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REASEARCH ARTICLE

Assessment of Macrobenthic fauna at some sites of Yamuna River

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ABSRACT

The present paper deals with composition, profile and diversity of Macrobenthic invertebrate fauna of River Yamuna in Agra City at three experimental sites(stations). Numerical density and species richness had variations at these sites. Some species were in convergence and other in divergence according to pollution loads at different stations. It was observed 40 genera predominantly belonging to Phylum Annelida, Arthropoda and Mollusca at studied sites. Amidst these groups, insecta superseded and dominated over the other two phyla both qualitatively and quantitatively. However quantitative analysis is not done to such research work. Upper tourist attended stream(along the Taj tourist walk side Station I 'A') of the river were found oligotrophic in nature whereas little lower stream parts Station II 'B'(kailash ghat) & Station III 'C'(poiaa ghat) were observed to be eutrophic in nature so, moderately polluted. Almost genera of Ephemeroptera, Plecoptera , Trichoptera and coleoptera together with few genera of diptera were observed as pollutophobic genera. They had higher genera richness at site 'A'. contrary to this, pollution tolerant genera and species (pollutophilic) of orders like Odonata, Diptera and classes as Oligochaeta and Gastropoda were present as greater numerocity & species richness as recorded at sites 'B' & 'C' respectively. Numerocity and diversity of Chironomous sps., Lumbriculus sps., Nais sps., Tubifex sps., psychoda sps., tabanus sps. and Gyarulus sps. throughout the study reflected the anthropogenic overload in to the River at sites 'B' & 'C'.

Key words: macrobenthic invertebrate, divergence , pollutophilic, species richness .

INTRODUCTION

Lentic and lotic ecosystems have magnificent biodiversity which helps to retain their properties constant to larger extent. Macrobenthic invertebrates are most common continuously distributed fauna which becomes precious in processing of organic matter and rotations of biogeochemical cycles in fresh water aquatic ecosystems. Homeostasis and ecoequalising suo Moto property of rivers get deteriorated when anthropogenic influences supersede the basic forms of all components of those ones. Degraded water quality not only effects physico-chemical temperaments but also becomes an alarming call for biotic communities like limnoplankton , benthic fauna and flora and above all fish & fishery.

Some of macrobenthic fauna get eliminated from polluted sites as they are pollutophobic and sensitive species. Other ones are found in bunches due to decreased competition and increased tolerance for adverse conditions as known as pollution tolerant species [1]. Macrobenthic fauna as indictor of pollution can serve as an added tool for rapid evaluation of water quality besides abiotic and biotic analysis. This group of macroinvertebrates is well recognized as integral entity of trophic dynamics of wetlands. They depend largely on decaying organic matter settled on the bottom mud as organic detritus.

By Increasing rate of population, ever growing industrialization, mechanization through human societies and their actions affect rivers and their ecosystem structurally and functionally with stand by bell of endings [2].Urbanization , metropolitanism creates huge amounts of organic and synthetic waste into the rivers with no treatment or flopped white elephant treatments. Excessive domestic sewage, industrial effluents, limitless fertilizers and pesticides uses alter rivers and their ecological parameters of River Yamuna in Agra city.

Three stations were selected in the present study . **Station I** (*Taj tourist walk side* **'A'**) station II (kailash ghat 'B') & station III (poiaa ghat 'C'). station 'A 'remarked as the less polluted little upper section of the river without or little any human interruption. Whereas **Station II** (kailash ghat **'B'**) was labeled along the city which was average or not severe exposed to several anthropogenic activities including municipal and domestic sewage and agricultural runoff, dredging, bathing, washing etc. **Station III** (poiaa ghat **'C'**) in the vicinity of city receives higher municipal and domestic sewage, agricultural runoff along with industrial discharges coming from the many drainages and lot of anthropogenic activities and thus polluting the river. So, stations **II(B) and III(C)** strike with very high level of anthropological doings due to heavy settlements across all the way .

MATERIAL AND METHODS

For the Sampling and Analysis of Macro Benthic Fauna:

Samples were collected on monthly interval (in the year 2008-2009) from the experimental stations of River Yamuna . Collection was made by dredge net. The dredge material was sieved with a sieve number 44 and left

material transfer to enamel tray, from here they were picked up and preserved in 5% formalin. Identification of fauna was done by using standards text.

