

# A Study on Seasonal Variations of Physicochemical Characteristics of Maan River: A Tributary of Narmada River in Relation to Zooplankton Diversity

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## ABSTRACT:

A study on the relationship between zooplankton abundance and physicochemical parameters of the Maan River of Manawar taluka of Dhar was made in January year of 2008. In the present study impact of the different physicochemical parameters were varied from place to place depending upon the conditions of the water body. The physicochemical parameters studied were within the permissible limits. The zooplanktonic community are 38 species belonging to 29 genera of the following group.

**Keywords:** Zooplankton, physicochemical parameters, abundance etc.

## INTRODUCTION:

Water is the most vital resource for all kinds of life on the earth and essential for the sustainability of the earth's ecosystem (UNESCO, 2003). Physico-chemical characteristics directly influence the life inhabiting it. Zooplankton is considered one of the most important linkages in the aquatic food chain and plays a major role in energy transfer. The physicochemical factor and nutrient status of water play the production of planktonic biomass. However little information is available on the seasonal variation of zooplankton and their relationship with the physicochemical parameters of the water in the Maan River of Manawar taluka of Dhar.

Literature on the ecology of the zooplankton population from different parts of India is available from the investigation of Sreenivasarn (1967) Michal (1968) Mathivvvvanan et al. (2007) and Kudari and Kanamadi (2008) etc. Chattopadhyay and Banerjee (2007 & 2008) worked on seasonal variation of zooplankton and their relationship with the physico-chemical parameters of Kanalsayer Burdhwon West Bengal. The present study aims to deal with the impact of various seasonal physicochemical factors and abundance of zooplankton populations in the Maan River of Manawar taluka of Dhar.

## METHODOLOGY:

### Description of Site:

Man River is in Umarban, Dhar district in Madhya Pradesh State in India. Man River near by pin code areas are 454449 (Dharampuri), 451556 (Anjad), 454446 (Manawar), nearby railway Station is located at the distance of 8 Km to Manawar City. Man River is geographically located at Latitude: 22° 13'

48.00" N Longitude: 75° 04' 48.00" E. The name Manawar came from name of river Man that flows at southern edge of the town.

**Material and Methods:**

The present investigation was conducted for the year January 2020 to December 2020 in the Maan River of Manawar. It is situated at 22° 20' 40" North and South 74° 56' 27". Sample were collected from the selected area of River Manawar using polythene container of two liter capacity for one year (January-December) at monthly intervals Ph and temperature were measured at the site of sample collection. Ph was measured by Ph meter and temperature with the help of a sample Celsius thermometer having an accuracy of 0°C and a range of 0°C to 50 0°C.

The methods of Trivedy and Goel (1986) and standard methods of APHA (1998) for zooplanktons counting the Sedgewick rafter (S-R) cell was used which is 50m.m long and 50m.m wide 1m.m.deep number of zooplankton in the S-R cell was derived from following formula.

$$\text{No. ml}^{-1} = \frac{C \times 1000\text{mm}^3}{L \times D \times W \times S}$$

Were, C = number of organisms

L = length of each strip (S-R cell length) in m. m.

D = Depth of strip counted.

S= number of strips counted.

**OBSERVATION AND RESULTS:**

**Table: 1 – Seasonal variation in physico-chemical parameter of the Maan River of Manawar during January 2020 to December 2020**

