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Study of Water Quality Status and Gastropod Diversity of Bodalkasa Dam and Pujaritola Dam of Gondia District, Maharashtra, India

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Abstract: Molluscs, a group of soft-bodied creatures that are frequently exoskeleton-covered, are crucial components of any ecological community and are biological indicators of ecosystems. Being most sensitive species in freshwater, physicochemicals parameters of water body are crucial in determining their occurrence and survival. Survey was conducted for six months at Bodalkasa dam and Pujaritola dam of Maharashtra in India for assessment of diversity of molluscs. Some water parameters including temperature, pH, color, turbidity, phosphate, sulphate, nitrate, silica, total dissolved solids, alkalinity, total hardness, dissolved oxygen and free carbon dioxide were quantified to analyze status of water body. The present study emphasizes on gastropods diversity of the study area. Abundant gastropod species of Pujaritola dam during pre-monsoon season is *Thiara lineata* and *Bellamya bengalensis*. Out of the three forms of *Bellamya bengalensis* species, form *doliaris* and *mandiensis* found dominant than form *typica*. During post-monsoon season *Pila globosa* is observed in more number than others at Pujaritola dam. The abundant gastropod species of Bodalkasa dam during pre-monsoon and post-monsoon season are *Thiara lineata* and *Bellamia bengalensis*, respectively.

Keywords: Molluscs, Gastropods, Diversity, Physicochemical parameters, Shell

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Introduction

Freshwater gastropods are important for the ecosystem and are an indicator of the status of a water body (Thom *et al.*, 2017). These are found in all aquatic habitats from marshes, seepages, and small ponds to streams, lakes, and rivers. Bivalves are typically found partially or completely buried

in the muddy or sandy bottom of aquatic bodies, unlike gastropods, which are typically found connected to submerged plants, rocks, or the substrate of water bodies while crawling on the mud (Dey *et al.*, 2007). Most of the freshwater gastropods are submerged and some had unique

habitats such as stones, leaf litter, aquatic vegetation, and wood. Some gastropods feed on dead organic material and most feeds on algae and play an unavoidable role in the food chain as food for fishes, and birds (Padghane *et al.*, 2017; Kumar *et al.*, 2019). Some freshwater gastropods like *Pila globosa*, *Bellamya bengalensis* are also used as food by people in many parts of India. Being transmitters of various diseases, some gastropods have medicinal importance (Subba Rao *et al.*, 1989). Subba Rao *et al.* (1989) did a principal study on freshwater malacofauna in various regions of India. Recently several workers contributed to record malacofaunal diversity in India (Sajan *et al.*, 2018; Chutia *et al.*, 2021). Gondia district of Maharashtra is rich in lakes, rivers, and forests. The present study examined gastropod diversity along with an analysis of some physicochemical parameters of two water bodies Pujaritola dam and Bodalkasa dam of Gondia district Maharashtra.

Materials and Methods

Study Area:

The Gondia district is situated in the northeastern part of the Maharashtra state of India. It lies at latitudes 20.390 and 21.380 North and longitudes 79.270 to 80.420 east. The district occupies an area of 5,234 km². Gondia experiences extreme variations in temperature with very hot summers and very cold winters and has an average relative humidity of 62 per cent. Each rainy season (June to September), the average recorded rainfall exceeds 1,200 mm. The Pujaritola Dam is an earth-fill dam built across the Bagh River near Amgaon located at 21.2054°N, 80.4187° E. Irrigation is the primary purpose behind this dam. Bagh is the main tributary of the river Wainganga. The Bodalkasa Dam is an earth-fill dam built across the Bhagdeogoti River near Tiroda. The surface area of the dam is 6.450 km² and is located at 21.3529582°N and 80.0292206°E (Fig. 1)

Both water bodies were visited for six months from May 2022 to October 2022. Quantification of malacofauna was done by the quadrat sampling

method. Molluscan samples were collected from the shore of the water body by visual survey method by picking up samples or by using a scoop net (Subba Rao *et al.*, 1989). After bringing to the lab, shells (in this study, no live molluscs were brought to the lab for analysis; only the shells of the molluscs were used) were washed thoroughly to remove mud and dried. Species were identified from morphological characters following keys by Subba Rao (1989), Ramkrishna and Dey (2005) and Dey (2007). Water Samples were collected from Pujaritola dam and Bodalkasa at the same duration and assessed for thirteen water parameters as temperature, pH, color, turbidity, phosphate, sulphate, nitrate, total dissolved solids, alkalinity, total hardness, dissolved oxygen, silica, and free CO₂ as per the standard methods (Kodarkar and Diwan, 1992)

