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Status Survey of a Slow Flowing Stream Using Invertebrates as Tool

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Abstract
Present study was undertaken to enlist the distribution of macro-benthic invertebrates inhabiting Devika stream. In the attempt, a total of 10 taxa were identified during the study period represented by *Tubifex* sp., *Aelosoma* sp., *Eisenia* sp., *Erpobdella* sp., *Lumbriculus* sp., *Chironomus* sp., *Culicoides* sp., *Lymnea* sp., *Physa* sp. and *Gyraulus* sp. When grouped to phyla level, in total three phyla were recorded and from the quantitative analysis among the phylum, Phylum Arthropoda was found to be dominant followed by Annelida then Mollusca. Further emphasising to know the percentage contribution of representing classes in this water-body, it was revealed that class Insecta was the dominant contributing 51.95% to the total benthic faunal population followed by class Clitellata and class Gastropoda contributed 27.62% and 17.70% respectively to the overall benthic population. An attempt has been made to analyse the trophic status of this water-body on the basis of benthic fauna inhabiting this water-body. Presence of species like *Chironomus*, *Tubifex* and *Physa* infers to the anthropogenic influence exerted on this water-body which is providing considerable environment for flourishing these species.

Keywords: Macro-benthic invertebrates, Arthropoda, Annelida, Mollusca and Percentage contribution

Introduction

Animals lacking back-bone, occupying the benthic zone of any water-body and generally visible to naked eye are the macro-benthic invertebrates. These biological elements with quality of responding to a variety of environmental conditions of rivers and streams may be used as bio-indicators for water quality assessment. Thus, the functional role of these benthic communities in the trophic dynamics of any aquatic ecosystem is well acknowledged. The qualitative and quantitative abundance of benthic organisms over a period of time in the investigated water-body provide an index of the water quality of that ecosystem. In recent years, there has been a greater emphasis for better understanding of benthic environment, its communities and productivity and this has led to the increased exploitation of many inland water-bodies.

Macro-benthic invertebrates react strongly and often predictably to human influences in aquatic ecosystem, by influencing sediment and benthic water chemistry, altering sediment organic content and structure and also by serving as major prey species for the organisms of higher trophic level (Covich *et al*., 1999) [4]. In addition, they have the ability to clean water-body as they utilize the organic and detritus matter as food.

Realising the immense importance, several workers have attempted to study the diversity of macro-benthic invertebrates in aquatic ecosystems in lotic water-bodies of Jammu province viz. Sharma, 2000; Sawhney, 2004 [10]; Mushtaq, 2007 [7]; Sawhney, 2008 [11], Sharma *et al*., 2011 [14]. Presently undertaken study is on a slow flowing stream Devika which flows through the heart of the city and thus, receives different pollutants. Pouring of wastes has led to the contamination of the stream creating a great impact in its diversity.

Material and Methods

Macro-benthic invertebrates

For this study, bottom collections from four stations shall be made using Ekman dredge and the collected sample will be washed through sieve no.40 (256 meshes/cm^2) and macro-benthic invertebrates, thus segregated, will be transferred to tubes and preserved in 5% formalin for subsequent identification (Ward & Wipple, 1959 [18]; Tonapi, 1980 and Adoni, 1985) [1, 17]. The total number of macro-benthic invertebrates/m^2 would be computed using the following formula:

Individual/m^2 = N/a x 10000

Where N = Average number of microscopic organism per sample

a = Area of sampler (cm^2)

Results and discussion

A.) Qualitative analysis: Qualitative analysis of macro-benthic invertebrates showed the presence of three phylum viz. Annelida, Arthropoda and Mollusca. Phylum Annelida was survived by class Clitellata, Oligochaeta and Hirudinea supporting 5 taxa. Phylum Mollusca contributed by 3 taxa belonging to only one class Gastropoda. Phylum Arthropoda was represented by 2 taxa belonging to only one class Insecta (Table I).

B.) Quantitative analysis: This is clear from the (Table I) that altogether 10 taxa belonging to 3 phyla- Annelida, Mollusca and Arthropoda were collected from the survey site during the study period. Of these, Phylum Arthropoda contribute the largest share constituting 51.95% of the total macro-benthic invertebrate fauna followed by Annelida sharing 30.35 % and Phylum Mollusca contributing 17.70% (Fig. I). Among Arthropoda, *Chironomus* sp. was the dominant species and it contributed 51.55% to the total benthic population and Culicoides was the least dominant which contributed 0.38%. Phylum Annelida was mainly represented by numerical abundance of *Tubifex* sp., which contributed 23.15% whereas *Erpobdella* sp. contributed lease i.e: 0.97% to the overall population of benthos. Group Mollusca was the third dominant group of macro-benthos inhabiting the stream represented by *Physa* sp. contributing 6.62% and least represented by *Gyraulus* sp. contributing 4.47% to the total benthic fauna.

