JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

TAXONOMIC APPROACHES TO MOLLUSCAN COLLECTION AND IDENTIFICATION: A REVIEW

[1]Joshi R. P. and [2]D. N. Pathar
Corresponding Author: [1]Joshi R. P.,
[1]Assistant Professor and [2]Research Scholar,
Department of Zoology, Shri R. L. T. College of Science, Akola, Maharashtra, India, 444001

Abstract: Mollusca is one of the most diverse and ecologically significant invertebrate phyla, comprising a wide range of taxa that occupy marine, freshwater, and terrestrial ecosystems. Molluscs contribute substantially to aquatic food webs, nutrient cycling, benthic processes, biodiversity maintenance, and ecosystem functioning, while several species also have considerable economic and biomedical importance. Accurate assessment of molluscan diversity depends largely on appropriate sampling, collection, preservation, and taxonomic identification methods. This review synthesises commonly used approaches for collecting and studying molluscan fauna, including handpicking, sediment sieving, quadrat sampling, net sampling, grab samplers, and macrophyte-associated sampling. Their applicability varies according to habitat type, water depth, substrate characteristics, organism size, mobility, and ecological niche. The review also highlights the importance of proper specimen handling, preservation, stereomicroscopic examination, morphological characterisation, and the use of standardised taxonomic keys for reliable identification. Contemporary approaches integrating morphological identification with photographic documentation, molecular tools, and quantitative ecological analyses can further improve the accuracy and reproducibility of molluscan diversity assessments. Anthropogenic disturbances, habitat alteration, pollution, and seasonal environmental changes can significantly influence molluscan communities, emphasising the need for systematic and standardised monitoring. This review provides a consolidated methodological framework for molluscan sampling and biodiversity assessment and identifies important considerations for future ecological and taxonomic investigations.

Keywords: **molluscan diversity; sampling methods; taxonomic identification; benthic fauna; bioindicators; aquatic ecosystems.**

INTRODUCTION:

Mollusca is one of the largest and most diverse animal phyla, comprising major groups such as Gastropoda, Bivalvia, Cephalopoda, Polyplacophora, and Scaphopoda. Globally, approximately 80,000–100,000 molluscan species are known, while India harbours about 3,271 species belonging to 220 families and 591 genera, including approximately 1,900 gastropods, 1,100 bivalves, 210 cephalopods, 41 polyplacophorans, and 20 scaphopods (Venkatraman & Venkatraman, 2012). Molluscs are predominantly soft-bodied animals, and many possess a calcareous shell that provides protection and serves as an important taxonomic character. The study of molluscan shells, including their morphology and identification, is known as conchology (George & Revathy, 2021). Molluscs and annelids share developmental features such as spiral cleavage and trochophore larvae and are placed within the broader lophotrochozoan lineage (Subba Rao, 2003).

Molluscs occupy diverse habitats, including rocky shores, sandy beaches, seagrass beds, coral reefs, mangroves, estuaries, freshwater bodies, and deep-sea environments (Tripathy & Mukhopadhyay, 2015). They

perform important ecological functions as grazers, filter feeders, detritivores, predators, and prey, contributing to nutrient cycling, energy transfer, and aquatic food-web dynamics (Kumar & Vyas, 2012). Their ecological and economic importance extends to food resources, pearl production, ornamental materials, industrial raw materials, pharmacological applications, and environmental monitoring (Jaiswar & Kulkarni, 2005). Molluscs also feed on algae, detritus, plants, and other organisms and can contribute to nutrient recycling within aquatic ecosystems (D'Souza et al., 2021). Their abundance and community structure may reflect environmental conditions, making them useful bioindicators of aquatic ecosystem health (Majagi et al., 2021).

Molluscan communities are increasingly affected by habitat degradation, pollution, overexploitation, and other anthropogenic pressures, resulting in changes in abundance, distribution, and species composition, particularly among vulnerable bivalve populations (Shinde et al., 2024). Accurate assessment of molluscan diversity therefore requires appropriate and standardised collection methods. Depending on habitat and study objectives, specimens may be collected through handpicking, sediment sieving, quadrat sampling, nets, macrophyte sampling, and benthic grab samplers. Appropriate preservation, morphological examination, stereomicroscopic observation, and taxonomic identification using standard keys are essential for reliable biodiversity assessment.

The present review summarises the major methods used for molluscan collection, preservation, identification, and biodiversity assessment, while highlighting their ecological significance and applicability across different aquatic habitats. Standardised and integrated approaches can improve the reliability of molluscan diversity studies and contribute to ecological monitoring, conservation, and sustainable management of aquatic ecosystems.

I. METHODS OF COLLECTION:

Molluscs are available throughout the year for collection, but the population varies due to seasonal changes and human interference.

