BIOLOGY, MEDICINE, & NATURAL PRODUCT CHEMISTRY ISSN 2089-6514 (paper)
Volume 15, Number 1, April 2026 | Pages: 1415-1421 | DOI: 10.14421/biomedich.2026.151.1415-1421 ISSN 2540-9328 (online)

Abundance of Bivalves in the Mangrove Ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency

Muslika Nifatun Umaya, Fatmah Dhafir*, Abd. Rauf, Syech Zainal, Rafiqa, Sutrisnawati, Manap Trianto
Department of Biology Education, Faculty of Teacher Training and Education, Tadulako University.
Jl. Soekarno Hatta No KM 9, 94148, Central Sulawesi, Tel./Fax. (0451)422611, Indonesia.

Corresponding author*
fatmahdhavir@gmail.com

Manuscript received: 13 July 2026. Revision accepted: 15 July 2026, Published: 27 July 2026.

Abstract

Bivalves are one of the molluscan groups that play an important role in maintaining the ecological balance of mangrove ecosystems. Their presence and abundance are influenced by environmental conditions, making them useful indicators of habitat quality. This study aimed to determine the abundance of bivalves in the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia. A quantitative descriptive approach was employed in this study. The research sites were selected using a purposive sampling technique based on the presence of suitable bivalve habitats. Sampling was conducted using the belt transect method at two observation stations, each covering an area of 500 m². Field sampling was carried out during low tide on 17–18 December 2025. Collected bivalve specimens were identified using taxonomic identification keys. In addition, environmental parameters, including water temperature, salinity, and pH, were measured. The collected data were analyzed using the species abundance index (R) and the Relative Abundance Index (RAI). The results revealed the presence of four bivalve species belonging to two orders and two families, namely *Polymesoda erosa* (39 individuals), *Polymesoda expansa* (19 individuals), *Polymesoda bengalensis* (38 individuals), and *Anadara granosa* (9 individuals), with a total of 105 individuals recorded. The species abundance index (R) value of 0.64 indicated a low level of bivalve abundance. The highest Relative Abundance Index values were observed for *Polymesoda erosa* (37.14%) and *Polymesoda bengalensis* (36.19%), both classified as highly abundant. In contrast, *Anadara granosa* exhibited the lowest relative abundance value (8.57%) and was categorized as having low abundance.

Keywords: Abundance; Bivalves; Conservation; Central Sulawesi; Mangrove ecosystem.

INTRODUCTION

Indonesia has high diversity of abiotic environmental conditions, enabling the survival and adaptation of a wide range of organisms. One of the ecosystems that plays a crucial role in supporting the existence of diverse biota is the mangrove ecosystem (Manik, 2018). Indonesia is home to the largest mangrove forest area in the world, covering approximately 4.25 million hectares (Sani et al., 2019). Mangrove forests are coastal ecosystems that are strongly influenced by tidal fluctuations. These ecosystems are generally characterized by substrates composed of mud, sand, or a mixture of both (Indriyanto, 2019). Furthermore, mangrove forests are recognized as highly productive ecosystems and therefore play a vital role in supporting various forms of aquatic life. They provide essential habitats for feeding, reproduction, growth, and development of numerous aquatic organisms, including small fish, shrimp, gastropods, and bivalves (Erika et al., 2022).

Bivalves are among the most common aquatic organisms found in coastal areas, including mangrove ecosystems (Kurniawan, 2025). They belong to the class Bivalvia within the phylum Mollusca and are characterized by soft bodies enclosed within two calcareous shells. These organisms are widely distributed in coastal habitats, particularly in mangrove ecosystems. Their occurrence and distribution are strongly influenced by environmental factors, such as food availability, muddy-sandy substrates, and salinity levels (Mawardi et al., 2021). As sessile organisms, bivalves play significant ecological and economic roles in aquatic ecosystems (Fatonah et al., 2023). They are frequently used as indicators of aquatic environmental quality because their sedentary lifestyle makes them highly sensitive to environmental changes (Tala et al., 2022). In addition, bivalves possess considerable economic value as they are widely consumed as a protein-rich food source. Some species are also utilized for ornamental and decorative purposes (Samson & Kasale, 2020). In Indonesia, most economically important mollusks belong to the class Bivalvia, comprising approximately 20 commercially

valuable species. However, their high economic value often leads to overexploitation, which can result in declines in both the abundance and diversity of natural bivalve populations (Supratman et al., 2019).