Results and Discussion

Water quality:

At study area, the highest temperature was recorded in May and the lowest in October. The highest pH values were recorded during May as Bodalkasa dam (7.62) and Pujaritola dam (7.36) (Table 1). The lowest pH values were observed during the rainy season. A high turbidity range was measured in Bodalkasa dam (8.4 NTU) in May as compared to Pujaritola dam due to high organic matter, algae, and planktonic mass in Bodalkasa dam. The lowest dissolved oxygen value was observed during May Bodalkasa dam (6.10 mg/l), and Pujaritola dam (5.70 mg/l) (Table 1). Free carbon dioxide, alkalinity, sulphate, and hardness values were observed within permissible limits (Kodarkar and Diwan, 1992; Patil *et al.*, 2012). The highest silica reading was observed during October in Bodalkasa dam (6.23 mg/l) as compared to Pujaritola dam (5.53 mg/l). Silica is an important structural component of diatoms, the growth of diatoms provides an abundance of food for molluscs, tunicates, and fishes (Kodarkar and Diwan, 1992).

Gastropod population:

Eight species of gastropods were collected at

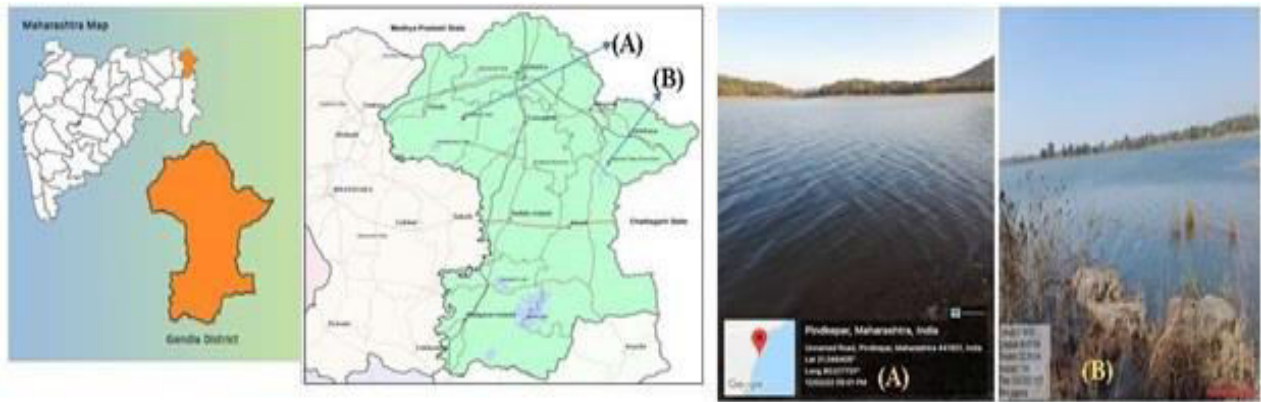


Fig. 1: Location of study area (A) Bodalkasa dam; and (B) Pujaritola dam of Gondia district Maharashtra India.

