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Study Of Molluscs Diversity And Environmental Parameters Of Indrayani River.

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ABSTRACT

The Indrayani River is a holy and ecologically important river flows through Pune, Maharashtra. This study investigates the diversity of freshwater Molluscs and their relationship with physicochemical parameters across five sites of Indrayani River i.e. Dehu, Talawade, Chikhali, Moshi, and Alandi, Pune, Maharashtra, India between February 2024 to April 2024. Molluscan samples were collected using hand-picking methods and identified using standard taxonomic keys. While water samples were collected in morning and afternoon sessions and physico-chemical parameters of the water including pH, temperature, salinity, electrical conductivity, total dissolved solids were measured using a multi parameter PCSTester™ (Eutech) and dissolved oxygen were measured using Winkler's method. Total seven Molluscan species belonging to six families were identified across the sites. Gastropods were more diverse and abundant group than Bivalves and *Filopaludina bengalensis* recorded as the dominant species in Indrayani River. Greater species diversity and favorable water quality were recorded at Talawade site, while lower species diversity was found at Moshi site. The study revealed that Molluscan diversity is affected by physico-chemical parameters. This study highlights the role of Molluscs as ecological important bioindicators and helps to understand freshwater biodiversity, supporting future conservation and management of the Indrayani River ecosystem.

Keywords: Environment, ecology, ecosystem, fauna.

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INTRODUCTION

The Indrayani River is deeply revered as a holy river in Hinduism which originates near the village of Kurvande, close to Lonavala in the Sahyadri mountains of Maharashtra, India. The length of the River is approximately 138 kilometers. The coordinates for the source of the Indrayani River are approximately 18°40' N latitude and 74°00' E longitude. The river flows eastward and meets the Bhima River at its end point, which is near Tulapur, Pune, Maharashtra, India. The confluence of the Indrayani River with the Bhima River is an important geographical feature of the region. The river holds significant importance like spiritual, ecological and economical. It flows through the pilgrimage centers of Dehu and Alandi which are associated with the revered saints Sant Tukaram and Sant Dnyaneshwar. These villages are key sites for religious gatherings and rituals, adding to the river's sanctity. Mollus are soft bodied animals with or without calcareous shell and are divided into three forms i.e. freshwater, marine and terrestrial. It is the second largest phylum after Arthropoda. The entire Mollusc comprises in three groups which are Gastropods, Bivalves and Cephalopods. Gastropoda is extremely diverse group in Mollusca and adapted to all habitats which includes snails and slugs. Bivalves have no head and their shell is divided from front to back into left and right valves. They include clams, oysters, mussels and number of families that live in freshwater [1-3]. Many Molluscan species are good bioindicators for water quality or pollution on the basis of their tolerance power against extremes of physico - chemical components of water [4]. Molluscs are found to be important economically, medicinally and ecologically [5]. They forms relationship between other organisms and environment and play an important role in aquatic ecosystems, providing food for many fish species and vertebrates. Molluscan fauna can be investigated from several perspectives i.e. zoological diversity, biogeographically distribution, paleontology, veterinary, agricultural plagues, invasive exotic species, conservation, alimentary resource (fishing and malacoculture), bioindicators of environmental quality and as a health hazard (as vectors or transmitters of human parasitic diseases). The soft bodies of Molluscan are used as a medium for fishing in the form of bait and hard shells are used for making various items such as buttons, decoration of door curtains, knife handles, ornaments etc. used in the form of poultry food [6].

This study aims to explore the relationship between Mollusc diversity and physico-chemical characteristics of the Indrayani River by studying the factors such as water pH, temperature, salinity, electric conductivity (EC), total dissolved solids (TDS) and dissolved oxygen (DO). This study will help to understand how these parameters influence the distribution and diversity of Molluscan fauna. The significance of this research is to contribute to conservation and management of river's ecosystem and helps to understand the dynamics of Mollusc populations in response to physico-chemical changes.

METHODS

Study Area

The five sites of Indrayani River were selected for the sampling purpose i.e., Dehu, Talawade, Chikhali, Moshi and Alandi from Pune, Maharashtra (Fig.1). Water samples were collected in clean bottles, labeled properly in the morning and afternoon section. The samples were collected for three months i.e., from February to April 2024. The water samples were used for further studies.