Bivalve abundance is closely associated with aquatic environmental conditions, which play an important role in determining community stability, organism density, and species composition. The presence of competitors, parasites, and predators may also influence community dynamics and stability. Low bivalve abundance may result from human activities that disrupt natural populations. Unsustainable utilization of natural resources without proper management can lead to environmental degradation and negatively affect community structure and ecosystem balance (Yuliana et al., 2020). Due to their high economic value, bivalves are often subjected to excessive harvesting, which may threaten the sustainability of their natural populations (Situngkir et al., 2022). In Pinotu Village, bivalves constitute an important source of livelihood for local communities. In addition, portions of the mangrove area have been converted into shrimp ponds, potentially causing degradation of natural bivalve habitats. Such environmental changes may affect the abundance and distribution of bivalve populations, thereby increasing the risk of population decline in the wild. Therefore, this study aimed to analyze the abundance of bivalves in the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia.

MATERIALS AND METHODS

Study area

This study employed a quantitative descriptive approach. The collected data were analyzed descriptively and presented as percentages, mean values, tables, and graphs without testing causal relationships among variables. The research was conducted in the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia (Figure 1), on 17–18 December 2025. The study sites and sampling locations were selected using a purposive sampling technique based on environmental conditions and the presence of habitats suitable for bivalves. Two observation stations were established. Station I was located in a mangrove area adjacent to a residential settlement, whereas Station II was situated in a mangrove area near shrimp ponds. The sampling area was determined as 10% of the total observed mangrove area, covering 1,000 m², which was divided equally between the two observation stations, with each station covering 500 m². At each station, two belt transects measuring 50 m in length and 2 m in width were established using the belt transect method. Bivalve sampling was conducted between 07:00 and 12:00 Central Indonesia Time (WITA), and observations were carried out once during low tide.

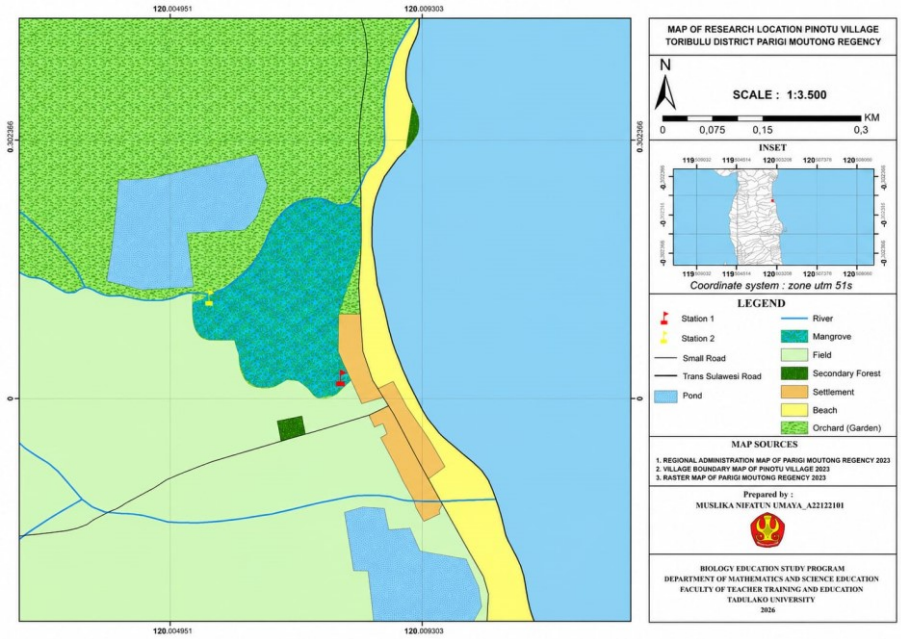

Figure 1. Map of the research location in Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia.

Procedures

Preparation Phase

The preparation phase began with a preliminary survey to identify the study area and confirm the presence of bivalves within the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia. In addition, the necessary administrative requirements were completed, including

obtaining a research permit issued by the Faculty of Teacher Training and Education (FKIP), which was submitted to the Pinotu Village Office as a prerequisite for conducting the study on bivalve abundance in the mangrove ecosystem.

