



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

MACROZOOBENTHIC DIVERSITY OF THREE URBAN LAKES OF NAGPUR, CENTRAL INDIA.

S.S.Lonkar¹ and G.T.Kedar²

1. Dept. of Zoology, Institute of Science, Nagpur-10.

2. Dept. of Zoology, Govt. of Maharashtra's Ismail Yusuf College, Jogeshwari (E) Mumbai-400060

Manuscript Info

Manuscript History:

Received: 12 February 2014
Final Accepted: 26 March 2014
Published Online: April 2014

Key words:

Nagpur, lakes, macrozoobenthos

*Corresponding Author

S.S.Lonkar

Abstract

The present study was carried at three urban lakes of Nagpur City in Central India from September 2010 to August 2012 confirmed macrozoobenthic diversity of 30 species belonging to 4 different phylum, viz Platyhelminths, Annelida, Arthropoda, Mollusca. The most abundant species are observed in Phylum Arthropoda, Class Insecta as larvae, nymph and naids of the aquatic insects. The presence of species belonging to Phylum Mollusca are also more in number with the occurrence of Gastropoda and Pelecypoda. The occurrence of Phylum Annelida is prominent with class Oligochaeta and Hirudinea. The species belonging to Phylum Platyhelminths of class Turbellaria are least in study. The study suggests that the rich benthic fauna is due to the organic rich habitat in the three urban lakes of city.

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INTRODUCTION

The term benthos includes all bottom dwelling organisms. Among the animals are representative of most of the phylum (Welch, 1952). Study of the macro benthos has received considerable attention due to their significance as biological indicators of environmental change in aquatic ecosystem and also as source of fish food organisms. These organisms inhabiting in the lentic or lotic water bodies, come across influence of human civilization and urbanization ultimately resulting into considerable variation in their community structure (Wilhm J and Dorris T. C., 1968). The presence of macro benthos in an aquatic ecosystem has close relationship with its environment and is regarded as an indicator organism in discussing the conditions of nature and characteristics of that ecology (Ganesh T and A.V.Raman, 2007).

Benthic organisms play an important role in the aquatic ecosystem because of their importance in food chain. These act as potential elements in fishery and sustaining biodiversity of vegetation. Benthic macro fauna is inhibited by the various degree of disturbances such as bottom activity of biogeochemical process in the sediment structure, rocks, zonation (Pearson T.H. and Rosenberg R., 1978). The presence of species and the species specific study evaluates the scenario of benthic environment. The factors affecting aquatic ecosystem as pollution, organic enrichment and physical disturbances are sensitized by benthic communities. These are termed as indicator species sensitive to multiple stressors. Such species are having different tolerance levels in community structure (Holtman, S.E. and Groenwold A, 1994)

STUDY AREA

The present study was carried out in the Nagpur city [21° 09'N. & 79° 09'E] in the Maharashtra state of Central India. The city has an average elevation between 274.50 to 350 meters above sea level. The city is endowed with natural water bodies, rivers and man made lakes. Since the period of urbanization these getting deteriorated to phase of extinction. The study was carried out to estimate the macrozoobenthic fauna in three lakes namely Futala, Ambazari and Gandhisagar of the city.

Futala lake –

The futala lake [21° 08' 44''N and 79°03'48''E] is a closed water body. This lake is located in west Nagpur. The initial purpose for irrigating nearby agricultural land was prominent amongst utilization of lake. The water is unpotable and now-a-days used for commercial fisheries. It does not have self cleansing capacity. Hence the continuous addition of nutrients through many polluting sources is leading. The watershed of Futala Lake is a part of nag river watershed. Four streams are prominent within the catchment.

Ambazari lake –

The ambazari lake [21°07'43''N and 79°02'26''E] is having its water supply from strom run-off and streams. To the north-west side hill top on the city is a small plateau from where originates the main streams of Nag river adding water to ambazari reservoir. The overflow point is responsible for shedding water during heavy rains. The lake water is sustained due to bund wall, built with the purpose to provide potable water to city. Due to rapid urbanization and industrial growth, the purpose merely exists up to commercial uptake of water, fishery and recreational purpose.

