

# Molluscan Distribution in and Around Munroe Island, Kollam, Kerala

Puja Vijay<sup>1,\*</sup>, Nisha V.<sup>1</sup>, Shynu R<sup>1</sup>, Sreela S.R.<sup>1</sup>, Vishnu Mohan<sup>1</sup>, Aadithya S.<sup>1</sup>

## Abstract

*The current investigation endeavors to comprehend the variation of Molluscan species, specifically gastropods, at Munroe Island in the Kollam district of Kerala. Munroe Island, is a traditional backwater village positioned at the meeting point of the Ashtamudi backwater and the Kallada River system. Comprising of eight small islands, it covers a combined area of 13.4 km<sup>2</sup>. The primary lithology of the island consists of sedimentary rocks on the mainland and low-lying areas of the delta region, located near the banks of the Kallada River and the confluence of Ashtamudi Lake. The region surrounding Munroe Island is part of the Asthamudi estuary, which is a significant geological feature of the South Indian peninsular shield. The estuary is primarily composed of crystalline rocks and tertiary sediments. The dominant lithology of the main island and its vicinity is made up of sedimentary rocks from the Warkalli and Quilon formations. Quaternary sediments of marine and fluvial origin can be found in the low-lying areas, particularly along the Kallada River and the western part near Asthamudi Lake, where numerous tidally active creeks are present. The coastal landscape and landforms exhibit a wide range of variations influenced by factors such as wave action, tides, currents, sedimentation, river stages, wind patterns, and the dynamic riverine environment. The newly discovered species on Munroe Island include *Littoraria pallescens*, *Assimineia woodmasoniana*, and *Acteocina decorata* the latter of which was initially documented in Ashtamudi Lake. The gastropods on Munroe Island have not been extensively studied, which has led to the initiation of this research aimed at examining the gastropod population in the area.*

**Keywords:** Munroe island, gastropods, mangroves, kallada river, ashtamudi lake

## INTRODUCTION

Gastropods represent the most abundant group of species within the mollusks worldwide, with an estimated 140,000 species globally [4]. A significant proportion of gastropods possess shells, while others exist without this characteristic. The gastropods with shells are commonly referred to as univalves. Certain gastropods fulfill crucial ecological functions, such as preying on other species, promoting the decomposition of deceased aquatic plants, and facilitating the recycling of nutrients [2]. Marine mollusks are found in a variety of environments, including rocky shorelines, sandy shores, seagrass meadows, coral reef systems, and mangrove forests. These organisms have successfully colonized nearly all types of ecosystems. In this study, our focus is directed towards gastropods that inhabit the mangrove ecosystem, given the high biodiversity value associated with this particular

### \*Author for Correspondence

Puja Vijay

E-mail: [pujavijay1994@gmail.com](mailto:pujavijay1994@gmail.com)

<sup>1</sup>Assistant Professor, PG Department of Geology, Sree Narayana College, Sreenivasapuram, Varkala, Kerala, India

Received Date: April 01, 2024

Accepted Date: May 02, 2024

Published Date: May 14, 2024

**Citation:** Puja Vijay, Nisha Keshav, Shynu R., Sreela, S.R., Vishnu Mohan S., Aadithya. Molluscan Distribution in and Around Munroe Island, Kollam, Kerala. International Journal of Marine Life. 2024; 1(1): 1–7p.

ecological niche where a variety of aquatic organisms, such as mollusks, have been documented [8]. The mangrove ecosystem, in addition to its biodiversity, offers several advantages; for instance, ecologically, mangroves have the capacity to mitigate atmospheric carbon dioxide levels [1]. Among the organisms found within this ecosystem, mollusks stand out, particularly those classified as bivalves and gastropods, due to their significant contributions to the functioning of both mangrove and marine ecosystems [7].

