

Ecological Studies of Renuka Yellamma Lake, Peddapally, Karimnagar District, Telangana

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Abstract

Yellamma Lake was constructed during the Kakatiya Regime and Dynasty. In this study we have estimated the total seventeen number of different Physico-Chemical parameters and four major groups of zooplanktons were studied. All the physico-chemical parameters are within the permissible limits. Four different major groups of zooplanktons are Rotifera, Copepoda, Cladocera and Ostracoda. The zooplankton of the selected lake mainly consists of Rotifera, Cladocera, Copepoda and Ostracoda, the total number of fifteen species were identified from the all the four orders during the present study. The total zooplankton population was dominated by Rotifera, Cladocera, Copepoda and Ostracoda respectively.

Keywords: Yellamma Lake; Physico-Chemical; Zooplankton.

Introduction

Water is a precious gift of Nature to this good earth and its bounty. Water is one of the few substances that can be found in all the three states (i.e. gas, liquid and solid) within the earth's climatic range. The solvent properties of water allow the uptake of vital nutrients from the soil and into plants; this then allows the transfer of the nutrients within a plant's structure. The ability of water to dissolve gases such as oxygen allows life to be sustained within bodies of water such as rivers, lakes and oceans.

In studying Hydrology the most common spatial unit of consideration is the catchment or river basin, this can be defined as the area of land from which water flows towards a river and then in that river to the sea. Towards the study of Hydrology, it is useful to consider the parameter of the Hydrological Cycle. This is a conceptual model of how water moves around between the earth and atmosphere in different states as a gas, liquid or solid. There are different scales that the hydrological cycle can be viewed at, but it is helpful to start at the large global scale and then move to the smaller hydrological unit of a river basin or catchment.

The term plankton is taken from the Greek verb meaning "to wander" and refers to organisms whose powers of movement are insufficient to prevent them from being moved by water currents. Commonly planktons are important food source to fishes in the aquatic field.

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Better Quality of water Described by its Physical, Chemical and Biological Characteristics. The physico-chemical and biological parameters are very important in estimating the constituents of water and concentration of pollutant or contaminant.

Methodology

YellammaLake was constructed during the Kakatiya Regime and Dynasty. It is situated in village and mandal of peddapalli, Karimnagar, Talangana at 18° 36' 52.85½ (N) latitude and 79° 22' 17.47½ (E) longitude and it is distance about 120 kilometers from Kakatiya University campus.

Collection of Samples

Water samples were collected on monthly basis. Collections were made on specific dates of every month. Surface samples were collected using a clean plastic container for the study of various physico-chemical and biological parameters. All the sample

collection and observation were made in the morning time (i.e. 6:00am to 8:00am) and some of the parameters are calculated at the collection point and other parameters were estimated in the lab throughout the study period. Water samples collected for the purpose of estimation of various parameters were brought to the laboratory and subjected to analysis immediately as far as possible Standard Methods per Estimation of Water and Waste Water 20th Edition, 1998 [1] were referred for estimation of parameters.

Zooplankton

Zooplankton collections were made employing a modified Haron-Trantor net with a square metallic frame of area 0.0625 m² area. The filtering cone was made up of nylon bolting silk plankton net (No. 25 mesh size 50 μ) was used for collection of zooplankton. Collected samples were transferred to labeled vial bottles containing 4% formalin. The qualitative estimation of zooplankton communities was carried out in the laboratory with using of Sedgwick-Rafter cell and planktonic organisms numerically counted and identified. The identification of zooplankton species was done by the Zoological Survey of India, Kolkata and the same was confirmed by [2-7].

Results and Discussion

During the period of study (i.e. October 2013 to September 2014) seventeen number of different physico-chemical parameters of Renuka Yellamma Lake were studied.

In the present investigation atmospheric temperature varied between 19.2°C to 33.7°C. Water temperature varied between 17.1°C to 32.0°C. During the study period maximum temperature was recorded in the month of June 2014 and minimum was recorded in the month of December 2013. In the present investigation atmospheric and water temperatures followed more or less similar trend of oscillation [8, 9]. Also suggested, that meteorological conditions are responsible for seasonal changes of temperature.

During the study period transparency and turbidity values were negative correlated each of them. Transparency values varied between 21.3 cms to 58.2 cms and turbidity values ranged from 9 NTU to 38 NTU. In this investigation maximum transparency values shows in the month of May and minimum values in the month of September. Whereas turbidity

values are highest in the month of September and lowest in the month of May. Similar results were observed by [10].

