

Benthic Macro Invertebrate Diversity of Tropical River Kolar, from Nagpur, (M.S.), India

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ABSTRACT

In the present investigation river Kolar, District Nagpur, Maharashtra state was studied with reference to benthic macro invertebrates diversity, as these are the ecological indicators of aquatic habitats. The study was conducted on monthly basis for a period of two years from February 2010 to January 2012 on four sampling sites of river Kolar and statistical analysis of the analytical data was computed in this paper. The most abundant benthic macroinvertebrates in the present investigation were Molluscs belongs to order Gasropoda and Pelecypoda, while Arthropods and Annelids were moderate and Nematodes were few in number. In the present investigation low species richness and low abundance of macrozoobenthic observed where water body shows moderate human intervention.

Key words: *Benthic Macroinvertebrates, River Kolar, Ecological indicators, Macrozoobentos*

Introduction

Benthic macroinvertebrates are the organisms which are commonly, Molluscs, Arthropods, Annelids, Nematods etc., living at the bottom of aquatic ecosystem. They are used for biological monitoring of aquatic ecosystems worldwide because they are found in different types of habitats having limited mobility. These are relatively very easy to collect using different types of samplers as well as with established sampling techniques. Diversity pattern of macrozoobenthic fauna ensures a wide range of sensitivities to change in both water quality and habitats (Hellawell, 1986 and Abel, 1989). Both geographical and physicochemical variables influence the overall macroinvertebrate diversity in tropical rivers (Musonge *et al.*, 2020).

Survival, distribution and abundance of macrozoobenthos depends on the characteristics of their environment such as organic matter content,

soil texture, sediment particles, substratum and depth (Dahanayakar and Wijeyaratne, 2006; Perkins, 1974 and Ankit Kumar *et al.*, 2017).

The benthic macroinvertebrates are the biological community most frequently used to evaluate water quality in aquatic environments and occupy a variety of trophic levels acting in the nutrients, bottom detritus and water column dynamics (Rodrigues *et al.*, 2002). Benthic macroinvertebrates can be used as bioindicators in the evaluation of the ecological integrity of surface river and stream systems that pass through industrial zones (Mark Edward Jolejole *et al.*, 2021)

Relevant and recent studies on benthic macroinvertebrates diversity has been made by Cabrera (2021), Kosazalka and Jablonska (2020), Maria Bejar *et al.* (2020); Mohammad *et al.* (2017), Ankitkumaretal (2017), Gowalkar *et al.* (2015).

Since the studies on benthic macroinvertebrates diversity are very less in Kolar river this paper is in-

tended to report benthic macroinvertebrates diversity which provides base line and firsthand information for future water management strategies.

Materials and Methods

The river Kolar is in the vicinity of Khaparkheda town, located at 21.3858107° north latitude and 78.9201379° east longitudes in Nagpur district of Maharashtra state. This river flowing besides the thermal plants (Khaparkheda TPS and Koradi TPS) and some villages in the downstream are located on the bank of this river and receiving effluents and domestic water.

Therefore, the river was monitored by collecting samples from four locations covering the complete stretch of the river, during the period of two years from February 2010 to January 2012. These sampling locations are Site - A (Dam Site), situated at Nanda Dam, Site - B (Village Site), situated near Kolar bridge on N.H.69 at Mahadula, Site - C (Village Site), Situated at Khaparkheda, Site - D (Confluence point Site), situated at Confluence point of river Kolar and Kanhan at Waregoan.

The sites for macro invertebrates studied were selected according to overall scheme of the study. Since macro invertebrate populations are not uniformly distributed even in a micro habitat, it is essential to take 2-3 replicates from the same sampling site. Sampling of macro invertebrates involves sampling of a portion of the sediment from which the macro invertebrates can be separated.

The samples for macro benthic community were collected every month by a surfer sampler with a sampling area of 10 x12 inch of river bed and bolting silk net with a mesh size of 500 µm. The dislodged animals were swept back by the water current and were collected in the net and transferred to a white tray. The macrozoobenthos were also collected from bottom sediments, stones and pebbles attached to substratum using sterilized forceps, washed and transferred in trays. The benthos were sorted and collected in different sterilized pre-labeled tubes and preserved in 70% ethanol or formaldehyde.

For identification the organisms were examined visually and through compound microscope. Further identification was done by following the keys of Needham and Needham (1972); Pennak, (1989); Ward and Wipple (1966); Welch, (1952) and Jayaram, (2000).

