

Molluscan Diversity in River Sip- A Tributary of River Narmada in Central India

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ABSTRACT

The survey was conducted to assess the freshwater molluscan diversity of the river Sip. The Sip River is a tributary of River Narmada, and joins in the Narmada at right bank just upstream of the Indira Sagar reservoir. This riverine system is poorly studied till date and, mainly lack of information about the molluscan fauna in this particular water body. During present investigation, a total of 17 species of molluscs were recorded from Sip River. Among collected molluscs, 17 species were identified from nine families i.e. Viviparidae, Thiaridae, Pilidae, Lymnaeidae, Planorbidae, Amblemidae, Unionidae, Corbiculidae, Pisiidae included in class Gastropoda and Bivalve. The molluscan community could be used as good bio-indicator for ecologically diverse freshwater habitat.

Key words: Sip River, Molluscs, Gastropoda, Bivalve, Bio-indicators.

INTRODUCTION

The freshwater Molluscs are one of the most diverse groups of benthic fauna, considered as second largest phylum next to Arthropoda. They constitute an important part of the ecosystem and found to be beneficial economically, medicinally and ecologically¹⁴. The Indian freshwater harbor a rich diversity of molluscs, representing 212 species belonging to 21 families, of these, 164 species were recorded from rivers and streams¹⁷. Molluscan are important component of aquatic ecosystem because they form the food for fishes and their productivity play an important role in food chain²⁰. Their

participation in aquatic ecosystem has made them significant partners in ecological communities. Many molluscan species are also good bioindicators for water quality or population on the basis of their tolerance power against extremes of physico-chemical component of water⁸. The presence of molluscan indicates the water is not acidic; hardly molluscs survive below a pH of 5¹. Several investigations were undertaken on major benthic animal groups of freshwater system. Notable contribution to our knowledge of molluscan fauna has been made by few authors.

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The paucity of information on molluscan community throughout entire catchment area of river in India have lead current estimate of freshwater molluscan diversity too low, better knowledge of actual distribution of molluscan fauna with relation to its particular habitat as well as ecological requirement of molluscan species should be made priorities for the future. It has been observed from decades that most of the studies were confined to the main river Narmada^{3, 4, 13,10} but this tributary is not taken into account, though it plays a crucial role in biotic and economic sources along its catchment and as well as on the hydrogeography feature of the river Narmada. Therefore, the present study was undertaken to address the distribution of molluscan community of River Sip- a tributary of river Narmada in central India.

MATERIALS AND METHODS

The river Sip originates from hilly ranges of Vindhychal Mountain near Ramdasi village in Sehore district, Madhya Pradesh. Geographically, it lies between 22° 34' - 22° 54' N latitude and 77° 11' - 76° 59' E longitude and elevation of above 517 msl. Basically, the River Sip is a tributary of river Narmada and joins river Narmada near Satdev village in Sehore district, M.P. The study was carried out from Oct, 2014 to July, 2016. Seven sampling sites was selected namely Site-1 Devpura, Site-2 Kaliyadev, Site-3 Kosmi, Site-4 Ambha kadim, Site-5 Chhapri, Site-6 Pandagoan, Site-7 confluence point. The sampling stations are systematically arranged from its origin up to Confluence point of the river Narmada in according to different land use/cover pattern (**Figure-1**).

