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RESEARCH ARTICLE

Molluscans can decide the water quality of rivers

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ABSTRACT

The Molluscans are helpful in purification of water in their capacity to act as scavengers. The Molluscans play an important role in the assessment of water quality that is they are used as Bio indicators. The rivers are always selected as the sites for drinking purposes. The biodiversity of Narmada River is quite varied, rich and needs regular monitoring and conservation as the river is subjected to various sources of point and non point pollution which are posing threat to these biota. The present investigation was carried out in four sampling stations of Narmada River and various species of class Gastropoda and pelecypoda were recorded through out the sampling period. Some species of Molluscans like Lymnea lives in only highly polluted environment. The species like Thiara and Indoplanorbis live in slightly polluted environment, while the species like Pseudomilleria delyi is highly sensitive to pollution and can survive in pollution free environment. On the presence these Species we can know the water quality of river.

INTRODUCTION

Benthic macro invertebrates, especially aquatic molluscans, are associated with substrates of streams, rivers and lakes. The aquatic molluscans are used as important animals to study the water quality of streams and rivers. The macro invertebrates are useful biological monitors because they are found in all aquatic environments, are less mobile than any other group of organisms, and are of a size which makes them easily collectable. The aquatic biota, show responses to a wide array of potential pollutants, including those with synergistic or antagonistic effects. Additionally, the use of benthic macro invertebrates has been shown to be a cost effective monitoring tool (Lenat 1988) (Engel and Voshell 2002).

Water pollution, including siltation is endemic to almost all inhabited parts of the world and is consistently ranked as one of the major threats to freshwater ecosystems (Richter *et al* 1997). Habitat loss and habitat degradation are also major reasons for worldwide biodiversity loss in aquatic ecosystems and are caused by anthropogenic disturbances (Allan and Flecker 1993, Richter *et al* 1997). The threat of global climate change is pervasive across all of the earth's ecosystems and is also often cited as a major threat to freshwater biodiversity (Sala *et al* 2000, Strayer and Dudgeon 2010).

Biological monitoring or Biomonitoring is the use of biological responses to assess changes in the environment due to anthropogenic causes (Martin *et al* 2000). Biomonitoring program may be qualitative, semi quantitative or quantitative. It is a valuable assessment tool that is receiving increased use in water quality monitoring programs of all types (Barbour and Paul 2010). Biomonitoring involves the use of indicators, indicator species or indicator communities. Molluscans are good environmental indicators because they are common components of freshwater ecosystem, relatively sessile in their aquatic phase and can be inexpensively sampled (Furse *et al* 2006, Arimoro *et al* 2007).

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MATERIAL AND METHODS

Study area

The present study was carried out for the period of one year in selected sampling stations of Narmada river. The Narmada river was selected for the present study, because it is one among the important rivers of India and is considered as the life line of Madhya Pradesh. Narmada river originates in the Maikal mountain ranges in Amarkantak in Madhya Pradesh state and flows through west for a distance of 1312 km into the Gulf of Cambay, west of Bharuch District in Gujarat State (National Institute of Hydrology 1999). The source of the Narmada is a small tank called Narmada Kund located on the Amarkantak hill 1,057 m (3,467.8 ft), in the Anuppur District of eastern Madhya Pradesh.

For the convenience of sampling, the river was demarcated into four sampling stations mentioned as under.

OMKARESHWAR (S-I)

Omkareshwar is a famous place of pilgrimage, situated 77 km from Indore in Khandwa District, Madhya Pradesh.

MANDLESHWAR (S-II)

Mandleshwar is a town and a Nagar Panchayat in Khargone district of Madhya Pradesh. It is a town of historical and religious importance situated on the bank of Narmada river, 8 km east of Maheshwar, and 99 km south of Indore.

MAHESHWAR (S-III)

Maheshwar culturally rich town, is located in north western part of Khargone district of Madhya Pradesh state. This holy town is situated

on north bank of sacred river Narmada formerly known as Mahishmati.

BARWANI (S-IV)

Barwani, also known as Siddh Nagar is a city and a municipality in Barwani district in the state of Madhya Pradesh, India.

METHODOLOGY

The present study was carried out for the period of one year from Aug 2010 to July 2011. Each and every method was used to collect the molluscan sample. The molluscans were collected from deep pro-fundal zone by using Ekman Grab and from the shallow zone by the help of Surber sampler. Besides this, the molluscans were also collected by hand picking and by using kick net. For statistical evaluation, Shannon Weiner diversity index (1963) was used.

