



Physico-chemical Parameters and Zooplankton Community at Dharma reservoir in Uttara Kannada District, Karnataka, India.

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Abstract

The study was undertaken to assess the physico-chemical conditions and record the zooplankton diversity at Dharma reservoir in Uttara kannada district . Dharma Reservoir Project was started by the honorable Karnataka chief minister Sri. S Nijalingappa on 20th February, 1965. Water is used for irrigation in Uttar kannada and Haveri districts and it's the main source of drinking water for nearest villages from the reservoir. A total 16 species recorded here. Rotifer was the dominating group in this pond with 7 species. *Keratella tropica* was the most abundant species in this group . The physical and chemical factors like temperature, pH, Transparency, conductivity, TDS, alkalinity, Chlorides, hardness, free carbon dioxide and DO were estimated.

Key words: Zooplankton diversity, physico-chemical parameters

INTRODUCTION

Water is nature's most wonderful, most essential and an invaluable gift to man, which not only keeps him alive by meeting the basic necessities of the smallest living unit, the cells, but also provides inexhaustible reserve of food to him. Without water, there would not be life of any kind on the earth. It is one of the basic necessities along with air. Man has used fresh water from the earliest time. At first only for drinking; cooking etc. Later growth of population, rising standard of living and advancement of technology in the last two centuries has proved the ever-increasing utility of water. According to Coulton and Mrak (1997) the sources of water supply in general, may be classified as follows.

1)Surface water: Contains dissolved salts, mostly from the biotic influences. It is in the form of inland lakes, rivers and streams. Of the total global water, it forms approximately 0.017%.

2)Ground water: This appears to be clearer because of percolation through the soil but it contains more of dissolved salts. It amounts to 0.625% of the total global water.

3)Sea water: supposed to be the most impure form of waters, contains a lot of dissolved salts. Most of the global water is sea water (97.2%).

4)Polar ice and glaciers: Usually it is in the solid form and is supposed to be in pure condition. This accounts for 2.15% of the global water. Of the natural elements, water is considered to be of prime importance to the existence of man, plants and animals. It also plays an essential role in agriculture, industries, pisciculture, forestry, and navigation.

Ponds have tendency to become thermally stratified during summer and winter to undergo definite seasonal periodicity in depth distribution of heat and oxygen. Light too penetrates only to a certain depth, depending upon turbidity. These gradations of oxygen, light and temperature profoundly influence life in the pond, its distribution and adaptations. In India the total water available for use is about 1900 cubic meters. Of this, about 86% is in the form of rivers, streams, lakes and ponds. Karnataka is one of the agriculturally and industrially leading states in India. Industrial effluents, treated or untreated, are dumped into natural water bodies causing irreparable damage to the aquatic biota. Karnataka state is known for its large number of water bodies like small impoundments and bigger tanks which are mainly used for irrigation, fisheries, washing, bathing, etc. Such water bodies are subjected to disturbances

like domestic waste discharge, cattle-bathing, human fecal contamination etc. The Dharma Reservoir project is an existing medium irrigation project on river Dharma in Uttara kannada district. Uttara Kannada district is located in the western part of India and it is a part of central Western Ghats.

2. Materials and Methods:

2.1 Study Area

Dharma reservoir is located at Veerapur village. It is 3.7 km away from Malgi village of Mundgod taluk, Uttara Kannada (Karwar) district in Karnataka state, which falls 75°00' 16" E longitude and 14°43' 29" N latitude. Dharma Reservoir Project was started by the honorable Karnataka chief minister Sri. S Nijalingappa on 20th February, 1965. Water is used for irrigation in Uttara kannada and Haveri districts and it's the main source of drinking water for nearest villages from the reservoir (Fig 1). Rain water is the only source of water for this reservoir.



