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# Zooplankton Diversity with Reference to the Physico-Chemical Parameters of Kajjarla Lake, Adilabad District, AP, India

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## Abstract

*Adilabad District is one of the tribal district of Andhra Pradesh. The district geographically connected with two state borders Maharashtra, Chhattisgarh. The selected a lake Kajjarla which is near to Adilabad town and assessed the physico-chemical parameters and zooplankton diversity, during the period from September 2011 to August 2012. The physico chemical parameters like air temperature, water temperature, pH, electrical conductivity, alkalinity, totalhardness, transparence, turbidiy, TDS, dissolvedoxygen, boilogical oxygen demand, chemical oxygen demand ,chlorides, sulphates and phosphate. Zooplanktons were examined quantitatively and with stranded identification methods. Zooplankton occupies a important position structure of lake ecosystem and plays a key role in the energy transfer. The zooplanktons were identified into four major groups comprises of Rotifer, Cladoceran, Copepod and Ostracoda. Zooplankton composition is highest in the summer months, and lowest in the monsoon months. Some of the protozoan and nematode parasites were also identified in this lake. The above study shows the lake is moderatory polluted as well as it transfer the nematode parasites.*

**Keywords:** Adilabad, Zooplankton, Nematode parasites.

## Introduction

Water is an important source for living organisms on the Earth. Day by day exploitation of human population water resources are polluted due to increased domestic sewage water, increased industrial, urbanization and agriculture activity. Water bodies contain large number of chemical substances. Physico chemical characteristics of water body play a significant role in composition, distribution and abundance of aquatic organisms in the lake. The water quality assessment and planktonic study are very important to determine the nature of the lake[1]. Lakes are most essential water bodies in rural area contributing to drinking water, agricultural practices, aquaculture, ground water charging, and sustainable development of flora and fauna. Zooplankton are micro organisms that float freely in the surface water column of water bodies, these are important food material for fish and invertebrate predators. Zooplanktons are very sensitive to pollutants and are they act as bio indicator of water bodies. Hence present investigation has been carried out on seasonal variation and special reference to its zooplankton diversity.

## Material and Methods

The Kajjarla lake situatuated 6 km distance from Adilabad district town, Geographically it is situated between the 19º 38'14 91" NL –78º 27' 10 76" EL. Water samples were collected monthly wise from September 2011 to August 2012 . Physical characteristics of water like air temperature, water temperature pH, Turbidity, TDS, and chemical character DO were measured at site. DO was measured by the Winkler's method. The another parameters like total alkalinity, conductivity, $co_2$, chlorides, phosphates,.sulphates, were analyzed in the laboratory by using stranded methods[2].

The zooplankton samples were collected by filtering l00 lit of water through plankton net of 50µ pore size filtering cloths and concentrated up to 30ml. The concentrated zooplankton sample was preserved in 4% formaldehyde. The one milliliter sample was analyzed, quantitative estimation of zooplankton with the help of Sedgwick-Rafter cell, collecting data expressed as number per liter.

## Results and Discussion

Monthly wise variations in physico-chemical characteristics of Kajjarla lake water have been studied in table 1. Correlation coefficient values are given in table 2.

**Temperature:** During the investigation period atmosphere temperature found to be in the range18.9°C to 33.6°C. Atmosphere temperature was maximum (33.6°C) in May and minimum (18.9°C) in December. Its influence on the biotic factor of the lake water. Water temperature found to be in the range18.4°C to 30.2°C. Water temperature was maximum (30.2 °C) in May and minimum (18.4°C) in January. Its controls all chemical reactions and biological process in a aquatic ecosystem. Atmosphere temperature positive correlated with water temperature, pH, transparence, alkalinity, DO, COD, chloride phosphate, and negative correlated with, turbidity, TDS, total hardness, BOD, Sulphate. Water Temperature positive correlated with pH, transparence, alkalinity, DO, COD,

chloride phosphate and negative correlated with Turbidity, TDS, total hardness, BOD and Sulphate.

