



# Morphometric analysis of freshwater mussel, *Lamellidens marginalis* from the Gomti River and Sai River, Lucknow, Uttar Pradesh, India

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**Abstract-** Freshwater mussels, like *Lamellidens marginalis*, indeed play a crucial role in ecology and are often regarded as ecological bioindicators due to their sensitivity to environmental changes. The morphometric analysis conducted on these mussels from the Gomti River and Sai River in Lucknow, Uttar Pradesh, provides valuable insights into their variation in size, length, height, and weight. By examining these parameters, researchers can glean important information about the health of the aquatic ecosystem and the potential impact of environmental factors on these mussel populations. For instance, changes in the size, weight, or distribution of *Lamellidens marginalis* could indicate shifts in habitat quality, water quality, or other ecological factors. Additionally, studying morphometric variations among populations from different rivers can help identify specific environmental stressors or differences in habitat conditions between these locations. Such research contributes to our understanding of freshwater mussel ecology and informs conservation efforts aimed at preserving these important organisms and the ecosystems they inhabit. By monitoring and studying freshwater mussel populations, scientists can assess the overall health of freshwater ecosystems and implement targeted conservation strategies to protect these vital habitats.

**Key words** - Fresh water mussel, *Lamellidens marginalis*, Gomti River, Sai River, Morphometric, Uttar Pradesh, Conservation.

**Introduction-** Freshwater mussels, including *Lamellidens marginalis*, are classified within the phylum Mollusca, order Unionida, and class Bivalvia. Serving as ecological bioindicators, they inhabit freshwater rivers, lakes, and ponds, where they play a crucial role in water purification and serve as indicators of pollution levels. While they possess separate sexes, distinguishing between them based on external morphology alone can be challenging. These mussels have a rich history of utilization in industries such as pearl and button production, as well as in medicine and cuisine (Misar, 2005; Safaktullah and Krishnamoorti, 2014; Dhaneshwari and Sanjeevi, 2016). Freshwater pearl culture is a growing industry in Asia, and it is strongly related to because of their extensive distribution and biological filtration function ((Lewandowski and Stanczykowska, 1975; Kasprzak, 1986), they play significant role as both environmentally and commercially (Subba Rao and Dey, 1989). The basic information on the indigenous fresh water pearl culture technology has been detailed by Janki Ram *et al.*, (1997) *Lamellidens marginalis* (Lamarck), an important pink pearl producing freshwater mussel is increasing demand in pearl producing countries (Ram 1989). There are no accessory glands and copulatory organ is present sexual dimorphism is present. Female is broader than the male. Female reproductive system is well modified for brooding larvae which are adapted for parasitic development on fish. Mussels have been used for food, decoration, pearls, lime and all throughout the world (Nayar and Rao, 1985; Saurabh *et al.*, 2014). As such as a study is plan to display morphometric variation of the mussels from the Gomti River and Sai River Lucknow (UP). *L. marginalis* have been reported from

Lucknow and identified by Zoological Survey of India (Shukla *et. al* 2018). *Lamellidens marginalis* found all over in the Gomti River and Sai River in Lucknow and fresh water pearl culture growing continuously by them (Rawat and Singh 2023).

## Material and methods-

For the collection and morphometric analysis of *Lamellidens marginalis* from Gomti River and Sai River these are the following methods we were followed –

### 1. Sample Collection-

Specimens of *Lamellidens marginalis* were collected from the Gomti and Sai River in Lucknow, Uttar Pradesh. Different specimens were sampled for the analysis. The collection was carried out with the help of fisherman and we were very careful about the mussel's preservation and conservation.



Fig 1- Animals collected from Gomti River

Fig 2- Animals collected from Sai River

### 2. Morphometric Measurements-

Measurements of the fresh water mussels *Lamellidens marginalis* carried out by the digital Vernier calliper. We measure their height, length, and width. The total length was measured from the anterior to the posterior end of the shell, while height and width were measured perpendicular to the total length. The measurements were recorded in millimetres (mm).

**Weight-** The weight of the *Lamellidens marginalis* measures in the grams and measurement carried out by the digital weighing scale.

**Shell length-** Shell length is measured as the distance from the anterior to the posterior end of the mussel shell. It provides insights into the overall size and growth of individuals within the species.

