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Species composition and abundance of mangrove gastropods in Desa Sutera, Kayong Utara, West Kalimantan

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ABSTRACT

The mangrove ecosystem in Desa Sutera, Kayong Utara Regency, West Kalimantan, Indonesia, serves as a habitat for various species of gastropods, many of which hold significant ecological and economic value. Data collection on gastropod species in this region is vital for establishing a baseline understanding of coastal and marine biodiversity, which is essential for the development of integrated and sustainable coastal management strategies. This study aimed to assess the species composition and abundance of mangrove gastropods in Desa Sutera. Sampling was conducted in May 2024 during low tide across four stations using quadrat transects. Thirteen species of mangrove gastropods were identified, representing nine genera and seven families, including *Chicoreus capucinus, Clypeomorus bifasciata, Cassidula nucleus, Littoraria carinifera, L. melanostoma, L. scabra, Onchidium sp., Nerita balteata, Neripteron violaceum, Pirenella alata, P. cingulata, Cerithidea quoyii*, and *C. obtusa.* Among these, *P. cingulata* and *L. carinifera* were the most abundant, whereas *L. melanostoma* and *C. obtusa* were the least prevalent. The gastropods were found inhabiting sandy and rocky substrates, as well as attached to the roots, trunks, and leaves of mangrove trees. This finding offers essential insights into the biodiversity and community structure of mangrove gastropods in the region, forming a basis for conservation and management strategies to protect this vital ecosystem.

Keywords: Gastropod, Littoraria, macrozoobenthos, mangrove, Pirenella

INTRODUCTION

Gastropods represent the largest class of molluscs (Albert et al., 2022), with around 80,000 - 100,000 identified species (Bouchet et al., 2005; Schiaparelli and Linse, 2014), that are widely distributed in freshwater, marine, and terrestrial environments (Zaidi et al., 2021; Haumahu dan Uneputty, 2022; Safitri et al., 2024). Additionally, 61 of these species are found living within the mangrove ecosystem, such as *Cerithidea*, *Chicoreus*, *Clithon*, *Ellobium*, *Littoraria*, *Nerita*, *Onchidium*, *Telescopium*, and *Terebralia* (Purnama et al., 2024), which can be found on the surface of the substrate (epifauna), inside the substrate (infauna), or on mangrove trees (treefauna). Previous study has reported that certain species are used by coastal communities as alternative sources of animal protein, like *C. obtusa*, *T. telescopium*, and *T. palustris* (Checon et al., 2023; D'Souza and Shenoy, 2023, Warsidah et al., 2024).

In Desa Sutera, located in Kayong Utara, West Kalimantan, mangrove forests support diverse marine and terrestrial species. Mangrove ecosystems are critical coastal habitats that provide numerous ecological benefits, including coastal protection, carbon sequestration, and serving as breeding and nursery grounds for various marine species (Islamy and Hasan, 2020; Arceo-Carranza et al., 2021; Wiraatmaja et al., 2022). Wang and Gu (2021) noted that nearly 90% of aquatic organisms complete their life cycles within mangrove ecosystems. This is due to the role of mangroves as nutrient providers (Cock et al., 2021). Mangrove forests generate litter that microorganisms break down into nutrients, which are then directly available to the biota (Selviani et al., 2024).

However, these habitats face increasing pressure from human activities such as coastal development, deforestation, and pollution. Such pressures can directly impact the species composition and population dynamics of gastropods, as they are particularly sensitive to environmental changes. Understanding how these gastropod populations are structured and how abundant they are in this area is important for managing and conserving mangrove ecosystems effectively.

Figure 1. Sampling location of mangrove gastropods in Desa Sutera, West Kalimantan, Indonesia.

Among the rich biodiversity in mangrove ecosystems, gastropods play a significant ecological role, contributing to nutrient cycling and acting as bioindicators of environmental health. Previous study has highlighted the role of molluscs as keystone species in mangrove ecosystems (Ortega-Jiménez et al., 2021), such as *Sphaerassiminea miniata* serves as a bioindicator of the environmental conditions within mangrove habitats (Purnama et al., 2024). The study of gastropod species composition and abundance within mangroves is therefore essential for understanding both ecosystem health and the effects of environmental changes. Therefore, the aim of this study was to evaluate species composition and abundance of mangrove gastropods in Desa Sutera, Kayong Utara, West Kalimantan.