**Figure-1**
**Kajjala lake photos**

**pH:** The pH values ranged between 7.4 - 8.5.The maximum pH was recorded in May and minimum in January. Approximately similar results were reported by Rajshekhar et al[3]. pH positive correlated with transparence, alkalinity, DO, COD, chloride phosphate and negative correlated with Turbidity, TDS, and total hardness, BOD and Sulphate.

**Transparence:** Transparence of water fluctuates from 9.8 cm to 13.1cm.The maximum value 13.1cm was recorded in May and minimum 9.8 cm. Khan and Chowdhury reported that higher transparence occurred during November to May due to absence of rain, runoff and flood water of surrounding land surface[4]. Transparence positive correlated with alkalinity, DO, chloride phosphate and negative correlated with Turbidity, TDS, total hardness, BOD, COD and Sulphate.

**Turbidity:** The turbidity values ranged between 82 NTU - 125 NTU. The maximum value 125 NTU was recorded in July and minimum value 82 NTU recorded in May. Turbidity positive correlated with TDS, total hardness, alkalinity, BOD, phosphate and sulphate and negative correlated with DO, COD and chloride.

**Total dissolve solids:** The TDS values ranged between 242 mg/lit -585 mg/lit the maximum value 585 mg/lit was recorded in July and minimum value 242 mg/lit was recorded in April. Total dissolved solids positive correlated with total hardness, BOD, phosphate, sulphate and negative correlated with alkalinity, DO, COD, chloride.

**Total Hardness:** The total hardness of water fluctuate from 71 mg/lit to 148 mg/lit. The highest value 148 mg/lit was recorded in January and lowest value 71 mg/lit was recorded in April. Salve and Hiware reported that total hardness was higher in winter months and lower in summer months[5]. Total hardness positive correlated with BOD, phosphate, sulphate and negative correlated with alkalinity, DO, COD chloride.

**Alkalinity:** Alkalinity of water was found to be in the range of 200 mg/lit to 274 mg/lit. It was maximum in April and minimum in August. Venkateshwarlu reported that alkalinity concentration affected directly by rainfall[6]. Alkalinity positive correlated with temperature pH, transparence and negative correlated with turbidity, TDS and total hardness.

**Dissolved Oxygen:** Dissolved Oxygen is important parameters in water quality assessment and it is reflect on biotic factors of the water. The value of DO ranged between 7.1 to 8.7 mg/lit. It was maximum in December and minimum in March. Dissolved oxygen positive correlated transparence, total hardness and negative correlated with temperature, alkalinity, turbidity and total hardness.

**Biological Oxygen Demand:** The BOD of water ranged between 5.4 to 22.2 mg/lit. The maximum BOD value (2.2mg/lit) was recorded in November and minimum in May. Sarang et al reported lower value of BOD in summer months and high BOD values in winter months[7]. Biological oxygen demand positive correlated with sulphate and negative correlated with COD, chloride and phosphate

**Chemical Oxygen Demand:** During the investigation period COD values range between 7.0 to 9.5 mg/lit. The maximum COD value 9.5 mg/lit was recorded in the month of May and minimum COD value was 7.0 mg/lit was recorded in the month of December. Chemical oxygen demand positive correlated with chloride and phosphate and negative correlated with COD and chloride.

**Chloride:** The chloride value of water fluctuates from 62 to 89 mg/lit. The highest value (89 mg/lit) was recorded in May and minimum value 62 mg/lit in August. The maximum values of chloride present during the summer season due to the low levels of water bodies[8]. Chloride positive correlated with temperature, transparence, pH, alkalinity, and COD and negative correlated with, turbidity, total hardness, total hardness, and BOD.