Fig- 1

2.2 Sample collection and analysis

For the analysis of physico-chemical factors the water sample was collected at regular interval of one month for a period of six months (August, 2019 to February, 2020) from Dharma reservoir. Collection of samples were made early morning between 6 am – 9 am. For qualitative analysis of zooplankton, water samples were collected by standard plankton net made of nylon blotting cloth silk net (68µm). plankton net had 30cm diameter at one end, tapers at another end. Zooplankton sample were collected by sieving 100 liters of water through net for quantitative estimation. Samples were collected in bottles adding formaldehyde and glycerin.

Electric conductivity, pH, TDS and Salinity were recorded with the help of a multi parameter PCSTestr 35, great for water. This laboratory multiparameter Testr features long-life pH electrode with a wide sample compatibility. Pin-style conductivity sensors feature stainless steel electrode for chemical resistance and durability. Atmospheric temperature and Water temperature were also recorded with the help of probe. Humidity was recorded with the help of Hygrometer. Water transparency was recorded with the help of Secchi disc. DO (dissolved oxygen), CO₂ (free carbon dioxide), total hardness, chlorides were analyzed titrimetrically (APHA AWWA publication).

3. Result:

3.1 Abiotic factors

The Atmospheric temperature at Dharma reservoir was recorded highest in the month of August, 2019 with 23°C and lowest in the month of November, 2019 with 21°C. The average atmospheric temperature during study period was 22°C. The water temperature of 26°C was highest in the month of December, 2019 and it was lowest with 24°C in the month of February, 2020 (Table 1). The average water temperature during study period was 25°C. pH was recorded highest in the month of August, 2019 with 7.72 and lowest in the month of November, 2019 which was 7.6. The average pH during the study period was 7.66. Humidity at Dharma reservoir it as recorded highest in the month of February, 2020 with 70% and lowest of 50% in the month of September, 2019. The average humidity was 62.14%. electric conductivity was maximum in the month of February, 2020 with 197.8mS/m and minimum with 75.8 mS/m in the month of August, 2019. The average conductivity was 121.04mS/m. Total dissolved solids (TDS) was maximum in the month of February, 2020 with 141.2 ppm and minimum in the month of August, 2019 with 53.8 ppm. Salinity was recorded highest in the month of February, 2020 with 111 ppm and lowest in the month of August, 2019 with 41.1 ppm. Transparency was maximum in the month of October, 2019 with 55cm and minimum in the month of August, 2019 with 30cm. DO was lowest in the month of December, 2019 having 4.4mg/l and highest in the month of February, 2020 having 22.12mg/l. free carbon dioxide was

constant in all months, the value is 0.66 mg/l. Total hardness was maximum in the month of December, 2019 with 38mg/l and minimum in the month of January, 2019 with 14.58mg/l. Chloride content was maximum in the month of February, 2020 with 25.32mg/l and minimum in the month of November, 2019 with 9.00mg/l. Total alkalinity of Dharma reservoir was maximum in the month of February, 2020 with 50mg/l and minimum in the month of August, 2019 with 10mg/l.

3.2 Biotic factors:

In Dharma reservoir 16 species of zooplanktons (fig1) were recorded consisting of 3 Cladocera, 6 Copepods, 7 Rotifera. Species richness was observed in the month of October, 2019 and it was minimum during September, 2019. The most abundant species among Cladocera is *Moina micrura*, *Tropocyclops prasinus* was most abundant Copepod and *Keratella tropica* is leading species amongst the Rotifers.