RESULTS AND DISCUSSION

TABLE .1- MACROBENTHIC FAUNA AT YAMUNA RIVER

Macrobenthic invertebrates	SITE (STATION) A	SITE (STATION) B	SITE (STATION) C
Annelida = 10			
Tubifex tubifex	+	++	+++
Nais sp.	-	++	+++
Lumbriculus sp.	-	++	+++
Aelosoma sp.	+	+	+++
Brachiura sp.	-	+	+
Chaetogaster sp.	+	-	++
Limnodrillus sp.	-	+++	+++
Dero sp.	-	+	+
Hirudinea	+	++	+++
Hirudinaria sp.	+	+	++
Glossophinia sp.	-	++	+
Mollusca =07			
Pila	+	+	++
Lymnea	-	++	+
Bellamya sp.	+	++	+++
Lamelliedens sps.	-	+	+++
Viviparae	-	+	++
indonaria	+	-	-
Gyraulus	-	+++	+++
Insecta =23			
odonata- Drangon fly nymph	++	+	-
Hemiptera : Laccotrephes sp.	+	-	-
Trichoptera : Hydropsyche sp.	++	+	+
Diptera:			
Chironomus sp.	+	+++	+++
Strictochironomus sp.	-	+++	+++
Culicoids sp.	+	++	+++
Tabanus sp.	+	+++	++
Psychoda sp.	-	+++	+++
Pentanura sp.,	+	+++	++
Simulium sp.	+++	++	+
Anopheles sp.	+	+++	+
Culex sp.	++	++	++
Ephimeroptera :			
Ephimerella sp.	++	+	-
,Baetis sp.	++	+	-
Cinygmule sp.	++	-	+
Centroptilum sp.	++	-	-
Hemiptera : belostoma sp.(giant water bug)	+	+	+
Coleoptera –(beatels):			
Psephenus sp.	++	+++	++
Berosus fairmeri	+	++	++
Helochares sp	+	+++	+++
Ectoptilum sp.	++	+	+
Hydroglyphus sp.	-	++	+++
Placoptera-(stone flies) larvae	+++	+	++
Total genera = 40			

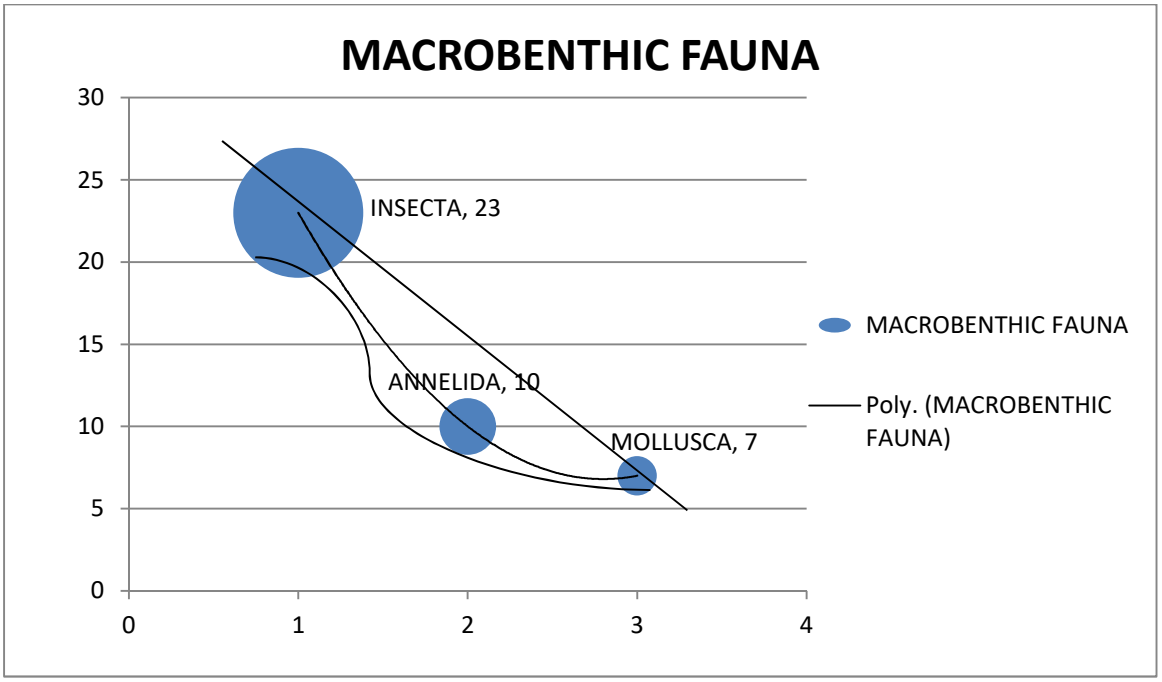

Plate no. 1: In plate no 1 trends of macrobenthic fauna is seen as insect>annelida>Mollusca . polynomial and logarithmic trends lines may verify such increasing trend , but linear trend is not justified to direct shoot up from Mollusca-annelida-insecta

Macrozoobenthic fauna was represented by Annelida, Mollusca and Insecta (Arthropoda). Such fauna has been an indicator of pollution and added tool for rapid evaluation of water quality besides physico-chemical and biological analysis. They depend largely on decaying organic matter settled on the bottom mud as organic detritus.

