

# WATER QUALITY ASSESSMENT OF GORAMA DAM OF HANUMANA REWA (M.P.) INDIA, WITH SPECIAL REFERENCE TO ZOOPLANKTON

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## Abstract:

Study on hydrological status of Gorama Dam water was made to assess the portability of water from January 2011 to December 2011. Some physico-chemical parameters were considered such as surface water temperature, turbidity, pH, dissolved oxygen, hardness, alkalinity, phosphate and nitrate contents. Among the in this study, we tried to assess the zooplankton species richness, diversity, and evenness and to predict the state of Gorama dam according to physico-chemical parameters. A total of 31 taxa were recorded: 6 protozoan, 14 rotifers and 11 Crustacean species. The study revealed that the presence of certain species like, *Monostyla* sp., *Keratella* sp., *Lepadella* sp., *Leydigia* sp., *Moinodaphnia* sp., *Diaptomus* sp., *Diaphanosoma* sp., *Mesocyclopes* sp., *Cypris* sp. and *Brachionus* sp. is considered to be biological indicator for eutrophication.

**Key words:-** Physico-chemical parameters, monthly variation, zooplankton and eutrophication.

## I. INTRODUCTION

Aquatic ecosystem is the most diverse ecosystem in the world. The first life originated in the water and first organisms were also aquatic where water was the principal external as well as internal medium for organism. The inter-relationship between the physico-chemical parameters and plankton production of dam water and its relation with fluctuation of zooplankton are of great importance and basically essential fish culture. Fishes are dependent on physico-chemical parameters. Any changes of these parameters may affect the growth, development and maturity of fish. Different casual influences, which determine the quality of water, show a characteristic change from season to season.

Zooplankton constitute important food item of many fishes. The larvae of carps feed mostly on zooplankton. Zooplankton also play an important role in food chain as they are second in trophic level as primary consumers and also as contributes to next trophic level. Sunkand, Patil (2004) and Islam (2007) have worked on physico-chemical condition and seasonal variation of zooplankton.

The present study was made on water quality and occurrence of some zooplankton with respect to physico-chemical parameters in Gorama dam of Hanumana Rewa (M.P.).

## II. MATERIAL AND METHODS

Gorama (stop dam) is an anthropogenic construction on the confluence of two small rivers Gorama and Pidrya in the between village Dadar Pidriya and Bijhauri on the right hand side of N.H.7 in Hanumana tahsil of Rewa district at 24°43' 13" N and 80°2'53" S. Rewa has 7495 sq. Km of territory and occupies about 2.5% of total geographical area of the state. It stretches about 150 Km from north to south and 83 Km. from east to west. Besides being a source of water for irrigation and also the water of this Dam used for artificial breeding of Indian Major Carp in the Chinese Hatchery. The present study conducted January from 2011 to December 2011.

Water samples were collected monthly in the morning at 8 am to 10 am from surface layer of the dam. Physico-chemical and biological analysis of water samples were made following standard methods suggested by APHA, AWWA, WPCI (2005).

Identification of zooplankton was done by using the work book on limnology A.D. Adoni (1985). The zooplanktons were counted by using Sedgwick Rafter counting cell. All data were statistically analyzed (standard deviation).

### III. RESULT AND DISCUSSION

The data on physico-chemical analysis of Gorama dam has been given in table no. 1

#### Water temperature (<sup>0</sup>C):-

During the presents study period water temperature ranged from  $19.6 \pm 0.16$  <sup>0</sup>C to  $30.54 \pm 0.11$  <sup>0</sup>C *Jayabhaye et. al;* (2006), *Salve and Hiware* (2006), observed that during summer, water temperature was high due to low water level and clear atmosphere. Similar results were obtained in the present study.

#### pH:-

The pH values ranges from  $7.22 \pm 0.1$  to  $8.1 \pm 0.08$ . The maximum value was recorded from June and Minimum in the month of January. pH was alkaline throughout study period.