METHOD

Study area

This study was conducted in May 2024 in the mangrove area of Desa Sutera, Kayong Utara Regency, West Kalimantan (Figure 1). The mangrove forest in this region has been established as an ecotourism area. Several types of mangroves found include *Avicennia*, *Bruguiera*, *Ceriops*, *Lumnitzera*, *Nypa*, *Rhizophora*, *Sonneratia*, and *Xylocarpus* with the mangrove density is quite high, as evidenced by the greater number of mature trees compared to saplings or seedling.

The sampling locations were selected qualitatively using a purposive sampling approach. Samples were collected from four stations with different environmental conditions.

Station I (01°14’32.56” NL, 109°57’04.59” EL) is closed to residential area, station II (01°14’57.63” NL, 109°56’46.07” EL) is the Sukadana mangrove tourism, station III (01°15’44.24” NL, 109°57’05.87” EL) is tourist site of Pulau Datok beach, while station IV (01°15’44.24” NL, 109°57’05.87” EL) is far from human activity.

Data collection

The samples collection was carried out using 1x1 m^2 plots, which were set up at each station upon the initial discovery of gastropods. Transects were established 40 m inland, with plots spaced 20 m apart. The plotting was repeated three times, with each repetition extending 5 m towards the shoreline. Epifauna and tree faunal gastropods were gathered manually (hand picking) using hand scoops and gloves (Purnama et al., 2019; Salwiyah et al., 2022). At each sampling site, water samples were obtained alongside gastropods collection, with three replications. Measurements of physical and chemical parameters such as pH, temperature, salinity, and DO were done using AZ 86031 Water Quality Checker instrument, soil pH was conducted using soil tester HI 98331 HANNA instrument, while substrate type was conducted using a coring method.

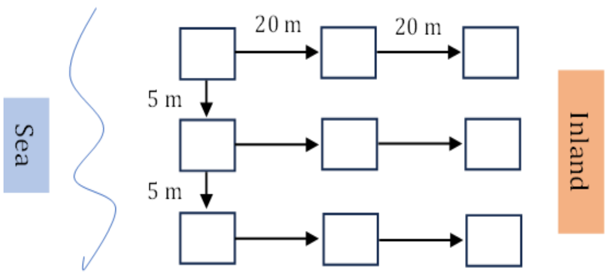

Figure 2. Scheme of gastropods collection using quadratic transect.

Gastropod identification was carried out at the Laboratory of Marine Science, Universitas Tanjungpura. Species identification process involves observing morphological features such as shell shape, ornamentation, and aperture structure. The identification of gastropods was based on resources such as the "World Register of Marine Species" (https://www.marinespecies.org), molluscabase (https://www.molluscabase.org), and the Collection of Worldwide Seashells (https://idscaro.net), along with various reputable journals and textbooks including Dharma (1988, 2005), Poutiers (1998), Cappenberg et al. (2006), Arbi (2014), and Dolorosa and Gallon (2014), Reid and Ozawa (2016), Zvonareva and Kantor (2016), Islamy and Hasan (2020), Hilmi et al. (2022).

Data analysis

Species abundance refers to the number of individuals of different gastropod species per square area in mangrove habitat. The gastropod’s abundance was assessed following the formula by Yasman (1998):

$$K = \frac{\mathrm{ni}}{\mathrm{A}} \quad \ldots\ldots\ldots\ldots (1)$$

where, K is abundance of gastropod’s species (ind/m^2), n_i is the individual amounts of gastropods (ind), and A is the sampling area (m^2).

The diversity index (H’) of gastropod was determined using Shannon-Wiener formula (Odum, 1993) :

$$H' = \sum_{i=1}^{n} \left(\frac{\mathrm{ni}}{\mathrm{N}}\right) \ln (\mathrm{ni}/\mathrm{N})$$

where, H’ represents the diversity index, n_i is the individual amounts of gastropods (ind), and N is the total number of gastropods (ind). The criteria for the diversity index are categorized into three levels (Wilhm, 1975), H'<1 indicates low species diversity, 1< H’ ≤ 3.0 reflects medium species diversity, and H’>3.0 signifies high species diversity.