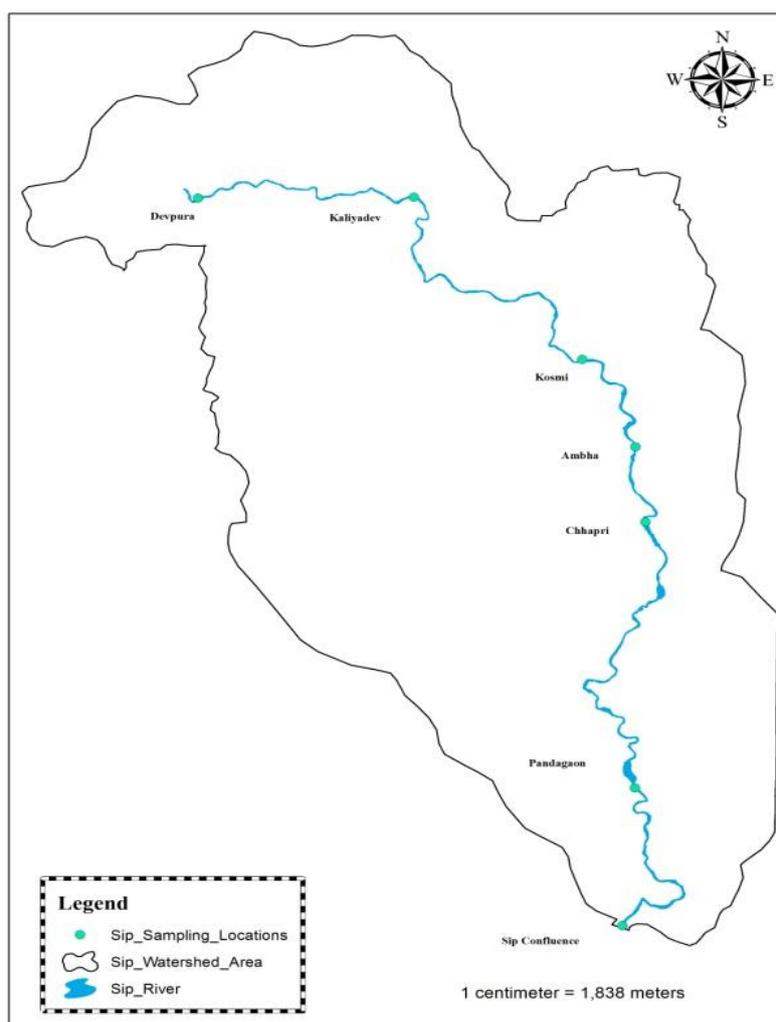


Fig. 1: Map of the Study Area with Sampling Stations

Collection, Preservation and Identification

The collection of molluscan fauna from each sampling stations was carried out by deploying different samplers as per the habitat of sampling locations. We used Peterson's grab sampler where depth was more than 1 meter and Surber sampler where depth is less than 1 meter. D- Frame net was used to collect molluscan fauna from Macrophytes. The collected organisms were then washed and fixed in 5% formalin solution and enumerated group wise. Preserved organisms were identified using Standard taxonomical keys^{5,16,18}. Numbers of each species were expressed as individuals/m².

In statistical analysis, Jaccard similarity index was evaluated within the sampling sites. This index is used for comparing the similarity and diversity of sampling site. The index only uses presence-absence data. The value of Jaccard index varies between 0 and 1. The Jaccard coefficient measures similarity between sampling sites. If values of Jaccard coefficient is equal to 0 that means there are no common species and if comes equal to 1 that indicates all species are equal.

Jaccard Similarity Index = (number of species in **both** sites) / (number of species in **either** sites)

RESULT AND DISCUSSION

The present study enlisted 17 species from all sampling sites belonging to 11 genera, under 9 families, of which 11 species was represented by Gastropoda and 6 species from Bivalve.

The Gastropoda was represented by two orders, viz., Mesogastropoda and Basommatophora, 5 families; 7 genera and 11 species. Bivalvia also had two orders Viz., Trigoinoidea and Veneroidea; four families; four genera and six species. A similar finding was done by Bijukumar *et al.*,² on molluscan community of the Bharathapuzha River in Kerala and thirteen species of molluscs belonging to five order, eight families and ten genera was reported. Kumar and Vyas¹¹ recorded 19 species of molluscan fauna represented by 4 order, 10 families and 12 genera from selected reach of River Narmada. Sharma *et al.*,¹⁵ studied molluscan from

Morand River-a tributary of Ganjal River in Narmada basin a total of 10 species of molluscan were reported of which 5 species were gastropoda and 5 species bivalve.

Among the Gastropoda species, *Bellamya bengalensis*, *Thiara scabra* (Muller), *Thiara (Melanoides) tuberculata* (Muller), *Tarebia granifera* (Lamarck), *Tarebia lineate* (Gray), *Lymnaea (Pseudosuccinea) acuminata* (Lamarck), and *Gyraulus labiatus* (Benson) was the most dominant, being present in all seven sampling sites followed by *Bellamya dissimilis*, *Gyraulus convexiusculus* (Hutton) and *Indoplanorbis excustus* (Deshayes) was recorded at 6 sites and *Pila globosa* in 2 sites (Table 1). Kumar and Vyas¹¹ studied molluscan diversity in the Narmada and reported 19 species, among them 13 species belong to the Gastropoda and six Bivalve. The Gastropoda was most dominant group found in all sampling stations as compared to bivalve. Vyas *et al.*,¹⁹ reported molluscan faunal assemblage in the river Narmada near water intake point and shown their dominance by contributing, nine species from gastropoda and two species from bivalves.

