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MACROINVERTEBRATE DRIFT IN A GARHWAL HIMALAYAN HILLSTREAM

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ABSTRACT

Macroinvertebrate drift was investigated in third order spring fed Western Himalayan stream Khandagad located in the Garhwal region. The aim of the study was to explore the drifting pattern of various macrozoobenthos belonging to the major groups namely Ephemeroptera, Trichoptera, Diptera, Coleoptera, Hemiptera and Plecoptera.

Keywords: *Macroinvertebrates, Drift, Hillstreams*

INTRO DUCTION

The phenomenon of drift, or the downstream movement of benthic macroinvertebates in the water column, is an important process in the ecology of river and stream ecosystems. Not only does it provide a source of food for drift feeding fishes like trout, but it is also important in the life history of the drifting organisms. Aquatic insects larvae use drift as a method of dispersal, escape from predation and as a way to locate better food sources.

The drift of the benthic fauna of the streams remains an interesting topic of research as to why they drift, how they drift and what are the important physicochemical and biological parameters effecting drifting of the benthic fauna. It has been widely studied, particularly in temperate streams and rivers for their density, seasonality, activity pattern and complexity with various environmental and biotic factors (Hynes 1979, Waters 1972, Brittain and Eikeland 1988). However, because most data arise from temperate streams, there remain large regions of the world where even basic drift patterns are undescribed.

Since its discovery, many studies have examined the effect of environmental factors and its ecological significance (Waters, 1972; Statzner, Dejoux and Elouard, 1984; Brittain and Eikeland, 1988; Allen, 1995). As a result, different terms describing the causes and types of drift have been introduced such as Behavioural drift, catastrophic drift, constant drift etc. The drifting benthos has attracted a large number of ecological studies by various authors on drifting patterns and colonization etc.,(Dance and Hynes, 1979; Pringle and Ramiraj, 1998, etc), drift dynamics and seasonal

fluctuations (Allen and Russek, 1985; Dudgeon, 1990), diel Periodicity (Tanaka, 1960; Waters, 1972; Mueller, 1974; and Brittain and Eikaland, 1988; etc.), environmental Perturbations and effects of anthropogenic activities on drift (Minshall and Winger, 1968), behaviour of drifting benthos (Melay, 1970; Skinner, 1985; Otto and Sjöstrom, 1986; Mcintosh and Peckansky, 1996; and Humpshires and Ruscton, 2002), drifting benthos as indicators of water quality (Larimore, 1974; Kremen, 1992), the effect of pesticides, insecticides and piscicides etc. on the invertebrate drifts (Dermott and Spence, 1984; Dudgeon, 1990).

The discovery of the diel periodicity of drift by Tanaka (1960) and subsequent reports by Waters (1961) and Muller (1963) stimulated further research on the nature of rhythm, density-dependant production and significance of drift in trophic ecology of fishes (Healey, 1984). Some studies have also pointed that the fish predation and evolution of invertebrate drift periodicity are closely linked, Flecker, (1992). The work on ecological studies of benthic drift is also significant in various areas such as: (I) For assessing the food availability to fishes and stream habitat quality monitoring. (II) The drift samples of terrestrial invertebrates can provide indices of riparian habitat quality.

The present study (first of its kind in the entire Garhwal Himalayan Region) was undertaken on a third-order spring-fed stream Khandagad at altitudes between 550-1200 m.a.s.l. and recorded the drifting patterns of the macroinvertebrates on a 24hr. (continuous) basis during 2004. There is almost no information available on this aspect of the benthic biota from these streams. Even though benthic communities have been used as a criterion to estimate water quality (Grzybkowska *et. al.,* 1986) and their density as a factor for determining seasonal and diel fluctuations in the drift (Diamond, 1967), no parallel studies have been attempted in the streams and rivers of India. The only information available about some aspects of drift from Indian waters is from river Tunga,

Western Ghats by Krishanmurthy and Reddy (1996). One more study on the Macroinvertebrate drift was done by Brewin and Ormerod (1994) in the streams of Nepalese Himalayas.

DESCRIPTION OF THE STUDY AREA

Khandagad is the upland spring-fed hill-stream of the Alaknanda river (one of the parent streams forming Ganges at Devprayag, Uttaranchal) System has been selected as the study area. It is a third order spring-fed stream at altitudes between 550-1200m.s.a.l. As this stream is a natural abode of the minor carps and loaches. They support a good population of stream benthos (Kumar and Dobriyal, 1993), but the drifting aspect of their behavior and associated ecological studies have so far

Monthly variations in the total number of drifting macrozoobenthic Ind./ 100 m^3/ hr for the stream Khandagad during the years 2004 are presented in the tables 3.

In the stream Khandagad during the year 2004, the maximum and minimum macrozoobenthic organisms were recorded in October and August respectively. In October 2004, a total of 749.39 No. of drifting Ind. / 100 m^3/ hr were recorded. On the contrary in August 2003, only 265.91 No. of drifting Ind. / 100 m^3/ hr were recorded. The graph shows a very high peak in the months of January and October and very low peak in April and May and in other month's moderate peak.

GENERAL DISCUSSION

Variability in Drift : The runs, riffles and pools had a different velocity and discharge (variable); which in turn might have affected the daily drift rates. Spatial variation in drift densities can be linked partly to the heterogeneous distribution of invertebrates in the benthos (Kumar N. *et.al.* 1998). Pridmore and Roper, 1985; also reported the higher density of benthic invertebrates in the riffle habitat and lowest in the pools.

Another factor contributing to the daily variation /site specific variation related to drift could be species related drift, responding to the light-intensity, resource distribution, physico-chemical parameters and predation by fish etc. The discharge during the study period however; was showing little variation within a day and showed little changes in the diel patterns. Brewin and Ormerod (1994) found no diel-periodicity in Nepalese streams that lacked drift feeding fishes but high noctural drift in streams containing fish. Sudden increase in Turbidity, also acted as a trigger for increase in May-fly drift and higher number of organisms were observed after siltation of streams after seasonal rains.

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