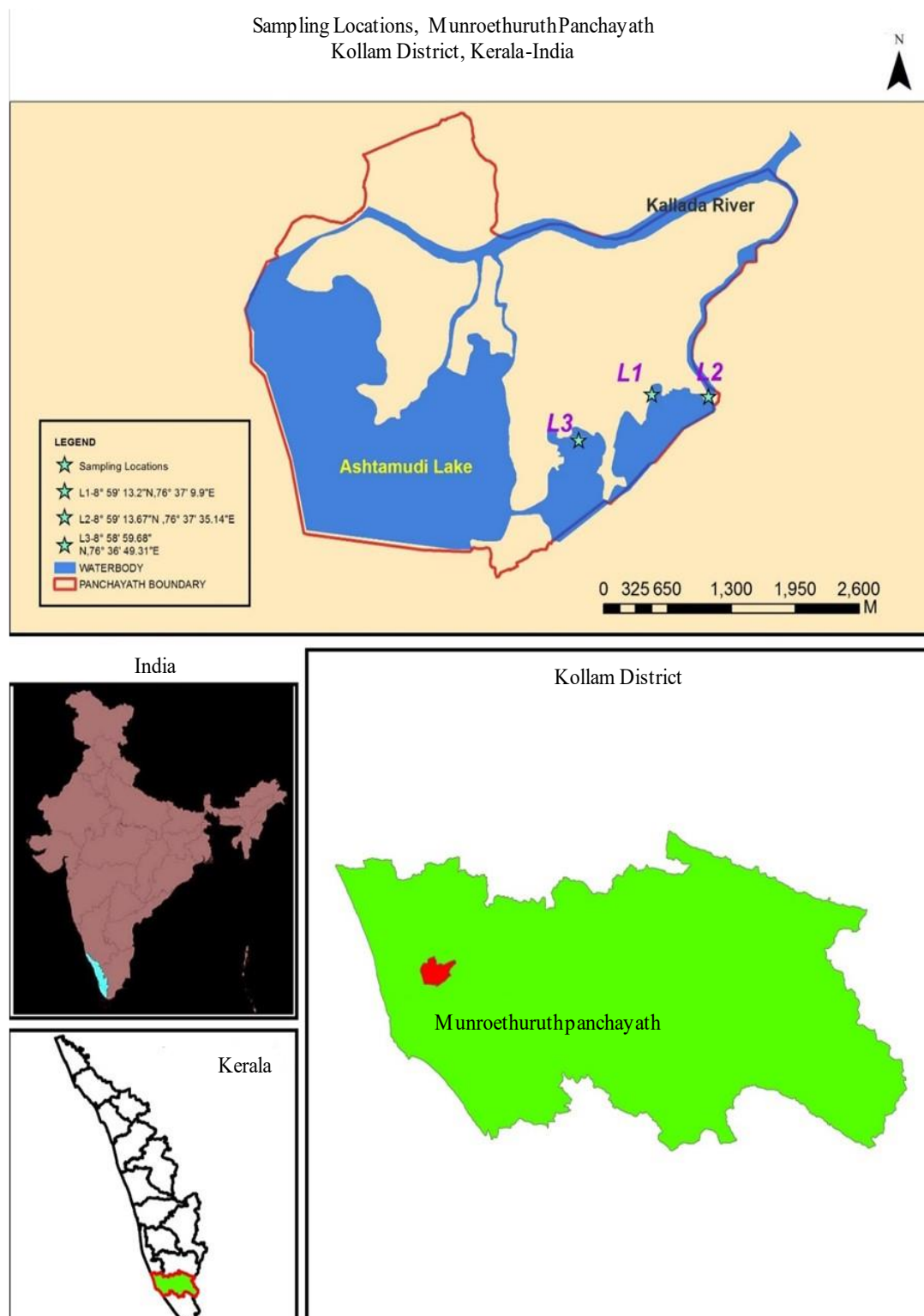
Mollusks, being macrobenthic organisms, are known to be predominant in the mangrove ecosystem [12]. Numerous research endeavors have been globally undertaken to explore the variety of gastropods and bivalves present in different mangrove habitats [6,5]. A multitude of investigations have been carried out regarding the diversity of gastropods and bivalves inhabiting the mangroves of India. Up to this point, a total of 215 mollusk species (inclusive of arboreal species) have been documented in Indian mangrove environments [3].

Munroe Island, situated at the confluence of Ashtamudi Lake and the Kallada River in Kollam district, Kerala, is a collection of eight small islets with a combined area of approximately 13.4 km<sup>2</sup>. The gastropods of Munroe Island have received limited attention in research, prompting this study to investigate the gastropod population on the island.

