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Edible Molluscs of West Bengal and Their Role in Human Health: A Review

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Abstract

Edible molluscs constitute an important component of aquatic biodiversity and traditional diets in many coastal and freshwater regions of India, including West Bengal. Molluscs such as snails, clams, oysters, and mussels are widely consumed by local communities due to their high nutritional value and availability in rivers, ponds, wetlands, and coastal ecosystems like the Sundarbans. These organisms provide high-quality proteins, essential amino acids, polyunsaturated fatty acids, vitamins, and minerals that support human health and nutrition. In addition, molluscs contain several bioactive compounds that possess therapeutic and nutraceutical properties. The present review discusses the diversity of edible molluscs found in West Bengal, their nutritional composition, and their role in promoting human health. The review also highlights their traditional consumption, economic significance, and potential for sustainable food systems and functional food development.

1. Introduction

Molluscs are soft-bodied invertebrate animals belonging to the phylum Mollusca, which includes snails, clams, oysters, mussels, and squids. These organisms are one of the largest groups of aquatic animals and are widely distributed in freshwater, marine, and estuarine ecosystems (Du et al., 2025). Molluscs are traditionally classified into several classes, among which **Gastropoda** (snails) and **Bivalvia** (clams, oysters, mussels) include most edible species consumed by humans (Singha et al., 2025).

In many Asian countries, including India, molluscs have long been used as a source of food and traditional medicine (Gogoi and

Bhuyan, 2025). In West Bengal, the extensive network of rivers, ponds, wetlands, and coastal mangrove ecosystems provides a suitable habitat for numerous edible mollusc species (Bablee et al., 2026). Local communities, particularly rural and tribal populations, collect and consume these molluscs as an affordable source of animal protein and micronutrients (Vijayan et al., 2025).

The increasing interest in alternative protein sources and nutraceutical foods has brought attention to molluscs due to their rich nutritional composition and health-promoting properties (Rambli et al., 2025). Molluscan meat is characterized by high protein content, low fat levels, and the presence of essential minerals and fatty acids that contribute to human health and disease prevention (Wright et al., 2018).

Therefore, understanding the diversity, nutritional value, and health benefits of edible molluscs in West Bengal is important for promoting sustainable food resources and improving nutritional security (Baghele et al., 2022).

2. Diversity of Edible Molluscs in West Bengal

West Bengal possesses diverse aquatic habitats such as rivers (Ganga and Hooghly), ponds, wetlands, estuaries, and coastal mangrove forests. These ecosystems support a variety of edible molluscan species that are harvested for food (Chakraborty, 2017).

2.1 Freshwater Edible Molluscs

Freshwater molluscs are widely found in ponds, lakes, and wetlands of West Bengal. Common edible freshwater species include:

***Pila globosa* (Apple snail)**

Pila globosa, commonly known as the apple snail, is one of the most widely distributed freshwater gastropods in India and is frequently found in ponds, lakes, paddy fields, and wetlands of West Bengal (Patel and Kurhe, 2023). This species is commonly collected by rural communities and used as a traditional food source due to its high protein and mineral content. The meat of *Pila globosa* is rich in essential amino acids, calcium, iron, and omega fatty acids, making it nutritionally valuable for human health. In many rural areas, the snail is cooked in curries or fried dishes and consumed as a source of affordable animal protein. Additionally, the shells of *Pila globosa* are sometimes used in lime production and poultry feed supplements due to their high calcium content. Because of its abundance and nutritional value, *Pila globosa* plays an important role in local

food security and traditional dietary practices in West Bengal (Shathi et al., 2022).

***Bellamya bengalensis* (Freshwater snail)**

Bellamya bengalensis is another common freshwater gastropod found in rivers, ponds, canals, and marshy wetlands throughout West Bengal. This species thrives in slow-moving freshwater ecosystems rich in organic matter. It is traditionally consumed by several rural and tribal communities and is valued for its high protein, low fat, and mineral-rich composition. The edible portion of *Bellamya bengalensis* contains significant amounts of calcium, phosphorus, and iron, which contribute to bone health and the prevention of anemia. In addition to its nutritional benefits, the snail also plays an ecological role by helping in the decomposition of organic matter and maintaining aquatic ecosystem balance. Due to its availability and low cost, *Bellamya bengalensis* serves as an important dietary supplement for economically disadvantaged populations in many parts of eastern India (Saha et al., 2017).