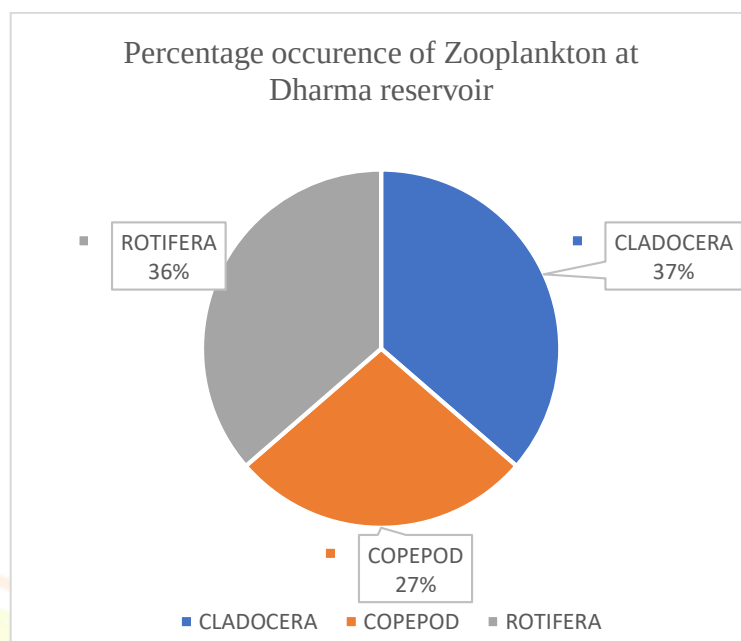
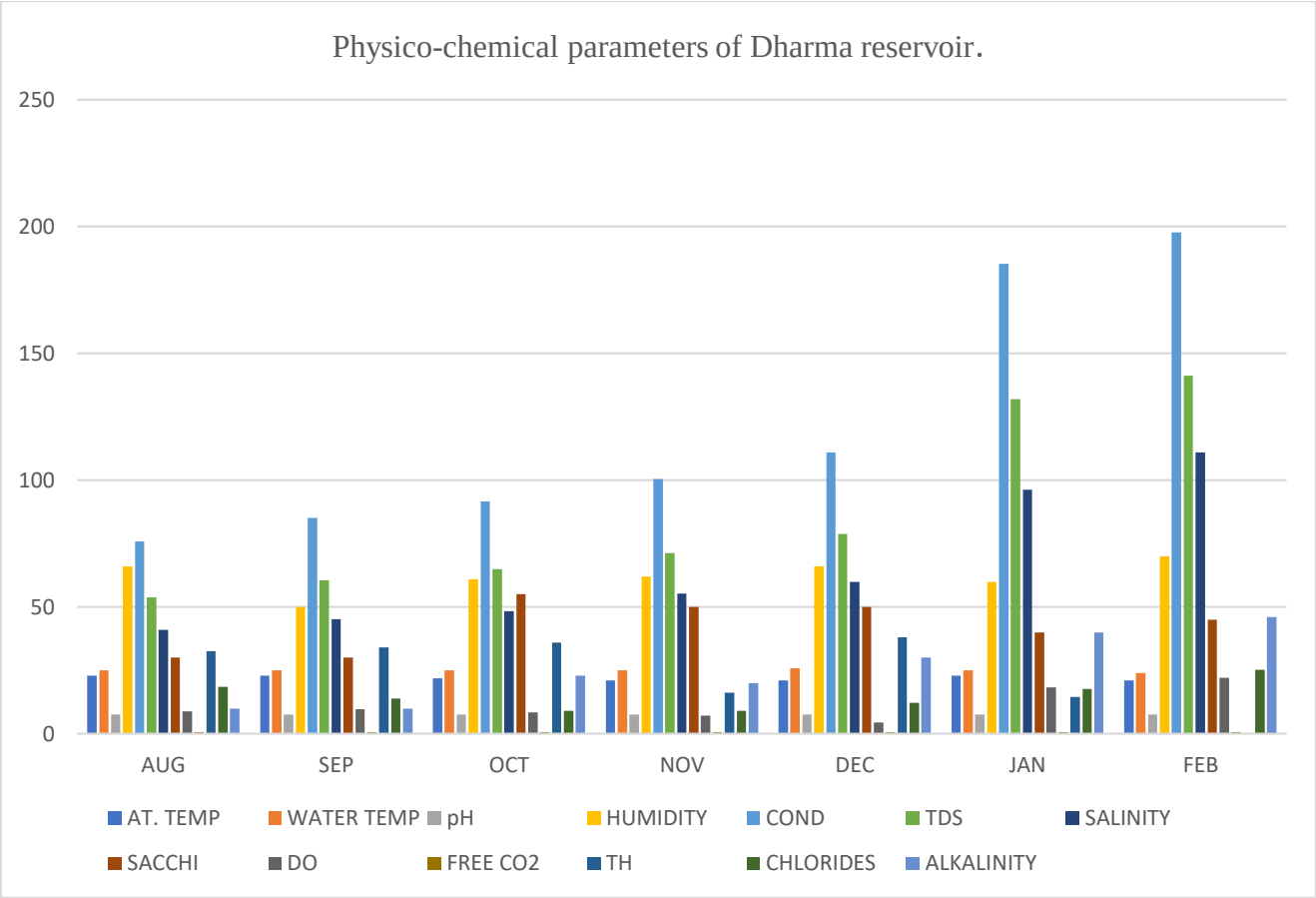