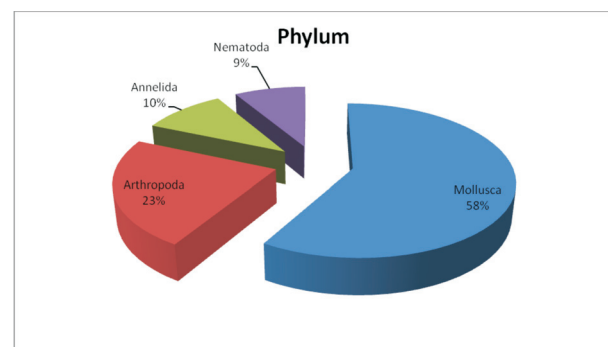
Results and Discussion

Benthic macro invertebrates are invertebrates (or animals without a backbone) that live on the bottom of streams during all or part of their life cycle. Relatively large sized organisms (usually above 6 mm) present at the substratum of lakes, ponds, streams and rivers and belonging to several categories, e.g. insects, molluscus, worms etc. are designated as Benthic macroinvertebrates. They occupy rocks, organic debris and other substrates at the bottom.

The major part of the present study is confined to biodiversity of Benthic macro invertebrates composition of river Kolar. Where 35species of Benthic macro invertebrates were recorded which include *Mollusks 17 species, Arthropods 08 species, Annelida– 07 species, Nematodes 03 species* (Table 1).

Observations revealed that Phylum Mollusca was found dominant with 59% followed by Arthropods 23%, Annelids 10% and Nematodes 8% (Fig. 1)

In the present investigation Phylum Mollusca was dominant in all four sampling stations represented by two classes Gastropoda and Pelecypoda. Class Gastropoda was represented by 04 order, 07 families and 12 genera. Whereas class Pelecypoda represented by 02 order 02 family and 05 genera. Gastropod dominance in the present investigation observed due to suitable substrate and macrophyte vegetation in Kolar River. This observation is in accordance with Ankit Kumar *et al.*, (2017) in Dudhi River- A Tributary of River Narmada. Gastropod dominance was reported by Mohammad Farooq Mir



Phylum	No. of Species
Mollusca	17
Arthropoda	08
Annelida	07
Nematoda	03

Fig. 1. Percent composition of Macro-benthos fauna in Kolar River for the period of Feb 2010 to Jan 2012.

Table 1. Diversity of Macro-benthos fauna in Kolar River for the period of Feb 2010 to Jan 2012.

S. N.	Taxa	Sampling Station			
		Site-A	Site-B	Site-C	Site-D
Phylum		Mollusca			
Class	Gastropoda				
Order	Mesogastropoda				
Family		Viviparidae			
1.	<i>Vivipara spp.</i>	+	+	+	+
2.	<i>Bellamyia spp.</i>	-	+	+	+
Family		Thiaridae			
3.	<i>Melania spp.</i>	+	-		-
Family		Bithynidae			
4.	<i>Digoniostoma</i>	-	+	+	+
Order	Neogastropoda				
Family		Muricoidae			
5.	<i>Alocinma spp.</i>	-	+	+	-
Order	Stylomatophora				
Family		Succineidae			
6.	<i>Quickia spp.</i>	-	+	+	+
7.	<i>Succinea spp.</i>	-	+	+	+
Family		Cerastidae			
8.	<i>Rachis spp.</i>	+	-	-	+
Family		Ariophantidae			
9.	<i>Euplecta spp.</i>	+	-	+	+
Order		Basommatophora			
Family		Limnaeidae			
10	<i>Lymnaea spp.</i>	-	+	+	+
Family		Planorobidae			
11	<i>Indoplanorbis spp.</i>	+	-	-	+
Family		Physidae			
12.	<i>Physa spp.</i>	+	-	-	+
Class	Pelecypoda				
Order		Unionida			
Family		Unionidae			
13.	<i>Lamellidenmarginalis</i>	+	-	-	
14.	<i>L. consobrinus</i>	+	-	-	
15.	<i>L. correanus</i>	+	-	-	+
16.	<i>Indonaia spp.</i>	+	-	-	
Order		Venerida			
Family		Cyrenidae			
17.	<i>Corbicula spp.</i>		+	+	+
Phylum		Arthropoda			
Class	Insecta				
Order	Odonata				
Family		Anisoptera			
18	<i>Dragonfly nymph</i>	-	+	+	+
Order		Trichoptera			
Family		Limnephilidae			
19.	<i>Caddisfly nymph</i>	-	+	+	+
Order		Diptera			
Family		Culicidae			
20	<i>Anopheles larva</i>	-	+	+	+
Family		Chironomidae			
21	<i>Chironomus larvae</i>	-	+	+	+
Family		Syrphidae			

Table 1. Diversity of Macro-benthos fauna in Kolar River for the period of Feb 2010 to Jan 2012.