Figure 1: Study area of water sample collection



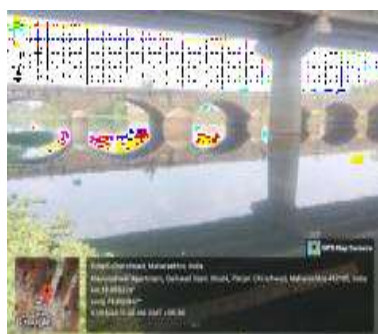
Dehu



Talawade



Chikhali



Moshi



Alandi

Figure 2: Collection sites of water samples

Water Quality Analysis

The water samples were analyzed for physico-chemical parameters viz., pH, temperature, salinity, EC and TDS were measured with the help of Multiparameter PCSTester™ 35 (Eutech). The DO levels of the water samples were also measured by Winkler method [7]. The collection sites of water samples are shown in Fig. 2.

Species Collection

Molluscan species were collected by visual searching and by simple hand-picking method with the help of forceps and containers from the water and all along the marginal area. All the species were carried to laboratory, cleaned neatly and used for identification purposes.

Species Identification

Molluscs species were identified with reference to the Handbook of Freshwater Mollusca of India [8-9].

RESULTS

The water quality analysis results are shown in Table 1. The TDS was more in water sample collected from Moshi area, Pune, Maharashtra which was 583 mg/lit (Table 1). The DO was more in Talawade area, Pune, Maharashtra. The pH, temperature, salinity, EC, TDS and DO of water samples are represented in Fig. 6, 7, 8, 9, 10 and 11 respectively.

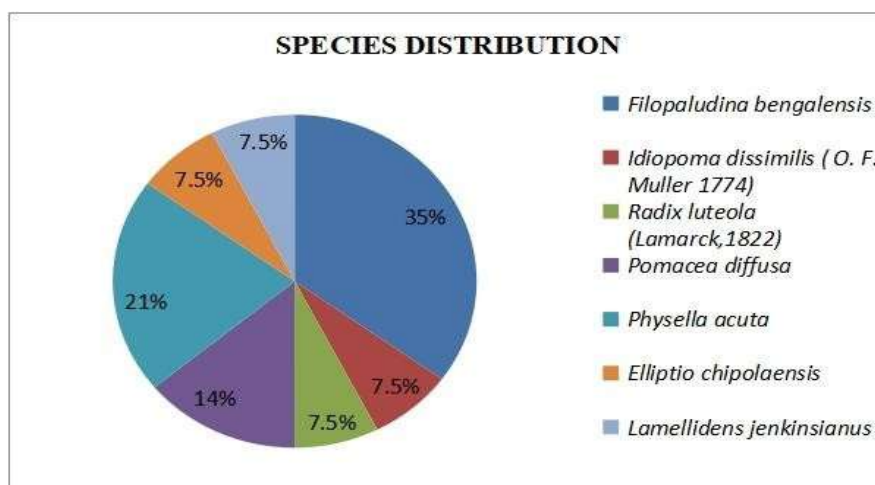
Table 1: Water quality analysis

Parameters	Dehu	Talawade	Chikhali	Moshi	Alandi
pH	7.63	8.51	7.96	6.31	7.30
Temperature (°C)	28.18	30.03	29.93	31.86	30.71
Salinity (ppm)	786	664	591	832	735
EC (µs/cm)	380.26	623.43	554.08	792.68	419.87
TDS (mg/lit)	267	449	298	583	239
DO (mg/lit)	7.44	8.33	7.15	6.25	7.86

Table 2: Distribution of species at collection sites

Class	Family	Species/Site	Dehu	Talawade	Chikhli	Moshi	Alandi
Gastropoda	Viviparidae	<i>Filopaludina bengalensis</i>	✓	✓	✓	✓	✓
	Bithyniidae	<i>Idiopoma dissimilis</i> (O.F. Muller 1774)	x	x	✓	x	x
	Lymnaeidae	<i>Radix luteola</i> (Lamarck,1822)	x	x	✓	x	x
	Ampullariidae	<i>Pomacea diffusa</i>	x	✓	x	x	✓
	Physidae	<i>Physella acuta</i>	✓	✓	x	x	✓
Bivalvia	Unionidae	<i>Elliptio chipolaensis</i>	✓	x	x	x	x
		<i>Lamellidens jenkinsianus</i>	x	✓	x	x	x

