Study On Different Hydrobiological Parameters Of Beehar River At Rewa Madhya Pradesh

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Abstract- The present study deals with the seasonal variation in hydrobiological parameters of the Beehar River to see if the water is good quality for fishes. Some of the things we are looking at are temperature, dissolved oxygen (DO), acidity (pH), turbidity, alkalinity, hardness, total dissolved solids (TDS), biological oxygen demand (BOD) and other constituents of Beehar River. This study provides information about how clean or dirty the water is in Beehar River in Rewa city. The river collects different kinds of waste from homes, farms, and factories as it flows through rural areas and urban areas. In simpler terms, we examine water to understand how clean it is and how human and cultural actions impact its physical, chemical, and biological characteristics. We discovered that the natural chemical makeup, including the amount of trace elements, of the water does not harm or limit the living creatures in the water.

Index Terms- Beehar River, Hydrobiological parameter, BOD, TDS.

I. INTRODUCTION

The Beehar River begins at Bairiha dam near the village of Judmaniya in Amarpatan, Satna district, Madhya Pradesh, India. After that, it keeps moving for about 50 kilometers until it gets to Rewa city. Beehar is the third largest river in the Vindhya region of Madhya Pradesh. Its main tributary is Bicchiya River at Rewa in Madhya Pradesh and it is a tributary of the Tons River. The river collects different kinds of waste from homes, farms, and factories as it flows through rural areas and urban areas.

Many researchers have studied the limnochemistry and properties of Indian river (Deshmukh and Ambore 2006) (Deshmukh and Sonawane 2008). The purpose of the study was to examine the natural features of the Beehar River at Rewa for fish farming and how the quality of its water can affect it. The study's outcomes will help us learn more about how we can make better use of water bodies in cities. Moreover, when water conditions change in areas affected by open pit mines, the roles of river water become even more important in terms of factors related to society, economy, environment, and water preservation. Understanding the true biological capabilities of Beehar river waters will help us better manage and utilize them for aquatic farming.

II. METHODS AND MATERIAL

1. Study Area

The research was done between 2020 and 2022. We measured the Physicochemical and hydrobiological -related factors at 4 different places in the Beehar River at Rewa city. . The Beehar River mainly gets water from canal of the Bansagar Dam situated at Deolond Town in Shahdol district. We collected water from four different stations in the Rewa city named 1. Rajghat Sangam (S-1): This sampling point was established near Rajghat Sangam. PHED pumping station is the characteristics of the site. 2. Nipania Bridge (S-2): This sampling point was established near Nipania bridge intensive human activities are the taking place at this site. 3. Vikram Bridge (S-3): This sampling point was marked near Vikram Bridge, a cloth washing by Dhobis and other human activities are the characteristics of the area. 4. Jayantikunj (S-4): This sampling station was established behind forest range office which characteristics the river moving out of the town (Fig-1).

Fig-1 . Four different stations of sample collection from Beehar river in Rewa city; (A)- Rajghat Sangam (S-1), (B)- Nipania Bridge (S-2), (C)- Vikram Bridge (S-3), (D)- Jayantikunj (S-4).

2. Environmental data and analytical procedure

The research was done between 2020 and 2022. We measured the temperature, Dissolved Oxygen (DO) in the lab using a method called Wrinkler's method. We used a Secchi disc to measure water transparency, also known as turbidity, in its natural environment. Water samples were collected every month throughout the study. In the lab, we did tests to measure the acidity of the water (pH). To carry out a pH value measurement, the electrode was immersed in the sample solution until a stable reading was achieved. The electrode was then rinsed after each sample measurement. The amount of different substances dissolved in it (total dissolved solids). Total dissolved solid (TDS) was determined as residue after evaporation of the filtered sample. To determine the total dissolved solid and evaporating liquid, an appropriate sample was removed and weighed. The unfiltered 50 ml of the sample was removed in an evaporation dish. This was evaporated on a water bath and the final weight was determined as the TDS value in mg/l.

$TDS (mg/L.) = (A - B\ 1{,}000) / V$

Where A = Final weight of the evaporation dish in mg. B = initial weight of evaporating dish in mg. V = sample volume taken in ml. S = volume of sample in ml.

We also measured the amount of oxygen needed by living organisms in the water (biochemical oxygen demand), as well as the levels of magnesium and calcium present for the alkalinity of the water, bicarbonate, and carbonate to determine the hardness of the water using a method called tritremetric. The levels of Chloride, Reactive Silicate, Inorganic Phosphate and Nitrate were checked using a special measuring method called spectrometry. The levels of sodium and potassium were checked using a device called a flame photometer. We followed the APHA guidelines (Clesceri 1998) when testing the water's chemicals. The amount of something was measured with an accuracy of 0.01mg/litre. The values are calculated by finding the average of three years, 2020 to 2022.