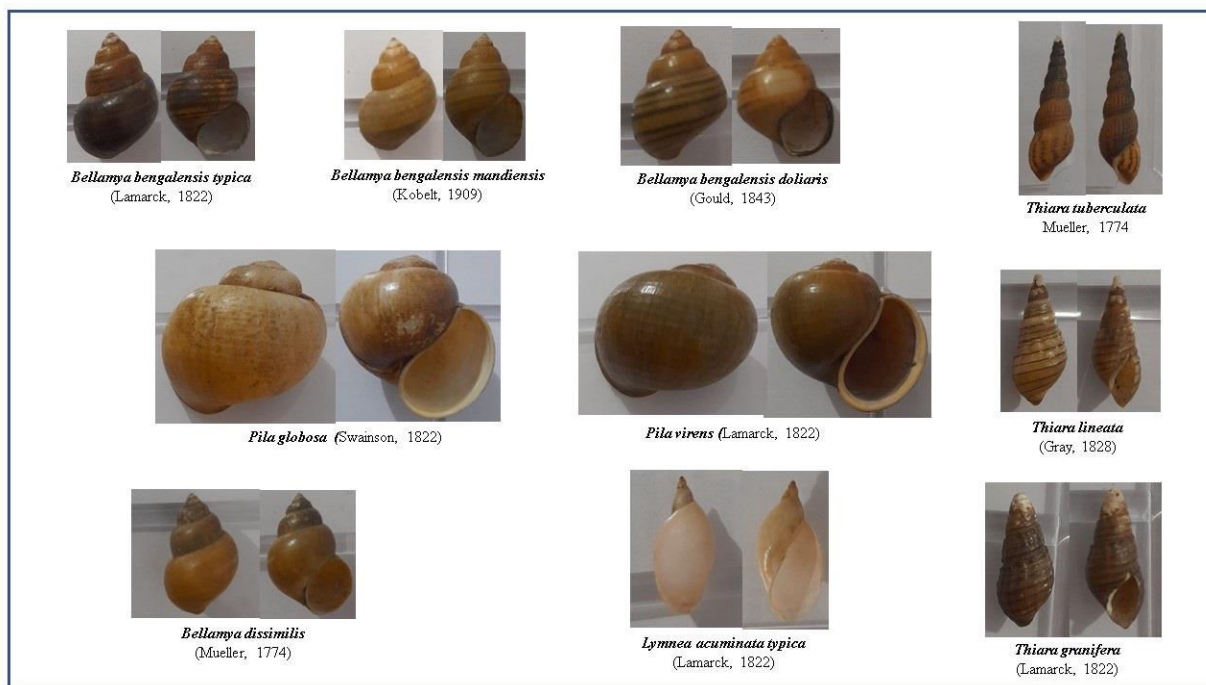


Fig. 2: Collected and identified gastropod species from Bodalkasa dam and Pujaritola dam of Gondia district Maharashtra India.

Pujaritola dam and Bodalkasa dam during six months study period from May to October 2022, including two orders, four families, and four genera. All eight collected gastropods species found at Pujaritola dam are *Thiara lineata*, *Bellamya bengalensis* (form *typica*, *mandiensis*, *doliaris*), *Thiara granifera*, *Thiara tuberculata*, *Bellamya dissimilis*, *Pila globosa*, *Pila virens* and *Lymnea acuminata* (Fig. 2). Percentage distribution of species in study months is shown in Figures 3 and 4. Only four species were collected from Bodalkasa dam which are *Thiara lineata*,

Bellamya bengalensis, *Thiara granifera*, *Thiara tuberculata*. Seasonal occurrence of gastropods during the study period was also analyzed. During the pre-monsoon period, maximum gastropods were noted in water bodies. Kumar *et al.* (2019) studied seasonal variation in molluscan diversity in Haryana and observed an abundance of molluscs during the pre-monsoon season. Fewer samples were collected during the monsoon period. In the post-monsoon period i.e., in October least number of molluscs were found at water bodies. A very dense population of gastropods was

Table 1: Physicochemical parameters of Bodalkasa Dam (A) and Pujaritola Dam (B) in Gondia District of Maharashtra India

S. No.	Water Parameters	Months											
		May		June		July		August		September		October	
		A	B	A	B	A	B	A	B	A	B	A	B
1.	Temperature °C	31.3	30.4	30.1	29.8	29.7	29.5	29.4	27.9	27.5	27.2	26	26.4
2.	pH	7.62	7.36	7.63	7.29	6.91	6.76	6.82	6.43	7.38	6.38	7.45	7
3.	Color Hazen	BQL (QL=1)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
4.	Turbidity NTU	8.4 NTU	BQL	7.34	BQL	5.58	0.14	4.88	BQL	3.27	0.24	2.1	0.3
5.	Phosphate (mg/l)	0.34	0.84	0.27	0.79	BQL	0.53	BQL	BQL	BQL	BQL	BQL	BQL
6.	Sulphate mg/l	8.53	5.52	7.85	4.48	4.84	3.84	3.56	3.49	2.50	2.66	1.80	1.80
7.	Nitrate mg/l	4.63	1.40	3.12	1.32	0.80	0.75	0.85	0.34	0.97	1.17	1.04	0.93
8.	Total Dissolve Solids mg/l	140	102.0	134	95.60	120	76.63	105	70.43	98	65.74	94	61.00
9.	Alkalinity mg/l	60	40.0	57	36.38	52	33.87	51	31.76	50	29.41	48	28.00
10.	Total Hardness mg/l	76	42.0	71.6	39.93	68.72	35.86	63.23	33.79	57.69	30.77	51	30.00
11.	Dissolved Oxygen mg/l	6.10	5.70	6.13	5.93	7.1	7.98	7.22	8.24	6.62	7.64	6.70	6.70
12.	Silica mg/l	3.11	1.34	3.41	2.95	4.43	3.65	4.61	3.39	5.78	4.60	6.23	5.53
13.	Free CO ₂ mg/l	7.04	1.34	6.89	1.05	3.0	0.59	2.97	BQL	3.11	BQL	3.12	BQL