Total seven species of Molluscs belonging to class Gastropoda and Bivalve were recorded during the study period. Amongst the Gastropoda group *Filopaludina bengalensis* belonging to family Viviparidae was dominant species followed by other six species as *Idiopoma dissimilis*, *Radix luteola*, *Pomacea diffusa*, *Physella acuta*, *Elliptio chipolaensis*, *Lamellidens jenkinsianus* (Fig. 3). *Physella acuta* was second largest species belongs to family Physidae followed by *Pomacea diffusa* species belongs to family Ampullariidae (Table 2). *Idiopoma dissimilis* belongs to family Bithyniidae, *Radix luteola* belongs to family Lymnaeidae, *Elliptio chipolaensis* and *Lamellidens jenkinsianus* belongs to family Unionidae are found in same number.


Figure 3: Distribution of species

Percent composition of Molluscan diversity throughout the study period showed that *Filopaludina bengalensis* as dominant species with 35% followed by *Physella acuta* (21%), *Pomacea diffusa* (14%), *Idiopoma dissimilis* (7.5%), *Radix luteola* (7.5%), *Elliptio chipolaensis* (7.5%) and *Lamellidens jenkinsianus* (7.5%).

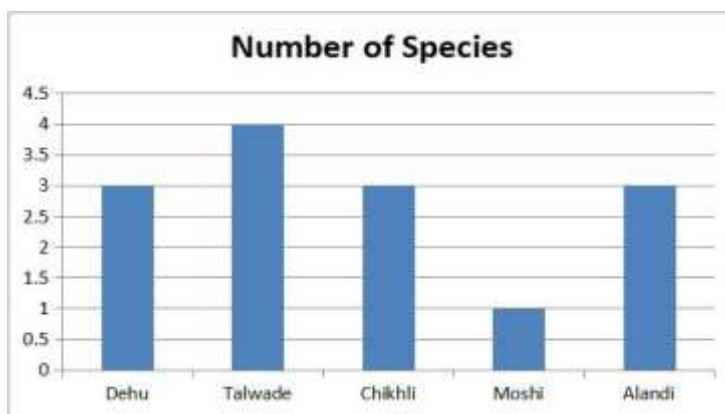


Figure 4: Number of species in different areas

The large number of species diversity recorded at Talawade site i.e. four species found there i.e. *Filopaludina bengalensis*, *Pomacea diffusa*, *Physella acuta* and *Lamellidens jenkinsianus*. The no. of species in different areas is shown in Fig. 4. While less number of species diversity recorded at Moshi site i.e. one species found there i.e. *Filopaludina bengalensis*. Same number of species i.e. three found at Dehu, Chikhali and Alandi, while at Dehu site found *Filopaludina bengalensis*, *Physella acuta* and *Elliptio chipolaensis* and at Chikhali site *Filopaludina bengalensis*, *Idiopoma dissimilis* and *Radix luteola* were found. At Alandi site *Filopaludina bengalensis*, *Pomacea diffusa* and *Physella acuta* were observed. The diversity of Molluscans is wide which is seen from this study here. The different Molluscans collected are represented in Fig. 5.