**Shell width** – Shell width refers to the maximum width of the mussel shell. It provides information on the width variation and shape characteristics of *Lamellidens marginalis*.

**Shell height-** Shell height represents the distance from the dorsal to the ventral side of the mussel shell. It indicates the vertical dimension and shape of the shell.

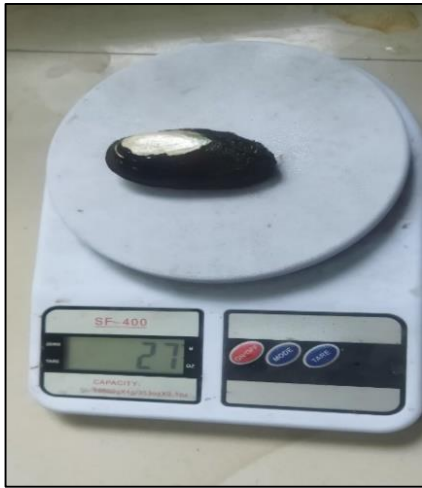


Fig 3- Measurement of weight



Fig 4- Measurement of length



Fig 5- Measurement of width



Fig 6- measurement of height

**Morphometric analysis of *Lamellidens marginalis* from the Gomti River** -The sampling process aimed to obtain a representative sample of the *Lamellidens marginalis* population at the Gomti River enabling a comprehensive morphometric analysis to be conducted.

Sr. Num	Weight	Height	Length	Width
1	23	18.6	61.7	29.2
2	26	19.7	67.5	33.6
3	28	20.9	64.8	32.2
4	41	22.8	73.8	36.7
5	21	18.9	61.7	27.8
6	26	18.7	63	31.7
7	23	18.8	60.8	30.2
8	34	21.4	69.2	32.9
9	25	17.1	64.2	31.0
10	31	26.00	74.70	38.90
11	24	3.10	43.10	13.80
12	26	16.30	64.40	32.10

13	23	19.80	60.60	30.00
14	27	17.80	62.30	32.10
15	30	25.60	72.30	33.40
16	40	21.40	71.70	35.70
17	25	17.20	64.00	31.20
18	27	20.10	65.30	31.10
19	29	21.20	67.00	34.20
20	31	27.10	74.10	37.90
21	24	19.20	61.30	31.00
22	36	23.40	70.50	33.40
23	34	20.70	69.40	31.90
24	38	24.40	72.60	34.40
25	32	28.00	75.00	36.80
26	41	22.00	74.00	36.90
27	33	28.00	75.50	38.00
28	34	21.10	68.80	30.80
29	30	26.80	73.60	35.60
30	35	21.60	70.40	32.00

Table 1–Morphometric data of *Lamellidens marginalis* from Gomti River

**Morphometric analysis of *Lamellidens marginalis* from the Sai River** -The sampling process aimed to obtain a representative sample of the *Lamellidens marginalis* population at the Sai River enabling a comprehensive morphometric analysis to be conducted.

Sr. Num	Weight	Height	Length	Width
1	24	19.9	60.6	30.7
2	23	18.6	58.9	31.0
3	34	22.1	70.0	22.6
4	37	24.8	71.8	34.4
5	42	34.6	74.3	35.8
6	26	18.9	59.0	31.7
7	32	21.6	72.7	38.9
8	21	17.9	55.8	31.3
9	43	32.7	60.8	36.7
10	32	26.8	72.7	39.3
11	45	26.6	71.8	36.7
12	35	22.7	68.8	34.8
13	43	23.9	69.8	38.9
14	47	28.8	70.3	37.2
15	34	25.6	68.2	23.8
16	29	21.7	67.4	37.8
17	22	19.4	58.9	31.1
18	31	28.5	73.7	32.1
19	25	19.6	60.8	31.5
20	27	18.5	58.9	32.5
21	43	22.6	61.8	35.7
22	26	17.5	60.8	32.6
23	39	25.6	70.3	34.3
24	28	21.8	68.7	22.8

25	31	28.9	70.7	31.9
26	37	26.9	70.5	32.7
27	42	23.7	68.9	34.8
28	30	25.7	72.9	33.7
29	40	23.4	71.4	37.1
30	20	18.1	56.7	30.1