Samples can be collected by selecting a specific number of sampling sites once a month. The shells are collected through handpicking and then washed, cleaned and preserved in 4% Formalin or 70% ethyl alcohol. The specimens are further identified using Standard keys. (Keshkar et al., 2025) (George G and Revathy S, 2021). (R.R Kumar, 2016) followed the same method, and further, the screening of the material was carried out using a stereomicroscope to bifurcate it into species or higher taxonomic categories.

(Kohan et al., 2012) also collected samples by handpicking during the spring and winter seasons. But to collect the samples at muddy shores, the first 5 cm of sediments were picked and separated using sieves of different mesh sizes (10mm, 1mm, 0.5mm).

Some of the researchers have performed collection of samples through various samplers, such as the Van Veen Grab Sampler (0.1 m^2) was used by S. Vineetha and Abhilash R. (2024), which helps to collect sediment samples. They also collected samples by direct search at low tide through handpicking, digging and scraping the substratum.

(Kumar A and Vyas V, 2012) used Peterson's grab sampler where the depth was more than 1 m, Surber Sampler in which depth was less than 1 m and a D-frame net for macrophytes. (Ashton EC et al., 2002) (Satheeshkumar P and Khan AB, 2012) collected the samples using quadrats of different sizes.

(Venkatraman C and Venkatraman R, 2012) and (Dwivedi A and Rawat RS, 2024) collected the molluscs using fishing nets. The animals were buried in the ground in a pit of 100 cm length, 50 cm width, and 25 cm depth, were allowed to decompose for 1 week and then washed in water and Hydrochloric acid and preserved in 90 % alcohol.

		
Peterson's grab sampler	VanVeen grab sampler	Fishing Net

https://www.coleparmer.in/i/wildco-1750-g30-petersen-grab-dredge-12-x-12-sampling-area/0547200?srsltid=AfmBOorNsCj8xNBb0s3RQEFAhYUHoSTPiSwdHttbsY5pClYoY5fxvz1m	https://aquaticbiotechnology.com/en/sediment-sampling/van-veen-grab	https://www.ubuy.co.in/product/4Q0ZCNP0Q-neween-cast-net-3-8-mesh-hand-cast-fishing-net-saltwater-bait-casting-net-4-6-8ft-radius-size?srsltid=AfmBOorYbpvIQn0YM2G3AIavhaux_d8fSyZ4mOSd_-iAtwx19emL3jDL
		
Surber Sampler	D-frame net	Quadrat sampling
https://www.veldshop.nl/en/nhbs-surber-sampler-medium-complete.html?srsltid=AfmBOorEz0W2pqS0xoi30tN01OAb7ko7tL6auNhj25Dw0QG5eYdYrFKX	https://www.coleparmer.in/p/wildco-d-frame-aquatic-dip-nets/54689?srsltid=AfmBOop7iGdPXri4DXuiin2_z1XXGlRecJofFQ2PVmRX2adBWGFxpHM6	https://www.nhbs.com/blog/how-to-use-a-quadrat?srsltid=AfmBOooJUACQ1lLkJxqxiHLGUWJxGzOqoIiBuiBY_zvHOwNasHqZAUTn

II. Methods of identification:

There are mainly 2 methods of identification of species, i.e using taxonomic keys and DNA barcoding.

Morphological identification: (Nahok et al.,2026) identified the species based on shell characteristics by referring to taxonomic literature with original descriptions. (BA Nugroho and Erisa Ayu Waspadi Putri, 2024) used the taxonomic descriptions provided by (Abbot and Dance,1982), (Carpenter and Niem,1988), (Jagadis et al., 2018). (C. Printrakoon et al., 2008) identified the species using Brandt (1974), Reid (1986), Lamprell and Whitehead (1992), Lamprell and Healy (1998) and Swennen et al. (2001). (A.K. Jaiswar and B.G. Kulkarni, 2005) referred to the key given by Hornell (1949), Subramanyam et al. (1949, 1951, 1952), Bhatt (1959) and Rao (1982).

DNA Barcoding: DNA barcoding is an important tool for taxonomists that can be used in the following ways, i.e., screening in collections, identification of specimens where morphological identification becomes difficult, possibility of discovering new species. This method is mostly used for biodiversity surveys and monitoring programs. (De Araujo Ad et al., 2023) performed the identification through DNA barcoding and then analysed using phylogenetic reconstruction and an algorithm to delimit OTUs. This helped them to understand the evolution and dispersion of species. As it was becoming difficult to identify species because of similarities between species, DNA barcoding was used by Imsong L. and M.Murali, 2023) and Bikashvili A. et al., 2022) for taxonomic identification. Genetic markers used included the cytochrome oxidase I gene, 16S rDNA and 18S rDNA. A fragment of the COI gene was sequenced, and DNA was compared to the sequence available in the genomic library.