Shannon and Weiver diversity index: It has been calculated as

$$H = \sum_{i=1}^{S} (p_i \ln p_i)$$

Where as

H = Shannon and Weiver Index.
Pi = ni / N (ni = number of individuals of the species.
N = Total number of individuals in the sample)

The value of Shannon and Weiner Index theoretically range from 0.00 to 4.00. Value less than 1.00 indicates poor water quality, value from 1.00 to 3.00 indicates moderate water quality and value above 3.00 indicates good water quality.

RESULTS

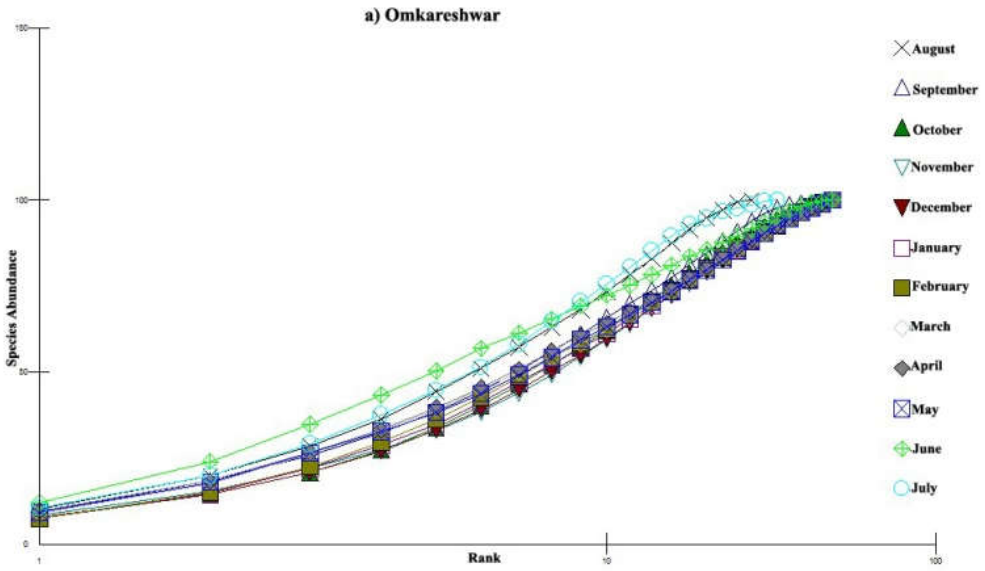
During the present study, higher abundance in molluscan fauna was recorded with five families of class Gastropoda and four families of class Pelecypoda in selected station of river Narmada. Among the Gastropoda, the Viviparidae and Lymnaeidae were recorded dominant at S-III followed by S-II. Figure a,b,c and d shows K-dominance curve indicating abundance of species at different sampling stations. During the present study, the value of Shannon Weiner index was recorded minimum of H= 2.5 at S-II and maximum of H=3.1 at S-I and S-IV (Table 1). As the value of H is observed above 3, indicating that S-I and S-IV are less polluted than S-II. In the present study, maximum population of family Lymnaeidae were recorded at S-II, indicating poor water quality, as these species survive only in highly polluted environment. At S-I and S-II, the dominant species recorded were *Thiara tuberculata* and *Indoplanorbis exustus*, indicating that both stations are slightly polluted than others.

DISCUSSION

During the present study, about five families of class Gastropoda and four families of class Pelecypoda were recorded in selected station of river Narmada. The molluscan diversity was found maximum in April-May months and minimum in July-August months. The families like Viviparidae and Lymnaeidae were recorded dominant throughout the study period. Such dominancy of the families were also reported by Sharma *et al* (2011) and Garg *et al* (2009). The molluscan species like *Lymnaea acuminata* and *Lymnaea auricularia*

Table 1. Monthly variation in Shannon and Weiner index at different Stations

Months	Shannon & Weaver Index			
	S-I	S-II	S-III	S-IV
Sep.	3.0	2.8	2.9	2.9
Oct.	3.1	3.0	2.9	3.0
Nov.	3.1	3.0	3.0	2.9
Dec.	3.1	3.0	3.0	3.0
Jan.	3.1	3.0	3.0	3.0
Feb.	3.1	3.0	3.0	3.0
Mar.	3.1	3.0	3.0	3.0
Apr.	3.0	3.0	3.1	3.0
May.	3.1	3.0	3.1	3.1
June.	2.9	3.0	3.0	3.0
July.	2.8	2.8	2.8	2.9