**Phosphate:** The phosphate values of water fluctuate from 0.9 to 3.1 mg/lit. The maximum value 3.1 mg/lit was recorded in June and minimum value 0.9 mg/lit in January. Generally aquatic bodies received phosphate from agricultural runoff, domestic sewage water[9]. Phosphate positive correlated with temperature, turbidity, total hardness, pH and negative correlated with transperence, alkalinity, DO, COD and chloride.

**Sulphates:** The sulphate values of water fluctuate from 16.8 to 27.5 mg/lit. The highest value (27.5 mg/lit) was recorded in

January and lowest value16.8 mg/lit was recorded in May. Pesticides are main source of sulphate to water bodies.

Monthly variation and the population dynamics of zooplankton data represented in table -3. The zooplankton comprises of rotifer, copepod, Cladoceran, and ostracods.The total zooplankton percentage in kajjarla lake like. Rotifers 43.15%, copepod 27.91%, cladocera 17.14%, and ostracod 9.61% respectively (table-3). During the investigation period zooplankton population was dominated by rotifer. Among rotifer a *Branchionus caudatus, Branchionus falcatus, Keratella tropica*, were the most dominant species. The maximum number of Rotifers were recorded in May (2760 Org/lit) and minimum number (176 Org/lit) were recorded in August. The rotifers population density depends up on the availability of food and temperature[10].

The Cladoceran population varied from 106 to1070 org/lit. Cladoceran *Daphnia* species is the dominant one. The copepod varied from 61 to1681 org/lit among. The maximum number of Cladoceran were recorded in March (1070 Org/lit) and minimum number (106 Org/lit) were recorded in August. The temperature is the main physical parameter which shows effect on distribution, abundance of Cladoceran population [11].

**Table-1**
**Physico-chemical characteristics of Kajjarla lake (Sep 2011-Aug 2012)**

| Months | 2011-Sep | Oct | Nov | Dec | Jan-2012 | Feb | March | April | May | Jun | July | August |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atmosphere temparature | 24.3 | 25.1 | 21 | 18.9 | 19.3 | 23 | 28 | 29.4 | 33.6 | 28 | 24.7 | 25.6 |
| water temperature | 23.7 | 23.6 | 18.7 | 17 | 18.4 | 20.6 | 27.1 | 27.4 | 30.2 | 26.3 | 23.1 | 23.8 |
| Ph | 7.5 | 7.9 | 7.7 | 8 | 7.4 | 7.8 | 7.9 | 8.2 | 8.3 | 8.5 | 7.8 | 7.3 |
| Transparence | 12.1 | 11.1 | 11.2 | 11.5 | 11.9 | 12.5 | 12.6 | 12.9 | 13.1 | 12.4 | 9.8 | 10.1 |
| Turbidity | 112 | 105 | 103 | 99 | 108 | 88 | 89 | 85 | 82 | 91.2 | 125 | 121 |
| TDS | 410 | 342 | 325 | 318 | 331 | 301 | 297 | 242 | 276 | 260 | 585 | 574 |
| Total hard ness | 121 | 132 | 120 | 139 | 148 | 75 | 77 | 71 | 94 | 102 | 142 | 129 |
| Alkalinity | 210 | 202 | 224 | 230 | 221 | 252 | 270 | 274 | 261 | 218 | 212 | 200 |
| DO | 8.31 | 8.2 | 8.34 | 8.7 | 8.5 | 7.5 | 7.1 | 7.3 | 7.2 | 7.6 | 7.8 | 8 |
| BOD | 18.4 | 21.5 | 22.2 | 20.1 | 18.1 | 5.8 | 6.1 | 8.2 | 5.4 | 9.8 | 14.2 | 16.8 |
| COD | 7.1 | 7.3 | 7.9 | 7 | 7.8 | 8.1 | 9.2 | 9.4 | 9.5 | 8.9 | 8.1 | 6.5 |
| Cl | 59.4 | 58 | 63.2 | 65 | 68 | 72 | 78.1 | 86 | 89 | 72 | 65 | 62 |
| P | 2.8 | 2.1 | 1.8 | 1.1 | 0.9 | 1.2 | 1.4 | 1.3 | 2.1 | 3.1 | 2.5 | 2.6 |
| S | 21.1 | 20.7 | 24.2 | 26.8 | 27.5 | 24.2 | 22.5 | 16.8 | 18.3 | 19.2 | 20.2 | 23.2 |

Transparence in Cm, Turbidity in NTU and another all parameters express in mg/lit.