III. REVIEW OF LITERATURE:

Benjamin SG et al., (2023) did a survey on the molluscan fauna from the selected sites of Kerala. They found the presence of 48 species that belonged to 2 classes, i.e Gastropoda and Bivalvia. There were 8 orders and 24 families that represented the gastropods and 5 orders and 7 families of Bivalvia. They observed the highest molluscan diversity in Kovalam with 26 species, whereas D. Irma and K. Sofyatuddin (2012) carried out a study in the area of mangrove rehabilitation in Banda Aceh and Aceh Besar districts, Indonesia, in which they found 14 species of Gastropods and 5 species of bivalves, which belonged to 7 and 4 families. It was noted that molluscan shells are essential for various commercial uses, which include poultry food, drugs, industrial raw materials, fisheries, and decorative items. A high abundance of gastropods was observed by D. Irma and K. Sofyatuddin (2012) and Majagi et al. (2021). Conidae is one of the most popular families among

gastropods because of its rarity and beautiful colour. Fishermen actively collect shells. They are used for making dolls and sculptures of God.

Majagi et al. (2021) conducted a comparative study of water quality, diversity and population density of molluscs in 2 water bodies in Gulbarga and Bidar districts. The study was carried out from October 2001 to September 2003. A total of 8 species of gastropods and 3 species of bivalves were identified. About 75.43 % of gastropods and 24.57% of bivalves were represented. Comparatively, the 2nd year represented a larger gastropod population. In Karanja reservoir, *Lymnaea luteola, L.acuminata, Melania,* and *Melania scabra var. elegans* were dominant species. Similarly, *Melania scabra var elegans, Digoniostoma pulchella, and Lymnaea luteola* were dominant in Khaji Kotnoor. Similarly, George G and Revathy S (2021) reported that a total of 31 genera of molluscan shells have been found from Munambam beach belonging to the classes Gastropoda and Bivalvia. The taxa *Anadara, Sunetta, Dentalium, Noetia, Turritella, Stramonita, Donax, Argopectin, and Tibia* were recorded every month of the year. Both of them showed the highest diversity during the monsoon season.

Kantharajan G et al., (2017) carried out a study in 8 mangrove areas by selecting 25 sites of Mumbai from August 2015 to May 2016. There were 61 molluscan species consisting of 46 gastropods, 14 bivalves and polyplacophora. The study also reported 2 new records for gastropods, namely *Salinator fragalis* and *Auriculastra subula*. Gastropods belonged to 31 genera of 22 families, and bivalves belonged to 14 genera of 12 families. The most common families were Ellobidae, Neritidae, and Littorinidae among gastropods, whereas Ostreidea and Arcidae belong to bivalves. Similar study was done by Printrakoon C et al., (2008) in which he observed that Mangrove tree habitats have higher diversity than unvegetated habitats in the Upper Gulf of Thailand in 2004. All 16 bivalves and 23 gastropods were classified as marine species; 4 gastropods were classified as estuarine and 4 as freshwater.

According to a study by Sary P.S. et al. (2014), the Shannon diversity index of cone shells recorded a value of 0.8821 on the Kerala coast, and the Margalef species richness index was 1.409. Similarly, Sarkar T. et al., (2021) calculated the Shannon diversity index, which was maximum at site 1, and minimum at site 2. The dominance index was high at site 2 & low 4 at site 5. The range of Margalef's species richness was 0.483 to 0.5119 in Dakshin Dinajpur, West Bengal. Different mollusc specimens were collected from 5 different sites. They recorded 5 edible species that fell under 2 orders and 4 families. The most common species was *Bellamya bengalensis.*

Jaiswar et al., (2005) and Shinde NS et al., (2024) findings suggest that molluscs are an important link in the food chain from primary to tertiary levels, leading to fish production. It is also an edible source for the coastal population. They are also used for ornamental trade, pharmacological products and in the manufacture of lime and cement. Due to human disturbance, coastal biodiversity is reducing day by day. Molluscs are more affected because of their sluggish nature and feeding habits, and that is why it has become important to map the diversity of existing molluscs. It has become an urgent need for their conservation. Freshwater molluscs improve the quality of water by filtering suspended particles, algae and pollutants. Eg *Lamellidens marginalis.* They also help recycle nutrients like nitrogen and phosphorus. Bivalves are harvested for food and pearls, which lead to economic growth.