#### Dissolved Oxygen(mg/l):-

The value of DO fluctuate from  $7.32 \pm 0.19$  mg/l to  $9.5 \pm 0.16$  mg/l. The maximum values were recorded in the month of April (Summer) and minimum value in the month of December (winter). The high DO in summer is attributed to increase in temperature and duration of bright sunlight. The long days and intense sunlight during summer seems to accelerate photosynthesis by phytoplankton's, utilizing CO<sub>2</sub> and giving off oxygen. This accounts for the greater quality of O<sub>2</sub> recorded during summer. The quantity is slightly less during winter as reported by *Masood Ahmed and Krishnamurthy* (1990).

#### Hardness (mg/l)

The value of hardness fluctuates from  $165.2 \pm 2.39$ mg/l to  $256 \pm 1.58$ mg/l. The maximum value was recorded in the month of June (summer) and minimum in the month of December (winter).

#### Alkalinity (mg/l):-

Total alkalinity ranges from  $158 \pm 1.58$  mg/l to  $209.8 \pm 1.92$  mg/l. The maximum value was recorded in the month of July (monsoon) and minimum value in the month of December (winter).

#### Phosphate (mg/l):-

The value of phosphate ranged from  $0.18 \pm 0.02$  mg/l to  $0.332 \pm 0.01$  mg/l. The maximum value was recorded in the month of August (monsoon) and minimum values in the month of April (summer). The high values of phosphate in August (monsoon) months are mainly due to rain, surface run-off, agricultural run-off; washing activities that contributed to the inorganic phosphate content. Similar results were reported by *Arvind Kumar* ((1995).

#### Nitrate (mg/l):-

The value of nitrate ranges from  $0.031 \pm 0$  mg/l to  $0.0472 \pm 0$  mg/l. The maximum value was recorded in the month of August (monsoon) and minimum in the month of January (winter). *Swaranlatha and Narsingrao* (1998) reported that nitrates are in low concentration in summer and high during monsoon which might be due to surface run-off and rain. Similar results were obtained in the present study.

**Table No. 1-** Monthly Variation of Physico-chemical parameters of water samples of Gorama dam of Hanumana Rewa (M.P.)

Months 2011	Temp °C	pH	Dissolved Oxygen(mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	Phosphate (mg/l)	Nitrate (mg/l)
January	19.6±0.16	7.22±0.1	8.48±0.33	165.2±1.3	204±1.58	0.324±0.02	0.031±0
February	20.52±0.13	7.354±0.16	8.64±0.27	177.8±1.3	211.2±2.39	0.28±0.02	0.0468±0
March	26.68±0.13	7.58±0.21	8.56±0.23	167±1.58	200.6±2.07	0.26±0.02	0.0422±0
April	29.54±0.11	7.786±0.2	9.5±0.16	252±1.58	184±2.24	0.18±0.02	0.0432±0

May	29.76±0.17	7.84±0.2	8.3±0.16	247±1.58	174.6±2.07	0.22±0.02	0.039±0	
June	30.54±0.11	8.1±0.08	9.4±0.2	256±1.58	197±1.58	0.22±0.02	0.034±0	
July	27.56±0.11	7.772±0.11	8.5±0.16	251.4±1.34	209.4±2.07	0.254±0.02	0.0472±0	
August	27.68±0.16	7.64±0.17	7.58±0.29	224.2±2.77	183±2.22	0.332±0.01	0.0316±0	
September	26.66±0.11	7.424±0.08	7.42±0.19	201.6±1.14	200±1.58	0.26±0.02	0.0316±0	
October	25.4±0.16	7.34±0.12	7.36±0.11	172±3.16	196.8±1.92	0.294±0.02	0.032±0	
November	22.5±0.16	7.16±0.11	7.6±0.29	168±3.16	200.8±1.92	0.31±0.02	0.0324±0	
December	20.44±0.11	7.136±0.06	7.32±0.19	165.2±2.39	158±1.58	0.29±0.02	0.0356±0	
Range	Min	19.6±0.16	7.32±0.19	7.32±0.19	165.2±2.39	158±1.58	0.18±0.02	0.031±0
	Max	30.54±0.11	9.5±0.16	9.32±0.19	256±1.58	209.8±1.92	0.332±0.01	0.0472±0