***Lamellidens marginalis* (Freshwater mussel)**

Lamellidens marginalis is a large freshwater mussel belonging to the family Unionidae and is commonly found in rivers, ponds, and lakes in West Bengal. This bivalve species is widely recognized for its edible flesh and is sometimes harvested by local communities for consumption. The meat of *Lamellidens marginalis* is rich in protein, essential amino acids, vitamins, and minerals such as zinc, iron, and calcium. Because of its high nutritional value, the mussel can serve as an alternative protein source in rural diets. Apart from its role as food, *Lamellidens marginalis* also has ecological importance, as it acts as a natural filter feeder that improves water quality by removing suspended particles and microorganisms from aquatic environments. In some regions, the shells of freshwater mussels are also used in handicrafts and lime production (Barman et al., 2018).

Lamellidens corrianus

Lamellidens corrianus is another freshwater bivalve species commonly distributed in ponds, rivers, and wetlands of eastern India, including West Bengal. This mussel species is considered edible and is occasionally collected for human consumption by local communities living

near freshwater bodies. The flesh of *Lamellidens corrianus* contains a good amount of protein and micronutrients, making it nutritionally beneficial. Like other freshwater mussels, it plays a significant ecological role in maintaining aquatic ecosystem health through filter feeding, which helps in reducing turbidity and improving water clarity. Although not as widely consumed as some marine shellfish, *Lamellidens corrianus* has the potential to serve as a supplementary food resource for rural populations, particularly in areas where other animal protein sources are limited (Babar et al., 2017).

Parreysia corrugata

Parreysia corrugata is a freshwater bivalve mollusc belonging to the family Unionidae and is commonly found in rivers and wetlands across eastern India. This species is occasionally harvested for consumption and is known for its edible flesh that contains valuable nutrients such as proteins, minerals, and essential fatty acids. The mussel contributes to the diet of rural populations by providing an inexpensive source of animal protein. Ecologically, *Parreysia corrugata* functions as an important filter feeder that helps maintain water quality and supports aquatic ecosystem stability. Its presence in freshwater bodies also indicates relatively healthy environmental conditions. Due to its nutritional value and ecological importance, *Parreysia corrugata* is considered a valuable component of freshwater biodiversity and traditional food systems in West Bengal (Premalatha et al., 2022).

These molluscs are commonly consumed by rural populations and tribal communities. Freshwater snails are often collected from paddy fields and wetlands during monsoon seasons.

2.2 Marine and Estuarine Molluscs

Marine molluscs occur mainly in the coastal regions of West Bengal, particularly the Sundarbans and Bay of Bengal coastal belt. Important edible marine molluscs include:

***Crassostrea madrasensis* (Indian oyster)**

Crassostrea madrasensis, commonly known as the Indian oyster, is an important marine bivalve mollusc found in estuarine and coastal waters along the Bay of Bengal, including the Sundarbans region of West Bengal. This species typically inhabits brackish water environments such as estuaries, tidal creeks, and mangrove ecosystems where it attaches to hard substrates like rocks, mangrove roots, and

shells. The Indian oyster is widely recognized for its high nutritional value, as its meat contains a rich source of protein, essential amino acids, omega-3 fatty acids, vitamins, and minerals such as zinc, selenium, and iron. Due to its nutritional composition, *Crassostrea madrasensis* contributes significantly to human health by supporting immune function, improving cardiovascular health, and preventing micronutrient deficiencies. Additionally, oyster farming has gained attention as a sustainable aquaculture practice that can provide livelihood opportunities for coastal communities in West Bengal (Ferdous et al., 2026).

***Meretrix meretrix* (Clam)**

Meretrix meretrix, commonly referred to as the Asiatic hard clam, is a widely distributed marine bivalve found in sandy and muddy substrates of estuaries, coastal lagoons, and shallow marine waters of the Bay of Bengal. This species is harvested for food in many coastal regions of India, including West Bengal. The edible flesh of *Meretrix meretrix* is highly nutritious and contains substantial amounts of protein, vitamins (especially vitamin B12), and essential minerals such as iron, calcium, and iodine. Regular consumption of clams can contribute to improved hemoglobin levels, enhanced immune function, and better overall nutritional status. Clams also play an ecological role by acting as natural filter feeders, helping to maintain water quality by removing suspended particles and organic matter from aquatic ecosystems. Due to their high nutritional value and availability, clams represent an important component of coastal diets and fisheries (Khan et al., 2024).

