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Macrozoobenthic diversity of a rural pond near Naihati, West Bengal

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Abstract

In the present communication the macrozoobenthic diversity of a rural pond was studied. This study was conducted for a period of one year. The result revealed the presence of 25 species of macrozoobenthos belonging to 3 major phyla namely, Annelida, Arthropoda and Mollusca. Among the molluscans, gastropods represented the maximum diversity and density with 13 species followed by crustaceans (4 spp.), insects (3 spp.), bivalves (2 spp.) and oligochaetes (2 spp.). Gastropod species like *Bellamya bengalensis*, *Gabbia orcula*, *Thiara granifera*, *Thiara tuberculata*, *Brotia costula*, *Lymnaea acuminata*, *Lymnaea luteola*, *Indoplanorbis exustus* and *Gyraulus convexiusculus*, were found to favour the pond bottom and were predominantly present throughout the study period. The presence of oligochaetes, *Limnodrilus hoffmeisteri* and *Branchiura sowerbyi* in great abundance throughout the year was significant as they indicated the eutrophic nature of the pond. Chironomid larvae, known to be prevalent in low oxygen conditions, were also found abundantly in the pond substratum. Both L*imnodrilus hoffmeisteri* and chironomid larvae are well known potent bioindicators of pollution and eutrophication of an aquatic system.

Key Words: Macrozoobenthos, diversity, gastropods, oligochaetes, bioindicators.

Introduction: Ponds are small freshwater bodies with no wave action, shallow depth, and negligible temperature variation along its depth. They sustain enormous floral and faunal diversity which is related to its geographical location, hydrobiological regimes, substrate conditions and anthropogenic influences. They are an important component of the freshwater ecosystem and help in controlling water cycles, recharge of underground water level and bear the load of pollution caused by runoff from the neighbourhood. (Nandi, 2000).

Rural ponds are more prone to eutrophication and pollution due to excessive anthropogenic activities and runoff from agricultural fields. They maybe the only source of freshwater to the adjoining areas. Hence, activities like washing, bathing, defecation, bathing of cattles, dumping of wastes etc. lead to increased organic pollution, decrease in depth, algal bloom, depletion of dissolved oxygen and ultimately eutrphication of the pond. Fertilizers and pesticides washed by rainwater also enter the pond and increase the level of toxic elements including heavy metals. (Ghosh and Benerjee, 1996)