Evenness index (E) was calculated using the formula by Odum (1993), as follows:

$$E = \frac{H'}{\ln S}$$

where H’ is diversity index and S is the total of gastropod’s species found. The value of Evenness index is divided into three categories, E < 0.31 reflect low level of uniformity, 0.31>E>1 identifies medium level of uniformity, and E>1 indicates high level of species uniformity.

The dominance index (C) measures the dominance of particular species in a community. It determines whether the community is dominated by one or a few species or is more evenly distributed. The formula to calculate the dominance index is (Odum, 1993):

$$C = \sum \left(\frac{ni}{N}\right)^2$$

where, n_i represents the number of individuals of species iii, and N is the total count of individuals across all species. The criteria for the dominance index are as follows:

- If 0<C<0.5, no species dominates the community
- If 0.5<C<1, a dominant species is present

RESULTS AND DISCUSSION

Composition of mangrove gastropods

In the study area, thirteen species of mangrove gastropods were identified, belonging to nine genera and seven families (Figure 3, Table 1). These gastropods exhibited varied morphological feature, such as *C. capucinus* has a brown to black shell on the upper surface and a light brown to whitish hue on the lower surface. The spire is serrated, and the apex is blunt. The average shell length is 4.2 cm and shell width of 2.3 cm. Species of *N. balteata* has a round-shaped shell, both the outer and inner lips are white and shiny. The bodywhorl is short and coiled, with the dextral rotation. The shell length is 4 cm and a width of 2.8 cm. *C. bifasciata*, locally known as "Tengkuyung Serai" in Desa Sutera, has a brown shell with a white tip near the pointed apex and a serrated spire. It averages 2.1 cm in length and 1.1 cm in width, while *N. violaceum* is a small gastropod with a dark brown shell, averaging 1.5 cm in length and 1.1 cm in width. *P. alata* has a dextral shell, averaging 3 cm in length and 1.2 cm in width. *C. nucleus* has a brown shell, the body whorl surface is smooth, and the spire is convex. The outer lip is thick, wide, and smooth internally, with both lips exhibiting a shiny appearance. Its shell averages 2.6 cm in length and 1.5 cm in width. *L. scabra* is characterized by a shell with a brownish-yellow color and patterned lines, with the average shell length is 1.73 cm and shell width of 1.1 cm.

In mangrove ecosystem, gastropods display varied ecological behaviours and adaptations, including food acquisition characteristics that enable them to thrive in the dynamic and changing conditions of these environments (Figure 4). Gastropods predominantly occupy the substrate and mangrove vegetation, including roots, stems, leaves, and twigs. Certain gastropod species even inhabit rocky surfaces by attaching themselves to the rocks.

Several species of gastropods from the genus *Chicoreus* are native to mangrove ecosystems, where they are primarily found as epifauna, though they are sometimes spotted on mangrove trees as well. Most of them are carnivorous and feed on a variety of worms (Ernawati et al., 2019). In the study site, *Cassidula* is recognized as a native species (Merly et al., 2022), inhabiting on substrate surface or climbing on *Rhizophora* roots and trunks. This genus is widely distributed in tropical waters (Hilmi et al., 2022; Mawardi et al., 2023), including West Kalimantan. The Littorinidae family is categorized as facultative gastropods (Susanti et al., 2021), capable of inhabiting both mangrove ecosystems and other environmental settings.

L. melanostoma and *L. scabra* exhibit both vertical and horizontal distribution patterns (Khade and Mane, 2012; Marshall et al., 2015), adhering to the roots, trunks, and leaves of mangrove plants, particularly *Avicennia* sp. The coarse surfaces of these structures provide optimal habitats for biofilm development, which serves as a primary food source for these gastropods. *Littoraria* species are described as opportunistic feeders, consuming a range of food sources such as mangrove tissues, fungi, microalgae, and algal filaments (Jensen, 2000;

Alfaro, 2008). *Cerithidea* snails are broadly distributed across the Western Indo-Pacific, including regions such as the Philippines, Malaysia, Indonesia, and Papua New Guinea. Recognized as a native species (Yuliawati et al., 2021), they are commonly found in brackish waters and intertidal zones.