Figure 5: Diversity of Molluscans

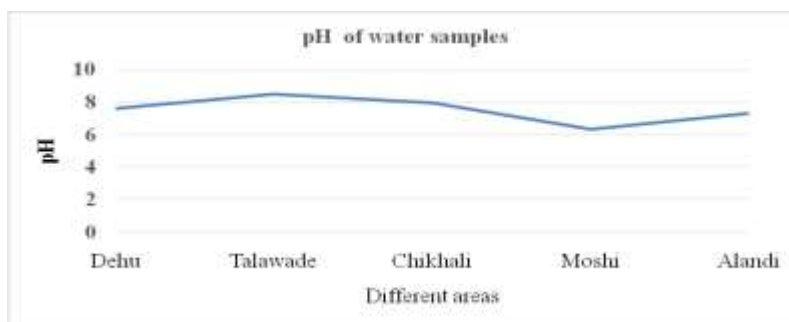


Figure 6: pH of water samples

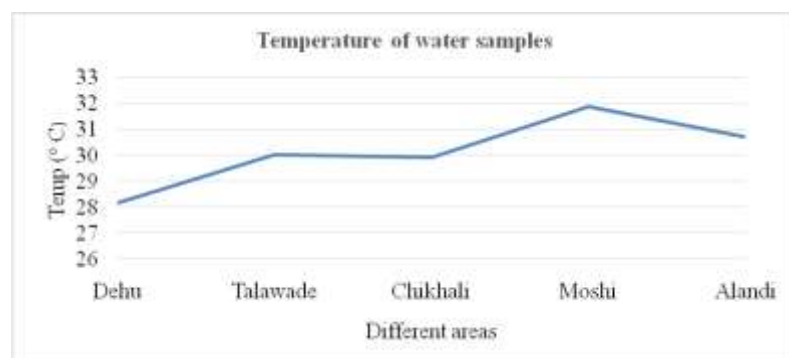


Figure 7: Temperature of water samples

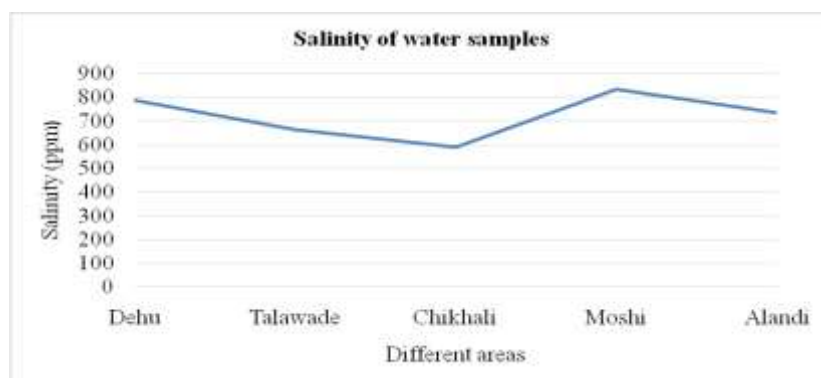


Figure 8: Salinity of water samples

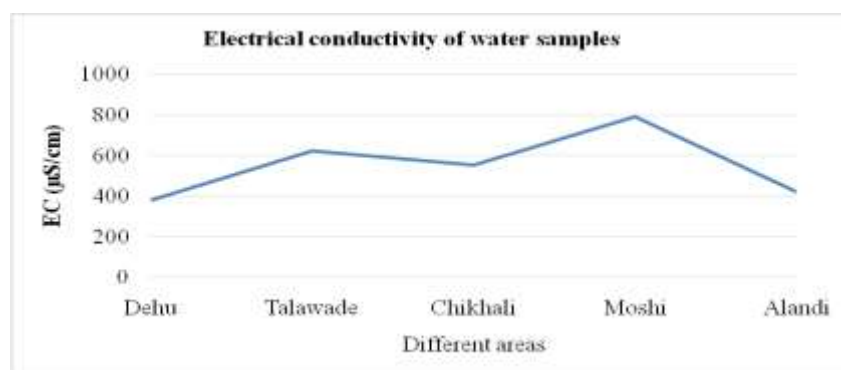


Figure 9: EC of water samples

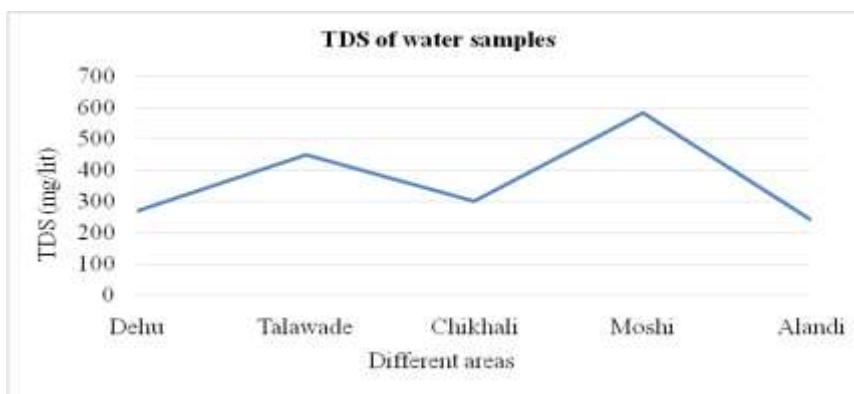


Figure 10: TDS of water samples

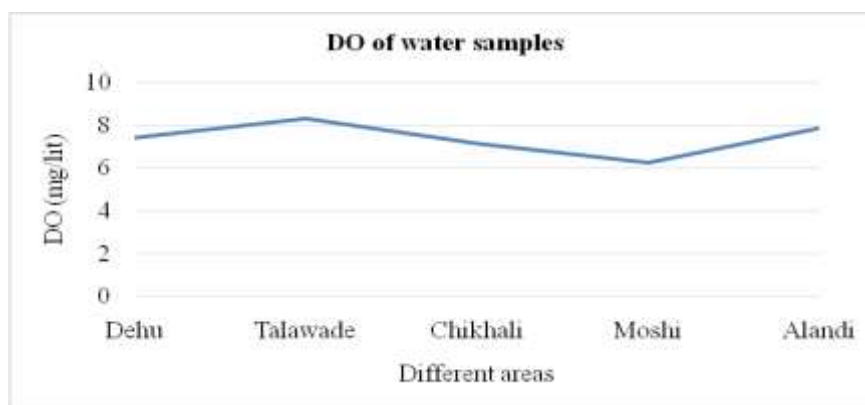


Figure 11: DO of water samples

DISCUSSION

The Molluscan populations are good indicators of localized condition, indicating water quality and play important roles in the ecosystem structure and biodiversity. They are extremely important ecological communities beneficial both economically and medicinally [10]. Harman has pointed out that Molluscs are bioindicators of freshwater pollution. As per present study it is cleared that water quality parameters affect the Molluscs diversity. Garg studied a correlation between Molluscan diversity with physico-chemical parameter with effects of water from Ramsagar reservoir. Also researchers have studied sewage pollution impact on microzoobenthic from Kalpi River [11]. Species diversity, richness and abundance of Molluscan fauna are greatly affected by physico-chemical parameters in the water body. Average temperature recorded during the study is 28-31°C which is suitable for development of Molluscan fauna. A positive correlation between Molluscs and temperature was also recorded by Palanisamy and Khan [12]. Molluscs diversity and pH show positive relationship with each other as per present study. Weak and insignificant negative correlation was observed between Molluscs and pH. This suggests that Molluscs were found to be independent of fluctuations with respect to pH value. Negative relationship between Molluscs diversity