A study was conducted by Kohan et al., (2012) at the Persian Gulf starting from spring 2009 until winter 2011. They took samples from Deylam at the Bushehr-Khuzestan borderlines, extending southeastward through Genaveh, Busher, Bolkheyr, Kabgan, Dayer and Nayband at the Bushehr-Hormozgan provincial borderlines. They reported a total of 87 species of Gastropods from 54 families. The most frequent species was *Planaxis sulcatus,* followed by *Turitella fultoni.*

The study conducted by the Marine Biological Station, Zoological Survey of India, Chennai reported the occurrence of a total of 1270 species belonging to 820 genera, including all the invertebrate and vertebrate groups. Out of them, 273 species belonged to molluscs. An investigation was done in July-December 2011 in Chennai by C.Venkatraman et al. (2012), in which they reported 47 species of molluscs were collected, of which 26 species were gastropods while 21 were Bivalves. *Turritella attenuata, Babylonia spirata, Chicoreus virgineus, Murex trapa* and *Bullia vittata* were found at all sampling stations. 16 gastropod species were found new to this study. *Arca symmetrica, Arca tortuosa, Cardita bicolour, Lucina ovum, Cardium setosum, Sunetta scripta, Mactra turgida, Donax Cuneatus, Tellina angulata* and *Laternula anatina* were found common in all stations. 3 Bivalve species were found new in this study.

Ashton EC et al., (2003) carried out a research study in the Sematon mangrove forest, Sarawak, Malaysia in which they concluded that 44 mollusc species were recorded. 13 molluscan species occurred in more than 50% of the study plots. Molluscan abundance was positively correlated with the number of mangrove associates and tree species. Similarly, R. Rajendra Kumar, (2016) conducted a study to know the diversity of gastropods and bivalves in Coringa mangrove. They collected 15 specimens from the mangrove area. The shells were handpicked randomly using a direct sampling method. The collected samples were screened with stereomicroscopes to distinguish them into various categories. They recorded 15 species of molluscs, which included 10 gastropods and 5 bivalves. The gastropods have a significant ecological role to play in the mangrove ecosystem. Rocky habitat is also suitable for gastropods.

Agravat PA et al., (2022) designed a study to assess the biodiversity of the macrobenthic organisms along the rocky intertidal zones of the Saurashtra Coast. The study was conducted in 2 phases. For the first phase, rocky coastlines of Chorwad, Aadri, Navapara, and Vadodara Dodiya were selected. In the 2nd phase, the study was conducted at the Mangrol, Aadri and Veraval coasts to assess the diversity of Molluscs. They found 68 species of Molluscs in which Veraval having the highest species richness in the 2nd phase. Compared to the 1st phase, Aadri showed fewer molluscs. Equivalently, Bikashvili A. et al., (2021) studied the species diversity and distribution of freshwater molluscs of Javakheti Highlands. It is a poorly studied area due to scarcity of field studies. They used the kick-netting method and handpicking method for sample collection. They collected 22 species from 42 sites, which belong to 15 genera. The western part was richer in species than that of the eastern part of the Khrani. *B. contortus* was found in both western and eastern parts of Javakheti Highlands.

Satyanarayana E.J and Krishna P.V, (2017) documented 14 Gastropods and 8 bivalves from the mangrove areas and estuary region of East Godavari estuary ecosystem. *Onchidium* species, which are shell-less terrestrial gastropods, were also recorded. And Raquel Hernandez and Fernando Alvarez, (2019) collected 653 organisms; of them, 120 species were molluscs. 14 molluscs were found to be new in Puerto Morelos Reef National Park, Mexico. The new records presented were analogous to 11 gastropods belonging to 11 different families and 2 bivalves from 2 different orders.

Kumar A and Vyas V, (2012) highlights the study of the molluscan fauna from eighteen sampling stations of the River Narmada, in which they observed 19 species (13 gastropods and 6 bivalves) during the period of the study. The most dominant gastropod species from gastropods were *Thiara* (Melanoides), *Tuberculata* (Muller) and *Tarebia granifera* (Lamarck) and from bivalves were *Parreysia* (Radiatula), *occata* (Lea) and *Corbicula striatella* (Deshyes) from 16 sites out of 18 sites. Gastropods were represented by 2 orders, i.e Mesogastropoda and Basommatophora; 6 families and 8 genera, and 13 species. Bivalvia were represented by 2 orders, i.e., Trigoniida and Veneroida; 4 families; 4 genera; and 6 species. Whereas D'Souza et al., (2021) studied the diversity of molluscs of the Karnataka coast, India, to understand the factors influencing variation in molluscan diversity. They selected 13 intertidal habitats, of which 6 sites were visited regularly from February 2017 to January 2018. Using quadrates of 0.25 m^2, Mollusc shells were collected. All the parameters, such as air temperature, water temperature, and wave frequency, were noted. They documented 36 species of molluscs, which included 21 species of gastropods and 15 species of bivalves. *Bullia melanoides, Saccostrea cuculata, and Echinolittorina leucostica* were found commonly. Species richness was higher during the post-monsoon period in intertidal areas. They came to know that wave frequency and electrical conductivity were the parameters responsible for molluscan diversity in intertidal zones.

Bradley RC et al., (2005) studied the molluscan diversity and abundance among coastal habitats of Northern Brazil from 1999 to 2003. A survey was carried out along the Ajuruteua peninsula (Brazil) in mangrove forest, sandy beach and estuarine habitats, in which a total of 30 species of bivalves belonging to 18 families and 19 species of gastropods from 15 families were documented. It was observed that these numbers were similar to the surveys of intertidal molluscs of the northern and northeastern coast of Brazil. It was observed that molluscs have important ecological roles as well as economic importance in the region.