Gandhisagar lake –

The Gandhisagar Lake [21° 08' 48'' N and 79°05'55'' E] This lake is situated in the central part of the Nagpur city towards East. It is closed water bodies at all proximities. This lake is fed by storm water drains. This lake has several temples on its bank which unknowingly contaminate water by dried flowers, garlands polythene bags and garbage.

MATERIALS AND METHODS

Study on macrobenthos was conducted between September 2010 to August 2012 at selectively four locations of each lakes. Sediment along with benthic fauna was collected with the help of Ekman dredge having size 6'' x 6'' x 6''. The collected sample was further sieved with the help of copper sieve having mesh size of 500 µ. Macro benthic invertebrates obtained after sieving were preserved in 4% formalin for further laboratory studies and identifications. Macrobenthos were analysed under the dissecting microscope (10 x ; 20 x) ; acetocarmine stain was used for staining the fauna. The benthic macro invertebrates were sorted out by forceps and classified them species wise, counted and catalogued. The identification up to the species was done by following the standard literatures (Edmondson 1959; Needam 1962; Tonapi 1980; Pennak 2001).

Observation -

RESULT AND DISCUSSION-

During the present investigation a total of 30 species of macro benthic invertebrates belonging to four phylum were recorded from all the three lakes. The Ambazari Lake showed high species diversity with 28 species, while 26 species were recorded from Futala Lake; however 24 species were recorded from Gandhisagar Lake. S.B. Zade and S.R. Sitre (2012) observed 13 macro benthic species belonging to three phylum in a polluted urban Naik lake of Nagpur city. In the present investigation Phylum Platyhelminths are represented by class turbellaria with *Planaria* sp. Phylum Annelida are represented by class Oligochaeta , family tubificidae with *Limnodrillus hoffemeistri*, family Nainidae with *Nais communis* and *Aeolosoma bengalensis*, family Lumbricidae with *Lumbricus variegates* species respectively. The class Hirudinea, family Glossphonidae includes *Glossiphonia* sp. In the phylum Arthropoda class arachnida includes *Hydracarina* sp. (Water mites). The class crustacea was represented by *Caridina* sp., *Paratelpusa jaquemonti* and *Gelasimus* sp. The major benthic fauna are observed as the larvae, nymph, naids of Class Insecta, includes order Odonata with sub order anisoptera and zygoptera as dragonfly and damselfly naids respectively. The species belonging to order Diptera includes larve of *Chironomus* sp., *Anopheles* sp., *Culex* sp., *Eristalis* sp., *Rhapidolabis* sp., *Tabanus* sp., *Musca automnalis*. The species belonging to order Hemiptera includes *Nepa* sp. and *Ranatra elongata*. In the present investigation the second major group of species belongs to phylum Mollusca having group Gastropoda includes *Vivipara bengalesis*, *Melania striatella*

tuberculata, *Melania scabra*, *Lynea lutiola*, *Indoplanorbis exustus*, *Faunus ater* and group Pelecypoda includes *Lamellidens correatus*, *Lamellidens marginalis* and *Parreysia corrugate nagpoorensis* (Lea). The macrozoobenthic studies in lotic ecosystem of Gadchiroli district in Maharashtra is done by Bhandarkar S.V. and Bhandarkar W.R. (2013).

In the present investigation their presence is determined and calculated. The result shows Ambazari is having more count followed by Futala and Gandhisagar. The present result is further analyzed as percentage of abundance and their frequency for each species. It is clear from the result of the present study that species belonging to phylum arthropoda, class insect and phylum Mollusca are abundant amongst the benthic invertebrates of all species. This clearly shows that Ambazari Lake is rich in benthic fauna compared to Futala Lake and Gandhisagar Lake. Such comparative studies of three seasonal ponds in relation to macro invertebrate fauna is studied by Sharma L.L. et al (2007) at southern Rajasthan. The presence of planaria sp., Hirudinea and Hemiptera in the assessment of macro invertebrates in the ranjit sagar reservoir, Jammu and Kashmir(I) is recorded by Adarsh Kumar et al. (2006). In general the benthic communities of polluted water bodies are determined by the larval forms of species belonging to Tubificidae and chironomidae (Hynes,1960). These have also been used as a pollution indicator (Gaufinn, 1957). Mandal and Moitra (1975) have reported minimum benthic fauna in urban lentic reservoirs at Burdwan. Occurance of the Oligochaeta in the lentic and lotic fresh water reservoirs in Nagpur are recorded by K.Vanamala Naidu and H.N.Shrivastava (1980). The studies regarding benthic fauna at Bhatagaon dam, distt. Parbhani M.S. (I) indicates the presence of Crustacea including Decapoda species and Mollusca species, Kadam D.D. et al (2005). Studies regarding trophic status of two lakes in Nagpur was carried by Indira Jayagoudar et al. (1984). This study reveals that Gandhisagar lake is subject to artificial eutrophication and the lake can be classified as hyper eutrophic. Futala lake is subjected to natural eutrophication and can be classified as mesotrophic. The benthic invertebrates act as a good foraging ground for standing fish crop, Jhingran(1982).The inference from the present study is the lakes harbors varied amount of benthic fauna and proved as a good productive ground for fish culture practice. It is also perceived that lakes are threatened to their productive grounds due to human anthropogenic activity and garbage waste dumped. It is in the need for conservation strategies to be implied and regulated.