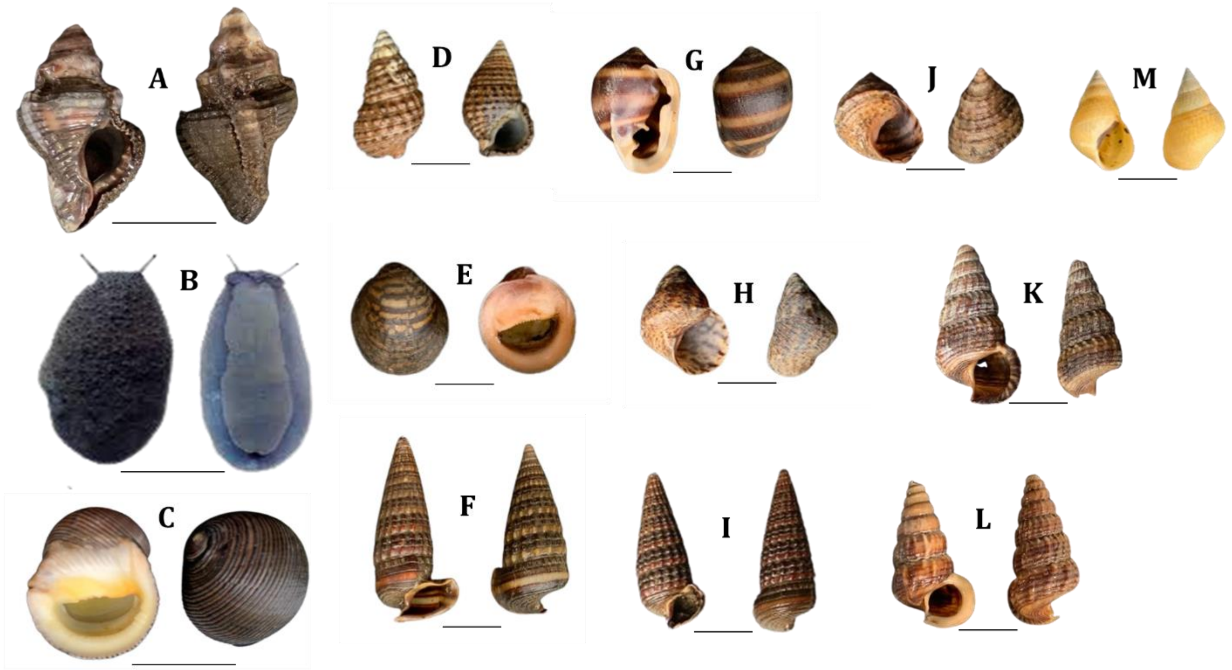

Figure 3. Mangrove Gastropods in Desa Sutera (A) *Chicoreus capucinus* (B) *Onchidium* sp. (C) *Nerita balteata* (D) *Clypeomorus bifasciata* (E) *Neripteron violaceum* (F) *Pirenella alata* (G) *Cassidula nucleus* (H) *Littoraria scabra* (I) *Pirenella cingulata* (J) *Littoraria carinifera* (K) *Cerithidea quoyii* (L) *Cerithidea obtusa* (M) *Littoraria melanostoma* (Scale A-C : 2 cm, D-M : 1 cm)

Table 1. Species of mangrove gastropods at each station in Desa Sutera, Kayong Utara Regency

Family	Species	English Name	Way of life	Sampling location			
				I	II	III	IV
Muricidae	*Chicoreus capucinus*	Quadrate Murex	EF, TF	+	+	+	-
Cerithiidae	*Clypeomorus bifasciata*	-	EF	-	-	+	-
Ellobiidae	*Cassidula nucleus*	Banded Mangrove Helmet Snail	EF, TF	+	+	-	-
Littorinidae	*Littoraria carinifera*	Carinate Periwinkle	TF	+	+	+	+
	Littoraria melanostoma	Periwinkle Snail Black Mouth Littorine	TF	+	-	-	+
	Littoraria scabra	Rough Periwinkle	TF	+	+	+	+
Neritidae	*Nerita balteata*	Lined Nerite	EF, TF	+	+	-	-
	Neripteron violaceum	Red-mouth Nerite	EF, TF	-	-	-	+
Onchidiidae	*Onchidium* sp.	Mangrove Slug	EP, TF	+	+	-	+
Potamididae	*Pirenella alata*	-	EP, TF	+	-	+	+
	Pirenella cingulata	Horn Shell	EF, TF	+	+	+	+
	Cerithidea quoyii	Quadrate Horn Shell	EF, TF	+	+	-	+
	Cerithidea obtusa	Obtuse Horn Shell	EF, TF	+	-	-	-