Table-1 revealed that and qualitatively there is a decrement in the diversity and density of macrobenthic invertebrates along the River Yamuna.. Such a decrement in diversity may be attributed to the increased influx of pollutometric factors and anthropologism. Class Insecta of Phylum Arthropoda registered its superiority among total macrobenthic invertebrate faunal diversity.

It was conferred that analytical justification of macrobenthic fauna stated that mono species of *Trichoptera* and mono *sps.* of *Plecoptera* were confined to station A in such a River whereas order *Ephemeroptera* exhibited a decreasing trend from station A to station C . Presence of Trichoptera, Plecoptera and Ephemeropotera at station A may be attributed to increased oxygen content, low depth, less organic load, less human activities thus less pollution load.

Order Odonata, Hemiptera, Coleoptera and Diptera recorded an increase in their population from station A to B to C as A<B<C. in the River. This may be due to the adaptations of the individuals in B & C as heterogeneity to live in moderate polluted waters. Further table 1, revealed that the Order Diptera chiefly comprised of 9 genera out of which *Chironomous sps.* was the dominant group and recorded its highest number in the highly polluted part (station C) of River Yamuna . It is proved that the family chironomidae is considered to be pollution tolerant and insensitive families of Order Diptera which may be due to the presence of haemoglobin pigment that helps them to collect transportation and storage oxygen directly from the atmosphere [3].

In addition to this other reasons of species richness of order Diptera at stations B & C of River Yamuna might be attributed to reduced flow of water, high nutrient load, increased human interference and increased decomposition. Numerical abundance of dipterans in the downstream sections with higher dirtyness of the water bodies have also been reported by many workers and their respective works [4-7].

Phylum Anneida was represented by two classes viz:- Hirudinea and Oligochaeta. Class Hirudinea had 2 *genera* , whereas Class Oligochaeta with 8 *genera.* was recorded maximum from the C station. Order of proliferation among oligochaeta was observed station wise as C>B>A.

According to Brinkhurst ***8.*** Oligochaetes are more encountered in grossly polluted and organically enriched water bodies with low oxygen. Organically enriched downstream station (B & C) favour the colonization of Oligochaetes. Phylum Mollusca showed the same trend of increased number from A-B-C . In the river. Increased diversity and species richness values in the slightly polluted station A in present study due to habitat heterogeneity and increased dominance index values in the highly polluted human stressed area of river.

In present study insect was first dominant group and Oligochaeta found as second dominant group of total benthic fauna. Oligochaetes have been widely used as indicator of pollution. They can resist even high pollution

load. if we talk about species richness then *Lumbriculus sp. , limnodrilus sp.* were higher in proportion in highly polluted stations viz. ponds B & C. However *Nais &Tubifex* genus were observed in less quantity as they had examined having directly proportional with pollution and had more dilution effect. However domestic sewage sludge, increase in decaying organic matter in the mud bottom provide an ideal medium for feeding, growth, burrowing [9]**,** richness, composition, survival, fecundity, reproduction, some absence of predators of Oligochaeta. The second entity Mollusca was represented by mainly *Pila, Lymnea, Viviparae* and *Gyrulus. Gyrulus* was found associated with moderately polluted water body [10, 11, 12]. *Gyrulus* diversity was higher at station B and C in present study as those were remarked as moderately polluted. In Insects apart from *Chironomus*(as discussed above) other ones like *Psychoda &Tabanus species* were present in abundance at pollution sites (stations B & C) as they were also pollutophilic genera, while *Simulium , Psephenus* Coleopteran dragon fly , *Ephimerella ,Baetis , Cinygmule , Centroptilum* , may fly, nymphs were observed in high quantity at station A , because they were examined as pollutophobic and pollutosensitive groups [12, 13]. Thus macrozoobenthic fauna was found in great extent in maintaining the limnoecosystem.

CONCLUSION

River Yamuna is found to be under high impact and is impaired and heavily contaminated at B & C stations . On the other hand, the river water is chiefly supplied for common people of Agra as well as it meets variety of purposes such as irrigation, cattle drinking and other domestic purposes and recreational activities. Demography horizons are on raising trends thus, it will contribute significantly towards the process of river biodegradation. This bio-survey and assessment of the macrobenthic invertebrate fauna gives an important insight into the eco-health of the river and adds the information, knowledge, current status and understanding of the management strategies involving biomonitoring as a significant tool in the river restoration studies.

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