***Anadara granosa* (Blood clam)**

Anadara granosa, commonly known as the blood clam, is an estuarine bivalve mollusc found in muddy coastal environments and mangrove ecosystems of the Bay of Bengal (Periyasamy, 2016). The name “blood clam” is derived from the presence of hemoglobin in its blood, which gives the flesh a reddish color. This species is valued as a nutritious seafood due to its high content of protein, iron, and essential amino acids. The high iron content of *Anadara granosa* makes it particularly beneficial for preventing iron deficiency anemia, especially in populations with limited access to other animal protein sources. In addition to its nutritional benefits, the blood clam also plays an important ecological role by improving sediment quality through its burrowing and filter-feeding activities. Its cultivation and harvesting contribute to the

livelihood of coastal fishing communities and support local seafood markets (Chen et al., 2020).

***Perna viridis* (Green mussel)**

Perna viridis, commonly known as the green mussel, is a marine bivalve mollusc widely distributed in the coastal waters of the Indian Ocean and the Bay of Bengal. This species is commonly found attached to rocks, wooden structures, and other submerged surfaces in intertidal and subtidal zones. The green mussel is considered a highly nutritious seafood, containing high levels of protein, omega-3 fatty acids, vitamins, and minerals such as iodine, selenium, and zinc (Saritha et al., 2015). These nutrients play an important role in maintaining cardiovascular health, supporting brain function, and strengthening the immune system. *Perna viridis* is also known for its bioactive compounds that exhibit anti-inflammatory and antioxidant properties. In addition to its health benefits, green mussel farming has significant potential as a sustainable aquaculture practice in coastal areas, including the Sundarbans region, providing economic opportunities and contributing to food security (Chakraborty et al., 2016).

These species are commercially important and contribute to fisheries and coastal livelihoods.

2.3 Cultural and Traditional Importance

In several parts of India, edible molluscs have long been used both as food and traditional medicine. In some communities, snail consumption is believed to help treat conditions such as gastritis, arthritis, and hypertension.

In West Bengal, snail curry and clam dishes are traditional foods among many fishing communities.

Table 1 Edible Molluscs of West Bengal and Their Habitat Distribution

Scientific Name	Common Name	Class	Habitat Type	Edibility
Pila globosa	Apple snail	Gastropoda	Freshwater ponds, wetlands, paddy fields	Edible
Bellamya bengalensis	Freshwater snail	Gastropoda	Rivers, ponds, marshes	Edible
Lamellidens marginalis	Freshwater mussel	Bivalvia	Lakes, rivers, ponds	Edible
Lamellidens corrianus	Freshwater mussel	Bivalvia	Freshwater wetlands and lakes	Edible
Parreysia corrugata	Freshwater mussel	Bivalvia	Rivers and slow-moving freshwater bodies	Edible

Crassostrea madrasensis	Indian oyster	Bivalvia	Estuaries, mangrove roots, coastal waters	Edible
Meretrix meretrix	Clam	Bivalvia	Sandy estuarine and coastal sediments	Edible
Anadara granosa	Blood clam	Bivalvia	Muddy estuarine sediments	Edible
Perna viridis	Green mussel	Bivalvia	Marine coastal rocks and structures	Edible

Source: Adapted from Subba Rao (2003); Dey (2016); Mohanty et al. (2018).

Figure 1. Diversity of Edible Freshwater, Marine, and Estuarine Molluscs Found in West Bengal and Their Habitat Distribution.

3. Nutritional Composition of Edible Molluscs

Edible molluscs are considered highly nutritious aquatic foods that provide a wide range of essential nutrients required for human growth, development, and overall health (Khalua, 2014). Both freshwater and marine molluscs contain significant amounts of high-quality protein, beneficial lipids, vitamins, and minerals. Due to their low fat content and high nutrient density, molluscs are often regarded as a healthy alternative source of animal protein. Their nutritional profile makes them valuable in preventing nutrient deficiencies and supporting physiological functions such as muscle development, immune response, and metabolic regulation (Bar, 2020).

3.1 Protein Content

Molluscan meat is an excellent source of high-quality protein containing all essential amino acids required for human nutrition (Wright et al., 2018). Marine bivalves such as oysters, clams, and mussels often exhibit protein levels exceeding 50% on a dry weight basis, making them comparable to or even richer than many conventional animal protein sources (Zhang et al., 2025). The proteins present in molluscs play a crucial role in maintaining body tissues, supporting muscle growth, and aiding in enzyme and hormone synthesis. In addition, molluscan proteins are generally easily digestible, which enhances their nutritional value. Regular consumption of molluscs can therefore contribute significantly to meeting daily protein requirements, particularly in coastal and rural communities where other animal protein sources may be limited (Panagiotidis et al., 2025).