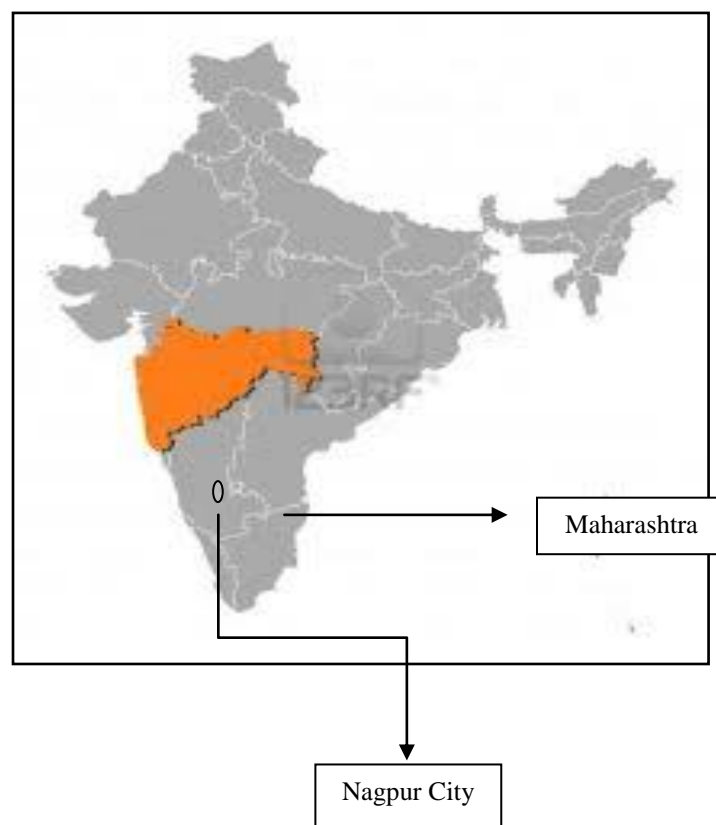


Fig. 1 –Map showing location of Nagpur city

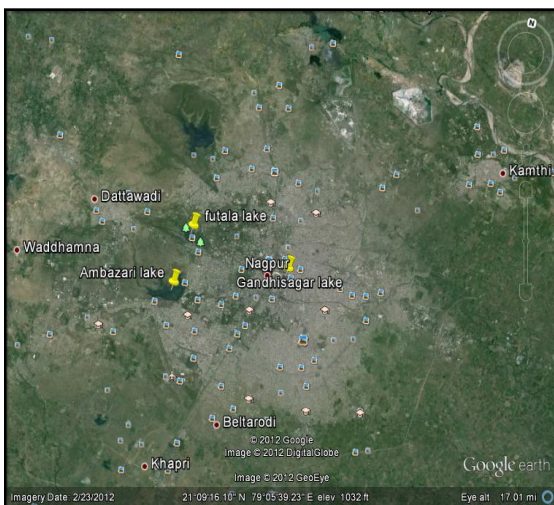


Fig.2 –Google map showing location of three lakes in Nagpur city

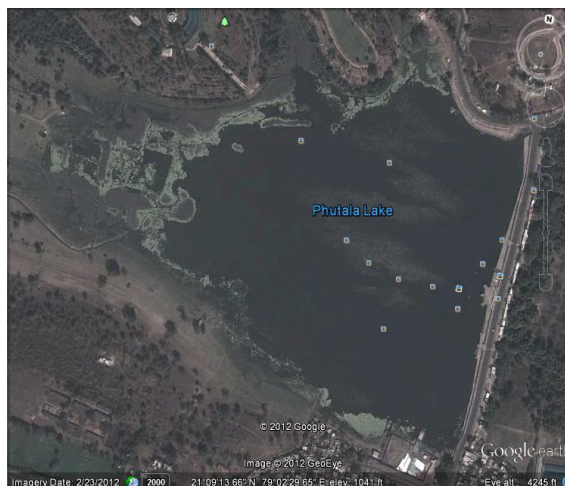


Fig.3 –Google map showing Telangkhedhi lake in Nagpur city