and salinity was recorded in present study. Salinity has a significant correlation to the population of Molluscs and greater Molluscan population was observed in alkaline lakes as compared to acidic lakes as per Sakhare and Joshi study [13]. Normal DO level was recorded in this study, while some Molluscs can also survive in very low oxygen conditions noted by Cheatum [14]. High DO is favorable for development of Molluscs. TDS shows negligible effect on Molluscan diversity. *Physa acuta* species found in highly polluted lentic water bodies and attached with floating vegetation. In 2015 *Physa acuta* changed the *Physella acuta*. Randall Bernot et al. showed the effect of ionic liquids on *Physella acuta* [15].

CONCLUSION

The Indrayani River is home to a rich variety of Molluscs. The *Filopaludina bengalensis* is the dominant species in the Indrayani River and it is present at all the sites of the river, suggests that this river provides

a suitable environment for these species. The *Physella acuta* is the second largest species present in this river. The number of gastropod species was more as compared to Bivalve species. The water quality of the river varies from site to site. Talawade's higher temperatures, DO level and mineral content supports the different species to live at that site. Moshi's acidic water, less DO level and high salinity might limit the diversity of Molluscs. Overall, the study indicates that the Indrayani River's diverse environments support a wide range of Mollusc species. The variations in water quality parameters play a significant role in determining the distribution and diversity of Molluscs in the river. This information is valuable for conservation and management efforts and understanding the ecological dynamics of the river system.

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