3.2 Lipids and Essential Fatty Acids

Although molluscs contain relatively low levels of total fat, they are rich in beneficial polyunsaturated fatty acids (PUFAs), which are important for maintaining human health. These include omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), as well as omega-6 fatty acids such as linoleic acid and arachidonic acid. Omega-3 fatty acids are particularly important for reducing inflammation, lowering blood cholesterol levels, and protecting against cardiovascular diseases. They also play a vital role in brain development and cognitive function. Because molluscs provide these essential fatty acids in significant amounts while maintaining a low overall fat content, they are considered heart-healthy seafood options (Zhukova, 2019).

3.3 Vitamins and Minerals

Molluscs are rich sources of essential vitamins and minerals that are necessary for maintaining various physiological processes in the human body. They contain important micronutrients such as iron, zinc, calcium, selenium, iodine, and vitamin B12. Iron and vitamin B12 are particularly important for red blood cell formation and prevention of anemia. Zinc supports immune function and wound healing, while selenium acts as a powerful antioxidant that protects cells from oxidative damage. Iodine contributes to proper thyroid gland function and hormone regulation. For instance, mussels are known to contain high levels of iron and vitamin B12, which help maintain healthy blood circulation. Similarly, snail meat provides significant amounts of iron and essential fatty acids, making it a valuable component of a balanced and nutritious diet (Sadjadi, 2018).

3.4 Mineral Composition

Freshwater snails and bivalves are especially rich in minerals, particularly calcium and phosphorus, which are essential for bone development and maintenance. Calcium is a critical nutrient required for bone strength, nerve transmission, and muscle contraction. Studies have shown that the calcium content in certain freshwater snail species may be higher than that found in commonly consumed animal foods such as beef, eggs, and milk. In addition to calcium, molluscs also contain important trace elements such as magnesium, potassium, and iron that contribute to maintaining electrolyte balance, supporting metabolic activities, and preventing mineral deficiencies. Due to their high mineral content, edible molluscs can play an important role in improving the nutritional status of populations that rely heavily on aquatic food resources.

Table 2 Nutritional Composition of Selected Edible Molluscs (per 100 g edible portion)

Mollusc Species	Protein (g)	Fat (g)	Iron (mg)	Calcium (mg)	Vitamin B12 (µg)	Energy (kcal)
Crassostrea madrasensis (Indian oyster)	9.5–11.0	2.0	6.5	60	16.0	68
Meretrix meretrix (Clam)	12.0–14.0	1.8	13.0	92	84.0	86
Perna viridis (Green mussel)	10.0–12.5	2.2	6.7	30	20.4	70
Pila globosa (Apple snail)	16.0–18.0	1.4	3.5	170	5.0	90

Bellamya bengalensis (Freshwater snail)	14.0–16.0	1.5	4.2	160	4.8	85

Source: Adapted from FAO (2016); Mohanty et al. (2018); Moniruzzaman et al. (2021); Ghosh et al. (2017).

4. Health Benefits of Edible Molluscs

Consumption of edible molluscs offers numerous health benefits due to their rich nutritional composition and presence of essential nutrients and bioactive compounds. Molluscs provide high-quality proteins, essential fatty acids, vitamins, and minerals that support several physiological functions in the human body. Regular consumption of these aquatic foods can contribute to improved nutritional status, enhanced immunity, and reduced risk of various chronic diseases. Because they are nutrient-dense and relatively low in fat, edible molluscs are increasingly recognized as valuable components of a healthy diet (Venugopal and Gopakumar, 2017).

4.1 Prevention of Nutritional Deficiencies

Edible molluscs are rich sources of iron and vitamin B12, both of which are essential for the formation of healthy red blood cells and the prevention of anemia. Iron plays a key role in the synthesis of hemoglobin, which transports oxygen throughout the body, while vitamin B12 is necessary for proper nerve function and DNA synthesis. In many developing regions, iron deficiency anemia remains a major public health problem, particularly among women and children. Regular consumption of molluscs such as clams, mussels, and snails can help improve iron intake and reduce the prevalence of anemia, thereby supporting overall health and physical performance (Wright et al., 2018).

