Environment Conservation Journal 9 (1&2) 135-138, 2008
(ISSN 0972-3099)

Studies on the ecology of River Beas with reference to benthic fauna

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Abstract

The paper incorporates the findings on the seasonal abundance and fluctuations of benthic fauna in relation to physico-chemical parameters of water in the selective stretches of river Beas. Considerable variations of benthic fauna in quality and quantity were observed. The population of benthic fauna was high in the month of July (418.0 units/m^2) while minimum in December (38.0 units/m^2).

Keywords : *Ecology, River Beas, Benthic, Physico-Chemical*

Introduction

The river Beas is one of the major rivers of Himachal pradesh. It originates from southern slope of Rohtang pass at an elevation of 4062 mts. The river recieves a number of tributaries both on right and left banks during its downward drift of over 470 kms. Its principal tributaries are Solang, Manalsu, Sujjain, Fojal and Sarvari on the right bank and Alain, Duhagan, Chhaki, Parbati, Tirthan and Sainj on the left bank. The disposition of the river in Kullu valley is shown in Fig. 1.

The water of Beas and its tributaries remains shallow, rapid cool and clear except during the rainy season. The bed comprises of mainly the boulders, stones and rubble. The vegetation along the banks consist mainly of the alnus, willow, rubenia and conifers. The ecology of the river is constantly degrading. Once teeming with large number of trout the catches are declining each year. The major reasons are attributed to fall in catches are ecological erosion, heavy silt deposition and shrinkage of feeding and breeding ground in the river. Observations were therefore made in the river Beas at Kullu District to study the abundance, seasonal fluctuations of benthic fauna.

Materials and Method

The physico-chemical parameters of water of river Beas like water temperature, pH, transparency, dissolved oxygen, total alkalinity were analysed fortnightly following APHA (1998) manual. Due to shallow depth, stony bottom and fast current, the transparency was measured by bright pin head method (Saha *et al.,* 1971). Hydrogen ion concentration of water was determined by pH digital meter. For dissolved oxygen 'Winkler's Method' (Welch, 1948) was adopted and total alkalinity was determined by 'titration' method. The aquatic insects and other bottom fauna were collected monthly from pre-selected sites of the river, by enclosing one square meter of river bed with square-meshed cloth. The bottom stones, gravel and sand were upturned to dislodge the aquatic life. This resulted in collection of all the benthic life in the square-meshed cloth. The organisms were hand-picked and preserved in 5% formaline and were analysed quantitavely and qualitatively (Jhingran *et al.,* 1988). The species composition of benthic life was done group-wise, genera-wise and where ever possible, species wise.

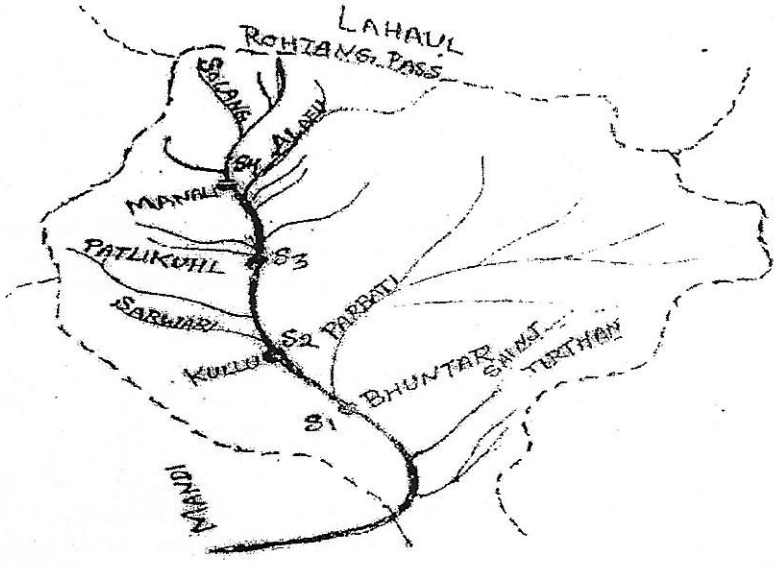


Fig. 1. Disposition of the experimental sites of river Beas in Kullu District.

Results and Discussion

The physico-chemical parameters studied in the river Beas includes water temperature, transparency, pH, dissolved oxygen and total alkalinity. Seasonal variations in physico-chemical parameters of water are shown in Table. 1. Water temperature (average) ranged from 5.2 °C to 17.7 °C . The pH of the river water was always found to be in the alkaline range (7.0-7.7). River water was clear and transparent during winter and turbidity was found during monsoon (6.1 cm) which was due to fast current and greater inflow of muddy rain water. Total alkalinity was high and the value was maximum in the month of February (85.0 ppm) and minimum was (53.7 ppm) in the month of August. Dissolved oxygen was quite high and showed wide fluctuation. Its value was maximum in December (12.8 ppm) and minimum during august (9.2 ppm).

Table. 1. Fluctuations in physico-chemical parameters of river Beas from December, 02 - November, 03.