Palanisamy S and Anisa BK, (2012) and Vineetha S and Abhilash R, (2024) conducted a study on seasonal variation in the distribution of molluscs. It was also observed that there was a rise in population during the post-monsoon and decreased during the monsoon season. They found *Cereithedia cingulata* to be the dominant group. Vineetha S and Abhilash R, (2024) observed that the species of class Bivalvia were found to be higher (28 species) than Gastropods (14 species). Mytilidae and Veneridae were found to be the ruling families among

bivalves, and among Gastropods, Neritidae was found to be most common, consisting of 4 species. *Mytellastrigata* and Gastropod- *Pirenellac ingulata* were dominant species.

Bhave V and Apte D, (2011) carried out a study in which they reported 16 species that belonged to 12 families. Out of 16, 15 species were found as new records for Maharashtra and 8 for the Indian coast. He suggested carrying out research in this area to reveal the true diversity. *Phidiana militaris, Phidiana anulifera and Anteaeolidiella indical* were found commonly. On the other hand, Vanmali H.S. and Jadhav R.N. (2015) presented research on the diversity of molluscs of the Dativare Coast of Vaitarna Estuary, Palghar, Maharashtra. The study was conducted from January 2013 to January 2015, which revealed that 30 molluscans species were observed belonging to the classes Gastropoda (17), Bivalvia (12) and Cephalopoda (1), i.e *Sepia aculeata*. 6 different classes were observed: Heterodonta and Pterimorphia (Bivalvia). (Caenogastropoda, Vetigastropoda, Neritomorpha). They came to the conclusion that the location is fully diversified, and some of the species have commercial value.

Dwivedi A and Rawat RS (2024) aimed to assess the diversity of freshwater molluscs within the Gomti River, which is located near Saidpur in Uttar Pradesh. According to them, this area has largely remained understudied. During the study, they found 9 species, which were identified from 7 families. Following species were identified: Viviparidae, Ampullariidae, Assimineidae, Pachychilidae, Lymnaeidae, Planorbidae and Unionidae. Correspondingly, Keshkar and Pawar (2025) carried out an investigation on molluscan diversity from June 2023 to May 2024 at Sina Dam, Ahilyanagar, Maharashtra. They recorded a total of 7 species of freshwater molluscs. They belonged to 2 different orders and 4 families. It consisted of 5 species of Gastropoda and 2 of Bivalvia. Gastropods were *Bellamya bengalensis, Beburnea, Idiooma dissimilis, Melanoides tuberculata, Tarebia granifera and Lamellidens corrianu; L. maginalis* belongs to Bivalvia.

de Araújo AD, Carvalho OS, Gava SG and Caldeira RL (2023) conducted a study on the diversity, dominance and evenness of mollusca in Tarakan Island. The study was conducted from March to August 2023 and found around 54 molluscan species, in which there were 46 species of gastropods and 8 species of Bivalves. Similar study was carried out by Nahok B et al., (2026) to calculate the diversity of Molluscs in the Chi River, Thailand which revealed that a total 2734 freshwater molluscs were collected, consisting of 5 families, 9 genera and 12 species of gastropods and 4 families, 8 genera and 13 species of bivalves. The most abundant group was found to be *Corbicula* spp and the least common was *Hyriopsis khoratensis.* They calculated Simpson's dominance index (0.19 - 0.77), Margalef's richness index (0.74 - 2.10), Shannon-Wiener diversity index (0.56-2.30), Bray Curtis dissimilarity index (0.185-1.000). Comparatively, R.Nagarajan and A. Prakash (2020) carried out research on molluscan diversity in the wetlands of Nagapattinam district of Tamil Nadu, India, in which they found a total of 71 species that belonged to 6 orders and 30 families. It was found that Tranquibar had the highest diversity (H= 2.9905) and Pazhaiyar had the lowest diversity (H'= 2.749) in relation to the molluscan family.

Raina et al., (2016) conducted research on the diversity of molluscs in the Sip, which is a tributary of the River Narmada. They used various types of samplers to collect samples of mollusc which were collected from 7 different sites. They enlisted 17 species from all the sites, which belonged to 11 genera and fell under 9 families. There were 11 species of gastropods that belonged to Mesogastropoda and Basommatophora, and 6 species of bivalves that belonged to order Trigoinoida and Veneroida. They calculated the Jaccard similarity index (J), which ranged between 0.62 and 1. Whereas Sharma K.K. et al. (2013) assessed the diversity and distribution of Mollusca in Gho Manhasan stream located in Jammu. They collected the specimens using Ekman's dredge and preserved them in 70% alcohol. Further, they measured pH, dissolved oxygen, and free Co2; bicarbonate and carbonates, chloride, calcium, and magnesium were measured. They found 7 species of gastropod and 4 species of bivalve. The peak was observed highest during March 2011, whereas the lowest was observed in December 2010. Bivalves were at their maximum during December 2010 and totally absent from April 2011 to June 2011.

