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Research Article

Diversity and distribution of Benthic fauna along the Valvanti river-a tributary of Mandovi estuary, Goa

S V Tari[1], P P Nagvekar[2], S S Pereira[3], A K Pednekar[4], V R Veluskar[5]

[1]Assistant Professor in Zoology, Government College of Arts, Science and Commerce, Sanquelim Goa, India
[2,3,4,5]Department of Zoology, Government College of Arts, Science and Commerce, Sanquelim Goa, India

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Corresponding Author:
S V Tari, Government College of Arts, Science and Commerce, Sanquelim Goa, India
E-mail Id:
sumantari2811@gmail.com
Orcid Id:
https://orcid.org/0009-0009-1097-948X
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A B S T R A C T

Benthic fauna diversity and distribution along the Valvanti river was studied for a period of one year. Since benthic fauna are regarded as the most reliable measures of pollution, it is important to study their diversity. The current investigation was conducted to study the structure, composition and diversity of benthic macroinvertebrate species. Four sampling stations along the Valvanti River were selected to collect samples. The current study reported 15 species of benthic macroinvertebrates, of which 13 were identified down to the genus level and two down to the family level. They were represented by six orders and nine families. Indicator species like Chironomus larvae and the Ceratopogonidae family dominated the sample. According to reports, the benthic fauna's Shannon-wiener diversity index (H) was 2.33, indicating a moderate diversity implicating that the community has a reasonable number of species and there is no complete dominance of a single species. The Shannon Evenness Index was estimated to be 0.82, that indicated high evenness ie. the community's species are fairly evenly distributed in terms of individual abundance. The Simpson's Reciprocal Index was calculated to be 13.15 which meant that the community was highly diverse and for several species, the distribution of individuals was more uniform.

Keywords: Benthic Fauna, Valvanti River, Shannon-Weiner Index, Simpsons Reciprocal Index

Introduction

Fresh water ecosystems constitute a life line for human population but are the most threatened in the world. Since they more precisely depict the historical and current environmental conditions of an ecosystem than physical and chemical indicators of water and soil, benthic fauna aids in the assessment of water quality.[1,2] Benthos are best organisms to study as they are regarded as bio indicators of pollution. They are easily collected due to their sessile and sedentary character. Benthos are animals that are fossorial in nature and travel to the bottom for feeding and reproducing.[3] Benthic fauna are organisms that live on, in, or at the sediment-water interface and are often classified according to size as microfauna (<0.1 mm), meiofauna (<1 mm), macrofauna (>0.5 mm), and megafauna (>10 mm). Benthic invertebrates from rivers in Goa are not widely studied and hence their functional importance is not known.

Valvanti river is one of the tributaries of Mandovi River. Pollution levels are tracked by the Goa State Pollution

Control Board (GSPCB) of Valvanti at one location in Sanquelim. The stretch between Poriem to Sanquelim-Bicholim is classified as C-class i.e for drinking water.

To the best of our knowledge, information on macrobenthic fauna of river Valvanti is unavailable so far. The study was undertaken to study the distribution, composition and diversity of the benthic macroinvertebrate species.

Materials and methods

Goa is a small state on the Southwestern coast of India situated in the Konkan region. Goa encompasses an area of 3,702 km^2 and lies between the latitudes 14°53'54" N and 15°40'00" N and longitudes 73°40'33" E and 74°20'13" E.

River Mandovi is the most important river in Goa whose length is about 81 Km. River Valvanti is one of the tributaries of Mandovi. River Valvanti begins from Karnataka (known as Haltar river in Karnataka) which flows further down and enters the state of Maharashtra where it is known as "Thorli Nhai". When it reaches Virdi in Dodamarg taluka at Kakandyar, emerging from the forest of Bokarwadi, it mingles into this river. It then enters the State of Goa via Siroli where it flows south to join Dusgir Kalti, which has its origins in the jungles of Ponsuli inside Mhadei Wildlife Sanctuary. Here the water is discharged along The Kudcho nalla from which it is called as Valvanti and Travels from Gotheli, Poirem, Sanquelim, Karapur, and Bicholim, before it joins Mandovi river.

The 20 Km stretch of Valvanti river is surrounded by riparian forest inhabiting rich fauna. Sankli, Bicholim and Poreim are stretches of polluted waters due to the population of humans in those areas which causes major garbage and industrial waste to be dumped in those areas also the use of those areas as defecating grounds is another issue. (Personal Observations). River Valvanti has fresh water till Bandirwada in Vithalpur of Karapur and as it proceeds further it enters the salt water.