Sampling Procedure

Bivalve sampling was conducted using the belt transect method. Specimens were collected from each observation station through direct field sampling. Bivalves occurring on the substrate surface were collected manually by hand, whereas individuals buried beneath the substrate, particularly within sandy sediments, were excavated using appropriate sampling tools. All collected specimens were placed in labeled sample containers and subsequently identified to species level using digital taxonomic identification keys.

Environmental Parameters

Environmental conditions were assessed by measuring several physicochemical parameters, including water temperature using a thermometer, salinity using a refractometer, and water pH using a portable pH meter. In addition, substrate characteristics were recorded and classified as muddy, sandy-mud, or sandy substrates, which represent the natural habitats of bivalves within mangrove ecosystems. The occurrence and distribution of bivalves are influenced by various physical and chemical factors, including water temperature, vegetation type, pH, nutrient availability, and substrate characteristics (Pangaribuan et al., 2022). Muddy substrates enriched with organic matter provide favorable habitats for bivalves; consequently, these organisms are commonly found either in aggregated groups or dispersed across such substrates.

Data analysis

Species Abundance

The data obtained were analyzed using the species abundance index formula proposed by Hilwan and Rahman (2021), as follows:

$$R = \frac{S-1}{ln\, N}$$

Where:

R = Species abundance index
S = Total number of species within the observation area
N = Total number of individuals recorded within the observation area

Criteria:

R < 2.5 = Low species abundance
2.5 ≤ R ≤ 4.0 = Moderate species abundance
R > 4.0 = High species abundance

Relatif Relative Abundance Index

The Relative Abundance Index (RAI) was calculated using the following formula:

$$IKR = \frac{Number\ of\ individuals\ of\ a\ particular\ species\ (ni)}{Total\ number\ of\ individuals\ recorded\ (N)} \times 100\%$$

The research data were subsequently analyzed using the Relative Abundance Index. The index was categorized according to the following criteria: values greater than 20% indicate high relative abundance, values between 15% and 20% indicate moderate relative abundance, and values below 15% indicate low relative abundance (Asrianny & Achmad, 2018).

RESULTS AND DISCUSSION

Results

Environmental Physical Conditions

The environmental conditions of the mangrove ecosystem at the study site were evaluated through the measurement of several physicochemical parameters, including water temperature, salinity, and pH. These parameters provide important information on the characteristics of the aquatic environment and serve as indicators of the ecological conditions within the mangrove habitat. The results of the measurements conducted at the two sampling stations are presented in Table 1.

Table 1. Environmental Physical Conditions Measured in the Mangrove Ecosystem.

No.	Parameter	Environmental Physical Conditions		Average
		Station 1	Station 2	
1	Temperature (°C)	30	30	30
2	Salinity (‰)	25	25	25
3	pH	6.54	6.57	6.56

Bivalvia Species Composition and Abundance

Based on the results of the study, four Bivalvia species belonging to two orders and two families were identified, namely *Polymesoda erosa*, *Polymesoda expansa*, *Polymesoda bengalensis*, and *Anadara granosa* (Figure 2). A total of 105 individuals were recorded during the survey, with varying abundance levels among the identified species. The environmental conditions of the mangrove ecosystem were relatively uniform across the two sampling stations, with an average temperature of 30°C, salinity of 25‰, and pH of 6.56 (Table 1). These environmental characteristics provide suitable habitat conditions that support the presence and distribution of Bivalvia species within the mangrove ecosystem.

Table 2. Bivalvia Species Recorded in the Mangrove Ecosystem of Pinotu Village.

No	Order	Family	Species	Station		Total
				1	2	
1.	Veneroida	Cyrenidae	*Polymesoda erosa*	29	10	39
			Polymesoda expansa	15	4	19
			Polymesoda bengalensis	27	11	38
2.	Arcidaa	Arcidae	*Anadara granosa*	9	0	9
Total				80	25	105

