



Comparative Study Of Benthic Macro invertebrates Between Two Lake Janala And Mul Lake, Dist : Chandrapur, Maharashtra, India

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Abstract: The quality of water is described by its physical, chemical and biological characteristics. As such an attempt is made to portray the water quality and biological characteristics of the two Lakes with different trophic status at Mul lake and Janala lake, to facilitate the possible conservation and management measures.

Benthic macro invertebrates are recognized as very important group of water quality surveillance as these organisms which move from the site of pollution and show considerable sensitivity of pollution. (Mason,1983). In lakes, benthic macro invertebrates are taken into consideration to get an idea of water quality.

monthly samples from three sites were collected for qualitative estimation of benthic fauna. The mud sample was collected with Ekman dredge and was transferred to laboratory in polythene bags. In the present study, Molluscs showed their dominance in Mul lake than Janala lake might be attributed to more availability of Calcium.

Keywords: Benthic macro invertebrates, Ekman dredge, Molluscs, Gastropods, Chironomids and Oligochaetes.

Introduction : Fresh water ecology emphasizes mainly the study of relationship between organisms and the fresh water environment. Study of all aspects (physical, chemical, geological and biological) of fresh water is termed as Limnology (Sharma, P.D. 1995).

Lakes are characterized by distinct biotic and abiotic environment. Lakes maintain ecological balance of flora and fauna and their interrelationship regulate surrounding climate and recharge ground water, but unfortunately they are dying. The lakes are getting polluted due to inflow of domestic effluents, apart from pollution, resulting from washing of clothes,

Vehicles, Cattle, immersion of Idols during certain festivals etc. All these activities are deteriorating the quality of the water in the lake resulting in the accumulation of the toxic chemicals and other sludge leading to ecological imbalance.

The quality of water is described by its physical, chemical and biological characteristics. As such an attempt is made to portray the water quality and biological characteristics of the two Lakes with different trophic status at Mul, to facilitate the possible conservation and management measures.

In the present investigation, biodiversity pertaining to plankton (phytoplankton and zooplankton), zoobenthos including annelids, mollusc, insect, and macrophytic and ichthyofaunal diversity is studied in details besides physico-chemical analysis of various parameters of water quality.

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MATERIAL AND METHOD

Water Bodies in and around the Mul:-

The Mul town is in the Chandrapur district of eastern part of Maharashtra and is situated between 20⁰,07'N and 79⁰ ,67' E. It is a taluka headquarter and commercially important town on Gondia, Chandrapur south central eastern railway line. It is popularly known as Rice city because of number of modern rice processing units in an around the town.

In the present investigation, two lakes are selected to study their limnological profiles and to assess their aquacultural potential. With the passage of time, the unplanned urbanization encroached the catchment area of Mul lake with increased human habitation and with the input of untreated domestic sewage deteriorated its water quality and if suitable measures are not taken, it may become eutrophic in the course of time.

The another lake called Janala lake is about 8 km away from the town and is surrounded by forest and little away from human habitation and therefore is still oligotrophic in nature. Therefore input of organic load due to domestic pollutants is less.

Description of Study Sites:

Morphological and Physiological features of two fresh water lakes at Mul		
Name of Lake	Mul Lake	Janala Lake
Location	Near Bus Stand	Near Janala Village
Town / Village	Mul Town	Janala Village
District	Chandrapur	Chandrapur
State	Maharashtra	Maharashtra
Age of Lake	70 Years	30 Years
Purpose	Agriculture, Fishing, washing and sociocultural practices.	Agriculture, Fishing and sociocultural practices.
Area of Lake	26.11 hectare	26.62 hectare

Benthic macroinvertebrates diversity.

Collection of Benthic Macro Invertebrate samples:

During the study period from January 2011 to December 2012, monthly samples from three sites were collected for qualitative estimation of benthic fauna. The mud sample was collected with Ekmann dredge and was transferred to laboratory in polythene bags. To sort out organisms the suspension was prepared in water and was filtered through three sieves having different mesh size kept one above the other. Filtered residue was transferred into a tray and sugar solution was added (10 gms . in 250 ml). Due to increase in the density in water, benthic organisms floating on the surface were picked up with the help of dropper and preserved in 4 % formalin for identification upto species level by following the keys from Edmondson(1959), K. Vanamala Naidu (2005), Pennack (1978),Tonapi (1988) and Mitra & Day (2005). Photography was done by Digi 2 Pro Labomed Camera attached to computer.

OBSERVATION AND RESULT

Biodiversity of the Lentic Ecosystems under study:-

The physical and chemical characteristics of water affect the abundance, species composition, stability and productivity of the indigenous population of aquatic organisms. The biological methods used for assessing biodiversity, include, collection, counting and identification of aquatic organisms, biomass measurement etc. and are essential for its effective management and conservation.

The study of lentic ecosystems in Mul was undertaken with reference to phytoplankton, zooplankton, benthos, macroinvertebrates, macrophytes and Ichthyofauna.

Table 4.5 : Benthic macroinvertebrates in Lentic ecosystems under study.				
SN	Benthic Macroinvertebrates	Family	Mul Lake	Janala Lake
A	Nematode			
1	Helicotylenchus spp.	Hoplolaimidae	+	-
2	Rhabditis spp.	Rhabditidae.	+	-
B	Annelida			
3	Chaetogaster spp.	Naididae	+	-
4	Nais spp.	Naididae	+	+
5	Dero spp.	Naididae	+	+
6	Pristina spp.	Naididae	+	+
7	Aulophorus spp.	Naididae	+	+
8	Slavina spp.	Naididae	+	-
9	Aelosoma spp.	Aeolosomatidae	+	+
10	Branchiura spp.	Tubificidae	+	-
11	Limnodrillus spp.	Tubificidae	+	-
12	Hirudinea medicinalis	Hirudidae	+	-
C	Insecta			
13	Chironomous spp.	Chironomidae	+	+
14	Mosquito larvae	Culicidae	+	+
15	Caddis fly larvae	Trichoptera	+	-
16	Mayfly larvae	Ehimeroptera	+	-
17	Odonata nymph	Odonata	+	-

18	Gerris spp.	Gerridae	+	+
19	Nepa spp.	Nepidae	+	+
20	Ranatra spp.	Nepidae	+	+
21	Eristalis spp.	Syrphidae	+	-
D	Gastropoda			
22	Digoniostoma spp.	Amnicolidae	+	-
23	Indoplanorbis spp.	Planorbidae	+	+
24	Glessula spp.	Glessulidae	-	+
25	Melania spp.	Melaniidae	+	+
26	Lymnaea spp.	Lymnaeidae	+	-
27	Pila globosa	Ampullaridae	+	-
28	Vivipara spp.	Viviparidae	+	+

DISCUSSION

In the lacustrine ecosystem, the physicochemical environment has profound influence on its biota. It controls diversity, biomass and spatial distribution of biotic communities in time and space. The physico-chemical parameters exert their influences both individually and collectively and their interaction produce abiotic environment which conditions the origin, development and ultimately their succession. Each ecosystem has its characteristic biotic and abiotic features and therefore thorough understanding is essential for maintaining the water quality as well as for the effective management and conservation of the ecosystem.

Benthic Macro-invertebrate :

The community of organism living on the bottom of water body is called the Benthos. It includes benthic macroinvertebrate communities of Nematodes, Oligochaete, Insect and Gastropods. The benthic macroinvertebrates can be used as barometer of overall biodiversity in the aquatic ecosystem. The invertebrate communities respond to change in water quality, integrates impact over a period of times and presence or absence of species can be an indication of specific environmental condition (Anitha et. al. 2004).

The benthic macroinvertebrates consist of biological communities most frequently used to evaluate water quality in aquatic environments , and occupy variety of trophic levels, acting in the nutrient, bottom detritus and water column dynamics (Rodrigues and Capitulo, 2002).

Benthos are important in the secondary productivity of fresh water lakes and playing significant role in exchange of autochthonous and allochthonous material in lake ecosystem. It has a great ecological importance because they form the food of fishes and their productivity plays a significant role in sustaining food chain and web.

Further the qualitative studies of the benthic macro invertebrates have been also been stressed by many workers (Dinkaran et. al. 2008; Sharma et. al. 2007; Anita,2003; Ryoli,2004; Naidu,2005; Oomachand and Belsare,1985; Jaiswal and Singh,1994 and Sisodia, 2007).