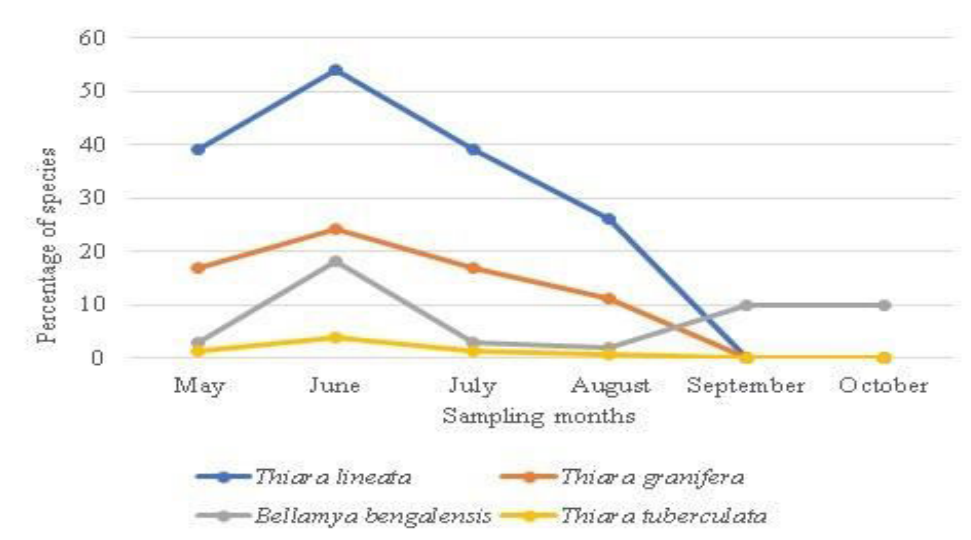


Fig. 3: Percentages of gastropods at Bodalkasa dam.

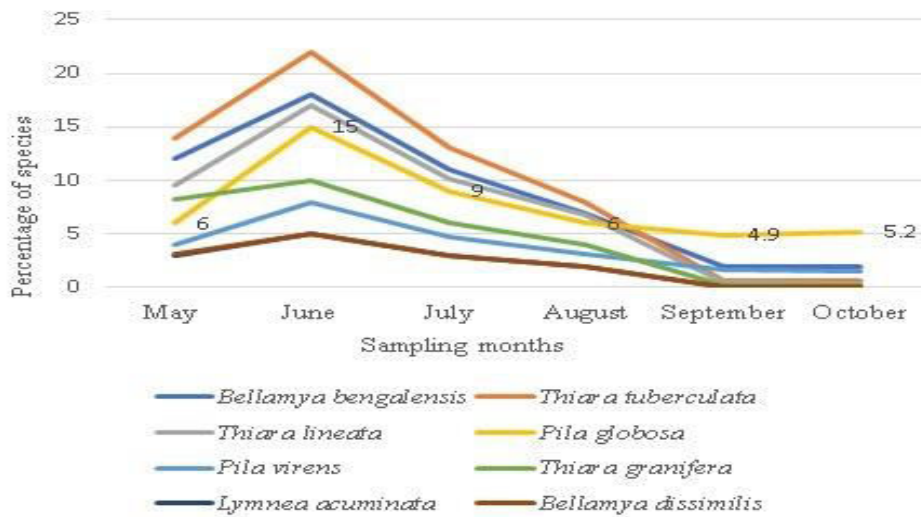


Fig. 4: Percentages of gastropods at Pujaritola dam.

observed in June. *Thiara lineata* was recorded as the most dominant species followed by *Bellamyia bengalensis* in Bodalkasa dam. At Pujaritola dam most prominent gastropod species during pre-monsoon period was *Thiara tuberculata* followed by *Bellamyia bengalensis* and *Thiara lineata*. Most variant and abundant gastropod species were found at Pujaritola dam than in Bodalkasa dam due to increase in total dissolved solids, hardness, and alkalinity due to pollution in this water body.

Conclusion

Total eight gastropod species and three forms of species *Bellamyia bengalensis* are recorded during six months of survey of Bodalkasa dam and Pujaritola dam of Gondia district Maharashtra, India. Analysis of some water parameters gave satisfactory conditions of these water bodies. Detail investigation will be continued in this area regarding malacofaunal diversity for extended period. Analysis of correlation of gastropods diversity and assemblage will be studied to see effects of physicochemical parameters of water on malacofaunal assemblage.

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