III. RESULTS AND DISCUSSION

1. Temperature:

Temperature ranges between 12^0C to 36^0C. The minimum temperature 12^0C was recorded in January (winter season) where as hottest during the June (summer) i.e. 36^0C (Table 1) seasonal variations were observed in water temperature which also exhibited a correlation with atmospheric temperature since shallow water reacts more quickly to change in atmospheric temperature (Adebisi 1981). The maximum temperature was recorded during pre monsoon and lowest during winter.

2. Turbidity:

Significant differences in turbidity were observed between 2020 and 2022 which ranges from 0.21 to 0.73 SDT m. Turbidity were observed more in monsoon season in comparison to winter and summer.

Table 1 (A) - Seasonal variation in physicochemical parameters in the Beehar river water in 2020-2022 at Rewa city.

Month	Temp ^{0}C	DO mg/lit	pH	Turbidity (SDTm)	Alkalinity mg/lit	Hardness mg/lit	TDS mg/lit	BOD mg/lit	PO$_4$$^{3+}$ mg/lit	Cl$^-$ mg/lit	Nitrate mg/lit	Na+ mg/lit	K+ mg/lit	Si mg/lit
Jan	12	7.6	6.7	0.31	81	184	415	3.6	0.16	28.4	0.37	11.8	1.37	12.4
Feb	16	6.8	6.8	0.28	84	197	558	3.4	0.53	36.2	0.48	27.9	1.94	12.9
Mar	22	4.9	7.3	0.23	87	203	670	3.1	0.89	59.4	0.73	47.3	2.8	13.6
April	31	3.6	7.8	0.21	88	215	730	4.7	1.32	67.7	1.08	55.4	2.97	14.9
May	33	4.3	8.1	0.23	92	240	835	5.3	1.54	78.4	1.7	70.1	3.3	15.2
June	36	4.5	8.3	0.65	89	232	820	5.2	1.78	65.8	2.7	60.3	3.01	15.6
July	31	4.9	8.0	0.73	77	216	790	5.1	2.06	44.9	3.1	38.7	2.4	17.8
Aug	28	5.6	7.9	0.72	75	205	765	4.8	1.87	41.2	2.8	32.8	2.2	16.4
Sept	27	6.8	7.7	0.68	72	195	690	4.5	1.64	38.4	1.3	18.4	1.6	15.3
Oct	24	7.3	7.4	0.58	76	173	540	4.4	0.58	33.5	0.94	12.5	1.49	14.7
Nov	21	8.7	7.2	0.44	78	166	495	4	0.37	31.4	0.38	6.7	1.33	14.2
Dec	16	8.4	6.8	0.35	80	179	470	3.9	0.08	26.7	0.21	4.6	1.24	13.7

(Abbreviations: SDT - Secchi disc transparency, DO – dissolved Oxygen, TDS - total dissolved solids, BOD - biochemical oxygen demand, PO$_4$$^{3-}$—Phosphate, Cl$^-$- Chloride ion, Na$^+$- Sodium ion, K$^+$- Potassium ion, Si- Silicon).

3. pH (Hydrogen ion concentration)

The PH parameter is one of the most important hydrobiological parameters that serve as an index for pollution. The pH is the value expressed as the negative logarithm of the hydrogen ion concentration Several studies have been reported that the pH of the Indian rivers ranges between 6.7 to 9 (Gupta, Yadav et al. 2013) (Kumar and Bahadur 2009) (Singh 1965) (Verma, Tyagi et al. 1978) (Vyas and Kumar 1968). In the present study, the pH of the water was between 6.7 and 8.3 during 2020 to 2022 (Table -1), indicating that the Beehar river is slightly alkaline. High water pH levels during the summer months can be due to the use of bicarbonates and carbonate buffer systems. (Mishra, Prajapati et al. 2011).

4. Dissolved Oxygen (DO):

The dissolved oxygen in the month of april is minimum (3.6mg/lit) where as maximum in the month of November (8.7mg/lit) which positively correlate between temperature and duration of sunlight. The dissolved oxygen in water at given temperature depends on temperature of water, partial pressure of the gas, dissolved salts amount. It has been reported that high dissolved oxygen levels are associated with higher pH of water (Shmeis 2018). Dissolved Oxygen concentration inversely proportional to the concentration of CO2 (Deshmukh , Prakash 1983).