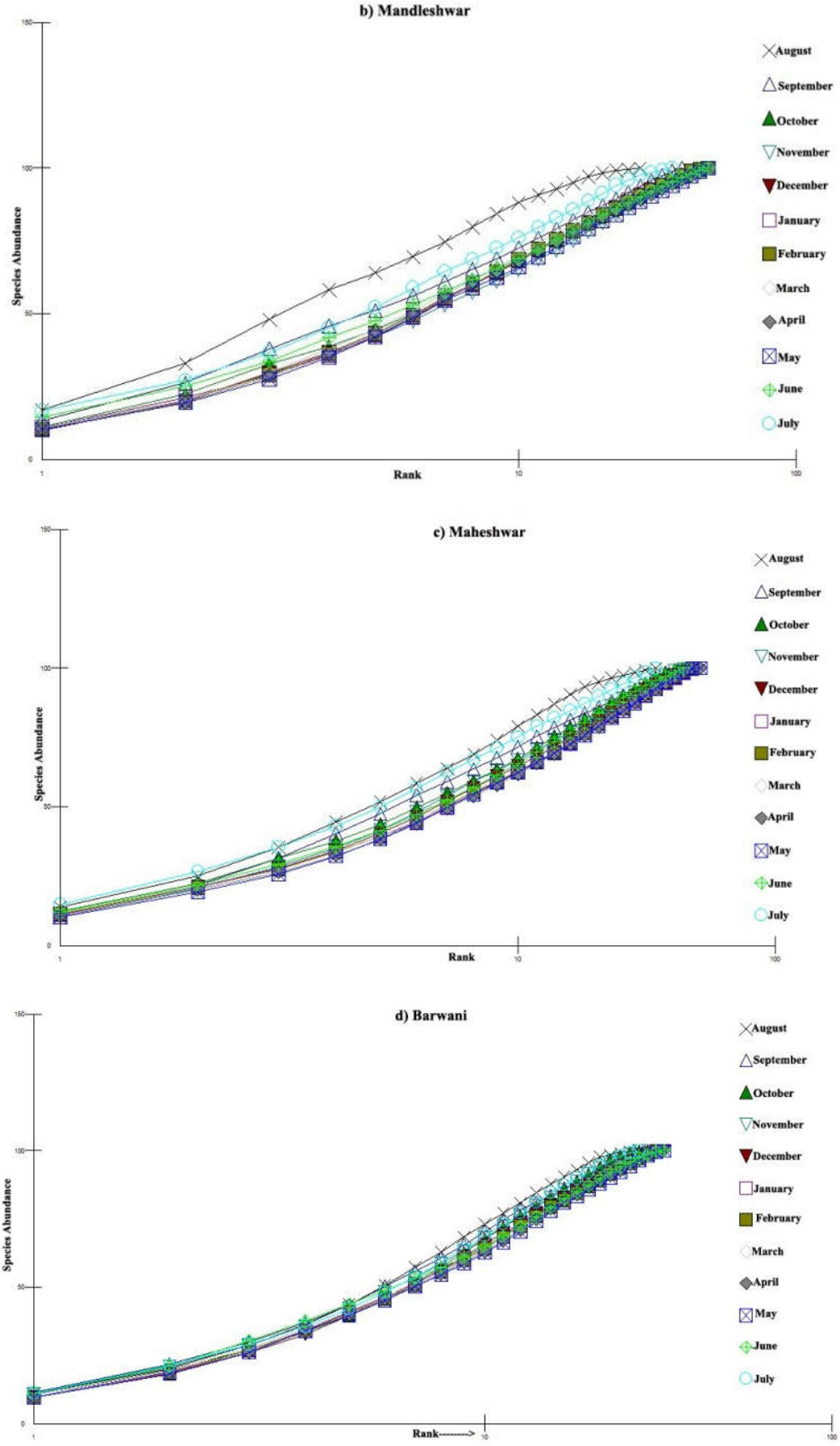


Figure a), b), c) & d). K dominance curve showing species abundance at different sampling stations.

as the S-II was highly influenced by anthropogenic activities. Such abundance was also recorded by Burdi *et al* (2009). The use of Shannon and Weaver Index has gained a wide acceptance and has become an important tool of water quality studies Yap *et al* (2003), Kathleen and Callahan (2005) and Babu *et al* (2010). In the present study, the value of Shannon Weiner index varied from H= 2.5 to H=3.1 (Table 1). The diversity index was recorded higher in summer months which may be attributed to the breeding season in nutrient rich and oxygenated habitat. Shukla and Shrivastava (2004) recorded value of H index in the range from 1.73 to 2.94 in Gandhisagar reservoir India. Bhat *et al* (2011) recorded the value of H index in the range between H= 1.99 to 2.42 in Kashmir Himalayas.