Pegu L. et al., (2019) study presents the diversity of freshwater molluscs of the wetland of Dhemaji district of Assam. They used a dip net of 30 cm *40 cm for collecting samples. They recorded a total of 11 species of freshwater mollusc species. *Brotia costula* and *Lammelliden marginalis* were found to be most common. Similarly, Pardeshi P.B. and Kalyankar V.B. (2016) presented a study of freshwater bivalve biodiversity from Nathsagar Dam at Paithan, Aurangabad. They carried out the study from June 2009 to May 2010, which

resulted in finding 4 species of freshwater bivalves that belonged to 3 genera under 2 families, i. e *Lamellidens marginalis, Lamellidens carrianus, Indonaia caeruleus and Corbicula stritella.*

IV. Conclusion:

Molluscs constitute an important component of aquatic biodiversity and play diverse ecological roles as herbivores, filter feeders, detritivores, predators, scavengers, and prey. Their distribution and community structure are closely associated with habitat characteristics, substrate type, water quality, food availability, and seasonal environmental fluctuations. Consequently, systematic assessment of molluscan communities can provide valuable information regarding biodiversity, ecosystem functioning, and environmental change.

The reviewed literature demonstrates that no single sampling technique is universally suitable for all molluscan habitats. Handpicking is effective in accessible shallow-water and exposed habitats, whereas quadrats and nets are useful for estimating abundance and sampling vegetation-associated fauna. Sediment sieving and grab samplers are more appropriate for benthic communities occurring within muddy or sandy substrates and deeper habitats. Combining complementary sampling techniques can therefore provide more representative estimates of molluscan richness and abundance.

Reliable biodiversity assessment also depends on standardised specimen handling, appropriate preservation, detailed morphological examination, and accurate taxonomic identification. The integration of conventional taxonomy with stereomicroscopy, digital imaging, molecular identification, and quantitative ecological analyses offers considerable potential for improving species-level resolution and reproducibility. Future investigations should adopt standardised sampling designs incorporating spatial and seasonal replication, environmental parameters, abundance measurements, and appropriate diversity indices.

Increasing anthropogenic pressure on freshwater and marine ecosystems further emphasises the importance of long-term molluscan monitoring. Since several molluscan taxa can respond sensitively to environmental changes, their communities may serve as useful indicators of ecosystem condition. Thus, comprehensive and standardised approaches to molluscan collection and diversity assessment are essential not only for documenting species richness but also for understanding ecological changes and supporting biodiversity conservation and sustainable management of aquatic ecosystems.

V. References

1. Abbott, R. T., & Dance, S. P. (1982). Compendium of Seashells (1982nd ed., Vol. 1). Odyssey Publishing
2. Agravat, P. A., HB. Parmar, DM. Bhatt, JV. Raval, PC. Mankodi (2022), Diversity of intertidal Macrobenthic Flora and fauna along the South Saurashtra Coastal zone, Gujarat, India. International Journal of Entomology Research, Vol. 7, Issue 4, 130-142.
3. B. Tripathy and AK Mukhopadhyay, 2015. Marine Molluscan Diversity in India, Marine Faunal Diversity in India.
4. Benchanwan Nahok, Chanidaporn Tumpeesuwan, Sakboworn Tumpeesuwan , Utain Chanlabut (2026). Freshwater Molluscan Assemblages in Upper Reaches of the Chi River, Northeastern Thailand and Its relationship of Physiochemical Habitat. Diversity,18,144.
5. Benjamin SG, M. Nair, N.J. Nandini. (2023), Molluscan diversity along the selected beaches of Kerala Coast, India, Biological Forum- An International Journal, 15(4): 946-950.
6. Bhave V and D Apte (2011), Illustrated checklist of opis thobranch fauna of Ratnagiri, Maharashtra, India. Journal of the Bombay Natural History Society (108) (3). 172-182.
7. Bikashvili A, Kachlishvili N, Japoshvili B, Mumladze L (2022) Species diversity and DNA barcode library of freshwater Molluscs of the South Caucasus. Biodiversity Data Journal 10: e84887.
8. Bikashvili A, Kachlishvili N, Mumladze L (2021). Species diversity and distribution of fresh molluscs of Java Kheti Highlands (Republic of Georgia). Biodiversity Data Journal 9: e66649
9. Bimo Aji Nugroho, Erisa Ayu Waspadi Putri (2024), Molluscan diversity: the mangrove ecosystem of Tarakan Island, Indonesia. BIOMA: Jurnal Ilmiah Biologi, 13(1), 50-68.
10. Carpenter, K. E., & Niem, V. H. (1998). The living marine resources of the Western Central Pacific (1st ed., Vol. 1). Food and Agriculture Organisation of the United Nations.