In the present investigation of the two lakes under study, the benthic macroinvertebrates consisted of Nematodes, Oligochaetes, Insect and Gastropodes.

Among Nematodes, two species i.e. *Helicotylenchus* spp. and *Rhabditis* spp. were collected from Mul lake and not from Janala lake. Presence of nematode species of Mul lake indicates the high load of organic matter due to input of sewage from nearby area. Gorai et.al. (2005) recorded *Rhabditis* spp. from two fresh water ponds in Dhanbad, Jharkhand. Nematodes play an important role in the decomposition of organic matter by influencing species composition and influencing carbon and nutrient cycle of soil.

Among Annelida two groups showed their dominance, Viz. Oligochaetes and Hirudinea.

Among the oligochaetes, in present study *Chaetogaster* spp. *Nais* spp., *Dero* spp., *Pristina* spp., *Slavinia* spp., *Aeolosoma* spp., *Limnodrilus* spp. and *Branchiura* *Sowerbyi* spp. were recorded.

Nais spp., *Pristina* spp., *Slavinia* spp., *Aulophorus* spp. and *Aeolosoma* spp. were recorded from both the lake.

Also *Dero* spp. was recorded from both lakes under study.

Limnodrilus spp., *Chaetogaster* spp. and *Branchiura sowerbyi* were collected from Mul lake only.

Many workers considered benthic Oligochaetes as an indicator of pollution. Mukherjee Nandi (2004) recorded *Limnodrilus* spp. and *Branchiura sawerbyi* in Subhas Sarovar lake, Kolkata.

Aston (1973) and Marshal (1978) stated that the occurrence of these species may be attributed to the increased eutrophication of a lake or to the increased sedimentation of organic matter. The importance of *Limnodrilus* species as an indicator of pollution has been well documented by Brinkhurst, 1965 and Brinkhurst and Cook, 1974.

Das (1978) suggested that some Oligochaetes such as *Chaetogaster* spp. and *Limnodrilus* spp. are biological indicators of pollution in his study on Nainital lake. Gorai et al. (2005) recorded more number of *Chaetogaster* spp. in Manaitand pond in Dhanbad which is a polluted one.

Thus it is clear that the occurrence of *Chaetogaster* spp., *Branchiura sawerbyi* and *Limnodrilus* spp. in Mul lake indicates that this water body is grossly polluted. *Hirudinea* spp. is present in both the lakes under study. This species is also recorded by Sharma et al. (2007) in Kishanpura lake, Indore and Adarsh Kumar (2006) in Ranjit sagar reservoir in Jammu and Kashmir.

Aquatic Oligochaetes are extensively studied by Ali (1973), Brinkhurst (1963), Jukla et al. (1989), Vanamala Naidu (2005), Tiwari et al. (1988), Vasisht and Gandhi (1972), Sarkar and Krishnamurthy (1977), Murkute (2009), Meshram (2010), Paliwal (2013).

Among the aquatic insects abundant Chironomus larvae were recorded from Mul lake which indicates its polluted nature, however only few specimens collected from Janala lake indicate that it is not organically rich.

Archana Rani (2004) recorded various species of Chironomids from Saroornagar lake, Hyderabad. The Chironomids have been recognized as indicators of trophic status of water body (Moore, 1978; Hul, 1987). Jana et al. (2009) recorded *Gerris* and *Ranatra* from fresh water pond, West Bengal.

In the present investigation, *Eristalis* spp. was recorded in Mul lake near Bus station sampling point which receives the sewage from Bus stand and thus indicates the higher pollution zone of the lake. May fly and Caddisfly larvae were recorded from only Mul Lake. Meckenthun (1966) and Larimore (1974) have stated that May flies are pollution indicators.

Among the Gastropods, *Indoplanorbis* spp., *Melania* spp., *Vivipara* spp. were collected from both Janala and Mul lake whereas *Digoniostoma* spp., *Lymnaea* spp., *Pila globosa* were collected from the Mul lake whereas *Glossula* species and few *Melania* were also collected from Janala lake.

Lymnaea spp., *Vivipara* spp., *Melania* spp., *Indoplanorbis* spp. were numerically abundant in the bottom sample collected from Mul lake which indicates its polluted nature. Janala lake being oligotrophic also had the *Indoplanorbis* spp., *Glossula* spp., *Melania* spp., *Vivipara* spp. but their number was comparatively very less.