Conclusion

As the Molluscans plays an important role in bio-monitoring, indicating the water quality of rivers. The aim of the present study is the conserve the world's freshwater molluscan population, which are declining at an alarming rate due to habitat destruction and pollution in water bodies. The species of molluscans which act as scavengers can be used as a biological tool to increase the water quality of the rivers.

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REFERENCES

Allan J. and Flecker A. (1993): Biodiversity conservation in running waters. *Bioscience* 43(1) 32-43.

Arimoro F. O., Ikomi R. B. and Efemuna E. (2007): Macro invertebrate community patterns and diversity in relation to water quality status of river Ase, Niger Delta Nigeria. *J. Fish. Aquatic science*. 2:337-344.

Babu A., Kaila K., Duraisamy A. and Santhanam R. (2010): Abundance and diversity of molluscs from Cuddalore coast. *Marine Biodiversity Records.*

Barbour M. T. and Paul M. J. (2010): Adding value to water resource management through biological assessment of rivers. *Hydrobiologia,* 651: 17-24.

Bhat S. U., Sofi A. H., Yaseen T., Pandit A. K. and Yousf A. R. (2011): Macro invertebrate community from Sonamarg streams of Kashmir Himalaya. *Pak. J. of Env. Sci.* 14(3): 182-194.

Burdi G. H., Baloch W. A., Begum F., Soomro A. N., Khuhawar M. Y. (2009): Ecological studies on freshwater bivalve mussels (Pelecypoda) of Indus river and its canals at Kotri. *Sindh University Research Journal* 41(1): 31-36.

Engel S. R. and Voshell J. R. (2002): Volunteer Biological monitoring: Can it accurately assess the ecological condition of streams. *American Entomologist*. 48 (3): 164-177.

Furse M. T., Hering D., Moog O., Verdonschot P. and Johnson R. K. (2006): The STAR project context, objectives and approaches. *Hydrobiologia.* 566: 3-29.

Garg R. K., Rao R. J. and Saksena D. N. (2009): Correlation of molluscan diversity with physico-chemical characteristics of water of Ramsagar reservoir, India. *Inter. Journal of Biodiversity and Conser.* 1(6): 202-207.

Lenat D. R. (1988): Water quality assessment of streams using a qualitative collection method for benthic macroinvertebrates. *Journal of the North American Benthological society* 7: 222-223.

Martin P., M. A. Haniffa., and M. Arunachalam (2000): Abundance and diversity of macroinvertebrates and fish in the Tamiraparani river, South India. *Hydrobiologia.* 430: 59-75.

National Institute of Hydrology (1999): Comprehensive hydrological studies of Narmada basin. NIH Roorkee, India.

Richter B., Braun D., Mendelson M. and Master L. (1997): Threats to imperiled freshwater fauna. *Conservation Biology*, 11(5): 1081-1093.

Sala O., Chapin F., Armesto J., Berlow R., Bloomfield J., Dirzo R., Huber S. E., Huenneke L., Jackson R., Kinzig A., Leemans R., Lodge D., Mooney H., Oesterheld M., Poff N. S. M., Walker B., Walker M. and Wall D. (2000): Global biodiversity scenarios for the year 2100. *Science*, 287(5459): 1770–1774.

Shannon G. E and Weaver W. W. (1963): The Mathematical Theory of Communities. University of Illinois. Press Urbana.

Sharma K. K. and Chowdary S. (2011): Macro invertebrate assemblages as biological indicators of pollution in a central Himalayan river, Tawi (J & K). *Int. J. of Bio. and Conser.* 3(5): 167-174.

Shukla A. and Shrivastava S. (2004): Species diversity of macrozoobenthos: A tool for Bio monitoring water pollution of Gandhisagar reservoir, M. P. India. *Bio. Memoirs,* 30(1): 7-13.

Strayer D and Dudgeon D. (2010): Freshwater biodiversity conservation: recent progress and future challenges. *Journal of the North American Benthological Society.* 29: 344–358.

Yap C. K., Ismail A. R. and Tan S. G. (2003): Species diversity of macrobenthic invertebrates in the Semenyih river, Selangor, peninsular Malaysia. *Pertanika J. Trap. Agric. Sci.* 26(2): 139 – 146.

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