Table 2- Morphometric data of *Lamellidens marginalis* from Sai River

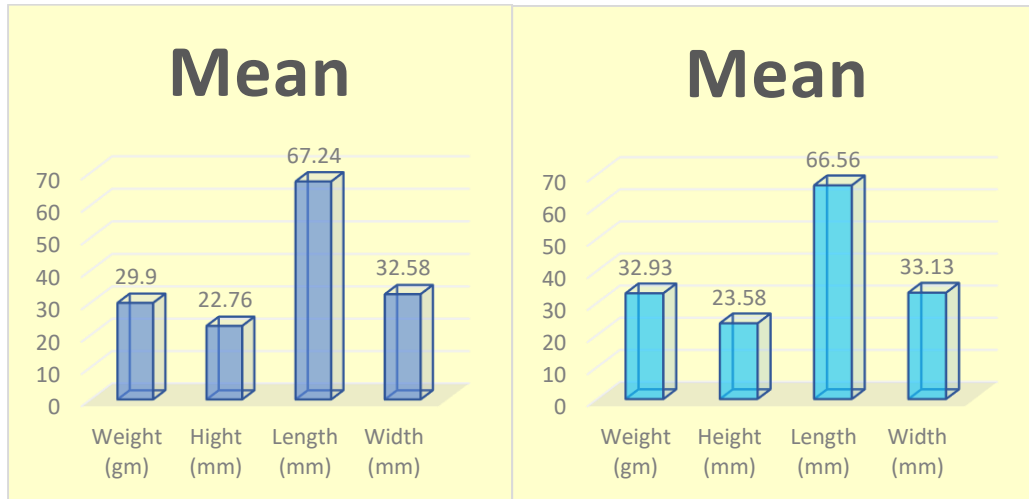


Fig- 7

Fig- 8

In fig 7 and 8, variation in mean value of Length, Height, Width and weight of animals of Gomti River and Sai River respectively.

**Result**

The collection of specimens was carried out during the month January, February and March (2024) at the day time from the Gomti and Sai River Lucknow U.P. from both of the rivers 30-30 species were collected for the morphometric analysis (measurements of the length, height, width). measurements data of all collected Specimens from both the rivers are given in the table. After taking morphometric Data of all collected specimens, their mean value of length, height, width and weight Is shown by bar diagrams.

The table 3 of all morphometric data comparative to both the rivers are as follows –

Site	Total Weight Mean (mm)	Total Height Mean (mm)	Total Length Mean (mm)	Total Width Mean (mm)
Gomti River	29.9	22.26	67.24	32.5
Sai River	32.9	23.58	66.54	33.15

(Table- 3)