In this study dissolved solids were ranged between 190 mg/lit to 350 mg/lit. Highest values of dissolved solids was recorded in the month of May and lowest values recorded in the month of September. Hydrogen-ion- concentration values varied from 6.9 to 8.6. Highest values of pH was recorded in the month of January and lowest values recorded in the month of May. Electrical Conductivity values varied between 401 μ mho/cm to 548 μ mho/cm. In this study maximum values of Electrical Conductivity was recorded in the month of July and lowest values recorded in the month of January. Similar results were observed by [11].

The results are clearly stated that the more transparency values may be due to less dissolved solids. Similar reports were made by [12], while studying the lakes of Gulbarga district [13]. Observed that pH is positively associated with total dissolved solids, electrical conductivity.

During the study period Dissolved oxygen values varied between 3.8 mg/lit to 9.5 mg/lit. In this study maximum values was observed in the month of March and minimum values observed in the month of September. The values of free carbon dioxide varied between 0 mg/lit to 8.7 mg/lit. Free carbon dioxide values are absent in south west monsoon and north east monsoon seasons. The distribution of oxygen is a net result of consumption for oxidation of organic matter and replacement from the atmosphere.

Calcium, magnesium, carbonates, bicarbonates, sulphates, chlorides, nitrates and organic matter together associate and forms hardness and alkaline nature of water. In the total hardness calcium values are varied between 30 mg/lit to 64 mg/lit and magnesium values are between 68 mg/lit to 155 mg/lit. The hardness values are highest record in the month of July and lowest in the month of March. In the total alkalinity, carbonate values are varied between 1.6 mg/lit to 8.2 mg/lit and bicarbonate values are between 140 mg/lit to 347 mg/lit. The alkalinity values are highest recorded in the month of February and lowest in the month of July. The total alkalinity values provide guidance in applying proper doses of chemicals in water and waste water treatment processes, particularly in coagulation; softening and operational control of anaerobic digestion [14, 15] studied on physico-chemical parameters and observes the range of alkalinity values from 168ppm to 462ppm.

In the present investigation Chloride values are varied from 48 mg/lit to 92 mg/lit. Highest values recorded in the month of April and lowest values in the month of January. In the present investigation Sulphate values are varied from 6.4 mg/lit to 17.3 mg/lit. Highest values recorded in the month of September and lowest values in the month of October. In the present investigation Phosphate values are varied from 1.4 mg/lit to 2.2 mg/lit. Highest values recorded in the month of September and lowest values in the month of June. The concentration of chlorides in natural waters is generally bears a strong correlation with sodium content and specific conductance [16]. Also attributed high chloride value due to increase of organic matter. Phosphorous controls the algal growth and primary productivity. Similar results are also made by [17].

Biological oxygen demand is nothing but the amount of oxygen utilized by microorganisms to stabilize the organic matter. According to BIS specifications potable water should be zero. But Biological oxygen demand value of 3-4 mg/lit is permissible. In the present investigation Biological oxygen demand values are varied between 2.2 mg/lit to 4.6 mg/lit. Highest values were observed in the month of February and the lowest value in the month of October.

Zooplankton

Zooplanktons are usually considered to be good indicators of environmental changes and have a fundamental role in energy flow and nutrient cycling in aquatic ecosystems.

Table 1: Monthly variation of physico-chemical parameters of Renuka Yellamma Lake during the year 2013-2014.

S. No.	Parameter	13-Oct	13-Nov	13-Dec	14-Jan	14-Feb	14-Mar	14-Apr	14-May	14-Jun	14-Jul	14-Aug	14-Sep
1	Atmospheric Temperature	22.6	20.8	19.2	19.8	25.5	30	31.2	33.5	33.7	29.6	27.5	24.4
2	Water Temperature	21.1	19.3	17.1	17.6	24	28.5	28.7	32	31.5	28.1	26.5	23.1
3	Transparency	32	31.4	32.4	40.1	42.6	51.6	54.2	58.2	39.8	28.2	26.2	21.3
4	Turbidity	30	30	30	15	14	11	10	9	16	29	13	38
5	Total Dissolved Solids	270	290	220	266	250	260	320	350	320	230	200	190
6	pH	7.7	8.1	8.3	8.6	8.1	7.2	7.3	6.9	7.1	7.2	8.1	8.3
7	Electrical Conductivity	438	456	450	401	444	488	436	496	523	548	518	491
8	Phosphates	2.2	1.9	1.5	1.8	1.3	1.6	1.6	1.9	1.4	2.1	2.1	2.2
9	Chlorides	53	61	55	48	81	86	92	79	62	70	58	52
10	Sulphates	6.4	8.2	6.8	7.2	10.1	11.6	12.4	12.9	15.9	16.2	16.8	17.3
11	Total Hardness	35	39	44	50	39	31	41	30	43	58	62	64
12	Total Hardness-mg	135	136	126	132	78	68	80	138	155	144	136	134
13	Dissolved Oxygen	5	6.4	6.1	8.4	9.1	9.5	8.8	8.4	5.2	4.6	3.8	3.8
14	Free CO ₂	Ab	Ab	Ab	4.6	5	8.7	5.6	Ab	Ab	Ab	Ab	Ab
15	Alkalinity- CO ₃	1.6	2.4	2.6	2.2	2.9	4.2	4.8	8.2	8.1	6.2	5.3	2.4
16	Alkalinity-HCO ₃	288	262	258	266	347	326	320	292	196	140	192	187
17	Biological Oxygen Demand	2.2	3.6	3.1	4.2	4.6	4.5	3.9	3.4	2.9	2.9	2.4	2.6