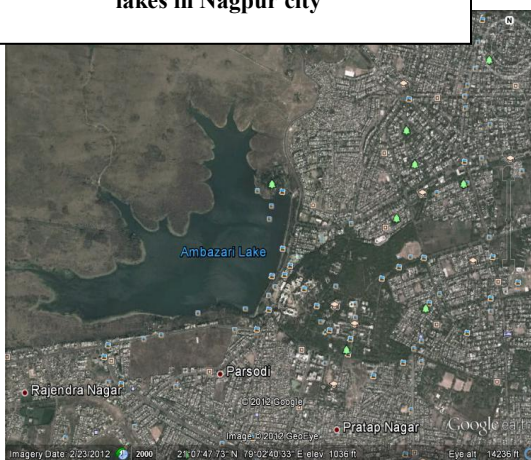


Fig.4 –Google map showing Ambazari ake in Nagpur city

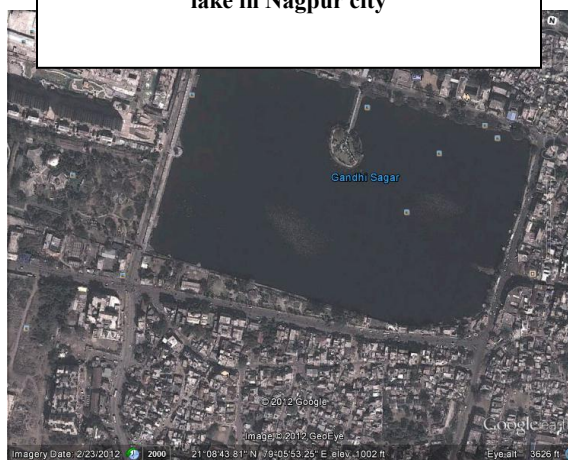


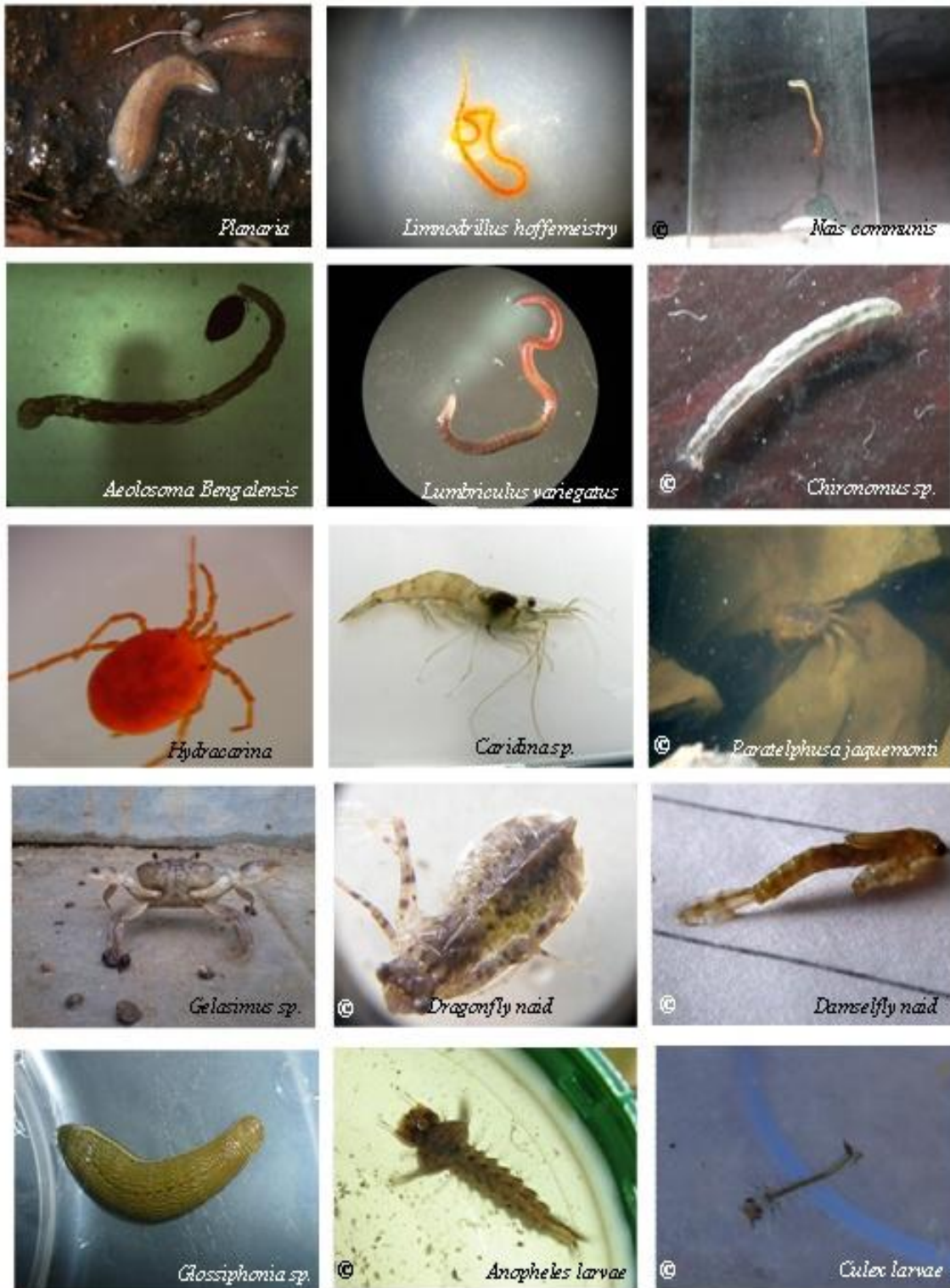
Fig.5 –Google map showing Gandhisagar lake in Nagpur city