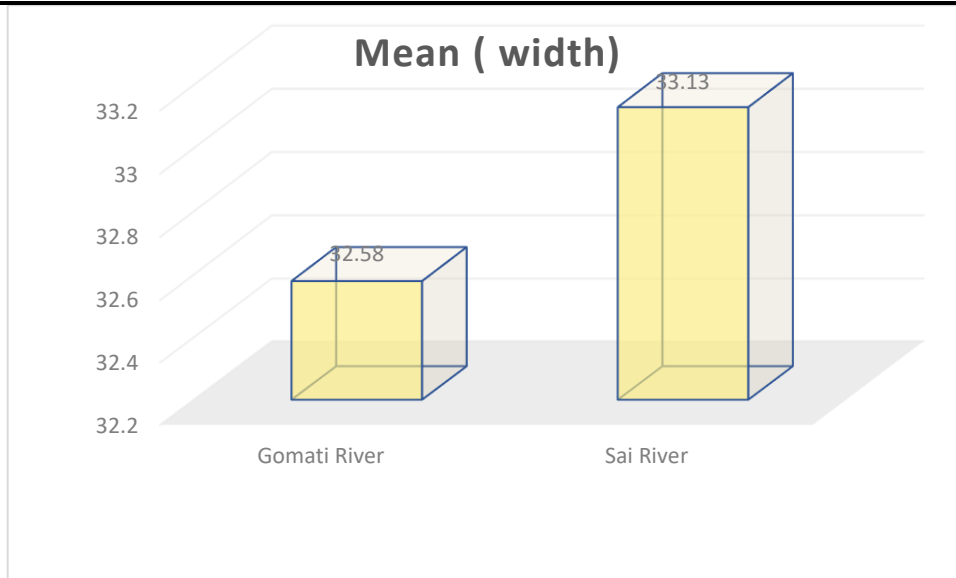


Fig- Comparison in total weight of all Gomti River & Sai River

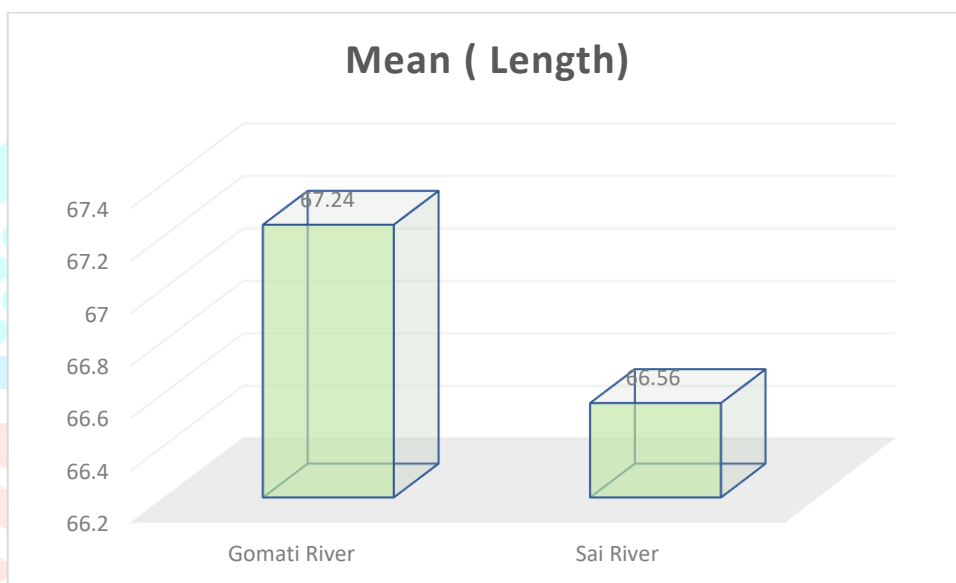


Fig- Comparison in total Length of all Gomti River & Sai River

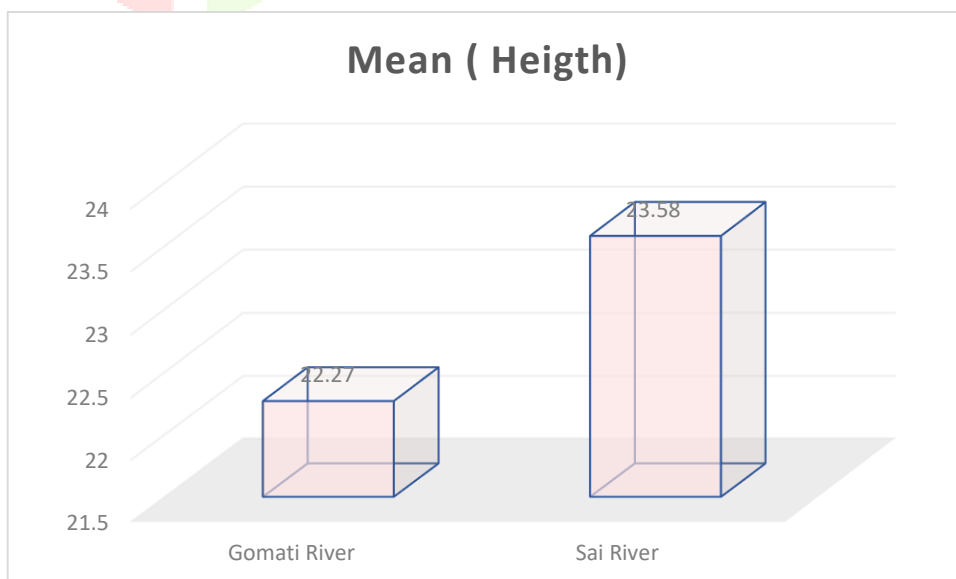


Fig- Comparison in total Height of all Gomati River & Sai River

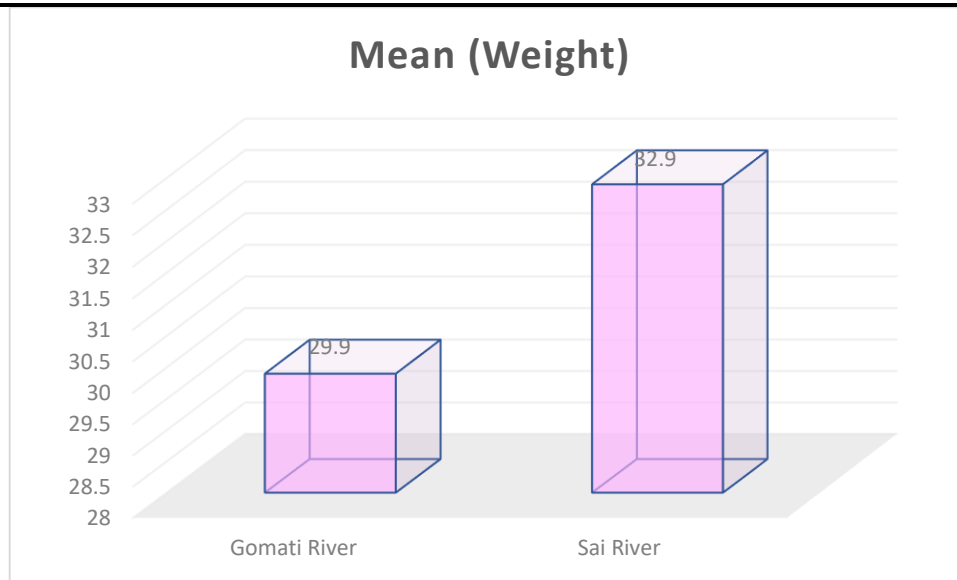


Fig- Comparison in total Weight of all Gomati River & Sai River

**Discussion** - The size variation found in the *Lamellidens marginalis* specimens in the Gomti River and Sai River may be affected by the many reasons like water pollution, food availability and habitat characteristics. Genetic and environmental factors are also playing a major role in growth of the freshwater mussels. The data provide information about the relationship between shell size and age and about the growth rates and life history traits. The distribution pattern of the freshwater mussels *Lamellidens marginalis* across the Gomti River and Sai River throwback their territory and adaptive nature for the environmental changes. Where the water quality is good and food availability is also good the growth of the mussels is also good on that site and their size is longer and they are healthier than the polluted areas. All these factors are help full in the understanding of the growth patterns and a suitable habitat for the *Lamellidens marginalis*. Due to the defence mechanism the outer shell is very strong and thicken where the predators are found in large numbers. The morphometric analysis and data collected from the observation help in the mussel conservation in Gomti River and Sai River. Understanding the variation and population distribution of Freshwater mussels help in the development of a