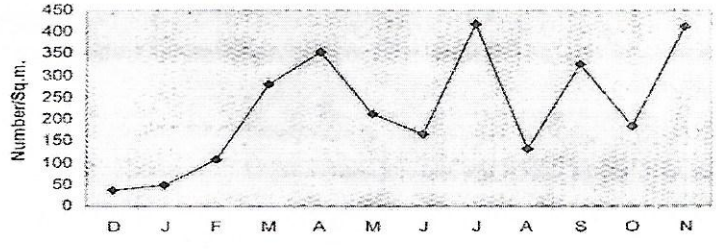
Months	Water Temp. (°C)	Transparency (cm)	pH	D.O. (ppm)	Alkalinity (ppm)
December	6.2	51.5	7.5	12.8	75.6
January	5.2	47.8	7.6	12.0	70.6
February	7.1	43.3	7.4	11.2	85.0
March	9.2	46.1	7.4	11.2	83.1
April	11.3	51.5	7.3	10.0	80.1
May	10.0	29.3	7.1	10.8	61.2
June	12.8	10.2	7.3	10.2	57.5
July	16.0	6.1	7.5	9.7	59.3
August	17.7	7.7	7.7	9.2	53.7
September	17.1	9.9	7.0	9.9	56.2
October	12.9	29.5	7.0	10.9	67.5
November	8.1	53.2	7.4	11.4	75.6

The analysed benthic fauna samples showed that the bulk of benthic organisms in different beats of river Beas comprised nymph, larvae and adults of different orders of class insects. The fluctuation of benthic fauna in the river during different months of the year is shown in Fig. 2. Insects contributed 98% in the selective stretches of Beas River. Their population is constituted by nymph of Ephemeroptera and Plecoptera, larvae of Trichoptera, Diptera, larvae and adults of Coleoptera contributing 79%, 2.6%, 4%, 7% and 5.8% respectively. The remaining was constituted by molluscs, annelids and others. The average numbers of organisms encountered were 223 units/m^2. Throughout the sampling year, the main bulk of benthic fauna was formed by Caenis and Baetis. The other genera viz., Iron, Hexagenia, Ephemerella and Triaenode were also dominated in the collections. Perla, Tabanus and Simulium showed their seasonal dominance while species like Antocha, Psychoda, Gomphus, Maurina, Elimidae, Mollusc and Annelids occurred only sporadically and in considerable small number.

The nymphs of Ephemeroptera were abundant in all the stretches ranging from 26-334 units/m^2. May-flies were available throughout the year in the collections. The maximum number 334 units/m^2 of may-flies were encountered during the November while lowest were encountered during December. The important genera in order of their abundance were Caenis, Baetis, Hexageia, Ephemeralla, Iron and Epeorus. The nymphs of Plecoptera (stone-flies) were less abundant in all the four stretches of the river. Stone-flies were available in the river in an average number of 6 units/m^2. The important genera in order of their abundance were Perla, Peltoperla, Nemoura. The larvae of Trichoptera (caddis-flies) both the cased and caseless were available in the river in an average number of 9 units/m^2. The important genera in order of their abundance were Brachycentrus, Triaenode and Rhyacophila.

The important genera of order Coleoptera in order of their abundance were Elmis, Dytiscus, Hydrogobus and Hydrophilus in the river. The important genera of order Diptera in order of their abundance were Simulium, Tabanus, Altherix, Antocha, Maruina and Psychoda. The order Odonata represented by only one genus viz. Gompohus. The order Gnathobdellida was represented by Hirudinaria genus (Leeches) in the collections. The order Basommatophora was represented by mollusc in the collection. The aquatic insects and other benthic organisms concentration were high in the river. The maximum number 418 units/m^2 of organisms were encountered during the July while minimum were 38 units/m^2 encountered during December. The genera belonging to order Ephemeroptera were recorded as the main biota of the river. The diversity and abundance of insect larvae which constitute the benthos are directly related to the substratum consisting of small sized boulders, cobbles which provide protection to the larvae (Johal, 2001). The insect population is numerically more in the months of higher alkalinity.

Fig. 2. Monthly fluctuation of benthic fauna in the river Beas during Dec, 02 to Nov, 03.



In the present investigation the relative abundance of major insect orders shows correlation with alkalinity and the carbonate alkalinity is more important than the other factor such as temperature, current, speed, volume of flow etc. in influencing the density of benthic fauna. The optimum temperature, high dissolved oxygen, slightly alkaline pH and reasonable high value of alkalinity were observed the main reasons of the high density in glacier-fed rivers (Dobriyal and Singh, 1990).

Acknowledgement

We are highly indebted to Dr. K. Kumar, Advisor of Fisheries, Himachal Pradesh for his keen interest, encouragement and critically going through the manuscript and offering valuable suggestions to undertake the study. We are also thankful to Mr. Rajan Sud, Asstt. Director of Fisheries and Mr. Bijay Kumar Sahoo for their kind cooperation.

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