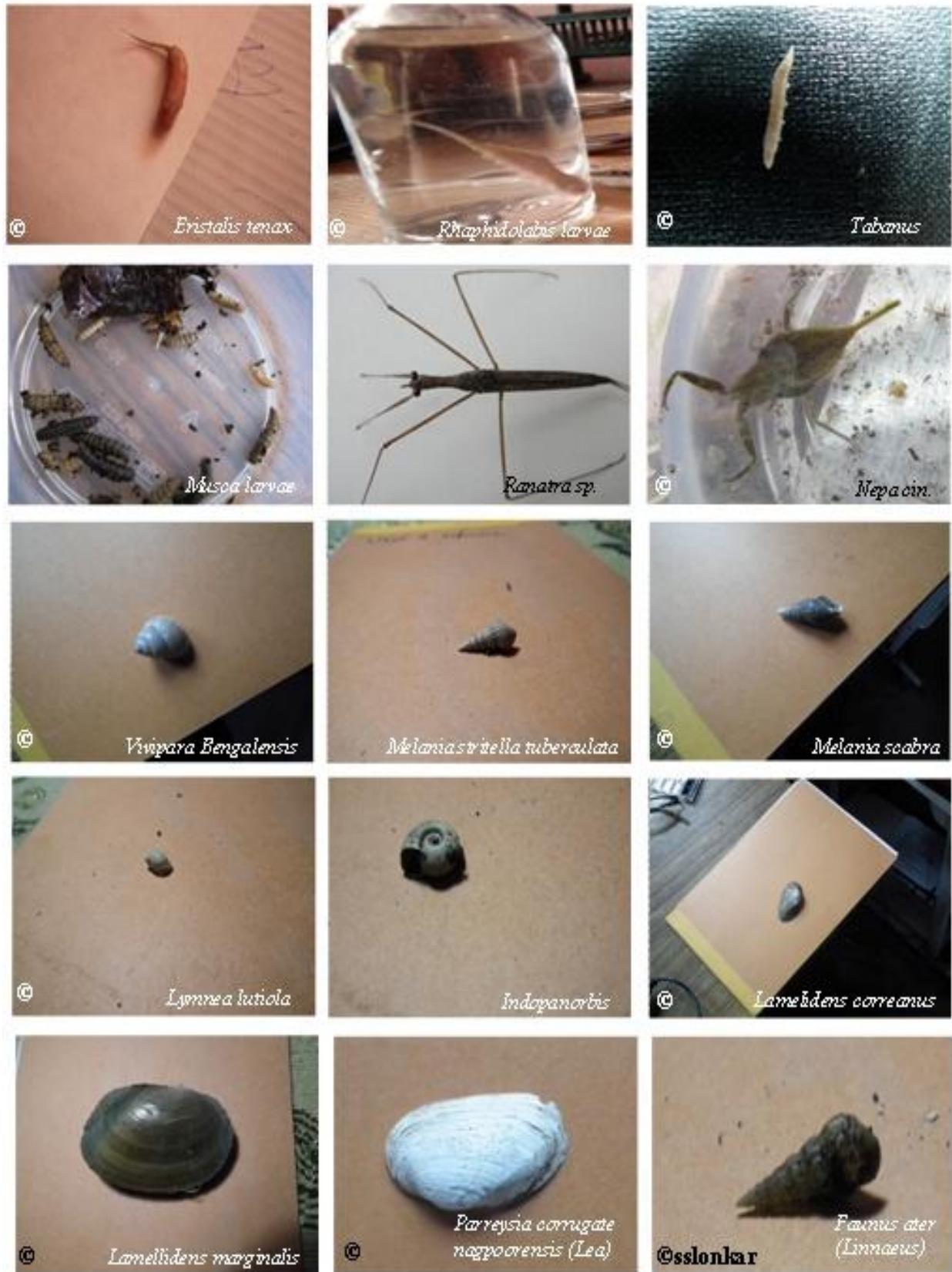
Table 1-Benthic Invertebrates of Three Lakes in Nagpur. (+ Present; - Absent)

Macro benthic Invertebrates		Lakes studied		
		Ambazari	Futala	Gandhisagar
Phylum-Platyhelminths				
Class-Turbellaria	Planaria	-	-	+
Phylum –Annelida				
Class -Oligochaeta				
Family-Tubificidae	Linnodrillus hoffemeistri	+	+	-
Family-Nadidae	Nais communis	+	+	+
	Aeolosoma bengalensis	+	+	+

Family-Lumbricidae	Lumbriculus variegates	+	+	+
Class- Hirudinea				
Family-Glossiphonidae	Glossiphonia sp.	+	+	-
Phylum –Arthropoda				
Class-Arachnida	Hydracarina sp.	+	+	+
Class - Crustacea				
Order-Decapoda	Caridina sp.	-	+	-
	Paratelphusa jaquemonti	+	+	+
	Gelasimus sp.	+	+	+
Class- Insecta				
Order - Odonata				
Sub order- Anisoptera	Dragonfly nymphs	+	+	+
Sub order- Zygoptera	Damselfly nymphs	+	+	+
Order- Diptera				
Family-Tendipididae	Chironomus sp.	+	+	+
Family-Culicidae	Anopheles sp.	+	+	+
	Culex sp.	+	+	+
Family-Syrphidae	Eristalis sp.	+	+	+
	Rhopidolabis sp.	+	+	+
Family-Tabanidae	Tabanus sp.	+	+	+
	Musca autumnialis	+	-	-
Order - Hemiptera				
Family-Nepidae	Nepa sp.	+	+	+
	Ranatra elongate	+	+	+
Phylum –Mollusca				
Group-Gastropoda	Vivipara bengalensis	+	+	+
	Melania stritella tuberculata	+	+	+
	Melania scabra	+	+	+
	Lymnea lutiola	+	+	+
	Indoplanorbis exustus	+	+	+
	Faunus ater(Linnaeus)	+	+	+
Group-Pelecypoda	Lamellidens correatus	+	+	+
	Lamellidens marginalis	+	-	-
	Parreysia corrugata nagpoorensis(Lea)	+	-	-

Table2 :Macro zoobenthos in Three Lakes.