11. Cochin, Kerala, India. Uttar Pradesh Journal of Zoology, 42(15): 90-94
12. Colin R. Beasley, Carlos M. Fernandes, Cleidson P. Gomes, Bethania A. Brito, Sonia M. Lima dos Santos and Claudia H. Tagliaro (2025), Molluscan diversity and abundance among coastal habitats of Northern Brazil. ECOTROPICA 11: 9-20.
13. de Araujo AD, Carvalho OS, Gava SG and Caldeira RL (2023) DNA barcoding as a valuable tool for delimiting mollusc species of the genus Biomphalaria Preston, 1910 (Gastropoda: Planorbidae). Front. Cell. Infect. Microbiol. 13:1167787. doi: 10.3389/fcimb.2023.1167787
14. D'souza SL, Neevan D'souza, K. Bhasker Shenoy (2021). Molluscan diversity of coastal Karnataka, India & role of physicochemical parameters on their diversity. Journal of Coastal Conservation. 26:2
15. Dwivedi A and RS Rawat (2024), A study on Molluscan Diversity of Gomti River, Lucknow, Uttar Pradesh, India. International Journal of Creative Research Thoughts. Vol 12, g597- g608.
16. Elizabeth C. Ashton, Donald J. Macintosh and Peter J. Hogarth (2003), A baseline study of the diversity and community ecology of crab and molluscan macrofauna in the Sematan mangrove forest, Sarawak. Malaysia. Journal of Tropical Ecology 19: 127-142.
17. G. Kantharajan, P. K Pandey, P. Krishnan, V. Deepak Samuel, V.S. Bharti, R.Purvaja (2017). Molluscan diversity in the mangrove ecosystem of Mumbai, West Coast of India. Regional Studies in Marine Science.
18. George and Revathy (2021), A preliminary checklist of Molluscan Shell collection from Munambam Beach,
19. Hornell, James.: The study of Indian molluscs, J. Bombay Nat. Hist. Soc. 48(2): 1-34 (1949).
20. Imsong L and M. Murali (2023). Efficacy of molecular Identification using DNA Barcoding Technique of Freshwater Edible Molluscs from Nagaland, India. Uttar Pradesh Journal of Zoology, Vol 44, no. 20, pp. 29-38.
21. Irma D., K. Sofyatuddin (2012) Diversity of Gastropods and Bivalves in mangrove ecosystem rehabilitation areas in Aceh Besar and Banda Aceh districts, Indonesia. Aquaculture, Aquarium, Conservation and Legislation 5(2): 55-59.
22. Jagadis, I., Mohamed, K. S., Venkatesan, V., & Kavitha, M. (2018). A picture book on marine gastropods (Vol. 1). ICAR-Central Marine Fisheries Research Institute. www.cmfri.org.in
23. Jaiswar AK. and B.G. Külkarni (2005), Conser-vation of Molluscan biodiversity from intertidal area of Mumbal coast. ISSN 93-105.
24. Keshkar BD and Pawar BA (2025), Studies on molluscan diversity of Sina Dam from Ahilya Nagar district of Maharashtra in relation of fish culture. Flora and Fauna, 31(2) , 270-274.
25. Kohan, Ahmadreza; Badbardast, Zahra; Shokri, Mohammadreza. (2012) The Gastropoda Fauna along the Bushehr Province Intertidal zone of the Persian Gulf. Journal of the Persian Gulf. Vol 3, 33-42.
26. Kumar A. and V. Vyas, (2012), Diversity of Molluscan communities in River Narmada, India. Journal of Chemical, Biological and Physical Sciences, Vol-2, 1407-1412.
27. Lamprell, K. & J. Healy, 1998. Bivalves of Australia, Volume 2. Backhuys Publishers, Leiden. 288 pp.
28. Lamprell, K. & T. Whitehead, 1992. Bivalves of Australia, Volume 1. Crawford House, Bathurst, New South Wales. 182 pp
29. Majagi SH, Anitha S.M., Jayadeva Naik, Dhanajaya S.G. and Somshekar, (2021), Diversity and population density of molluscans in two water bodies, Karnataka, India. Indian Journal of Pure and Applied Biosciences, 9(2), 188-194.
30. Nagarajun R & A Prakash (2020) Diversity of Mollusca in selected coastal wetlands of Nagapattinam district in the east coast of Tamil Nadu, Southern India. J.Sci. Trans. Environ. Tecnov 13(13):122-130.
31. Palanisamy S and AB Khan, (2012), Influence of Environmental Parameters on the distribution and diversity of molluscan composition in Pondicherry Mangrove, Southeast Coast of India. Ocean Science Journal 47 (1) ; 61-71.
32. Pandey C., S. Thiske, G.S. Guru, N.A. Mansoori, (2025), A review on molluscan diversity in freshwater habitats: Implications for conservation and aquatic health. International Journal of engineering. sciences and research technology 14(2).
33. Pardeshi P.B. and V.B. Kalyankar (2016). Study of freshwater bivalve biodiversity from Nathsagar Dam, At Paithan, District Aurangabad (Maharashtra). SCHOLARS WORLD-International Refereed Multidisciplinary Journal of Contemporary Research.
34. Pegu L., J Gogoi, P. Khound (2019). Habitat ecology of molluscan fauna and its ethnozoological importance in rural livelihood of Dhemaji District, Assam. Ilkogretim Online-Elementary Education Online, vil 18 (Issue 2): pp. 1025-1033.