Note: (+) presence; (-) absence; (EF) epifauna; (TF) tree fauna

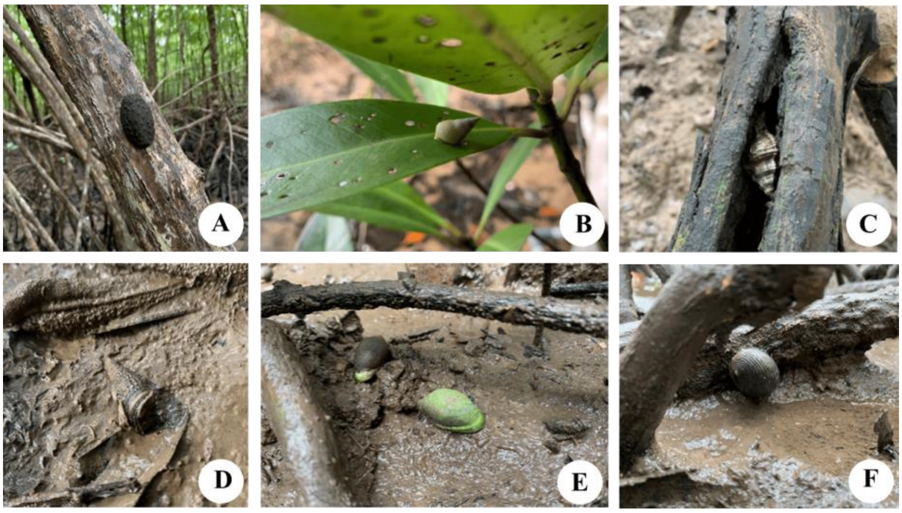

Figure 4. Regular behavior of various gastropod species within the mangrove ecosystem of Desa Sutera (A) *Onchidium* sp. (B) *L. melanostoma* (C) *C. capucinus* (D) *P. alata* (E) *C. nucleus* (F) *N. balteata*

Htwe and Oo (2019) has reported that *C. obtusa* is both an epifaunal and arboreal species, commonly attaching to the roots and trunks of mangrove trees at heights of 1-2 meters. During low tide, these snails temporarily descend to the substrte for foraging and then ascend back to the mangrove trunks before high tide when they cease foraging activities (Oo and Oo, 2019). Thus, as an epifaunal species, *Pirenella* feeds by benthic grazing, consuming microalgae, diatoms, and organic detritus (Solanki et al., 2017).

Species abundance of mangrove gastropods

In the mangrove area of Desa Sutera, a total of 1068 individual mangrove gastropods were collected, and the abundance of individuals varies among the different gastropod species. *P. cingulata* and *L. carinifera* were the most abundant species with total abundance of 24.89 ind/m^2 and 24.67 ind/m^2, respectively. Additionally, *C. bifasciata* (22 ind/m^2) and *P. alata* (20.11 ind/m^2) also showed high density at the study site. Meanwhile, *L. melanostoma* and *C. obtusa* were the least common, with only 0,89 ind/m^2 recorded (Figure 5).

