceeded the prescribed limit. That means in the case of Iron, the water is not desirable for potable purpose (table-1).

The Phosphorus is a major factor contributing to most of the blooms. Both autochthonous and allochthonus sources contribute to the phosphorus sink. Here the value ranged between 23.20 to 400.19 mg/L which is higher than the limit within which it can use for the potable purpose. The influx containing domestic waste may be the prime culprit for the higher values obtained for the parameters (table-1).

Nitrites and nitrites limit to 45 mg/L in IS: 10500 standards related to the drinking water. Here the value obtained for NO_2 is higher than the limit in three sampling points out of the total nine. At all sampling points the NO_3 value exceeded the limit (table-1).

Here the ammonia value ranged between 54.86 to 2063.11 mg/ L. which is higher than the exceeding limit of effluent characteristic as per IS: 10500 which is only 5 mg/L. High amount of ammonia directly influence the aquatic life (table-1).

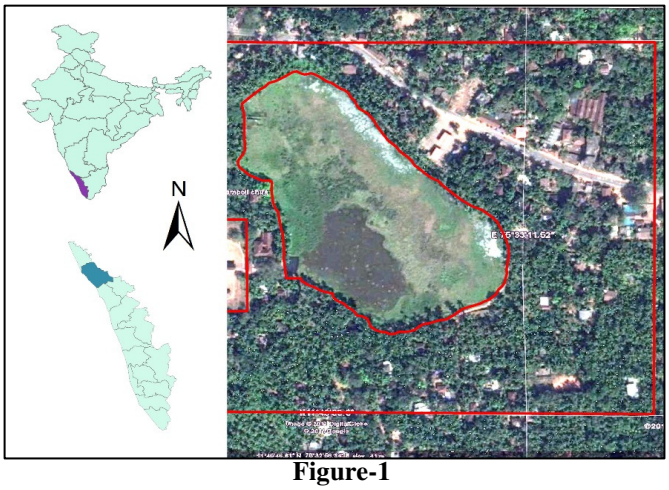

Figure-1
Location map of Kottayam Chira

Table-1
The water quality parameter studied

Sampling. Points.	DO mg/L	NO_2 µg/L	NO_3 µg/L	NH_3 mg/L	TP mg/L	TOC mg/L	Iron mg/L	Na mg/L	K mg/ L	pH	COD mg/L	Alkalinity mg CaCO3/L
1	4.72	4.28	380.35	79.33	30.55	5.64	1.2	25	0.7	7.44	653	48
2	2.36	6.15	458.63	74.96	30.8	5.5	0.9	27	0.5	7.18	778	36
3	0.39	4524.94	5336.96	889.06	23.69	5.66	1.0	46.2	1.3	6.52	1317	32
4	2.76	35.28	77.7	153.1	47.42	5.05	4.5	26.2	0.3	6.77	1173	28
5	5.9	3.87	3733.02	54.86	23.2	3.86	0.4	47.4	1.6	6.9	1224	24
6	0	47.87	380	2063.11	400.19	25.34	8.7	78.3	4.1	7.73	882	Not detectable
7	0	904.99	1065.96	1419.39	98.51	5.21	0.9	33.6	0.6	7.26	54	26
8	1.18	27.57	1978.87	229.61	107.9	3.59	1.2	25.1	0.7	6.96	741	22
9	1.97	4.01	52.6	92.94	38.51	6.32	0.1	28.5	1.0	6.87	1232	24

Conclusion

From the results, it is clear that most of the parameters tested during the study does not follow the standards prescribed for the parameters. The entire water body is stagnant and no mixing of water is seen as parameters showed considerable variations from different sampling sites. Usual correlation of parameters often seen during water quality analysis is not seen in the water body. High amount of total organic carbon (TOC) and Chemical oxygen demand (COD) along with low Dissolved Oxygen (DO)reveals presence of high volume of decaying plant materials. Further studies shall bring out a yet better picture about the degenerated status of the water body. Hence it can be concluded that the water body is in a serious state of degeneration and immediate measures has to be undertaken for its restoration.

References

1. Biswas Arkoprovo, Jana Adarsa and Sharma Shashi Prakash, Delineation of Groundwater Potential Zones using Satellite Remote Sensing and Geographic Information System Techniques: A Case study from Ganjam district, Orissa, India, *Res.J.Recent Sci*., **1(9),** 59-66 **(2012)**

2. Diersing N., Water Quality, Frequently Asked Questions *PDA,* NOAA, **(2009)**

3. Ramachandra T. V., Kiran R. and Ahalya N., Status, Conservation and Management of Wetlands, Allied Publishers (P) Ltd, **(2002)**

4. Maya K., Babu K. N., Padmalal D. and Seralathan P., Hydrochemistry and dissolved nutrient flux of two small catchment rivers, south-western India, *Chemistry and Ecology,* **23(1),** 13-27 **(2007)**

5. P.V. Joseph and Claramma Jacob, Physico chemical characteristics of Pennar River, A Fresh Water Wetland in Kerala, India, *E-Journal of Chemistry*, **7(4)**, 1266-1273 **(2010)**

6. World Health Organization, Guidelines for Drinking water quality, Volume 1, 3rd edition, WHO Press, Switzerland **(2009)**

7. Abraham W.R., Megacities as Sources for Pathogenic Bacteria in Rivers, *Inter. J. Micro.* **(2011)**

8. APHA, Standard Methods for the Examination of Water and Wastewaters (20th Edn.) Washington DC: APHA, AWWA, WEF **(1998)**

9. Indian Standard Specification for Drinking Water, IS-10500- **(1991)**

10. B.I.S. Bureau of Indian Standards Drinking water specification, 1st revision, ISS 10500 **(1991)**

11. ICMR: Manual of standards of quality for drinking water supplies Special report series No. 44, 2nd edition. **(1975)**

12. S. Meera and S. Bijoy Nandan, Water quality status and primary productivity of Valanthakad Backwater in Kerala, *Indian Journal of Marine Sciences,* **39(1)**, 105-113, **(2010)**