Out of all these 3 groups recorded, quantitatively, group Arthropoda held the maximum bulk contribution followed by Annelida and then, Mollusca. As the benthic fauna acts as bio-indicator of ecological conditions of any aquatic ecosystem (Sarang and Sharma, 2009) [9], the presence or absence of certain species depicts the impact of anthropogenic stress in a water system (Sharma and Choudhary, 2011) [14]. There are cascade of factors influencing the diversity and density of macro-benthos viz a viz - the chance settlement of pelagic larval forms of different species, affinity to suitable substratum and also degree of stress caused by strong waves and currents (Olive *et al.*, 2002) [8]. Baring such hazards, among arthropods, numerical abundance of *Chironomus* sp. indicates that optimal conditions have been caused due to some anthropogenic interference in this water source (Manoharam *et al.*, 2006) [6]. Numerical abundance of *Tubifex* sp. among Annelids could be due to the organic matter enrichment and deposition of algae and mosses on large stones and other hard substrates as these provide feeding material to the members of this group (Baturina, 2012) [2]. Gastropods play a vital role at the debris interface as they consume living and decaying plant and animal materials (Brendon *et al.*, 2007) [3]. Abundance of *Physa* sp. could be attributed to the presence of soft bottom and to the tolerance of these organisms to some levels of pollution (Sharma *et al.*, 2013) [15].

From the statistical analysis (Table II), it was found that all the benthic groups were positively correlated with one another, which might be due to their preference for different niches, habitats and food preferences.

Conclusion

Macro-benthic representation in Devika stream has been enlisted by 10 no. of species. Among these, the dominance species like *Tubifex, Chironomus* and *Physa* which are to be established in the environment having organic matter which is usually added to a soft bottom water-body by addition of household and other pollutants. Thus, this survey and macro-benthic inhabitants so recorded are a clear indication for deteriorating status of this water source.

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Table 1: Showing the species of macro-benthic invertebrates in Devika stream

Groups	Class	Name of the species
Annelida	Clitellata	*Tubifex sp. (Lamarck, 1816)*
		Eisenia sp. (Savigny, 1826)
		Lumbriculus sp. (Muller, 1774)
	Polychaeta	*Aelosoma sp. (Ehrenberg, 1828)*
	Hirudinea	*Erpobdella sp. (Verill, 1872)*
Arthropoda	Insecta	*Chironomus sp. (Meigen, 1803)*
		Chironomus larva
		Culicoides (Latreilla, 1809)
Mollusca	Gastropoda	*Lymnea sp. (Lamarck, 1799)*
		Physa sp. (Draparnaud, 1801)
		Gyraulus sp. (Charpenter, 1837)

Table 2: Showing the correlation analysis between different groups of macro-benthic invertebrates

	Annelida	Arthropoda	Mollusca
Annelida	-		
Arthropoda	0.024976	-	
Mollusca	0.635663	0.198569	-

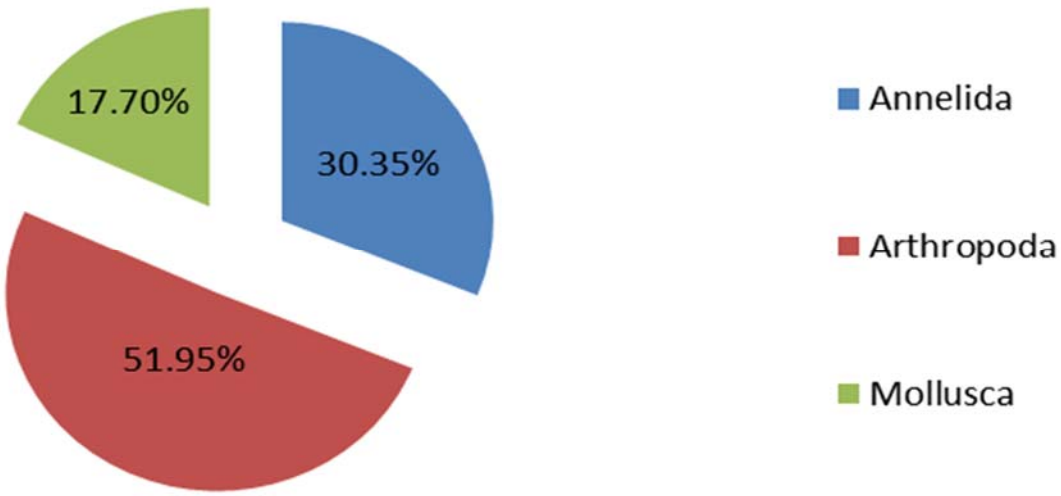

Fig 1: Showing the percentage distribution of different groups of macro-benthos

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