Studies on diversity of benthic macro invertebrates in two lotic ecosystems near Chandrapur, Maharashtra, India

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Abstract:
The benthic macro invertebrates are the biological community most frequently used to evaluate water quality in aquatic environments. The benthic macro invertebrates can be used as a barometer of overall biodiversity in the aquatic ecosystem. In the productivity of lotic ecosystem, the importance of bottom fauna as a link in the energy flow from primary productivity to fish yield has been stressed by many workers.
This paper describes the results of investigation of two lotic ecosystems on benthic macro invertebrates to determine the effects of increased nutrient concentrations from urban runoff inputs. The presence of indicator species like *Chironomous* larvae, *Limnodrillus* and *Lymnia* in abundance in river Zarpat indicate polluted status of the ecosystem. However, the absence or less abundance of indicator species in river Wardha indicates its less polluted nature.
Key Words: Wardha river, Zarpat river, Chandrapur, Maharashtra

Introduction:
The organisms living on the bottom are commonly called as benthos and include benthic macro invertebrate communities of Nematodes, Oligochaets, Insects, Gastropods and Pelecypods etc. Benthological variables are particularly useful in measuring the water quality and such biological monitoring can provide resolution in space and time, Tittizer and Kothe (1978) and Price (1978). The ubiquitous and sedentary nature of benthic macro invertebrates (Rosenberg and Resh1992), as well as their measurable responses to ambient conditions and exposure over time (Wells *et al.* 2002), facilitates their use as important environmental indicators in stream ecosystem monitoring.
The benthic macro invertebrates can be used as a barometer of overall biodiversity in the aquatic ecosystem. Benthic communities have been the best indicators of water quality and organic pollution because of their constant presence and relatively long sedentary habitats, comparatively large size and varying tolerance to stress (Curry 1962, Mylinski and Ginsburg 1977 and Petridis 1993).

Study area
The lotic ecosystems selected for the study are river Wardha and river Zarpat in Chandrapur, which is a district headquarter in Maharashtra state and is situated at 19° 57' N latitude and 79° 22' Longitude at a height of 321.95 M above MSL. The river Wardha, a major river of the District, is perennial and flows about 10 kms away from Chandrapur city through Ballarshah. The sampling site selected on it is near Ballarpur Fort in Ballarshah town. The Zarpat river is

highly polluted, flows through the Chandrapur city from near the Mahakali temple. On the occasion of Mahashivaratri the pilgrims from all over the Maharashtra visit the temple, take holy bath adding further anthropogenic wastes to river which is already polluted because of domestic and municipal sewage. The sampling site selected is near Anchaleshwar temple.

Materials and methods:

Benthic macro invertebrates were collected by Ekman-dredge. The collected bottom sediment brought to laboratory as early as possible. The residue was transferred to an enamel tray and little sugar solution (about 250 ml and sugar 10 gms) was added to it. Due to increase in water density, the benthic organisms floated on surface and were picked up with the help of dropper and forceps and preserved in 70% alcohol and identified using standard keys (Edmondson 1959, Tonapi 1980 and Naidu K. Vanmala 2005).

Results and Discussion:

Many aquatic invertebrates have specific and narrow habitat requirement and are therefore restricted to places that vary little from year to year. Others are general and can survive over a wide range of habitat types (Thorl and Covich, 1991). Invertebrates are abundant and diverse in most of the aquatic habitats and are relatively easy to sample and analyze.

In the present investigation of lotic ecosystems under study, the benthic macro invertebrates collected consisted of Nematodes, Oligochaets, Insects, Gastropods and Pelecypodes. Nine macro invertebrate species were recorded from river Wardha and eighteen from river Zarpat. Among the Nematodes only two species i.e. *Diplogaster spp.* and *Rhabdolaimus spp.* were collected from Zarpat river ecosystem whereas not recorded from Wardha. Similar species are also reported by Narayana and Somashekhar (2002) from river Cauvery. Nematodes play an important role in the decomposition of organic matter by influencing species composition and balancing carbon and nutrient cycle of soil.

Among Annelids, *Limnodrillus* and *Dero* species were found in greater number in river Zarpat but not recorded from river Wardha and in Oligochaets the *Pristina* and *Aelosoma* species were recorded from Wardha whereas not recorded from Zarpat. Purdy (1926) studied the bottom fauna of some polluted rivers and come to the conclusion that *Limnodrillus* prefers an environment of heavy pollution. Among the insects, the indicator species such as *Chironomous* larvae were recorded in abundance from Zarpat indicating the polluted status of the ecosystem and their absence in Wardha indicates less polluted nature. Other studies also have shown that the increased Oligochaets and Chironomids population densities were in association with organically polluted lotic ecosystems (Prat and Ward 1994, Zamora-Muroz and Alba tercedor 1996).

Among the insects eight species were collected from the river Zarpat, in which mosquito larvae (*Anopheles* and *Culex*) were dominant with *Chironomid* larvae whereas, only three species were collected from river Wardha which consist of *Odonata*, *Notonecta* and *Gerris spp*.

In this study, Molluscan species shown their dominance by contributing, six species from the Gastropods and two from Pelecypods, in which *Lymnea, Melanoid* and *Corbicula* species were numerically more in Zarpat indicating gross pollution of the ecosystem. Jayaram (2000) also reported *Corbicula spp*. from the polluted zones of river Cauvery and system. Arvind Kumar and Bohar(1999) also reported *Melania spp*. from Santhal Pargana, Bihar and reported as a good bioindicator of sewage born heavy pollution and hyper eutrophication.

Conclusion

The study reveals that presence of indicator species such as *Chironomous* larvae, *Limnodrillus* and *Lymnea* in abundance from Zarpat river indicating the polluted status of the ecosystem and their absence or less abundance in Wardha indicates its less polluted nature. Anthropogenic use of freshwater for diverse purposes than any other natural resources

threatens life supporting aquatic ecosystems so planned development is the only solution available with the developing countries to avoid depletion or degradation of the natural environment.

Table 1			
The diversity of benthic macro invertebrates in the lotic ecosystems under study			
S.N.	Benthic Macro invertebrates	Wardha	Zarpat
A	Nematoda		
1	*Diplogaster spp.*	--	++
2	*Rhabdolimus spp.*	--	++
B	Annelida		
1	*Pristina spp.*	++	--
2	*Aelosoma spp.*	++	--
3	*Dero spp.*	--	++
4	*Limnodrillus spp.*	--	++
C	Insecta		
1	*Odonata nymphs*	++	++
2	*Anopheles larva*	--	++
3	*Culex larva*	--	++
4	*Chironomous tentum*	--	++
5	*Chironomous tendipetiformes*	--	++
7	*Notonecta spp.*	++	++
8	*Gerris spp.*	++	++
D	Gastropoda		
1	*Melanoid spp.*	--	++
2	*Indoplanorbis spp.*	++	++
3	*Bellamya spp.*	--	++
4	*Lymnea spp.*	--	++
5	*Gyrulus spp.*	++	++
6	*Pila globosa*	++	++
E	Pelycepoda		
1	*Lamellidens marginalis*	++	--
2	*Corbicula spp.*	--	++

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