Fig1

Table1. Monthly average values of physico-chemical parameters of Dharma reservoir

Months	At Temp, °C	Water Temp, °C	pH	Humidity, %	Conductivity, mS/m	TDS, ppm	Salinity, ppm	Transparency, cm	DO, mg/l	Free CO ₂ , mg/l	Hardness, mg/l	Chlorides, mg/l	Alkalinity, mg/l
AUG 2019	23°C	25°C	7.72	66%	75.8	53.8	41.1	30cm	8.92	0.66	32.6	18.46	10
SEP	23°C	25°C	7.62	50%	85.2	60.5	45.3	30cm	9.72	0.66	34	14.01	10
OCT	22°C	25°C	7.7	61%	91.6	65.0	48.4	55cm	8.52	0.66	36	9.009	23
NOV	21°C	25°C	7.6	62%	100.5	71.2	55.3	50cm	7.2	0.66	16.24	9.00	20
DEC	21°C	26°C	7.70	66%	111.0	78.8	60.0	50cm	4.4	0.66	38	12.313	30
JAN 2020	23°C	25°C	7.6	60%	185.4	132	96.3	40cm	18.4	0.66	14.58	17.619	40
FEB	21°C	24°C	7.7	70%	197.8	141.2	111	45cm	22.12	0.66	15.55	25.32	50



Graph-1 Physico-chemical parameters of Dharma reservoir

Table2. List of zooplankton species recorded in the Dharma Reservoir during the study period.

GROUP	FAMILY	GENUS
CLADOCERA (03)	<i>Sididae</i>	<i>Diaphanosoma</i>
	<i>Moinidae</i>	<i>Moina</i>
	<i>Chydoridae</i>	<i>Chydorus</i>
COPEPOD (06)	<i>Diaptomidae</i>	<i>Heliodiaptomus</i>
		<i>Neodiaptomus</i>
	<i>Cyclopoidae</i>	<i>Tropocyclops</i>
		<i>Mesocyclops</i>
		<i>Thermocyclops</i>
ROTIFER (07)	<i>Brachionidae</i>	<i>Keratella</i>
		<i>Brachionus</i>
	<i>Filiniidae</i>	<i>Filinia</i>

Table 3: Monthly variations of Zooplanktons at Dharma reservoir.

PLANKTONS	AUG	SEP	OCT
CLADOCERA			
<i>Moina micrura</i>	+	+	-
<i>Diaphnosoma sarsi</i>	+	-	-
<i>Chydorus reticulatus</i>	-	-	+
Total	2	1	1
COPEPOD			
<i>Tropocyclops prasinus</i>	+	-	+
<i>Thermocyclops hyalinus</i>	+	-	+
<i>Heliodiaptomus viduus</i>	+	-	-
<i>Mesocyclops hyalinus</i>	+	-	-
<i>Neodiaptomus strigilipes</i>	+	+	-
<i>Halicyclops exiguus</i>	-	+	-
Total	5	2	2
ROTIFERA			
<i>Brachionus calyciflorus</i>	-	+	-
<i>Brachionus quadridentatus</i>	-	+	-
<i>Keratella tropica</i>	+	+	+
<i>Brachionus forficula</i>	-	-	+
<i>Brachionus diversicornis</i>	-	-	+
<i>Filinia camasecla</i>	-	-	+
<i>Keratella cochlearis</i>	-	-	+
Total	1	3	5