In the present study, Molluscs showed their dominance in Mul lake than Janala lake might be attributed to more availability of Calcium. Tudorancea, (1972) regarded alkaline

nature of water and high concentration of calcium as a contributory factor towards the dominance of Molluscan in the water bodies studied by him.

The biodiversity of Benthic Macroinvertebrates has been intensively studied by various workers, Jayaraju et. al. (1994); Jayaram (1994); Arvind kumar (2002); Sabu Thomas (2002); Kiran et. al. (2007); Sisodia (2007).

- 1) The benthic macroinvertebrates belonged to Nematoda, Annelida, Insecta and Gastropoda.

Conclusion:

Limnological studies have immense values in sustainable development of any ecosystem and also from the point of view of future environment impact assessment programmes. In this context, the present investigation deals with the limnological profile of two lentic ecosystems in Mul.

The benthic macroinvertebrates like Gastropods, Chironomids and Oligochaetes, in terms of their density and diversity also reveal the polluted nature of Mul lake. As the Mul lake is situated in the heart of the city, it is organically enriched as it receives the domestic sewage from the densely urbanized locality around this pond. The sewage and other waste from the adjoining bus depot also increases its nutrients load from many years. Therefore excessive growth of Pistia and Lemna minor in the lake during winter and early summer as a consequence of organic enrichment is very common.

If this is continued the process of eutrophication will be enhanced and the lake may become eutrophic in the coming years.

Janala lake is situated in the forest area near the Janala village and the pace of urbanization is not alarming. Values of various physico-chemical parameters in this lake were found to be within a permissible limit. Clean water species of zooplankton were recorded from this lake. Bioindicator species of zooplankton and phytoplankton have very less density and with macrophytic diversity is an indicative of its oligotrophic nature. But agricultural fields in the vicinity may add to the organic load it not controlled in near future and may change its status from oligotrophic to eutrophic, if necessary conservative measures are not undertaken in time.



Indoplanorbis spp.



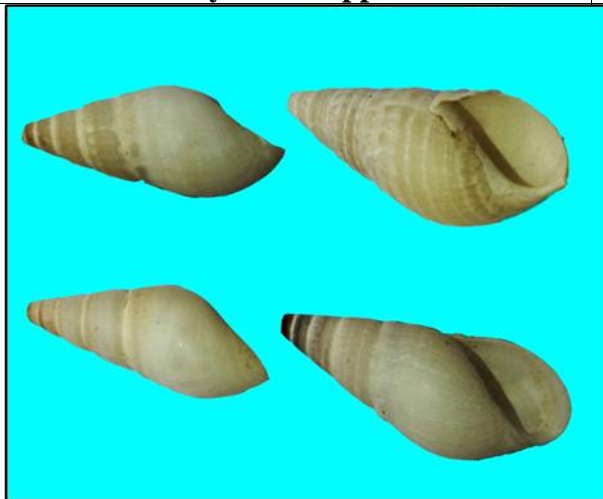
Lamiellidens corrianus.



Lymnaea Spp.



Vivipara spp.



Melania Spp.



Pila globosa.



Aelosoma spp



Branchiura sowerbyi



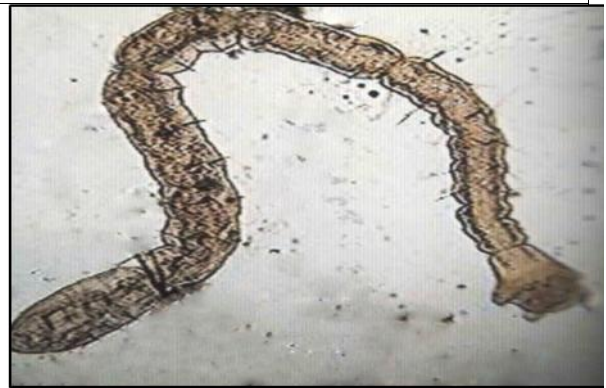
Chironomus larva



Insect Larva



Slavina spp.



Dero spp.



May Fly Larva



Aelosoma spp

PLATE – XVI

Benthic Macroinvertebrates Diversity of Lentic Ecosystems under Study

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