REFERENCES

- Adarsh Kumar, T.A. Qureshi and Alka Parashar (2006):** biodiversity assessment of Macro Invertebrae in Ranjit Sagar Reservoir, Jammu Kashmir (I). *J. Aqua. Biol.* Vol.21 (2):39-44
- Bhandarkar S.V. and Bhandarkar W.R. (2013):** A study on species diversity of benthic macro invertebrates in freshwater lotic ecosystems in Gadchiroli district Maharashtra. *Int. J. of Life Sciences*, 2013 Vol.1 (1): 22-31 ISSN: 2320-7817
- Edmondson W.T. (1959):** fresh water biology (IInd Edition) Ward H.B. and G.C. Whipple. John Wiley and Sons, New York. Pp: 1248
- Ganesh T and Raman A.V. (2007):** Macrobenthic community structure of north east Indian shelf, Bay of Bengal, *Marine Ecology Progress Series*, 341:59-73
- Gaufin A.R. (1957):** The use and value of aquatic insects syndicators of organic enrichment, Biological problems in water pollution. U.S. Public Health Service, Washington D.C. pp139-149
- Geographical Information on Nagpur city (2006):** National Informatics Centre, Nagpur.
- Holtman S.E. and Groewold A (1974):** Distribution of zoobenthos on the dutch continental shelf: The western Frisian Front, Brown Bank and Broad Fourteens, Netherlands Institute for Sea Research, NIOZ-NIOO-CEMO rapporten en verslagen, pp:136.
- Hynes, H.B.N. (1960):** The biology of polluted waters. Liverpool, Liver pool Univ. Press, 202 pp.
- Indira Jayagoudar et al (1984):** Trophic status of two lakes in Nagpur, IAWPC Annual, X I, 1-10.
- Jhingran V.G. (1982):** Fish and Fisheries of India, Hindustan Pub. Corporation India.
- K. Vanamala Naidu and H.N. Shrivastava (1979):** Some fresh water oligochaets of Nagpur, India. *Hydrobiologia*, Vol.72 Issue I Pg. 261-27
- Kadam D.D., Mali R.P., Kadam M.S. and Ambhore N.E. (2005):** Ecology of Bhategaon dam, district Parbhani, Maharashtra. *J. Aqua. Biol.* Vol.20(2) : 101-104
- Mandal B.K. and Moitra S. K. (1975):** Studies on the bottom fauna of fresh water fish pond at Burdwan. *J of Inland Fisheries Society of India*, 7:43-48.
- Needham (1962):** A guide to study of fresh water biology, Holden day Inc. San Francisco, 5th Edition.
- Oomanchan, L. and D. K. Belsare (1975):** Bathymetric distribution of Mollusca in lower lake of Bhopal, *Bull. Bot. Soc. Univ Sagar*. 32:34-38.
- Pearson T.H. and Rosenberg (1978):** Macro benthic succession on relation to organic enrichment and pollution of the marine environment. *Oceanography. Marine Biological Review*, 16:229-311
- Pennak R.W. (1989):** Freshwater Invertebrates of the United States. A Wiley Inter science publication. John Wiley and Sons Inc. P. 628.
- Sharma L.L., N. Sarang and B.K. Sharma (2007):** Occurrence of macroinvertebrates in relation to water and sediment characteristics in three seasonal ponds of southern Rajasthan. *J. Aqua. Biol.* Vol.22 (2): 49-54

Tonapi G.T. (1980): Freshwater animal of India: An ecological approach. Oxford and IBH Publishing company
New Delhi pp.341.

Welch P. S. (1948): Limnology II edition. Mc graw Hill book Company, New York.

Wilhm J. L. and Dorris T. C.(1966): Species diversity of benthic macro-invertebrates in a stream receiving
domestic and oil refinery effluents. Am Midl. Nat., 76:427-449.

Wilhm J. and Dorris T. C. (1968): Biological parameters for water quality criteria, Bioscience, 18 : 477-481

Zade S.B. and Sitre S.R. (2012): Biodiversity of benthic macro invertebrates in a polluted urban lake of Nagpur
city (M.S.) India. Eco revolution 2012 Colombo,Srilanka Bionano Frontier ISSN 0974-0678