The Study area included 4 sites with a 4 Km distance between each location along Valvanti river. Samples were collected for a period of one year from each site. The Van Veen grab was deployed for sampling as it was easily operated by a rope. Reagent glass bottles of 10 ml and transparent sample collection bags were used. A definite size area was marked and sediment samples were scooped out with the help of shovel and transferred into the polythene bags. The bags were labelled with details like site number, collection point, date and time of collection. Also, water sample was collected for physico-chemical analysis. Water sample for determining dissolved oxygen was fixed with Winkler's A and B reagent at the site. Dissolved oxygen was determined using Winkler's Iodometric method using starch as the indicator. The pH of water was determined with help of pH meter (Equiptronics EQ 615). Surface water temperatures and air temperature was taken with the help of hand-held thermometer. Salinity was determined by Mohr's titration method.[4]

Samples were bought to the laboratory and were transferred into a white tray. Then the sample was sieved through a sieve to remove leaves and other unwanted debris in the sample. A dilute solution of Rose Bengal stain was mixed with the sediment sample. With the help of forceps and paint brush the micro invertebrates were isolated one by one in a watch glass and then transferred to 40% formalin in separate bottles marked by date and sampling site number. Micro invertebrates were observed under light microscope and were photographed for further identification.

Animals were sorted and then identified using the proper identification keys at the taxonomic level. The benthic macrofauna were identified using a dissecting stereomicroscope coupled with a compound microscope when observation of fine details was needed. Appropriate identification procedures were followed for the identification of benthic fauna.[5-7]

Results and Discussion

From November 2022 to October 2023, sampling was done every two weeks. During the current study, ten visits were made to four sample locations along the Valvanti River. Among the physico-chemical parameters, maximum temperature was recorded at Bicholim site and lowest temperature at Keri site. Bicholim is a semi-urban area while Keri is surrounded by western ghats forests due to which atmospheric temperature was least in this area. Pravin Kumar et.al[8] also reported similar observations.

Dilution and evaporation brought on by the South-West monsoon caused the salinity variation, which was typical of tropical ecosystems.

Dissolved oxygen levels in the current study ranged from 3.2 to 5.5 mg/L during the monsoon season at all locations, which may be the result of the cumulative effect of increased wind velocity. Similar findings were previously reported by Fernando[9] and Tripathy,[10] with high values during the monsoon and low values throughout the summer. The freshwater inflow was the primary cause of the seasonal fluctuations in dissolved oxygen. It is commonly recognised that salinity and temperature have an impact on how easily oxygen dissolves.[11] Over the course of the study, the pH of the surface water stayed alkaline at every location, reaching its highest during the summer and its lowest during the monsoon. Seasonal variations in pH are typically ascribed to a variety of reasons, including the breakdown of organic matter, the dilution of seawater by the inflow of freshwater,

the reduction of temperature and salinity, and the removal of CO2 by photosynthesis through bicarbonate degradation. The fourth site (Bicholim) had the highest salinity, 18.43 mg/L, and the lowest salinity was found to be of site 2nd and 3rd (Keri and Sanquelim) that is 11.34mg/L in the post monsoon season.

Out of four sites selected, most number of species were found in site 1 i.e Siroli and least number of species were found in site 3 i.e Sanquelim. Siroli lies in the upstream section of the river bordering Maharashtra state where the influence of pollution in terms of industrial discharge is comparatively lower. This may be reason for more diversity and abundance of benthic fauna in that area. The stretch of Valvanti flowing through Sanquelim is influenced by lot of anthropogenic activities like the weekly market dump, temples along the banks, washing clothes and to some extent mining effluents. This may have contributed to the lesser number of benthic fauna in this site.

Total 15 species were found along the four sites and out of which 2 species were unidentified and 13 were identified. The study revealed the presence of indicator species such as Chironomous larvae in abundance from river Valvanti indicating the polluted status of the ecosystem. Use of freshwater for various domestic purposes than any other natural resources threaten the survival of aquatic species. So proper monitoring of aquatic ecosystems is necessary to avoid depletion or degradation of the natural environment. This is in agreement with the studies of Dahegaonkar [12] from studies in Maharashtra.

In the present study, the benthic invertebrates were represented by organisms belonging to six orders viz. Diptera, Tibificida, Calanoidea, Ephemeroptera, Coleoptera and Odonata (Fig. 1). Order Diptera dominated with 46% of the species followed by Order Coleoptera (20%). The benthic invertebrates in the present study were represented by organism belonging to 9 families (Fig. 2) dominated by family Chironomidae (20%) and family Leptophlebidae (20%). Akhand et.al[13] reported that abundance of macro benthic invertebrates decreased during summer. They also concluded that macro benthic invertebrates act as pollution indicators and water quality of the river was moderately polluted in monsoon, highly polluted in winter and severe polluted in summer.

The Shannon-Weiner diversity index (H) was calculated as 2.23 which indicates a moderate diversity in the study area. The Shannon Evenness Index (SEI) was calculated to be 0.82 which indicates an uneven distribution of benthic fauna in the four sampling sites studied. The Simpson's reciprocal Index (D) was calculated to be 13.15 which is an indication of moderate richness.

