



Seasonal fluctuation of zooplankton in relation to industrial pollution in Irai river water, Dist. Chandrapur, (M.S.), India

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Abstract

With the view to investigate the various changes in hydrobiological features during summer, winter and rainy season and to correlate the same with zooplankton productivity, the limnological survey of Irai river Dist. Chandrapur was undertaken during the year 2003-2004. The parameters such as temperature, conductivity, TDS, pH, CO₂, DO have been studied. In the present investigation zooplankton showed low inverse correlation with temperature and pH, while moderate positive correlation with conductivity, turbidity, TDS, CO₂. However, dissolved oxygen showed strong inverse correlation with temperature, CO₂ and conductivity. In present investigation, among zooplankton *Rotifera* was the dominant group throughout the study. The highest count of zooplankton was recorded at sampling station D in winter season. The correlation coefficients between each pair of parameter for all possible correlation have been discussed in this paper.

Keywords:- Limnology, Physico-chemical, Zooplankton, Industrial pollution

Introduction

Zooplankton are microscopic organism, which do not have power of locomotion and move at the mercy of water current. Zooplankton occupy a central position between the autotrophs and other heterotrophs and are important link in food web of freshwater ecosystem. The occurrence and abundance of zooplankton depend on its productivity, which in turn is influenced by physico-chemical parameters and level of nutrients in water. The zooplankton belong to four main groups, *Rotifera*, *Cladocera*, *Ostracoda* and *Copepoda*. The relevant studies on various aspects of zooplankton were made by Shankar and Hosmani (2002) and Patra and Datta (2004), Gupta and Sharma (2007), Khanna *et al.* (2007) Shazia and Raja (2007), Rajkumar *et al.* (2007) But in Irai river, studies on the zooplankton characteristic are very less in

number. The present study was therefore undertaken to study the zooplankton characteristic especially in relation to industrial pollution and their correlation with physico-chemical parameters.

Materials and Method

For the present investigation four sampling stations A, B, C and D were selected along the course of Irai river.

Sampling station A: The area located near the water supply pumping station of Chandrapur Super Thermal Power station (CSTPS), on Irai Dam was selected as sampling station A.

Sampling station B: The area selected as station B is about 20.98 km. away from the station A and is located at the junction of channel coming from Chandrapur Super Thermal Power Station. Apart from thermal wastes this channel also carries domestic waste from the locality settled on the bank of the channel.

Sampling station C: The area chosen as sampling station C is about 2.7 km from station B and is located near the water supply pumping station near the bridge of road coming from Ramnagar, Chandrapur.

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Sampling station D: About 1.2 km away from station C, near the junction of channel coming from Chandrapur MIDC (Data), selected as sampling station D. This channel is seasonal and flows from monsoon to winter.

For physico-chemical and zooplankton analysis surface water samples were collected fortnightly for 12 months from Sep. 2003 to Aug. 2004 between 8.00 AM to 11.00 AM in clean plastic bottle (1500 ml) as per the standard procedure. Collected samples were analyzed in the laboratory as per the methods describe by NEERI (1986), Trivedy and Goel (1986) and Ramesh and Anbu (1996). For zooplankton analysis water sample of maximum 40 liters was collected from each station and was passed through the plankton collecting net made up of silk bolting cloth No.25. The concentrated sample collected at the bottom tube of plankton net was preserved in 5% formalin. The preserved sample was gently stirred to obtain the uniform suspension and with the help of wide mouth pipette the sample was quickly drawn and transported to the Sedgwick Rafter counting cell. The zooplankton were counted in entire Sedgwick Rafter cell as per the methodology of Michael (1973) and Michael (1986). The observations were presented in the form of the minimum and maximum numbers of plankton per liter.

Results and Discussion

The seasonal variation of physico-chemical characteristics and total number of zooplankton per liter are given in the Table-1 while Table-2 depicts the list of zooplankton in Irai river at different sampling stations. The correlation coefficients ('r' values) between each pair of parameter for all possible correlation is computed and listed in Table-3.

Temperature is one of the most important physical parameter which affects the chemical and biological reactions in water. According to Prasad (1956), temperature is the determining factor in the seasonal distribution of aquatic organisms. Shukla *et al.* (1991) stated that temperature affects not only the metabolic activities of plankton but also their proliferation. In the present study maximum numbers of zooplankton were recorded during winter season at sampling station D. The temperature showed weak negative

correlation with zooplankton and significant negative correlation with DO. However, pH, CO₂, TDS, turbidity and conductivity showed moderate positive correlation with temperature. George (1962) reported that temperature is the main factor regulating the production of zooplankton. Danilove (1963) and Hynes (1970) had reported that the plankton were maximum during summer and minimum in winter.

Conductivity is the capacity of water to carry an electric current and varies both with number and types of ions. Most dissolved inorganic substances in water are in the ionised form and hence contribute to conductance. Conductivity of Irai river water shows variations according to type of pollution discharge at different sampling stations. Discharge of industrial wastes from Chandrapur MIDC in river water resulted into high values of conductivity at Station D. However, at sampling station B values of conductivity were recorded in high ranges in summer due to discharge of thermal effluents and less flow of river water which offer less dilution of pollutants. The conductivity showed moderate positive correlation with zooplankton and strong positive correlation with CO₂, TDS and Turbidity while, strong negative correlation with DO.

The colloidal matter present in water impart turbidity of water. The turbidity in water may be due to clay and silt particles, organic matter, sewage, industrial effluents and presence of microorganisms. In present investigation maximum values of turbidity recorded at sampling station band D, was due to industrial effluents. The moderate positive correlation of turbidity is observed with pH, CO₂, TDS and zooplankton and moderate negative correlation with DO.

Minerals and some organic substances present in water are referred to total dissolved solids. The TDS contents varied according to seasons as well as with the increasing load of pollution. In Irai river water TDS values were well above the permissible limit throughout the study period at sampling station B and at sampling station D only during the winter season. The strong positive correlation of TDS is observed with CO₂, weak positive correlation with pH and zooplankton and strong negative correlation with DO. The CO₂ content of any aquatic body is the best single