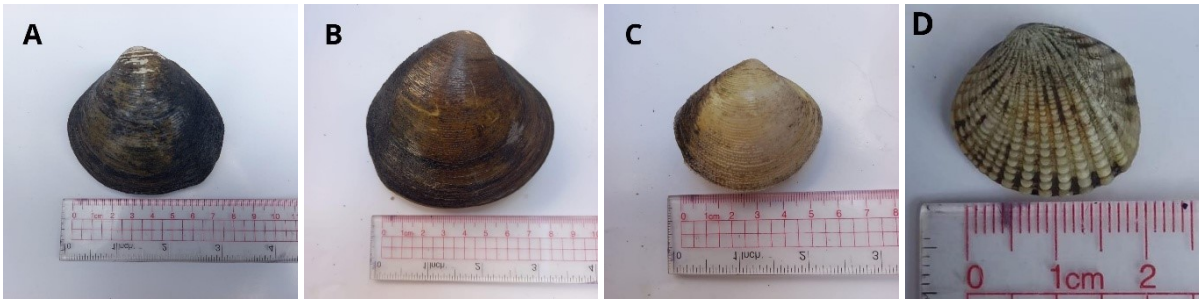

Figure 2. Bivalvia Species Found in the Mangrove Ecosystem of Pinotu Village: (A) *Polymesoda erosa*, (B) *Polymesoda expansa*, (C) *Polymesoda bengalensis*, and (D) *Anadara granosa*.

Species Abundance and Relative Abundance Index (RAI) of Bivalvia

This study was conducted in the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi. All collected data were analyzed to determine the Species Abundance Index (R) and the Relative Abundance Index (RAI). The results were used to describe the abundance level of Bivalvia and the proportional contribution of each species recorded during the study (Table 3).

Table 3. Relative Abundance Index (RAI) of Bivalvia.

No	Species	ni	N	ni/N	KR (%)	Category
1.	*Polymesoda erosa*	39	105	0.371428571	37.14	High
2.	*Polymesoda expansa*	19	105	0.180952381	18.09	Moderate
3.	*Polymesoda bengalensis*	38	105	0.361904762	36.19	High
4.	*Anadara granosa*	9	105	0.085714286	8.57	Low

S = 4
ln (N) = 4.6539603502
R = 0,6446122816
R<2,5 = Low

Discussion

At Station 1, a higher abundance of bivalves was recorded compared to Station 2, with a total of 80 individuals belonging to four species: Polymesoda erosa, Polymesoda expansa, Polymesoda bengalensis, and Anadara granosa. The relatively high abundance observed at this station was likely supported by favorable environmental conditions, including a water temperature of 30°C, salinity of 25 ppt, and pH of 6.54. Water temperatures ranging from 28–32°C are considered optimal for bivalve survival and growth (Zahroh et al., 2019). Likewise, salinity levels between 25 and 30 ppt provide suitable conditions for the survival of bivalves (Tritama & Akhrianti, 2022). Although the pH value was slightly acidic, it remained within the tolerance range of mollusks (Shahra et al., 2023). According to Putra et al.

(2022), pH values ranging from 6 to 8 are still suitable for supporting macrozoobenthic communities. In addition to these physicochemical conditions, the relatively high abundance at Station 1 may also be attributed to the well-developed mangrove vegetation, thick muddy substrate, and high availability of organic matter, which serves as an important food resource for bivalves. Although this station was located adjacent to a residential area, the habitat conditions remained favorable for sustaining a relatively large bivalve population. Mangrove forests provide suitable habitats for bivalves due to their characteristic muddy and sandy substrates and the availability of freshwater inputs from rivers and groundwater, which contribute to favorable conditions for the growth and survival of bivalves (Hermi et al., 2021).

In contrast, only three bivalve species were recorded at Station 2, with a total of 25 individuals, namely *Polymesoda erosa*, *Polymesoda expansa*, and *Polymesoda bengalensis*. The absence of *Anadara granosa* at this station suggests that the habitat conditions may be less suitable for this species. The measured environmental parameters at Station 2 included a water temperature of 30°C, salinity of 25 ppt, and pH of 6.57. Water temperature was identical at both stations. Temperature is a key environmental factor influencing aquatic organisms, as it affects metabolic processes, growth, and reproduction. Ecologically, temperature variations may also influence the composition and abundance of bivalve communities (Samson & Kasale, 2020). Similarly, salinity values were consistent across both stations, indicating relatively homogeneous water conditions that remained within the brackish-water range characteristic of mangrove ecosystems. Although the pH values at both stations were slightly acidic, they remained within the tolerance limits of many aquatic organisms. