

MINOR RESEARCH PROJECT

- 1)Name of the project : Study of aquatic flora and fauna of Wardha river.
- 2)Name of the principal investigator : Shri Sadashiv D. Tummawar
- 3)Project Reference No. : 47-616/08(WRO)
- 4)Scheduled life of project : One and half years
- 5)Date of research period : 16th march,2009-17th sept. 2010

Summary

Water and life have an inseparable unique relationship and are considered as two sides of a coin. It is the elixir of life and the substance from which all life springs forth. It is vital to the existence of all living organisms. It is one of the most important and precious natural resources available on our planet earth. But this valued resource is increasingly being threatened as human population grows and demand more water for domestic purposes and economic activities.

It is now generally accepted that aquatic environments cannot be perceived simply as holding tanks which supply water for anthropogenic activities. Rather, these environments are complex matrices that require careful use to ensure sustainable ecosystem functioning well into the future.

Knowledge about the riverine biodiversity of different regions is prerequisite for the proper understanding of riverine ecosystems. In tropical Asia, riverine ecosystems support a significant portion of the global biodiversity which includes not only plankters and invertebrates but also vertebrates. Study of plankton is a very useful tool for the assessment of water quality in any type of water body and also contributes to an understanding of the basic nature of the concerned river.

India is very rich in lotic ecosystems and though number of reports are available on the water quality, phytoplankton and their role in assessment of pollution, zooplankton, benthic macroinvertebrates, Ichthyofauna and so on from the lotic ecosystems from other states of our country, investigation on

rivers of Maharashtra particularly Vidharbha are very much restricted.

The lotic ecosystem under study i.e. River Wardha which is the tributary of the Godavari river system originates at an altitude of 777 meters in Satpura Range near Multia in Betul district of Madhya Pradesh. From the origin it flows 32km in Madhya Pradesh and then enters into Maharashtra, where it travels towards south and reaches in Wardha district. Further it flows towards the north, west and south boundaries of district and enters in Chandrapur district. It is the only perennial river in the district having the longest river course as compares to the other two major rivers of the district. Though Wardha river is the major river of the district, barring few reports, no attempts were made to analyse the water quality as well as the very rich and varies biodiversity, therefore this investigation.

Chandrapur, a district headquarter of Nagpur division in Vidharbha region of Maharashtra state, is located about 155 kms from Nagpur and situated at 19° 57' N latitude and 79° 22' longitude at a height of 321.95M above MSL.

Four sampling stations with varying degrees of pollution along the stretches of Wardha river were selected to find out hydro biological status with respect to seasonal fluctuation.

Site **SW1** is known as filtration plant site, which is situated just near the filtration plant which supplies water to the Ballarpur town. Site **SW2** is known as Fort site and is surrounded by substantially populated residential area which is extensively used for anthropogenic activities and disposal of untreated sewage from surroundings area. Site **SW3** is known as *Sasti* bridge site, located just beneath the bridge situated near *Sasti* town.

The samples for water quality parameters were collected once in a month from the sampling sites, across the river and seasonal variations were recorded in monsoon, winter and summer seasons.

The physio-chemical parameters of water quality were-

- a. Temperature recorded with sensitive thermometer and expressed in degree Celsius (°C).
- b. pH recorded with pH meter (Sistrionics Digital pH Meter No.335).
- c. Conductivity measured with portable water analysis kit (Labotronics model LT-60).
- d. Total dissolved solids determined as per standard methods.
- e. Chloride was determined by titrimetric method using potassium chromate as an indicator.
- f. Total hardness, calcium hardness and magnesium hardness were determined by titrimetric method using Eriochrome Black T indicator.
- g. Total alkalinity of water was estimated by titrimetric method using Phenolphthalein and Methyl orange indicators.
- h. Dissolved oxygen was determined by modified Winklers method.
- i. Free carbon dioxide was determined by titrimetric method using phenolphthalein indicator.
- j. The estimation of phosphate and nitrate was done by using spectrophotometer (Labotronics India, model No. UV-108).
- k. The sulphate concentration was determined by turbidometric using spectrophotometer (Labotronics India, model No. UV-108).

BIOLOGICAL PARAMETERS:

Samples for planktonic study were collected monthly from each site. The samples were collected in the morning hours between 8:30 to 10:30 am. 50 litres of water sample was filtered through the plankton net made of bolting silk number 25 with mesh size

50 μ . The collected samples were allowed to settle down by adding Lugol's iodine. Sample was concentrated up to 50ml depending on the number of plankton and preserved in 5% formalin for further studies.

Phytoplankters preserved in 5% formalin were photographed and identified using pertinent literature. Quantitative enumeration was done by S.R. Cell method and expressed as IndL⁻¹.

Sample for benthic macroinvertebrates were collected by Ekman-dredge. Individual benthic macroinvertebrates segregated and identified using standard keys.