## MATERIALS AND METHODS

Sampling was conducted at three distinct locations: location 1 (L1) located at 8°59'02" N, 76°37'9" E; location 2 (L2) situated at 8°60'06" N, 76°37'14" E; location 3 (L3) positioned at 8°58'68" N, 76°36'31" E. situated along Munroe Island in Kollam, India (Figure 1). The specimens were gathered, meticulously marked, and enclosed in zip lock bags. Samples from the lake were obtained with a medium-sized Van Veen grab. Gastropods were collected by hand picking method. Handpicked sample were transported to laboratory for identification at species level. Location 3 (L3) was specifically chosen in close proximity to the Kallada river. The turbid and contaminated waters from the Kallada river flow into an estuary carrying high concentrations of suspended particles, there by impeding light penetration and inhibiting photosynthetic processes. The entrance of the Kallada River into the Ashtamudi estuary marks a significant point. With a maximum length of 16 kilometers and a breadth of 14 kilometers, the lake maintains a passage to the sea at its western end known as Neendakara Bar. The adequate depth of the bar's mouth supports the navigation of small vessels and barges, while a 440-meter road bridge extends across the backwater near the Neendakara bar. Various distinct zones have been identified within the lake, including the River zone characterized by paper mill effluents, manual dredging, CO<sub>2</sub> processing, and heavy siltation. The Confluence zone faces siltation from the river mouth and is impacted by isolated retting and paper mill effluents. Kanjirakode, the interior mouth segment, features algal and seagrass beds, intense fishing activities, coir processing, clam beds, and industrial pollutants. Ashtamudi, the central segment of the estuary, is marked by intensive fishing, isolated retting, and scattered algal beds. Chavara, situated in the interior area of the estuary, experiences pollution from coconut husk retting. Thopilkadavu is characterized by isolated retting, coir processing, and shelters, while Kandarachira, located in the interior region of the estuary, displays intense retting and sewage pollution. The Marine zone, closest to the Arabian Sea and encompassing the Neendakara harbor area, serves as a major fish landing center on the southwestern coast of India, boasting several small islands abundant in algae and clams. The current investigation was conducted over a brief duration, focusing on just 3 randomly selected locations. It is imperative to conduct comprehensive research across multiple sites for an extended period to gain a deeper insight into the distribution of gastropods along Munroe Island. Scanning Electron Microscope (SEM) images of gastropods were taken at the Central Instrumentation and Facilitation (CLIF) facility located at the University of Kerala.

The Munroe Island in Kollam district was created through the process of sediment deposition by the Kallada River and Ashtamudi Lake, hence its origin is lacustrine. The archipelago consists of eight smaller islands. Currently, the island has become a popular destination for tourists attracted by its natural beauty and the presence of numerous interconnected canals. Both modern and traditional aquaculture practices can be observed in the area. Settlements are scattered among coconut plantations, with mixed coops dominating the land use in the higher areas of the island. Historical large-scale coir retting activities have now become limited to a few specific locations. In recent years, the island has faced a significant threat from rising water levels, leading to flooding and subsequent subsidence of 3 to 4 meters, posing a major challenge for the local inhabitants. Various factors such as improper agricultural techniques, recent construction projects, and climate variations have contributed to the sinking of the island.



**Figure 1.** Map of Munroe Island showing study sites

## TAXONOMIC DESCRIPTION OF GASTROPODS FOUND IN MUNROE ISLAND

Order: Littorinimorpha

Family: Littorinidae

Genus: *Littoraria*

Species: *Littoraria pallescens* [10]

### Description

The elongated shell of *L. pallescens* tapers at the ends, with a very small and soft tapered shape. Resembling a thread roll up, it forms a pyramid. Like in the subclass Prosobrancia, *L. pallescens* has a shell cover, also known as a purplish operculum. While this species may appear similar to other *Littoraria* species, it can be distinguished by examining the color of the shell cover or operculum. *L. pallescens* can be found living on any species of mangrove tree, scattered on the leaves, branches, and roots [13].

### Remarks

*Littoraria pallescens* *Littoraria pallescens* is discovered in location-3, adjacent to the Kallada river, and it inhabits regions with elevated turbidity levels. The estuary receives the turbid and polluted waters from the Kallada river, which transport significant amounts of suspended particles.

### Dimension

The shell color of this marine mollusk can provide clues about its habitat and development. In terms of physical characteristics, this sea snail features a conical shape with two distinct variations, specifically light and dark. The dimension of shell range from 15 mm to 18 mm.