The documentation of bivalve as a whole during the period of study was less dominant as compared to Gastropoda. Of which, *Parreysia occata* (Lea) and *Corbicula striatella* (Deshayes) was most ubiquitous being found in all sampling sites. *Lamelliden marginalis* (Lamarck) and *Pisidium (Afropisidium) nevilleianum* (Theobald) were found at 5 sites. *Parreysia corrugate* and *Lamelliden corrianus* (Lea) were reported from 4 sites (Table 1). The same finding was reported in River Barak and on its tributaries in Assam. The author observed gastropods in dominant position as compared to bivalves and recorded sixteen molluscan taxa belonging to two classes¹². Similar was documented from the river Nile⁶ and in the upper Murrumbidgee River in southeast Australia⁷.

Jaccard similarity index (J) - The values of Jaccard similarity index within seven sampling sites varies between 0.62 and 1. The lowest similarity was seen between site 1 and site 2 (0.62) and highest similarity was seen in site 6 and site 7 (1) (**Figure-2**). The Jaccard

similarity index will be beneficial for other freshwater species which are not well known. Izsak and Price evaluated Jaccard index along

with other similarity index for measuring the patterns of similarities for marine species⁹.

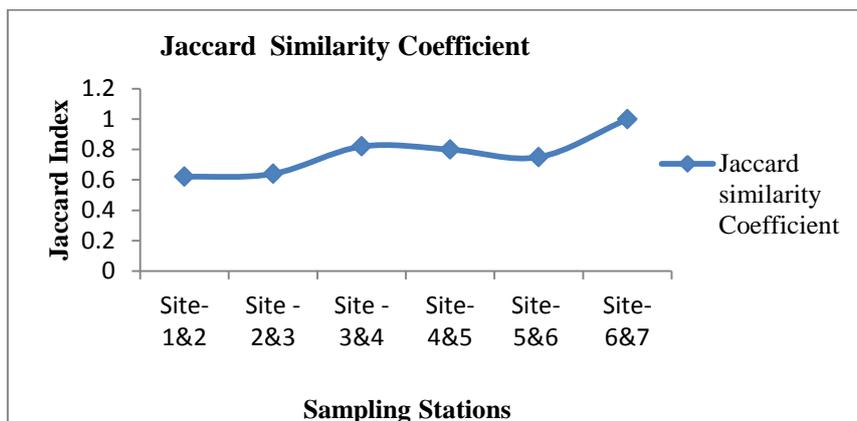


Fig. 2: Graph showing Jaccard Similarity Coefficient values among various sampling stations

Table 1: Distribution of Molluscan community at different sites of the study area

		Sampling Stations						
S. N.	Taxa	Site- 1	Site- 2	Site- 3	Site- 4	Site- 5	Site- 6	Site- 7
Phylum	Mollusca							
Class	Gastropoda							
Order	Mesogastropoda							
Family	Viviparidae							
1	<i>Bellamyia bengalensis</i>	+	+	+	+	+	+	+
2	<i>Bellamyia dissimilis</i>	+	-	+	+	+	+	+
Family	Thiaridae							
3	<i>Thiara scabra</i> (Muller)	+	+	+	+	+	+	+
4	<i>Thiara (Melanoides) tuberculata</i> (Muller)	+	+	+	+	+	+	+
5	<i>Tarebia granifera</i> (Lamarck)	+	+	+	+	+	+	+
6	<i>Tarebia lineata</i> (Gray)	+	+	+	+	+	+	+
Family	Pilidae							
7	<i>Pila globosa</i>	+	-	+	-	-	-	-
Order	Basommatophora							
Family	Lymnaeidae							
8	<i>Lymnaea (Pseudosuccinea) acuminata</i> (Lamarck)	+	+	+	+	+	+	+
Family	Planorbidae							
9	<i>Gyraulus labiatus</i> (Benson)	+	+	+	+	+	+	+
10	<i>Gyraulus convexiusculus</i> (Hutton)	+	+	-	+	+	+	+
11	<i>Indoplanorbis exustus</i> (Deshayes)	+	-	+	+	+	+	+
Class	Bivalvia							
Order	Trigoinoidea							
Family	Amblemidae							
12	<i>Parreysia (Radiatula) occata</i> (Lea)	+	+	+	+	+	+	+
13	<i>Parreysia corrugata</i> (Lea)	+	-	+	-	-	+	+
Family	Unionidae							
14	<i>Lamellidens marginalis</i> (Lamarck)	-	+	+	+	-	+	+
15	<i>Lamellidens corrianus</i> (Lea)	-	-	+	+	-	+	+
Order	Veneroidea							
Family	Corbiculiidae							
16	<i>Corbiculla striatella</i> (Deshayes)	+	+	+	+	+	+	+
Family	Pisidiidae							
17	<i>Pisidium (Afropisidium) nevilleianum</i> (Theobald)	-	+	+	+	-	+	+
	Total	14	12	16	15	12	16	16

CONCLUSION

The freshwater molluscs aid in assessment of ecological status of the water bodies. Hence, studies relevant to the diversity, distribution and ecology become imperative. The result of the present study indicated the distribution of molluscan species and found that both Gastropoda and Bivalve communities inhabit the different sites of river Sip. The noteworthy information was extracted from the study which revealed higher dominance of Gastropoda then Bivalvia. These species can be considered as bioindicators of pollution and ecosystem health. Findings of the present work could be useful for better management and conservation of molluscan fauna from this region.