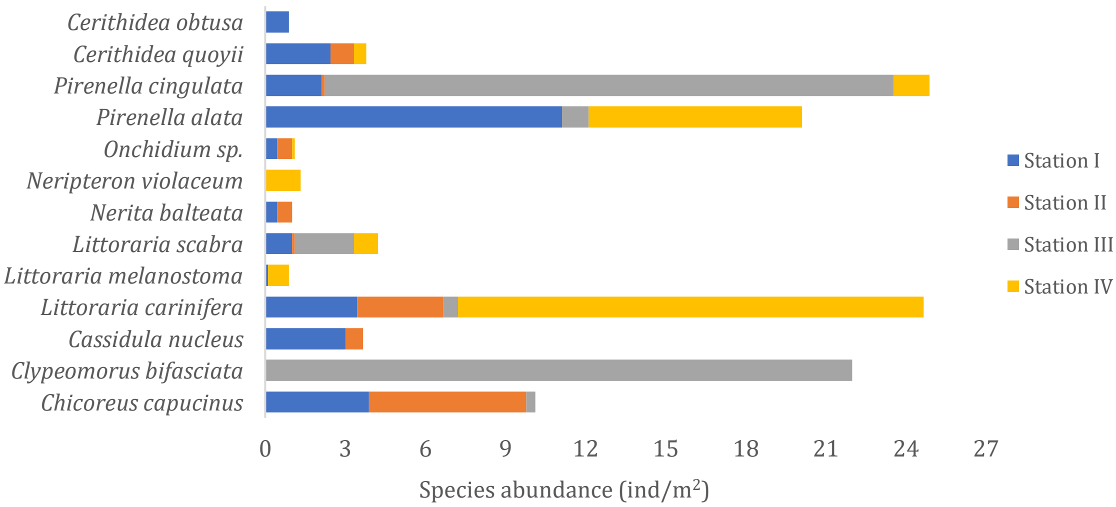

Figure 5. Species abundance of mangrove gastropods in Desa Sutera, Kayong Utara Regency West Kalimantan, Indonesia.

Hundreds *P. cingulata* individuals were recorded on the forest floor in the mangrove area of Desa Sutera, particularly at station III, which is characterized by sandy substrates. Sindern et al. (2022) reported that *P. cingulata* typically thrives in open sandy environments, making the mangrove habitat in Desa Sutera an ideal condition that supports its high abundance at the study site. Previous study has also reported a high abundance of *P. cingulata* in mangrove habitats (Sandaruwan et al., 2024) and can be found throughout all seasons (Jatav et al., 2022), where it is also used for biomonitoring mangrove health (Joseph dan Ramesh, 2016; Basyuni et al., 2022). In addition, the genus of *Pirenella* is known for inhabiting extreme environments, such as brackish estuaries, hypersaline lagoons, and inland lakes (Islamy and Hasan, 2020). *P. cingulata* is characterized as an opportunistic snail species with a rapid growth rate. In brackish water, it is considered a pest, as the limited presence of predators and competitors facilitates swift population growth (Zvonareva and Kantor, 2016). The prevalence of *P. cingulata* among gastropod species likely indicates its high adaptability and resilience to changing environmental conditions. This dominance suggests that it is well-suited to cope with fluctuations in its habitat. This adaptability plays a vital role in ensuring the sustainability of gastropod populations (Nicolai and Ansart, 2017; Leung et al., 2019).

The Littorinidae family exhibited polymorphism, displaying color variations such as beige and yellow-orange, with dark brown being the most common (Zeidan et al., 2020), as obtained at the study site. Species of *L. carinifera* exhibited the highest abundance, that it appears to be well adapted to fluctuating water conditions. It is closely linked to mangrove habitats, commonly found residing on the roots and trunks, particularly within *Rhizophora* sp., where it prefers strata close to the ground and more shaded areas. The dense root systems of mangroves in the study site also offer stability and shelter, contributing to a more favorable microhabitat. Furthermore, the high density of *L. carinifera* observed at station IV, a mangrove forest located far from human activities, suggests that such areas typically feature more stable and intact habitats. Previous studies in West Kalimantan have also documented the presence and abundance of this species within mangrove vegetation (Rupmana et al., 2021; Yugovic et al., 2024). These findings highlight the significance of mangrove ecosystems as key habitats for *L. carinifera* and emphasize the role of mangrove environments in supporting the species' populations. This species tends to be more abundant in undisturbed environments due to favourable habitat conditions. In well-preserved mangrove ecosystems, essential ecological functions like nutrient cycling and substrate stability are maintained, supporting the growth of *L. carinifera* populations.

Clypeomorus bifasciata is another species observed in high abundance, particularly at station III, located at the tourist area Pantai Pulau Datok. This site is defined by rocky substrates, which align with the species' habitat preference. Several studies have also reported occurrence and high abundance of this species (Baxi et al., 2017; Mashar et al., 2021; Vian et al., 2022; Isroni et al., 2023) in mangrove habitat. This snail is an epifaunal species commonly found in environments such as the intertidal zone, estuaries, and areas surrounding mangrove vegetation. It frequently occupies diverse substrates, including rocky surfaces, limestone formations, as well as muddy or sandy substrates between the pneumatophores of *Avicennia* (Soekendarsi, 2019).