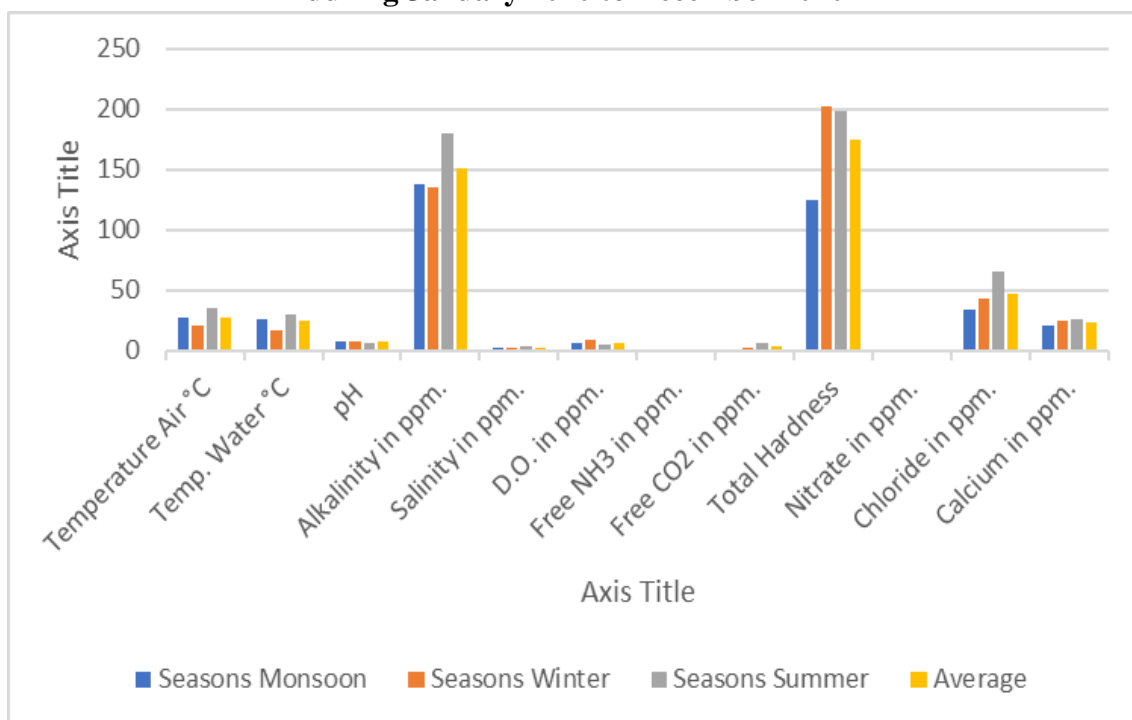
Physico-chemical parameters	Seasons			Average
	Monsoon	Winter	Summer	
Temperature Air °C	28.00	20.20	35.80	28.00
Temp. Water °C	26.50	17.00	30.50	24.67
Sun light	Intermittent	Direct	Direct	---
Water flow	Slow	Stagnant	Stagnant	---
Color	Light green	Green	Brownish	---
Odor	Absent	Absent	Present	---
pH	7.50	8.20	6.80	7.50
Alkalinity in ppm.	138.00	135.00	180.00	151.00
Salinity in ppm.	2.10	2.50	3.70	2.77
D.O. in ppm.	6.0	8.80	4.50	6.43
Free NH3 in ppm.	0.01	0.01	0.01	0.01
Free CO2 in ppm.	1.50	2.50	6.50	3.50

Total Hardness	125.00	202.00	198.00	175.00
Nitrate in ppm.	0.30	0.38	0.55	0.41
Chloride in ppm.	34.20	43.50	65.20	47.63
Calcium in ppm.	20.50	24.40	26.00	23.63

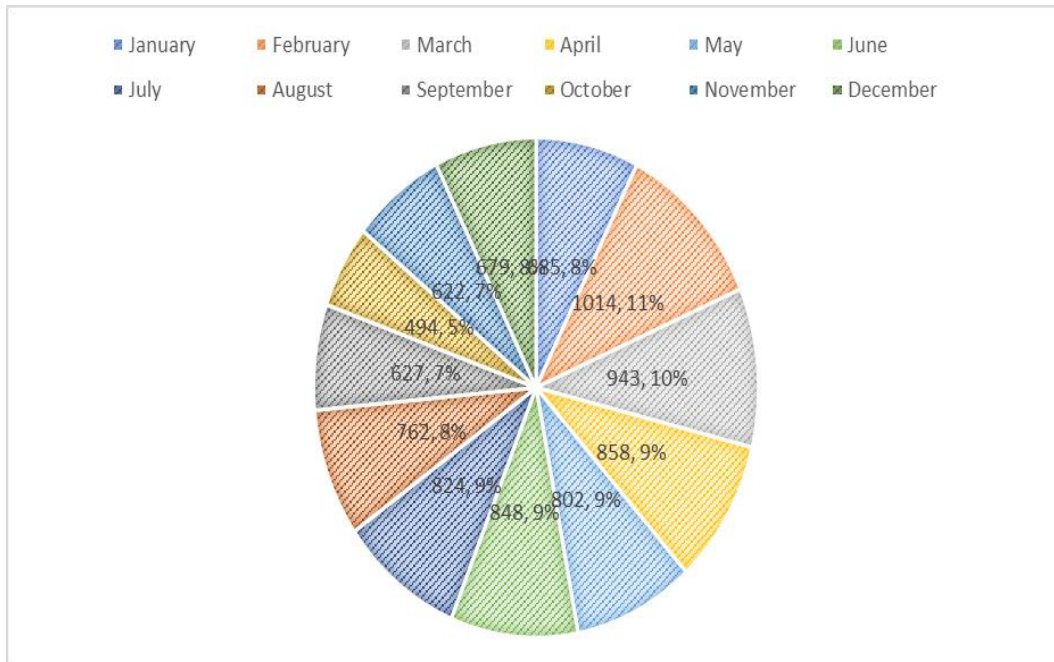
**Table: 2 – Monthly average abundance of zooplankton in Maan River during January 2020 to December 2020 Zooplankton (Org./L)**

Month	Total
January	685
February	1014
March	943
April	858
May	802
June	848
July	824
August	762
September	627
October	494
November	622
December	679

**Graph: 1 – Seasonal variation in physico-chemical parameter of the Maan River of Manawar during January 2020 to December 2020**



**Graph: 2 – Monthly average abundance of Zooplankton in Maan River during January 2020 to December 2020 Zooplankton (Org./L)**

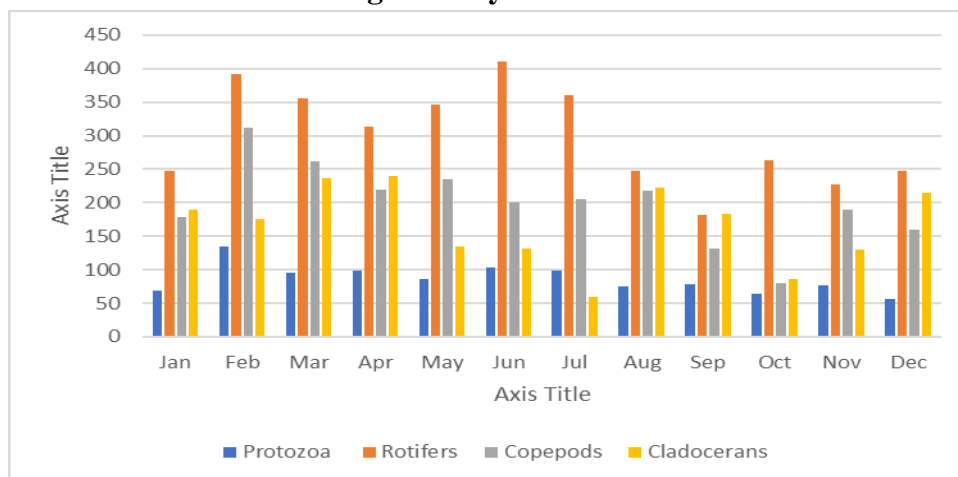


**Table: 3 - Monthly fluctuation in zooplanktons population and genera (organism/L) in Man River of Manawar during January 2020 to December 2020**

Zoo plankton	Months'												Mean $\pm$ SD $\pm$ SE
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Protozoa	69	134	95	99	86	104	98	75	78	64	76	56	86.16 $\pm$ 21.27 $\pm$ 6.142
No. of Genera	2	2	2	2	2	2	2	2	2	2	2	2	
Rotifers	248	392	356	313	347	411	361	248	181	264	227	248	299.66 $\pm$ 73.185 $\pm$ 21.127
No. of Genera	7	7	6	6	5	7	6	6	4	6	5	7	
Copepods	178	312	262	219	235	201	205	217	132	80	189	160	199.167 $\pm$ 59.93 $\pm$ 17.301
No.	3	3	3	3	3	3	3	3	3	3	3	3	

of Gen era													
Cladoc erans	190	176	236	239	134	132	60	222	184	86	130	215	170.833±61.32±17.703
No. of Gen era	4	4	4	4	4	4	4	4	4	2	3	4	
Tot al Zoo plan kton	685	1014	949	858	802	848	924	762	575	494	622	679	

**Graph: 3 - Monthly fluctuation in zooplanktons population and genera (org./L) in Man River of Manawar during January 2020 to December 2020**



**RESULT AND DISCUSSION:**

The physicochemical properties of freshwater of the River of Maan have been shown in Table -1 and Graph - 1.