For Ichthyofaunal observation, fishes were collected from landing sites, and identified by referring standard literature. Avian fauna including resident and migratory birds were recorded. The observations were usually undertaken early in the morning between 6am to 8am and in the evening 5pm to 7pm. Birds were observed with the help of a binocular and photographed using Sony Cybershot Camera (Model No. DSC-HX1).

The physicochemical parameters exert influence both individually and collectively which conditions the origin, development and succession of biotic communities and their interaction producing the abiotic environment.

The temperature at all sites ranged between 21.50°C to 34.50°C and seasonally maximum temperature was recorded during the summer season and minimum during winter season. The higher temperature recorded at sampling site SW2 was might be due to mixing of domestic sewage and washing activities.

The pH value at all the sampling sites was slightly alkaline, ranging between 7.64 to 8.42, maximum pH was observed during summer and minimum in monsoon season. A slightly alkaline pH

was recorded throughout the study at all the sampling sites of the river.

The total dissolved solids ranged between 208.00 mgL⁻¹ to 546.00 mgL⁻¹. As for as seasonal variation are concern, the maximum T.D.S was recorded in summer and minimum in monsoon season. Relatively low level of TDS during monsoon attributed to the dilution of pollutants. Along the stretch of the river, maximum T.D.S was recorded at site SW2 may be due to addition of domestic and industrial effluents from the vicinity.

The conductivity at all sites ranged between 0.272 mmhoscm⁻¹ to 0.697 mmhoscm⁻¹. High values of conductivity were recorded at sampling site SW2. The maximum conductivity was recorded during summer and minimum during winter season.

The chloride at all the sites ranged between 11.04 mgL⁻¹ to 41.18 mgL⁻¹. Maximum chloride was recorded at site SW2 attributed to inflow of sewage and addition of high amount of domestic and industrial effluents. Seasonally, maximum values of chloride were recorded during monsoon and minimum during winter season.

The total hardness at all the sites ranged between 35.00 mgL⁻¹ to 79.00 mgL⁻¹. Maximum total hardness recorded during summer season at site SW2 may be due to low water level and addition of calcium and magnesium salts used for different anthropogenic activities. Maximum calcium and magnesium hardness recorded during summer season and minimum during monsoon season.

The total alkalinity at all the sites ranged between 50.50 mgL⁻¹ to 135.00 mgL⁻¹. The maximum values were recorded at site SW2 may be due to pollution causing activities. As for as seasonal variation are concern, maximum total alkalinity was recorded during summer and minimum during monsoon season. The low

values during monsoon attributed to the high water level and dilution.

The dissolved oxygen at all the sites ranged between 4.25 mgL^{-1} to 9.10 mgL^{-1} . Maximum values of dissolved oxygen were recorded during the winter season might be due to higher density of phytoplankton and decrease in water temperature. However, low values during summer may be due to high water temperature.

The free carbon dioxide at all the sites ranged between 0.72 mgL^{-1} to 4.64 mgL^{-1} . The free carbon dioxide was recorded maximum in summer season and minimum in winter season. Maximum values recorded during summer season may be due to increase in atmospheric temperature and biological oxidation of organic matter. However, low values of CO_2 during winter may be due to maximum utilization of CO_2 by more algal blooms in winter, decreased water temperature and low diffusion from air. Along the stretch of the river, the maximum values recorded at site SW2 may be due to depletion of oxygen content and increase in the built of free CO_2 by the process of anaerobic digestion of sewage waste.

The nitrate at all the sites ranged between 0.410 mgL^{-1} to 1.205 mgL^{-1} . Maximum nitrate was recorded during monsoon season and minimum during summer.

The sulphate at all the sites ranged between 21.05 mgL^{-1} to 24.25 mgL^{-1} . Maximum sulphate values were recorded during the monsoon season and minimum during winter season at all the sites.

The phosphate at all the sites ranged between 0.680 mgL^{-1} to 0.986 mgL^{-1} . The maximum concentration of phosphate was recorded in summer season and minimum in winter season. The discharge of municipal sewage, domestic and industrial effluents at site SW2 was responsible for increased values of phosphate.

The plankton consisted of phytoplankters and zooplankters 51 species of phytoplankton and 39 species of zooplankton were recorded. The phytoplankters belonged to cyanophyceae, euglenophyceae, bacillariophyceae and chlorophyceae and two years of average study shows the following sequence.

Chlorophyceae > Bacillariophyceae > Cyanophyceae > Euglenophyceae at site SW1,SW3.

However at site SW2 the sequence was

Chlorophyceae > Cyanophyceae > Bacillariophyceae > Euglenophyceae

Zooplankton belong to Rotifera, Cladocera, Copepoda and Ostracoda and at all the sampling sites in two year average showed the following sequence.

Rotifera > Copepoda > Cladocera > Ostracoda

The benthic macroinvertebrates recorded belonged to Nematoda, Annelida, Insecta, Gastropoda and Pelecypoda.

The Ichthyofaunal diversity composed of 48 species belonging to 7 orders and 14 families.

The Avifunal diversity composed of 58 species belonging to 9 orders and 29 families.