**Table-2**
**Correlation coefficient of Kajjala lake**

| | Atmos tempar | Water temperature | pH | Transparence | Turbidity | TDS | Total hardness | Alkalinity | DO | BOD | COD | Cl | P | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atmos tem | 1 | | | | | | | | | | | | | |
| Water temperature | 0.98 | 1 | | | | | | | | | | | | |
| pH | 0.58 | 0.52 | 1 | | | | | | | | | | | |
| Transparence | 0.56 | 0.51 | 0.57 | 1 | | | | | | | | | | |
| Turbidity | -0.47 | -0.41 | -0.71 | -0.47 | 1 | | | | | | | | | |
| TDS | -0.22 | -0.18 | -0.63 | -0.64 | 0.91 | 1 | | | | | | | | |
| Total hard ness | -0.59 | -0.57 | -0.49 | -0.64 | 0.8 | 0.55 | 1 | | | | | | | |
| Alkalinity | 0.46 | 0.42 | 0.48 | 0.75 | -0.82 | -1.37 | -1.48 | 1 | | | | | | |
| DO | -0.83 | -0.82 | -0.52 | 0.75 | -0.34 | -1.49 | 0.15 | -0.70 | 1 | | | | | |
| BOD | -0.7 | -0.68 | -0.53 | -0.42 | 0.67 | 0.37 | 0.84 | -0.67 | -0.64 | 1 | | | | |
| COD | 0.69 | 0.66 | 0.72 | -0.42 | -0.74 | -0.59 | -0.7 | 0.74 | 0.73 | -0.79 | 1 | | | |
| Cl | 0.71 | 0.6 | 0.67 | 1.64 | -2.4 | -2.2 | -97 | 1.22 | -0.68 | -14 | 0.83 | 1 | | |
| P | 0.38 | 0.41 | 0.10 | -0.30 | 0.37 | 0.43 | 0.16 | -1.00 | -0.30 | 0.049 | -0.13 | -1.13 | 1 | |
| S | -0.86 | -0.86 | -0.6 | -0.59 | 0.28 | 0.09 | 0.46 | -0.1 | -0.14 | 0.47 | -0.58 | -0.2 | -0.6 | 1 |

**Table-3**
**Composition of Zooplankton from September 2011 to August 2012**

| Months | Rotifer | Copepod | Cladocera | Ostracoda | Protozoea | Nematode larva | Nauplies larva | Average |
|---|---|---|---|---|---|---|---|---|
| Sept2011 | 855 | 1179 | 121 | 46 | 21 | 26 | 24 | 324 |
| Oct | 801 | 802 | 140 | 35 | 6 | 24 | 20 | 261 |
| Nov | 730 | 389 | 304 | 6 | 7 | 19 | 17 | 210 |
| Dec | 860 | 212 | 830 | 221 | 6 | 20 | 21 | 310 |
| Jan2012 | 950 | 176 | 541 | 416 | 7 | 17 | 16 | 303 |
| Feb | 1250 | 76 | 880 | 117 | 18 | 21 | 20 | 340 |
| Mar | 1690 | 61 | 1070 | 809 | 15 | 14 | 17 | 525 |
| April | 2130 | 158 | 692 | 543 | 19 | 15 | 21 | 511 |
| May | 2760 | 311 | 232 | 221 | 16 | 16 | 18 | 510 |
| Jun | 560 | 1509 | 147 | 131 | 21 | 23 | 16 | 343 |
| July | 253 | 1681 | 107 | 167 | 23 | 28 | 12 | 324 |
| August | 176 | 1865 | 106 | 187 | 24 | 26 | 19 | 343 |
| **TOTAL** | **13015** | **8419** | **5170** | **2899** | **183** | **249** | **221** | |
| % | **43.15** | **27.91** | **17.14** | **9.61** | **0.60** | **0.82** | **0.73** | 100% |