4.2 Cardiovascular Health

Molluscs contain beneficial polyunsaturated fatty acids, particularly omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These fatty acids play a significant role in promoting cardiovascular health by reducing inflammation, lowering blood triglyceride levels, and improving lipid profiles. Omega-3 fatty acids also help regulate blood pressure and reduce the risk of atherosclerosis and coronary heart disease. Since molluscs generally contain low levels of saturated fat and high levels of heart-

protective fatty acids, their consumption is considered beneficial for maintaining a healthy cardiovascular system (Zhukova, 2019).

4.3 Immune System Support

Molluscs are rich in important micronutrients such as zinc, selenium, and other antioxidant compounds that contribute to strengthening the immune system. Zinc plays a crucial role in immune cell development, wound healing, and protection against infections. Selenium acts as an antioxidant that helps neutralize harmful free radicals and reduces oxidative stress in the body. The presence of these nutrients in molluscs helps improve the body's defense mechanisms and enhances resistance to various bacterial and viral infections. Regular intake of nutrient-rich seafood such as molluscs can therefore support overall immune health (Suraiya et al., 2022).

4.4 Brain and Cognitive Health

Essential fatty acids and micronutrients present in molluscs contribute significantly to brain development and cognitive function. Omega-3 fatty acids, particularly DHA, are vital for maintaining the structure and function of brain cells and supporting neural communication. These fatty acids are especially important during early childhood development and can also help maintain cognitive performance in adults. In addition, vitamins and minerals such as vitamin B12, iodine, and iron play important roles in supporting neurological health and preventing cognitive disorders. Therefore, the inclusion of molluscs in the diet may help promote better brain health and mental performance (Zhukova, 2019).

4.5 Bone Health

Edible molluscs contain significant amounts of calcium, phosphorus, and other minerals that are essential for maintaining strong and healthy bones. Calcium is a critical nutrient required for bone formation, bone density maintenance, and proper functioning of muscles and nerves. Adequate intake of calcium helps prevent bone-related disorders such as osteoporosis and reduces the risk of fractures, particularly in older adults. Freshwater snails and bivalves are known to contain high levels of calcium, making them beneficial dietary components for supporting skeletal health and improving mineral balance in the body (Wright et al., 2018).

4.6 Functional and Nutraceutical Potential

Marine molluscs contain several bioactive compounds such as peptides, antioxidants,

and polysaccharides that possess potential nutraceutical and pharmaceutical properties. These bioactive substances may exhibit anti-inflammatory, antimicrobial, and antioxidant activities that contribute to disease prevention and overall health promotion. Research has indicated that compounds derived from molluscs may help enhance immune responses, protect against oxidative stress, and reduce the risk of chronic diseases such as cardiovascular disorders, diabetes, and certain types of cancer. Due to these functional properties, edible molluscs are increasingly being explored as valuable resources for the development of nutraceutical products and functional foods (Ngandjui et al., 2024).

5. Economic and Nutritional Importance in West Bengal

Edible molluscs provide an affordable protein source for rural communities in West Bengal. Their harvesting and trade also support local livelihoods, particularly in coastal fishing villages.

The cultivation and sustainable harvesting of molluscs can contribute to:

- Food security
- Nutritional improvement
- Economic development in coastal areas

Mollusc farming (aquaculture) has significant potential in the Sundarbans and other coastal areas of the state.

6. Challenges and Health Risks

Despite their nutritional benefits, some challenges are associated with mollusc consumption:

1. **Contamination risks** – Molluscs may accumulate pollutants, heavy metals, and microorganisms from aquatic environments.
2. **Allergic reactions** – Shellfish allergy is common in some individuals.
3. **Overexploitation** – Excessive harvesting may threaten natural populations.

Therefore, proper monitoring, hygienic handling, and sustainable harvesting practices are essential.

7. Future Perspectives

Research on edible molluscs in West Bengal should focus on:

- Nutritional profiling of local species
- Development of mollusc-based functional foods
- Sustainable aquaculture practices

- Exploration of nutraceutical compounds

Such initiatives could enhance the value of molluscs as an alternative protein source and functional food.

8. Conclusion

Edible molluscs represent an important yet underutilized food resource in West Bengal. These organisms provide high-quality proteins, essential fatty acids, vitamins, and minerals that contribute significantly to human health. Regular consumption of molluscs can help prevent nutritional deficiencies, support cardiovascular health, and improve immune function. In addition to their nutritional value, molluscs also have considerable economic potential for local communities through fisheries and aquaculture. However, sustainable harvesting practices and proper food safety measures are necessary to ensure long-term utilization of these resources. Further research and awareness programs are required to promote edible molluscs as a nutritious and sustainable component of the human diet.

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