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REFERENCES

1. Boycott, A. E., The habitats of land mollusca in Britain, *Journal of Ecology.*, **22**: 1-38 (1934).
2. Bijukumar, A., Sushama, S. and Biswas, T., Molluscs collected from the Bharathapuzha River, Kerala. *J. Inland Fish. Soc. India.*, **33(2)**: 68-69 (2001).
3. Bhandari, R., Shukla, A., Distribution of Benthic macroinvertebrate and its correlation with physico-chemical parameter from Narmada River, Jabalpur (M.P.). *Sci-fronts journal of multiple sciences.*, **10** (9):71-77 (2015a).
4. Bhandari, R., Shukla, A., Preliminary study of molluscan diversity in Narmada River, Jabalpur region (M.P.). *International journal of Recent Scientific Research.*, **6** (10): 7041-7044 (2015b).
5. Dey, R.A., Handbook on India Fresh Water Molluscs. Zoological Survey of India, Calcutta. 1-399 (2007).
6. Fisher, M.R. and Williams, W. P., A feasibility study to monitor the macroinvertebrate diversity of the River Nile using three sampling methods. *Hydrobiologia.*, **556**: 137-147 (2006).
7. Harrison, E.T, Norris, R.H. and Wilkinson, S. N., Can an indicator of river health be related to assessment from a catchment scale sediment model? *Hydrobiologia.*, **600**: 49-64 (2008).
8. Harman, W. N., Snails (Mollusca: Gastropoda), in C.W. Hart and S.L.H. Fuller (eds.), *Pollution Ecology of Freshwater Invertebrates*; Academic Press, New York. 275-302 (1974).
9. Izsak, C. and Price, A.R.G., Measuring β – diversity using a taxonomic similarity index and its relation to spatial scale. *Marine ecology progress series.*, **215**: 69-77 (2001).
10. Kumar, A. and Vyas, V., Diversity of molluscan communities in River Narmada, India. *Journal of chemical, Biological and Physical Sciences.*, **2(3)**: 1407-1412 (2012).
11. Kumar, A. and Vyas, V., Diversity of macrozoobenthos in the selected reach of River Narmada (Central Zone), India. *International journal of research in biological sciences.*, **4(3)**: 60-68 (2014).
12. Roy, S. and Gupta, A., Molluscan diversity in River Barak and its tributaries, Assam, India. *Assam University Journal of Science and Technology: Biological and Environmental Sciences.*, **5(1)**: 109-113 (2010).
13. Shukla, A., Sustainability of water supply in Jabalpur using macroinvertebrates for assessment of River Narmada, *A quarterly journal of multi-disciplinary research.*, **3(1)**: **185**: 187 (2016).
14. Sharma, K.K, Bangotra, K., Saini, M., Diversity and distribution of mollusca in relation to the physico chemical profile of Gho – Manhasan stream, Jammu (J &K). *International J. of Biodiversity and Conservation.*, **5(4)**: 240 – 249 (2013).

15. Sharma, R., Kumar A., and Vyas V., Diversity of macrozoobenthos in Morand River- A tributary of Ganjal River in Narmada Basin. *International journal of Advanced Fisheries and Aquatic Science.*, **1(1)**: 57-65 (2013).
16. Subba Rao, N. V., Handbook- Fresh water Molluscs of India. Published by Zoological Survey of India, Calcutta. 165(1989).
17. Subba Rao, N.V., In K.S. (ed), Recent Advance in Freshwater Biology, **2**: Anmol Publications, New Delhi, India.1993a: 187-201 (1993).
18. Tonapi, G.T., Freshwater animal of Indian Ecological approach, Oxford and IBH Publishing Co., New Delhi. 341 (1980).
19. Vyas, V., Bharose, S., Yousuf, S. and Kumar, A., Distribution of macrozoobenthos in river Narmada near water intake point. *Journal of Natural Science Research.* **2(3)**: 18-24 (2012).
20. Waghmare, B.D., Kulkarni, A.N., Molluscan diversity in Lendi River, District Nanded, Maharashtra, India. *International journal of scientific engineering and research (IJSER).* **3(2)**: 19-21(2015).