*Order:* Littorinimorpha

*Family:* Assimineidae

*Genus:* Assiminea

*Species:* Assiminea woodmasoniana [9]

### Description

*Assiminea woodmasoniana* [Figure 2(e) (f)] stands out as one of the most elongated species within its genus. During its lifetime, the shell of this species exhibits a blackish and glossy appearance. Additionally, the animal boasts black eyes and a reddish patch beneath each eye stalk [14]

### Remark

*Assiminea woodmasoniana*, a remarkably elongated species found in the genus, is regarded as a rare and recently identified discovery in Kerala. This species has been observed along the Bengal coasts in India, Thailand, Andaman Islands, and Sumatra. Notably, *Assiminea woodmasoniana* thrives abundantly in location 2.

### Dimension

Measuring approximately 3.7 mm in length, the shell possesses a unique spiral thread located midway between the suture and the outer edge.

*Order:* Cephalaspidea

*Family:* Tornatinidae

*Genus:* Acteocina

*Species:* Acteocina decorata [11]

### Description

The snails are commonly referred to as "bubble snails", with their shells being called "bubble shells" due to the highly inflated shell of certain species, which is nearly spherical in shape, thin, and lightweight.

### Remarks

oval-shaped external shells that are spacious enough to house the entire snail when it withdraws. The shells of all species exhibit a similar shape, featuring a profound, slender umbilicus at the highest point.

### Dimension

Measuring approximately 3.5 mm in length and the lack of an operculum is clearly visible.