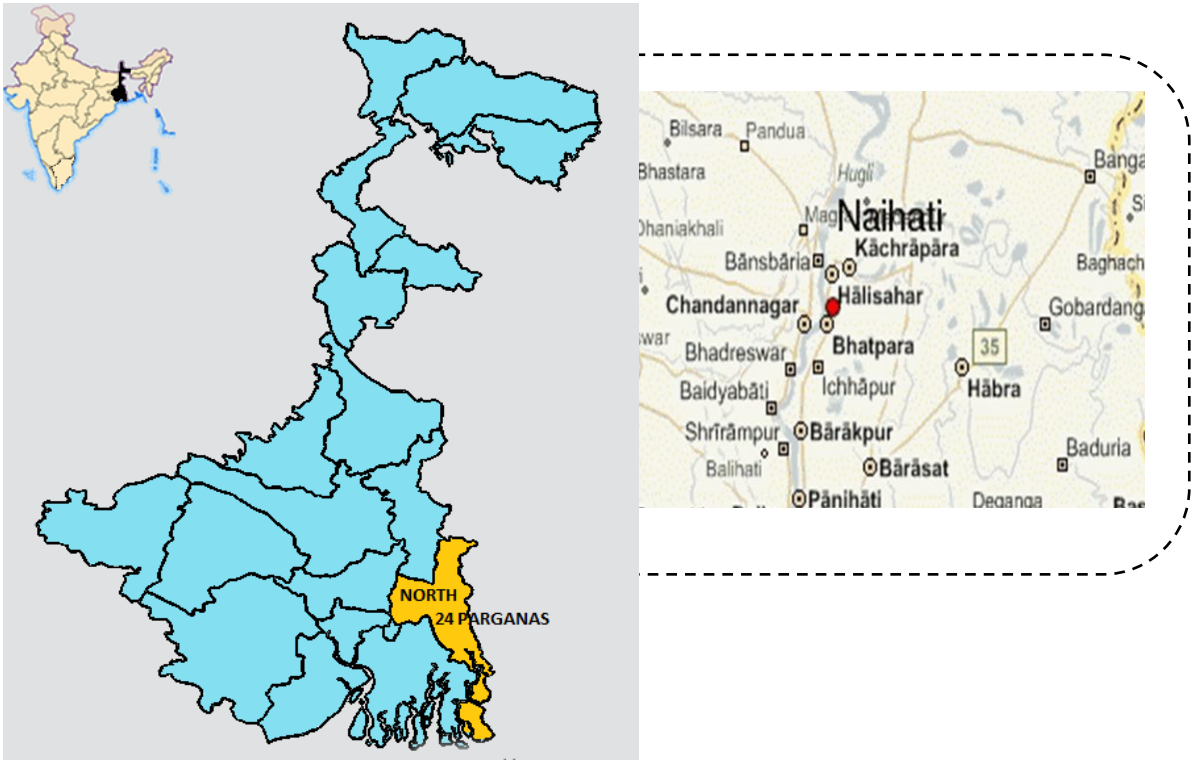
Benthic animals are adopted to live in or on the substrate or bottom of an aquatic system. The dead and decaying matter sustain the benthic food chain and hence most of them are scavengers or detrivores. They regulate the flow of nutrients and energy through their food-web linkages and thus have the ability to influence food resources on fish and other aquatic organisms. Benthic animals are also regarded as useful indicator tools to estimate the health of an aquatic system (Covich, *et. al.* 1999).

Keeping in mind, the importance of macrozoobenthic animals in an aquatic system an attempt was made to study the diversity of macrobenthic fauna in a rural pond near Naihati, West Bengal and the effect of eutrophication on them.

Study area: Naihati lies in the geographical co-ordinates of 22°54’10” N and 88°25’0” E. It has an average elevation of 15m (48ft) from sea level. Phulpukur area is a rural area where people depend on agriculture and fisheries for their livelihood. The village pond has an area of approximately 10 acres.

Methodology: Sampling was done monthly from different sites of the pond along the littoral bottom zone, delimited by rooted aquatic vegetation, to get an overall idea of the macrozoobenthic diversity and the impact of pollution and eutrophication on them. Survey was conducted for a period of one year from May 2013 to April 2014. Qualitative sampling was done by hand picking, drag netting or by a box type sampler (15X15X10 cm). All animals were sorted and preserved in 4% formalin (Mukerji and Nandi, 2004).

Figure 1 Map of the Study Area



Result and Discussion: The occurrence and distribution of macrozoobenthos are known to be intimately associated with the substrate condition and the surrounding environment, Silty loam or clayey substratum with dense macrophytes are known to be preferred by bentic animals (Roy and Nandi, 2008). The diversity and abundance of macrobenthos in the studied pond can be attributed to its silty loamy substratum.

The study revealed the presence of 25 species of macrobenthic fauna belonging to 3 phyla comprising of 8 major groups viz. Oligiochaeta, Hirudinea, Crustacea, Odonata, Coleptera, Diptera, Gastrpoda and Bivalvia. The pond harboured 13 spp. of insects and 2 spp. of bivalves and oligochaetes (Table 1).

Oligochaeta: Oligochaeta was represented by 2 species, *Limnodrilus hoffmeisteri* and *Brachiura sowerbyi***,** the former species being highly abundant throughout the year.

Hirudinea: *Hemiclepsis marginata* was the only leech encountered. It was mostly found on or within the shells of molluscs. It was poorly represented in number and occurrence.