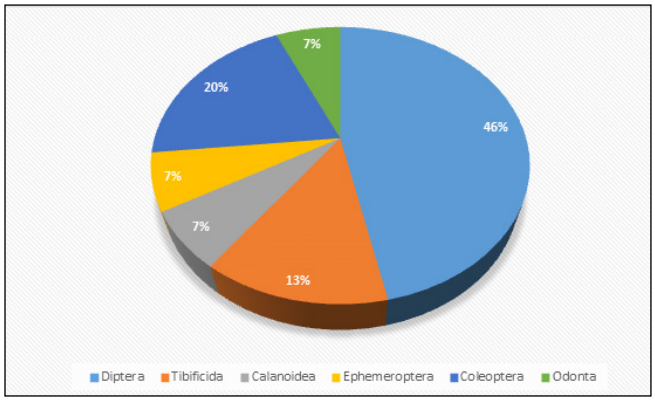

Figure 1.Order wise distribution of species encountered in the study area

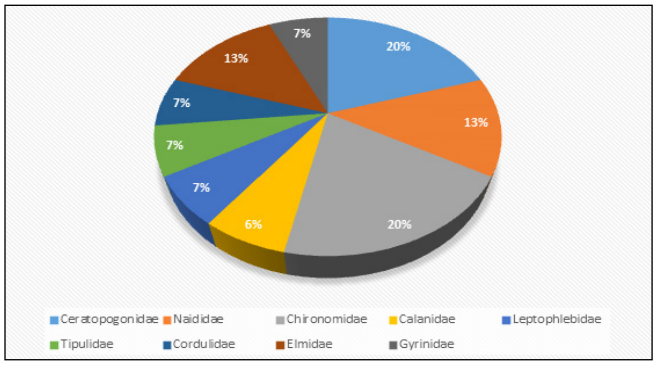

Figure 2.Family-wise distribution of species encountered in the study area

Conclusion

Benthic organisms contribute significantly to nutrient cycling, sediment stability, and energy flow within marine and freshwater environments. Understanding the diversity, composition, distribution, and ecological functions of benthic communities is essential for assessing environmental changes and implementing effective conservation strategies. Continued research and monitoring is essential protect these organisms and ensure the sustainability of the aquatic ecosystems.

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References

1. Hynes H. The Biology of Polluted Waters. Liverpool: Liverpool University Press; 1978. p. 202.
2. José de Paggi S. Diversity of rotifera (Monogononta) in wetlands of Río Pilcomayo national park, Ram-

sar site (Formosa, Argentina). Hydrobiologia. 2001 Oct;462:25-34.
3. Petersen C. Valuation of the Sea. 2. The Animal Communities of the Sea Bottom and Their Importance for Marine Zoogeography. Rep Danish Biol Sta. 1913;21:1–68.
4. Kumar R, Moharir KN, Singh VP, Pande CB, Varade AM, editors. Sustainability of Natural Resources: Planning, Development, and Management. CRC Press; 2024 Jun 28.
5. Chowdhury AJ, John A, Aqilah NS, Abdullah R, Salihah NT, Basir KH, Marsal CJ. Macrobenthic community towards sustainable aquatic ecosystem: a systematic review along the coastal waters of Malaysia. Geology, Ecology, and Landscapes. 2024 Jan 2;8(1):57-70.
6. Edmondson WT. Methods and Equiment in Freshwater biology 2nd ed. John Willey and Sons. Inc., NewYork. 1959;1202.
7. Tonapi G. Fresh Water Animals of India: An Ecological Approach. New Delhi: Oxford and IBH Publishing Co.; 1980.
8. Pravinkumar M, Murugesan P, Prakash RK, Elumalai V, Viswanathan C, Raffi SM. Benthic biodiversity in the Pichavaram mangroves, Southeast Coast of India. Journal of Oceanography and Marine Science. 2013;4(1):1-1.
9. Fernando O. Studies on intertidal fauna of the Vellar estuary. J Mar Biol Assoc India. 1987; 29:86–103.
10. Tripathy S. Water quality assessment of Gautami-Godavari mangrove estuarine ecosystem of Andhra Pradesh, India. Earth Syst Sci. 2005;42(1-2):21–4.
11. Vijaykumar S. Seasonal distribution and behaviour of nutrients with reference to tidal rhythm in the milky estuary, Southwest Coast of India. J Mar Biol Assoc India. 2000; p. 21–4.
12. Nguyen TH, Wang SL, Nguyen VB. Recent advances in eco-friendly and scaling-up bioproduction of prodigiosin and its potential applications in agriculture. Agronomy. 2022 Dec 7;12(12):3099.
13. Akhand A, Chanda A, Dutta S, Manna S, Hazra S, Mitra D, Rao KH, Dadhwal VK. Characterizing air–sea CO 2 exchange dynamics during winter in the coastal water off the Hugli-Matla estuarine system in the northern Bay of Bengal, India. Journal of oceanography. 2013 Dec;69:687-97.