In the present study a comparison account was studied in Renuka Yellamma Lake. The annual and seasonal fluctuation and composition of zooplankton were depicted in Table 2.

The zooplankton of the selected lake mainly consists of Rotifera, Cladocera, Copepoda and Ostracoda, the total number of fifteen species were identified from the all the four orders during the present study. The total zooplankton population was dominated by Rotifera, Cladocera, Copepoda and Ostracoda respectively.

In the present investigation Rotifera group of zooplanktons showed high diversity followed by Copepoda, Cladocera and Ostracoda. Among the

Rotiferans *Keratellatropica* was dominated species followed by *Brachionus falcatus*, *Keratellacochlearis*, *Brachionus angularis*, *Brachionus caudatus* *Cephalodellagibba* and *Lecaneluna* respectively. In group the of Copepoda *Paracyclops fimbriatus* was dominated followed by *Mesocyclops leukarti* and *Mesocyclops shyalinus*. In the group of Cladocera *Ceriodaphnia cornuta* species was dominated followed by *Moina branchiata* and *Moina macrocopa*. In Ostracoda group *Heterocypris* species was dominated followed by *Cypris* species [18]. Did studied on the diversity of zooplankton in Kandlapally lake, Telangana.

Table 2: Zooplankton diversity at station A of Yellamma Lake, Peddapally during the year 2013-2014

	13-Oct	13-Nov	13-Dec	14-Jan	14-Feb	14-Mar	14-Apr	14-May	14-Jun	14-Jul	14-Aug	14-Sep	Total
Rotifera													
<i>Brachionus angularis</i>	44	58	72	70	89	98	61	52	36	22	16	31	649
<i>B. caudatus</i>	32	28	36	39	32	48	50	36	28	12	12	8	361
<i>B. fulcatus</i>	96	132	146	152	161	210	140	70	50	32	16	0	1205
<i>Keratella tropica</i>	38	160	172	180	210	221	152	110	62	30	0	0	1335
<i>K. cochlearis</i>	140	142	164	191	210	180	60	60	0	0	18	0	1165
<i>Cephalodella gibba</i>	25	35	45	36	51	41	41	8	4	4	0	12	302
<i>Lecanotona</i>	11	14	18	26	42	51	29	26	14	8	0	0	239
Total	386	569	653	694	795	849	533	362	194	108	62	51	5256
Copepoda													
<i>Paracyclops fimbriatus</i>	11	11	46	86	110	140	160	110	80	60	80	62	956
<i>Mesocyclops thalimus</i>	14	18	26	48	112	124	82	62	28	10	8	8	540
<i>Mesocyclops leukarti</i>	8	8	26	48	52	52	82	120	80	122	98	110	806
Total	33	37	98	182	274	316	324	292	188	192	186	180	2302
Cladocera													
<i>Ceriodaphnia cornuta</i>	189	241	101	52	43	11	8	10	19	96	41	30	841
<i>Moina macrocopa</i>	30	30	31	12	16	18	22	10	10	60	41	11	291
<i>Moina branchiata</i>	42	36	18	22	26	10	8	8	36	82	62	42	392
Total	261	307	150	86	85	39	38	28	65	238	144	83	1524
Ostracoda													
<i>Cypris Sps.</i>	12	18	16	42	70	110	122	136	82	34	42	28	712
<i>Heterocypris</i>	14	8	28	92	88	132	151	80	74	44	52	40	803
Total	26	26	44	134	158	242	273	216	156	78	94	68	1515

During the study period total highest number of zooplankton species were observed in the month of March (1446 No. of individuals/liter) and lowest number of zooplankton species were observed in the month of September (382 No. of individuals/liter)

Conclusion

In the present investigation all the selected parameters are within the permissible limits of Bureau of Indian Standards (BIS), American public health Association (APHA) and American Water Works Association (AWWA). The zooplankton diversity of this lake is also clearly stated that the selected lake was not much polluted.

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