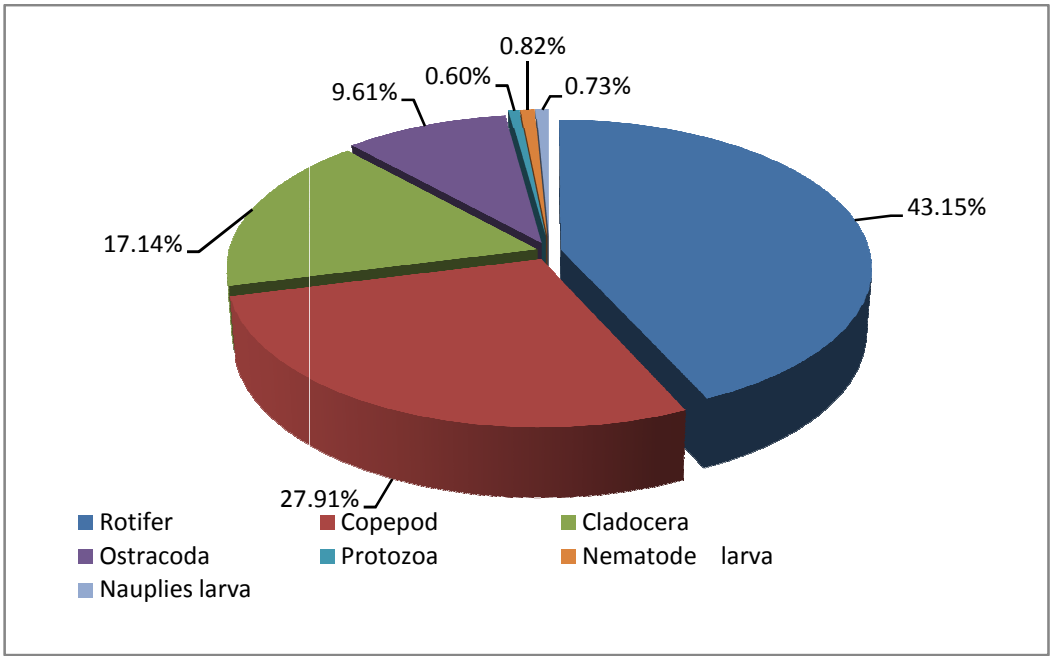


**Figure-2**
**Composition of Zooplankton from September 2011 to August 2012**

The copepod species are living in all type of water bodies. It's the food for many fish species and play a important role in water bodies ecosystems[12] Copepod *Cyclops* species is the dominant one. The maximum number of copepod were recorded in August (1865 Org/lit) and minimum number (61 Org/lit) were recorded in March. Maximum abundance of copepods in rainy season (June-Sep) may be due to beginning of raising water movement, quality of water are the favorable condition to more abundance of copepod population reported [13].

In the Ostracods are the low population diversity recorded compare to another zooplankton, the number of individual varied from 6 to 809 org/lit. The maximum average number was recorded in March minimum number was recorded in November.

## Conclusion

During one year investigation period zooplankton species highest density in summer season (February-May) and lowest in rainy season (June-Sep) A part from zooplankton in the investigation period protozoa is (volvox), nauplies larva, nematode larva's and pin warms also identified in the lake. We observed that many people in the surrounding suffering from

nematode diseases. This is may be because of the human excretory material is released in to the area of the lake surrounding. This my be the main course to spread over the nematode disease the area. All the observation this lake is having a productive nature.

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