During the tenure of the research work following parameters were estimated and compiled in three replicates as follows:

Seasonal variation of air temperature was recorded highest in summer season followed by monsoon and winter season with 35.80 °C, 28.00 °C and 20.20 °C respectively with average annual value 28.00 °C. Water temperature was highest in summer followed by monsoon and winter seasons with 30.50 °C, 26.50 °C and 17.00 °C during the study period. Seasonal variation of pH and annual average value was recorded 8.20 in winter, 7.50 in monsoon and 6.80 in summer season and 7.50 respectively. In which the pH value was highest in winter season followed by monsoon and summer season. Seasonal variation

of alkalinity was highest in summer season followed by monsoon and winter seasons with 180.00 ppm, 138.00 ppm and 135.00 ppm respectively with annual average value 151.00 ppm during the tenure of one year of study period. The value of salinity was recorded 3.70 ppm, 2.50 and 2.10 ppm in summer, winter and rainy seasons respectively with average value 2.77 ppm in Maan river during the research period. Seasonal variation of Dissolved Oxygen was recorded highest in winter with 8.80 ppm, followed by monsoon with 6.00 and summer 4.50 ppm respectively with mean annual value 6.43 ppm. Free Ammonia was recorded 0.01 ppm at all seasons during the study period. Seasonal variation of free Carbon dioxide was highest in summer followed by winter and rainy seasons with 6.50 ppm, 2.50 and 1.50 ppm respectively with average value 3.50 ppm during the tenure of the research work. Seasonal variation of total hardness was recorded 202.00, 198.00 and 125.00 ppm in winter, summer and monsoon seasons respectively with annual average value 175.00 ppm. During the study period nitrate seasonal variation was recorded highest in summer followed by winter and rainy season with 0.55, 0.38 and 0.30 ppm respectively and annual average value 0.41 ppm. Chloride content was highest in summer season with 65.20 ppm, followed by winter with 43.50 and rainy season with 34.20 ppm an average annual value was 47.63 ppm. Seasonal variation of calcium content was recorded 26.00, 24.40 and 20.50 ppm in summer, winter and monsoon seasons respectively with average value 23.63 ppm during the tenure of one year of research period (Table – 2 and Graph -2).

The Zooplankton population in man river is composed of four major groups viz., Rotifera, Protozoa, Copepoda and Cladocera. During the study period range of zooplankton was recorded 1014 org/l to 494 org/l in February and October. Among the groups of zooplankton rotifers were the dominant group followed by copepods, cladocerans and protozoans with range value 392 to 227 org/l, 312 to 80 org/l, 239 to 86 org/l and 134 to 36 org/l respectively (Table – 3 and Graph – 3).

Similar dominance of rotifers also reported by Lampert (1981) and Levis (1979), who claimed that phytoplankton exerted direct control over the reproduction of herbivores zooplanktons. In conclusion the analyzed parameter of sample compare to permissible limit of W.H.O. the constitute of sample water of man river are within permissible level. Zooplankton is more in the summer than during winter and rainy seasons which was also reported by (Abdus, et. al (1995) and Kumar et. al. (2001). Jhingran (1982) reported that in winter months pond habitats are found rich in zooplankton it may be due to biotic interaction operating through feeding pressure rather than water quality. Dissolved oxygen (DO) is positively correlated with zooplankton because in high temperatures the solubility of oxygen is lowered and also the organic substances are degraded. The concentration of DO is inversely proportional to temperature at a given time. DO value shows a significant positive correlation with Zooplankton. A similar conclusion has been drawn by Singh and Singh, 1993. In conclusion the well growth of plankton in the month January to March and decline to September and also, we conclude water quality regulates biotic diversity and the trophic level of an ecosystem. The present investigation involves the analysis of physico-chemical and biological parameters that reflect the abiotic status of an ecosystem. This in turn, helps in planning exploitation, antipollution, or conservation strategies.

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