35. Printrakoon C., FE. Wells; Yaowaluk Chitramvong, (2008) Distribution of monks in Mangroves at six sites in the upper Gulf of Thailand. The Raffles Bulletin of Zoology. (247-257)
36. R. Rajendra Kumar (2016), Distribution of Molluscan fauna in Coringa Estuarine Mangroves, South East Coast of India, An international quaterly journal of Biology & Life Sciences. 4(2): 261-264.
37. Raina RK., V Vyas, Swarup, A. and Gurjar, P., (2016) Molluscan diversity in River Sip - A tributary of River Narmada in Central India. Int J. Pure App. Biosci 4(5): 108-113
38. Rao, S. K.: Taxonomy of Indian oysters. Cent. Mar. Fish. Res. Inst. Bulletin, 12: (1982)
39. Raquel Hernandez, Fernando Alvarez (2019), Mollusks from the Puerto Morelos Reef National Park, Quintana Roo, Mexico; new records for the Mexican Caribbean, Revista Mexicana de Biodiversity.
40. Reid, D. G., 1986. The Littorinid Molluscs of Mangrove Forests in the Indo-Pacific Region: the Genus Littoraria. British Museum (Natural History), London. 227 pp.
41. Sarkar T., S Debnath, BK Das, M. Das (2021). Edible freshwater mollusc diversity in the different water bodies of Gangarampur Block, Dakshin Dinajpur, West Bengal. Eco. Env. and Cons.
42. Sary, P.S, P. Kiran, RB. Balasubramanian, N.K. and Biju kumar, A. (2013) Diversity of cone snails (Mollusca: Conidae) along Kerala Coast. Journal of Aquatic Biology and fisheries Vol 2/2014/pp 607 to 610.
43. Satyanarayana TE. & P.V. Krishna (2017). Species diversity & distribution of Molluscan fauna. from estuary and Mangroves of the East Godavari estuarine ecosystem, Andhra Pradesh, India. International Journal of Advanced Research, 5(1) Pg. 2930-2937.
44. Sharma K.K, K. Bangotra and M. Saini (2013), Diversity & distribution of Mollusca in relation to the physico- chemical profile of Gho - Manhasan stream, Jammun (J&K). International Journal of Biodiversity and Conservation. Vol 5(4), pp 240-249.
45. Shinde NJ, R R. Raut, AR. Kurhe, TS. Pathan, (2024), Review on the freshwater bivalve mollusc: Importance and conservation status in Maharashtra. World Journal of Biology Pharmacy and Health Sciences 20(03), 313-316.
46. Subba Rao, N. V.: Mollusca, Animal Resources of India, 125-147 (1991)
47. Subramanyam, T.V., K.R. Karandikar and N.N. Murthi. Marine gastropods of Bombay. Part I. J. Univ. Bombay, 20: (1951).
48. Subramanyam, T.V., K.R. Karandikar and N.N. Murthi. The marine gastropods of Bombay Part II. J. Univ. Bombay, 21(1): (1952).
49. Subramanyam, T.V., K.R. Karandikar and N.N. Murthi.: The marine pelecypods of Bombay. J. Univ. Bombay, 17: (1949).
50. Swennen, C., R. G. Moolenbeek, N. Ruttanadakul, H. Hobbelink, H. Dekker & S. Hajisamae, 2001. The molluscs of the southern Gulf of Thailand. Thai Studies in Biodiversity [The Biodiversity Research and Training Program, Bangkok], 4: 1-210.
51. Vanmali H.S. and Jadhav R.N. (2015) Assessment of mollusc diversity of Dativare coast of Vaitarna Estuary, Dist. Palghar, Maharashtra (India). Research Inventy: International Journal of Engineering & Science. Vol 5. Issue 9. PP-01-06.
52. Venkatraman C. and K. Venkataraman (2012), Diversity of Molluscan fauna along the Chennai Coast. Uttar Pradesh State Biodiversity Board.
53. Vineetha.S and R.Abhilash (2024), Preliminary study in the mangrove-associated molluscan diversity of Ashtamudi Lake, Kerala, India, Vol 124 (15), 431-438.