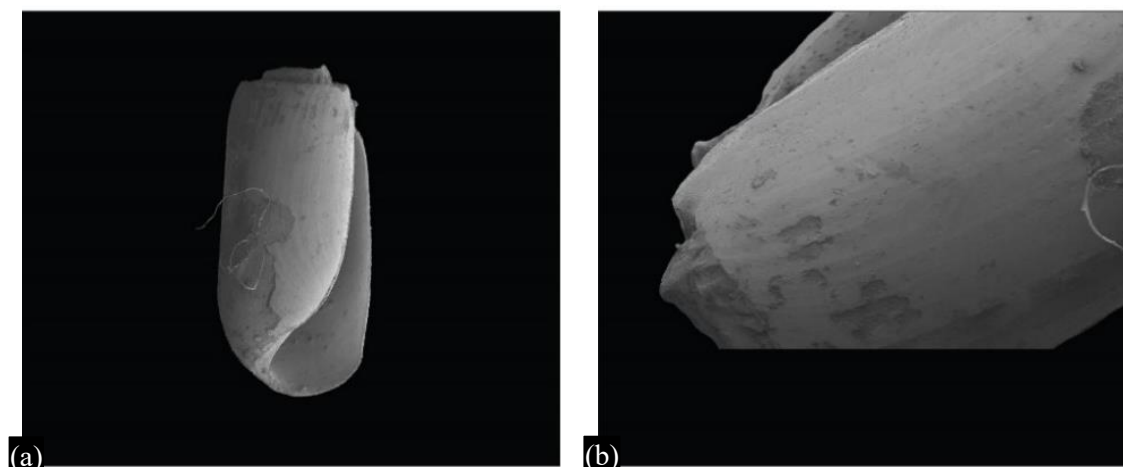
## RESULTS AND DISCUSSION

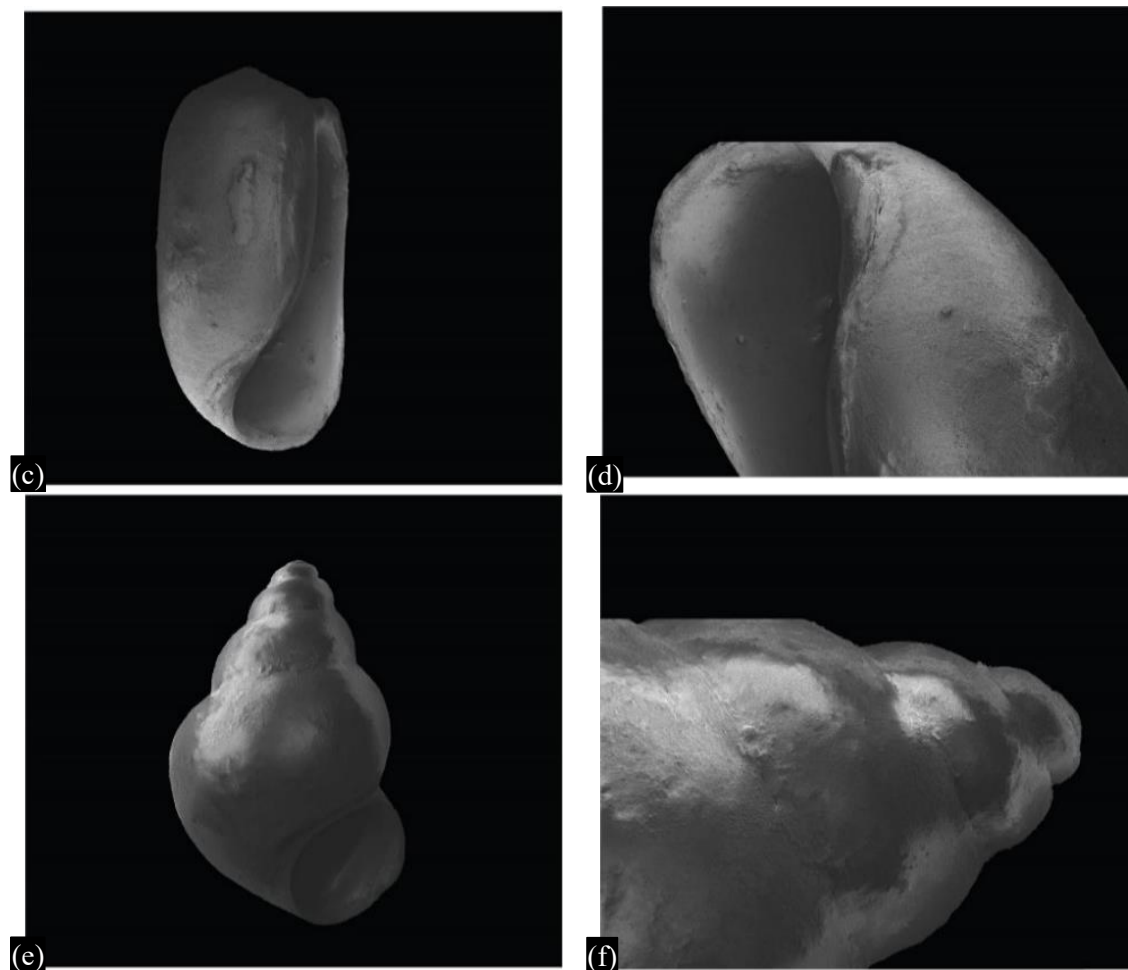
The Munroe Island in Kollam district was created through the process of sediment deposition by the Kallada River and Ashtamudi Lake, hence its origin is lacustrine. The archipelago consists of eight smaller islands. Currently, the island has become a popular destination for tourists attracted by its natural beauty and the presence of numerous interconnected canals. Both modern and traditional aquaculture practices can be observed in the area. Settlements are scattered among coconut plantations, with mixed coops dominating the land use in the higher areas of the island. Historical large-scale coir retting activities have now become limited to a few specific locations. In recent years, the island has faced a significant threat from rising water levels, leading to flooding and subsequent subsidence of 3 to 4 meters, posing a major challenge for the local inhabitants. Various factors such as improper agricultural techniques, recent construction projects, and climate variations have contributed to the sinking of the island [15]. The *Littoraria pallescens* can be found in location-3, near the Kallada river, where it prefers habitats with high levels of turbidity. The estuary is influenced by the turbid and contaminated waters from the Kallada river, carrying substantial quantities of suspended particles. The color of the shell of this marine mollusk can offer insights into its environment and growth. This sea snail has a conical shape with two different color variations, light and dark. The size of the shell typically falls within the range of 15 mm to 18 mm.

*Assiminea woodmasoniana*, an exceptionally elongated species discovered within the genus, is considered a rare and newly recognized finding in Kerala. This particular species has been documented along the coasts of Bengal in India, Thailand, the Andaman Islands, and Sumatra. It is worth mentioning that *Assiminea woodmasoniana* flourishes abundantly in location 2. With a length of approximately 3.7 mm, the shell showcases a distinctive spiral thread positioned midway between the suture and the outer edge.

*Acteocina decorata* [Figure 2 (a) (b)] are often known as "bubble snails", and their shells are referred to as "bubble shells" because of the inflated shell of certain species, which is almost perfectly round, thin, and lightweight. The external shells are oval-shaped and provide enough space for the entire snail to retract into. All species have shells with a similar shape, characterized by a deep, slender umbilicus at the top. The absence of an operculum, which is easily noticeable, is another distinguishing feature, with the snails measuring approximately 3.5 mm in length.