5. Total Alkalinity:

The alkalinity level in river water ranges between 72 and 92 milligrams per liter. Carbonates and bicarbonates make water alkaline. Their amounts were shown in Table-1. The amount of alkaline in the water was opposite to the water level (Adebisi 1981, Clesceri 1998). This means that when the water level was high, the alkalinity was low, and vice versa. The river water is not very alkaline in September but becomes more alkaline in May. Our findings showed that the alkalinity is high during winter and

summer but low during the monsoon season because there is a lot of water.

6. Total Hardness:

The level of water hardness goes from 166 to 240 milligrams per litre. This hardness is mostly caused by carbonate substances like calcium and magnesium, and is measured as an equivalent amount of calcium carbonate. The high level of hardness in water, which is measured between 150-300ppm and higher, can harm fish's hearts and kidneys, leading to diseases. We have found that the highest amount of water hardness in the river Beehar was 240 milligrams per litre. In November, the hardness was found to be low at 166 mg/l, and in May it was high at 240 mg/l.

7. Biochemical Oxygen Demand (BOD):

This is a measurement used to find out if there are things in trash that can break down naturally and to show how polluted it is. Biochemical oxygen demand is a measurement of the amount of oxygen needed by organisms to break down organic matter in water. It varies from 3.1 to 5.3mg/lit. The level of BOD is higher during the summer season compared to winter and monsoon because there is less solid waste and fewer microorganisms present in the water (AHER and AHER 2020). The reason for the high BOD levels in the summer months could be that several microbes accelerated their metabolic activities due to concentrated amounts of organic matter released by human activities and therefore required more oxygen (Kumar and Sharma 2005).

8. Total Dissolved Solids (TDS):

The amount of dissolved substances varies from 415 to 835 mg per litre. The level of dissolved substances is lower in January and higher in May. The amount of dissolved solid increases because decayed matter from underwater plants is being released. The amount of dissolved solids in water is the lowest during winter and the highest during summer (Jayaraman, Devi et al. 2003). Earlier study has reported when the level of TDS (Total Dissolved

Solids) in water increases, the water becomes harder (Shastri, Sonawane et al. 2004).

9. Sodium and potassium ion concentration (Na$^+$, K$^+$, Cl$^-$, Reactive Silicate, Inorganic Phosphate and Nitrate concentration)

Higher amounts of chloride (Cl-) and sodium (Na+) ions are commonly found together at certain levels. Between 2020 and 2022, the average levels of chloride ion 26.7- 78.4 mg/lit and sodium ion 4.6-70.1 mg/lit were observed. The levels of ions were generally high throughout the whole study. We also noticed that in Table-1, the amount of certain chemical indicators changed a lot and varied greatly depending on the season. Different amounts of particles were being found in river water with different concentration levels in different season. This means that the levels of ions can vary depending on how much of a substance is dissolved in the solution. The nitrate content of the river water was at least 0.21 mg/lit in December and 3.1 mg/lit in July. The higher values of nitrate content were measured in monsoon season, moderate in summer season and lower in winter season. The amount of inorganic phosphate in the water varied from 0.08 mg per liter to 2.06 mg/lit. It was found to be higher during the monsoon season compared to winter and summer. In simpler terms: The amount of Si (Silicon) in water can change and be between 12. 48 -17.8 It is higher during the rainy season because there is more dust and soil in the water.

IV. CONCLUSION

A study done on the Beehar River in Rewa city for four years found that the water in the river is similar to freshwaters in terms of its chemical properties. The source of these waters can be identified by a slightly higher amount of dissolved solid materials in them. This usually happens when there is more carbonates and chlorides. It is very hard to say what the typical makeup of fresh water is, since the saltiness of lakes and rivers around the world can be very different. In saltwater, there is a lot of chloride and sodium. But in freshwater, there is more of carbonates and HCO3 −. In the Beehar River, the level of hardness of the water varied from 166 to 240 milligrams per liter on average. Between 2020 and 2022, the amount of alkalinity (a measure of certain substances dissolved in water) varied between 72 and 92 milligrams per liter, depending on the total amount of dissolved solids in the water (Bœuf and Payan 2001). The amount of these substances in the river was not very high because the water in the river usually moves continuously. Geochemistry helps us understand why there is a lot of calcium and carbonates in the water, which makes it more likely to stay basic. (Pękala 2014) found that the levels of sulfate, sodium, and chloride ions can sometimes be high in water released by the dewatering system. This study indicates that knowledge of environmental requirements of fish is a good practice for better growth rate of the aquaculture creatures in the river system. In our study, the hydrochemical background, including the concentration of trace elements, has not been a limitation or a threat to biological potential of the aquatic environment.

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