Crustacea: This group was represented by 4 species including an isopod 2 species of freshwater crabs (*Sartoriana spinigera* and *Varuna* sp. and a freshwater prawn, *Macrobrachium* sp. They formed a minor portion of the macrozoobenthic sample, apparently going down to the bottom for feeding purpose only.

Odonata: *Pseudogrion* sp. was the only benthic odonate to be seldom encountered during the survey.

Coleoptera: Only one species, *Hydrocoptus subvittulus* was found to dwell in the bottom of the pond and was sampled frequently.

Table 1 Macrozoobenthic Diversity of the Study Area

PHYLUM / GROUP/ SPECIES	ABUNDANCE
PHYLUM – ANNELIDA	
GROUP 1 – OLIGOCHAETA	
1. *Limnodrilus hoffmeisteri*	+++
2. *Brachiura sowerbyi*	++
GROUP 2 – HIRUDINEA	
3. *Hemiclepsis marginata*	+
PHYLUM- ARTHROPODA	
GROUP 3 – CRUSTACEA	
4. Isopods	+
5. *Macrobrachium* sp.	++
6. *Sartoriana spinigera*	+
7. *Varuna* sp.	+
GROUP 4 – ODONATA	
8. *Pseudogrion* sp.	+
GROUP 5 – COLEOPTERA	
9. *Hydrocoptus subvittulus*	+++
GROUP5 - DIPTERA	
10. Chironomid larvae	+++
PHYLUM – MOLLUSCA	
GROUP 7 – GASTROPODA	
11. *Bellamya bengalensis*	+++
12. *Pila globosa*	+
13. *Gabbia orcula*	++
14. *Digoniodtoma cerameopoma*	++
15. *Thiara scabra*	+++
16. *Thiara granifera*	+++
17. *T. lineata*	++
18. *T. tuberculata*	+++
19. *Brotia costula*	++
20. *Lymnaea acuminata*	+++
21. *L. luteola*	+++
22. *Indoplanorbis exustus*	+++
23. *Gyraulus convexiusculus*	+++
GROUP 8 - BIVALVIA	
24 . *Lamellidens marginalis*	++
25. *Pisidium clarkeanum*	++

+++ : ***Highly abundant*** ; ++ : ***Moderately abundant***; + : ***least abundant***

Diptera: Chironomid larvae was the only dipteran found to be truly benthic and was encountered in abundance during the study period.

Gastropoda: This was the largest group of benthic animals in terms of number and density. *Bellamya bengalensi*, *Thiara scabra*, *T. granifera*, *T. tuberculata*, *Lymnaea acuminata*, *L. luteola* , *Indoplanorbis exustus* , *Gyraulus convexiusculus* were the most abundant benthic gastropods. They were also found to remain associated with the submerged macrophytes. The prevalence of molluscs in the benthic community was also reported by Aniitha *et. al.* (2004).

Bivalvia: Two species of bivalves, *Lamellidens marginalis* and *Pisidium clarkeanum* were found to be embedded the substratum of the pond.

The presence of 25 species of macrozoobenthic animals in the pond indicates its rich diversity and is in accordance to the studies conducted in various wetlands of the Indian subcontinent (Mukherji *et. al.,* 2005 and Shibu *et. al.,* 2006). The rich littoral vegetation supports the insect diversity (Pal and Nandi, 2008).

Anthropogenic activities like washing, bathing of the man and cattles, defeaction, agricultural runoff increase the organic load of the pond water. This leads to detrimental effects like eutrophication, algal bloom, depletion of dissolved oxygen etc. Under such conditions pollution, indicator species like *Limnodrilus hoffmeisteri* and chironomid larvae are known to thrive.

Chapman (2001) and Martins *et. al.* (2008) had reported that oligochaetes are useful tools to indicate water quality and assess ecological risks of an aquatic system. Morais *et. al.* (2010) had studied the role of chironomids as bioindicators in aquatic systems at different trophic levels. Relying on their studies and in accordance to their findings we can also conclude that the high density and prevalence of *Limnodrilus hoffmeisteri* and chironomid larvae in the rural pond indicates its eutrophic nature and high level of pollution.

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