The taxonomic nomenclature of *Cylichna lemchei* [16] [Figure 2 (c) (d)] and *Acteocina decorata* [11] is still uncertain, despite the possibility of them belonging to the same family. To resolve this uncertainty, a comprehensive analysis will be carried out to determine the classification of these species. It is worth noting that both species were previously classified under the genus *Bulla*. *Acteocina decorata* [11] *Bulla voluta* Quoy & Gaimard, 1833 (in 1832–1833): 359, 360, pl. 26 figs. 33–35 (type locality: Guam) (junior primary homonym of *Bulla voluta* Gmelin, 1791).





**Figure 2.** (a, b) *Acteocina decorate*, (c, d) *Cylichna lemchei*, (e, f) *Assiminea woodmasoniana* [9,11, 16].

## REFERENCES

1. Analuddin, K., La Ode, K., La Ode, M.Y.H., Andi, S., Idin, S., La, S., Rahim, S., La Ode, A.F., Kazuo, N. (2020). Above ground biomass, productivity and carbon sequestration in *Rhizophora stylosa* mangrove forest of Southeast Sulawesi, Indonesia. *Biodiversitas Journal of Biological Diversity*, 21(4).
2. Bloch, C.P. (2012). Why snails? How gastropods improve our understanding of ecological disturbance. *Bridgewater Review*, 31, 8–13.
3. Boominathan, M., Ravikumar, G., Chandran, M.S., Ramachandra, T. (2012). Mangrove associated molluscs of India, in: National Conference on *Conservation and Management of Wetland Ecosystems*. pp. 1–11.
4. Davis, J.P., Pitt, K.A., Connolly, R.M., Fry, B. (2015). Community structure and dietary pathways for invertebrates on intertidal coral reef flats. *Food Webs*, 3, 7–16.
5. Ghasemi, S., Zakaria, M., Mola Hoveizeh, N. (2011). Abundance of molluscs (Gastropods) at mangrove forests of Iran. *Journal of American Science*, 7, 660–669.
6. Jiang, J., Li, R. (1995). An ecological study on the Mollusca in mangrove areas in the estuary of the Jiulong River. *Hydrobiologia*, 295, 213–220.
7. Kantharajan, G., Pandey, P., Krishnan, P., Samuel, V.D., Bharti, V., Purvaja, R. (2017). Molluscan diversity in the mangrove ecosystem of Mumbai, west coast of India. *Regional Studies in Marine Science*, 14, 102–111.
8. Murniati, D.C., Pratiwi, R. (2015). *Kepiting uca di hutan mangrove Indonesia: tinjauan aspek biologi dan ekologi untuk eksplorasi*. LIPI press.

9. Nevill G. (1881). Description of a new species of *Rostellaria*, from the Bay of Bengal. *Journal of the Asiatic Society of Bengal*, 50 (Part 2), 262.
10. Philippi R., A. (1849). Centuria tertia testaceorum novorum. *Zeitschrift für Malakozoologie*, 5, 161–176.
11. Pilsbry H., A. (1904). New Japanese marine Mollusca: Gastropoda. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 56, 3–37.
12. Satheeshkumar, P., Khan, A.B. (2012). Influence of environmental parameters on the distribution and diversity of molluscan composition in Pondicherry mangroves, southeast coast of India. *Ocean Science Journal*, 47, 61–71.
13. Thiele J. (1925). Gastropoden der Deutschen Tiefsee-Expedition. II Teil. Wissenschaftliche Ergebnisse der Deutschen Tiefsee Expedition auf dem Dampfer “Valdivia” 1898-1899, 17, 35–382.
14. Ullah, Z., Zehra, I., Gondal, M.A. (2015). Species diversity, distribution and seasonal abundance in mangrove associated molluscs along the Karachi Coast, Pakistan. *Journal of Bioresource Management*, 2, 2.
15. Vishwanathan, C., Biju Kumar, A. (2023). Diversity and spatial distribution of molluscs along the salinity gradient in Ashtamudi Lake Ramsar site, Kerala, India. *Zoological Survey of India* (special issue), 1–359.
16. Voisin, C., Voisin, J.-F., Jouanin, C., Bour, R. (2004). Liste des types d’oiseaux des collections du Muséum national d’Histoire naturelle de Paris. 13: Gangas et Pigeons (Pteroclididae et Columbidae), première partie. *Zoosystema*, 26, 107–128.