successful administration strategies for their preservation. It is crucial to consider the potential threats faced by these mussels including habitat destruction, pollution and climate change to device appropriate conservation measures. The morphometric analysis in molluscans seems to be common and similar growth models were reported in *Donax cuneatus*, (Taker et al., 2021) and *Pila globosa* in India (Panda et al., 2021) and *Perna viridis* in Bangladesh (Khan et al., 2010). Body morphometric is an extensively used tool for the conservation, biological assessment and resource management of aquatic organisms.

**Conclusion** -In this research paper conclude that the morphometric analysis on the *Lamellidens marginalis* from the Gomti River and Sai River in Lucknow Uttar Pradesh, India. The data obtained from the observation on the Gomti River and Sai River says about their size variation, growth patterns ecological characteristics, shedding lights on its biology and the distribution. The data obtained gives a brief knowledge about the importance of their in the ecosystem. And also help in the conservation of the mussels for the future references. We hope that the information obtained from this research paper will help in the future investigation in ecology and the preservation of *Lamellidens marginalis* not only in the Gomti and Sai River but also help in the other sites of the rivers and water areas where these are founds across the India and beyond. By working collaboratively and implanting effective preservation measures, we can ensure the continued survival and ecological significance of *Lamellidens marginalis* and other freshwater mussel species for generation to come.

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