Ecological index of mangrove gastropods

The ecological index of mangrove gastropods, such as species diversity (H’), evenness (E), and dominance (C) (Table 2) provides crucial insights into the health and stability of mangrove ecosystems. Measuring this index is important for assessing the ecological balance and detecting potential environmental changes, that helps in understanding the role of gastropods as bioindicators.

Table 2. Ecological indices of mangrove gastropods in Desa Sutera, Kayong Utara

Index	Station I	Station II	Station III	Station IV
Diversity index (H')	1.90	1.43	0.88	1.12
Evenness index (E)	0.79	0.69	0.49	0.54
Dominance index (C)	0.21	0.33	0.42	0.41

In this study, the diversity index values ranging from 0.88 to 1.90, indicated moderate biodiversity within the ecosystem. A moderate biodiversity index generally indicates a transitional phase where species richness and evenness are present but not maximized. This can suggest a relatively stable ecosystem, providing sufficient resources like food and shelter for gastropod species, yet facing certain ecological pressures that restrict higher diversity. In mangrove ecosystems of Desa Sutera, moderate biodiversity among gastropods can be influenced by factors such as salinity fluctuations, substrate variability, and anthropogenic influences like pollution. These factors may constrain species diversity while still supporting a functional community. Assessing moderate biodiversity levels is critical as it acts as an early warning signal for ecosystem health, emphasizing the importance of ongoing monitoring and potential conservation measures to prevent further loss of biodiversity.

The evenness index (E) of gastropods in the mangrove area of Desa Sutera, ranging from 0.49 to 0.79, suggests variability in species distribution within the community. A higher evenness value, suggests a more equitable distribution of individuals among the gastropod species, where no single species dominates the ecosystem. This balanced distribution might be an indication that resources such as food, space, and habitat conditions are being shared relatively equally among species, allowing for a more stable and resilient community structure.

The dominance index (C) of mangrove gastropods in the studied area, ranging between 0.21 and 0.42, reflects different levels of species dominance within the community. A lower index value near 0.21 indicates a more balanced ecosystem in which no single species significantly dominates the population, facilitating greater species coexistence and enhancing ecological stability. Under these conditions, food and habitat are more equitably shared among species, promoting a diverse and resilient community structure. Conversely, a dominance index approaching 0.42 signifies a higher degree of species dominance, where one or a few species are disproportionately abundant compared to others.

At Station I, with the highest diversity and evenness index, a wide range of gastropod species likely contribute to various trophic levels in the food chain, playing essential roles as herbivores, detritivores, and prey for higher predators. In contrast, Stations III, with lower diversity and higher dominance indices, may indicate environmental stress or a less stable ecosystem. A dominant species in these areas could suggest limited species interactions, which might result in reduced resilience to changes such as pollution or habitat degradation. These stations could serve as early warning indicators of potential degradation or declining health of the mangrove ecosystem.

Water quality parameters

Water quality parameters play a crucial role in supporting the survival and health of aquatic organisms, including gastropods. Variations in these parameters can significantly affect gastropod composition and abundance within aquatic ecosystems.

In this study, the water temperature varied between 28.8 and 32.7 °C, and as stated in the Ministry of Environment Decree No. 51 of 2004, this value remained within the optimal temperature range for the growth of organisms, which is 28–32 °C. Temperature is a key physical parameter that significantly impacts species' life. Previous study reported that favorable condition including temperature within the threshold promote the growth of juvenile marine gastropods and improve their foraging effic (Hu et al., 2021), while changes in temperature over threshold can influence the metabolic processes, reproduction, distribution, and abundance of gastropods (Latupeirissa et al., 2020; Imamsyah et al., 2020).