S. N.	Taxa	Sampling Station			
		Site-A	Site-B	Site-C	Site-D
22.	<i>Eristalispp</i>	-	+	+	
Order	Ephemeroptera				
Family	Baetidae				
23.	<i>Mayfly Larvae</i>	+	-	-	+
Order	Coleoptera				
Family	Dytiscidae				
24.	<i>Hydaticusspp</i>	+	-	-	+
Order	Hemiptera				
Family	Gerridae				
25.	<i>Gerris spp.</i>	-	+	+	+
Phylum	Annelida				
Class	Polychaeta				
Order (not assigned)	Insertaesedis				
Family	Aelosomatidae				
26.	<i>Aelosomaspp</i>	+	-	-	+
Class	Clitellata				
Order	Haplotaxida				
Family	Naididae				
27.	<i>Pristina spp.</i>	+	-	-	+
28.	<i>Dero spp.</i>	-	+	+	+
29.	<i>Nais spp.</i>	-	+	+	+
30	<i>Slavina spp.</i>	-	+	+	
31	<i>Limnodrilus spp.</i>	+	-	-	+
32	<i>Branchiura spp.</i>	-	+	+	+
Phylum	Nematoda				
Class	Chromadorea				
Order	Rhabditida				
Family	Rhabditidae				
33.	<i>Rhabditis spp.</i>	-	+	+	+
Family	Diplogastridae				
34	<i>Diplogaster</i>	-	+	+	+
Order	Tylenchida				
Family	Haplolamidae				
35	<i>Helicotylenchus</i>	-	+	+	+

et al., (2017), in Dal Lake and Rehn (2009) in Sierra Nevada stream of California.

Arthropods were represented by eight genera which belong to the class Insecta. Class insecta was represented by 06 order, 08 families and 08 genera. Chironomous larvae were dominant at site B, C, and D, which is in accordance with the observations of Part and Ward (1994) and Zamerias-Meiroz and Alba (1996) who stated that increased oligochaetes and chironomoids population were in association with organically polluted lotic ecosystem.

Among Nematods only three species were recorded from sampling site B,C & D. Similar observations were recorded from Narayana and Somsekar, (2002) from river Cauvery. Nematods plays impor-

tant role in the decomposition of organic matter and balancing carbon and nutrient cycle of soil.

Phylum Annelida represented by two classes, i.e. Polychaeta and Clitellata. Class Polychaeta was represented by 01 genera while Class Clitellata with 06 genera. Annelids were less in numbers at sampling site A while present dominantly at other sampling sites. Rafia Rashid *et al.*, (2015) had conducted study of biomass of annelids of Wular Lake, Ramsar site in Kashmir and concluded that all biomass was dominated by polychaetes and oligochaetes which reflects moderate eutrophication of aquatic habitat. The biodiversity of benthic macroinvertebrates pertaining to Polychaetes and Oligochaetes was studied by Sarkar and Krishnamurthy (1977) at Nagpur, India.

Jayaram (2000) also reported *Corbicula spp.* from the polluted zones of river Cauvery and system. Arvind Kumar and Chandan Bohra (1999) also reported *Melania spp.* from Santhal Pargana, Bihar and reported as a good bioindicator of sewage born heavy pollution and hyper eutrophication. The presence of *Melania spp.* in the present investigation of sampling site B and C is in conformity with their observation.

The biodiversity of benthic macroinvertebrates was studied by various workers, Jayaram (1995), Sabu Thomas (2002); Chetana Anand *et al.*, (2004), which are in accordance with present investigation.

Conclusion

In the present investigation low species richness and low abundance of macrozoobentos were observed. Phylum mollusk was dominant at all four sampling station. Chironomous larvae were dominant at Site B, C and D, which are characterized by anthropogenic activities where organic and agricultural wastes mix with river water. Annelids and Nematodes were less in number where water body shows moderate eutrophication.

It will not take long time for the nature to alter the ecology of Kolar river if the human intervention does not stop, similarly regular monitoring and care should be taken.

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