**Zooplanktons:-**

The zooplanktons were represented by three groups viz Protozoa, Rotifera and Crustacea 31 species as mentioned in Table No. 2 were identified in the water of Gorama dam. Out of which 6 species belong to group Protozoa *Arcella discoidea*, *Diffuzia limnetica*, *Euglypha sp.*, *Ceratium sp.*, *Paramoecium bursaria* and *Vorticella sp.* Rotifers were represented by 14 species including *Mytilina ventralis*, *Brachionus falcatus*, *Brachionus rubens*, *Brachionus forficula*, *Brachionus angularis*, *Trichocera sp.*, *Trichocera longiseta*, *Keratella tropica*, *Keratella procurva*, *Monostyla bulla*, *Asplanchnopus brightwelli*, *Polyarthra vulgaris*, *Filinia longiseta* and *Lecane*. 11 species of Crustaceans were identified at Gorama dam. These species are *Cyclops bicuspidatus*, *Cyclops viridis*, *Cyclops Sp.*, *Mesocyclops leuckarti*, *Diaptomus*, *Nauplius*, *Bosmania sp.*, *Daphnia longispina*, *Cerodaphnia reticula*, *Cypris pelluotella*, *Macrothrix species*.

Gorama dam is an important water resource of district Rewa which has its own socioeconomic value. The dam productivity level of somewhere between oligotrophic and mesotrophic status. Vashist (1968) Verma and Munshi (1967) have also expressed the similar investigation. In the present study, the densities of planktonic members have also found increased in winter and summer at high pH and temperatures. Shrinivasan (1964), Kadam (1990) have reported that large system is an important indication of normal quality of water. The present study depicted considerable variations in community structure within limnetic zooplankton. Dominance of rotifers in the dam could be attributed to the continuous supply of food material Singh D.N. (2000). The order of dominance of various groups of zooplanktons were represented- Rotifera > Crustacea > Protozoa.

**Table 2.** Showing species composition of Zooplankton at Gorama dam, Hanumana Rewa, (M.P.).

Group	Order	Name of Species
1. Rotifera	<i>Ploimida</i>	1. <i>Mytilina ventralis</i> . 2. <i>Brachionus falcatus</i> 3. <i>Brachionus rubens</i> 4. <i>Brachionus forficula</i> 5. <i>Brachionus angularis</i> 6. <i>Trichocera sp.</i> 7. <i>Trichocera longiseta</i> 8. <i>Keratella tropica</i> 9. <i>Keratella procurva</i> 10. <i>Monostyla bulla</i> 11. <i>Asplanchnopus brightwelli</i> 12. <i>Polyarthra vulgaris</i> 13. <i>Filinia longiseta</i> 14. <i>Lecane</i>
2. Crustacea	<i>Copepoda</i>	1. <i>Cyclops bicuspidatus</i> . 2. <i>Cyclops viridis</i> 3. <i>Cyclops Sp.</i> 4. <i>Mesocyclops leuckarti</i>

		<p>5. <i>Diaptomus</i> 6. <i>Nauplius</i> 7. <i>Bosmania sp.</i> 8. <i>Daphnia longispina</i> 9. <i>Cerodaphnia reticula</i> 10. <i>Cypris peluotella</i> 11. <i>Macrothrix species.</i></p>
3. Protozoa	<p><i>Sarcodina</i></p> <p><i>Ciliata</i></p>	<p>1. <i>Arcella discoides.</i> 2. <i>Diffuzia limnetica</i> 3. <i>Euglypha sp.</i> 4. <i>Ceratium sp.</i> 5. <i>Paramoecium bursaria</i> 6. <i>Vorticella sp.</i></p>

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