Table 3. Physical and chemical parameters of Desa Sutera

Parameter	St. I	St. II	St. III	St. IV
Temperature (°C)	28.8	28.9	32.7	30.8
Water pH	7.7	7.2	7.6	7.6
Soil pH	6.9	6.7	6.6	6.3
Salinity (ppt)	5.1	14.2	18.7	7.6
DO (mg/L)	3.5	6.6	6.1	6.7
Substrate	Clayey sand	Sandy	Sandy	Sandy

The pH levels in Desa Sutera ranged from 7.2 to 7.7 falling within the optimal range for gastropod survival. Gastropods are generally adaptable to different pH levels, depending on the species, but according to Effendi (2003), most aquatic organisms are sensitive to pH fluctuations and thrive best in a pH range of 7 to 8.5. Excessively acidic pH levels can hinder gastropods from forming their shells, as the acidic environment disrupts the mineralization process. This affects their ability to properly develop and maintain their protective calcium carbonate shells. Ewald et al. (2009) also reported that acidic environments disrupt ion regulation in molluscs, as shown by the ionoregulatory imbalances in the snail *Elimia flava* exposed to a pH of 4. Furthermore, pH is known a critical factor that affects gastropod populations. Neutral pH levels promote a higher diversity of species within aquatic communities. As pH decreases, both the density of invertebrates and the richness and diversity of species tend to decline. In acidic pond conditions (pH <6), the gastropod species *Anisus spirorbis* and *Aplexa hypnorum* are commonly found. In contrast, alkaline ponds are inhabited by a variety of non-native gastropod species, including *Physa acuta* (Spyra, 2017).

In this study, salinity across all sampling sites ranged from 5.1 to 18.7 ppt, and is considered optimal to support the life of gastropods in this area. In general, mangrove gastropods are euryhaline (Tudu et al., 2017), able to tolerate a broad range of salinity levels, although tolerance varies by species and life stage (Hilmi et al., 2022; Lawrie et al., 2024). Salinity influences gastropod physiology, behavior (Cañedo-Argüelles et al., 2019; Barrios-Figueroa dan Urbina, 2023), and development (Qin et al., 2020). Chaparro et al. (2009) reported that high salinity leads to dehydration and stress due to reduced freshwater availability, while low salinity induces osmotic stress, affecting metabolism and reproduction.

The concentration of dissolved oxygen levels varied between 3.5 and 6.7 mg/L, remaining within the optimal range for the growth of organisms, except in station I that closed to residential area. High human activity in waters can lead to oxygen deficiency (anoxic conditions) by increasing the supply of organic matter. The decomposition of organic matter, especially by bacteria, can further reduce oxygen levels, potentially leading to anaerobic conditions (Rangkuti et al., 2017). The Decree of the State Ministry for the Environment No. 51 (2004) states that dissolved oxygen levels above 5 mg/L are adequate for supporting aquatic life, while concentrations below 2 mg/L can be fatal to organisms (Effendi, 2003). Recurring hypoxic events and the exposure of organisms to low oxygen levels during early development may lead to long-term impacts throughout their life cycle (Li and Chiu, 2013).

The species of gastropods varied according to the type of substrate. Gastropods typically prefer muddy and clay substrate types due to their fine texture and high nutrient content. However, certain species from the family Potamididae can be found on sandy substrates. In this study, one hundred individuals of *P. cingulata* were found at a sampling site with sandy substrate, indicating that the mangrove habitat in Desa Sutera provides ideal conditions for the high abundance of gastropods.

CONCLUSION

This study provides a comprehensive evaluation of the mangrove gastropods community in Desa Sutera, Kayong Utara, West Kalimantan. A total of thirteen species was observed, belonging to nine genera and seven families, with both epifaunal and tree faunal life strategies. The research highlights significant variation in species abundance and distribution patterns, with certain species demonstrating higher prevalence while others remain scarce. The species *P. cingulata* and *L. carinifera* were identified as the most prevalent, while *L. melanostoma* and *C. obtusa* were the least abundant. The moderate levels of biodiversity and evenness observed indicate a functioning ecosystem, though subject to varying degrees of species dominance. These findings offer critical insights into the biodiversity and community structure of mangrove gastropods in the region, forming a basis for conservation and management strategies to protect this vital ecosystem. Conserving mangrove habitats is essential to maintaining gastropod diversity, as these ecosystems provide critical resources and shelter for various species. Further research is needed to understand the relationship between gastropods and mangrove ecosystem functions, particularly their role in nutrient cycling and energy flow.

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