4. Discussion

Lower values of atmospheric and water temperature were recorded in Dharma reservoir (21°C and 24°C respectively) during August 2019, and higher values in during August, 2019 and November, 2019 (23°C and 25°C respectively) in the present study water temperature exceeded air temperature during the months of January, 2020 and February, 2020. Dharma reservoir also the range is 7.6 to 7.72 According to Wetzel (1975), low pH values are found in natural waters rich in dissolved organic matter. It is quite possible that when organic matter is more the aerobic bacterial degeneration will also be more which results in the release of carbon dioxide reducing pH. The humidity at Dharma reservoir ranged between 70% to 66%. It was recorded highest in the month of February, 2020 and recorded lowest in the month of August, 2019. Conductivity range was higher in Dharma reservoir (75.8 to 197.8 mS/m). The presence of salts and contaminations increase the electric conductivity of water. TDS in Dharma reservoir 53.8ppm to 141.2ppm. Salinity in Dharma reservoir was ranged between 41.1 ppm to 111 ppm. Transparency the lower ranges are observed during August, 2019 and September, 2019 may be due to shallow ness of pond with higher anthropogenic disturbance which cause higher turbidity. DO varies 4.4 mg/l to 22.12 mg/l. It was lowest in the month of December, 2019 and highest in the month of February, 2020 because poorly treated water and anthropogenic activities. free carbon di-oxide having constant value in all months, the value having 0.66 mg/l. The increase in hardness was coupled with the increase in the calcium concentration which suggests that calcium is one of the factors contributing to the hardness. chloride content varies between 9.00mg/l to 25.32 mg/l. Most of the alkalinity in natural waters is formed due to dissolution of carbon-di-oxide in water Total alkalinity varied from 10 to 50 mg/l.

In the present investigation Cladoceran densities shows peaks in August, 2019. In the present study 3 Cladoceran species belonging to 3 families are recorded from Dharma reservoir (Table 2), which account 37% of total Zooplankon group. In the present investigation cladoceran densities shows peaks in August. In the present study 6 Copepod species belonging to 2 families are recorded from Dharma reservoir which account 27% of total Zooplankon group (Table 3). *Tropocyclops prasinus*, *Mesocyclops hyalinus*, *Thermocyclops hyalinus* and *Halicyclops exiguus* were recorded during the study period *Tropocyclops prasinus* was the most frequently observed Copepod in the study period. In the present study 7 species were recorded from Dharma reservoir, which account 36% of total Zooplankon group. *Brachionus falcatus*, *Brachionus diversicornis*, *Brachionus caudatus*, *Keratella tropica* and *Keratella cochlearis*. In Filinidae family 1 species, *Filinia camasecla* were recorded during study period. *Keratella tropica* was the most frequently observed Rotifer in the study period.

5. Conclusion

A water body were investigated for monthly variation of physico-chemical and Zooplankton composition, DO levels were moderate CO₂ content, Hardness, chloride, TDS and alkalinity content were low. Conductivity level in Dharma reservoir is very high. Zooplankton diversity studied for a period of 4 months revealed that the diversity is rich with 25 species of Zooplanktons. The species composition also shows monthly variations. However, further studies are required to understand the population dynamics and to evaluate the trophic status of the water body based on the Zooplanktons. The water quality of Dharma reservoir is still quite suitable. If the habitats have to be preserved for their intended use, sustainable and holistic management measure for the remediation of the tanks are an immediate necessity.

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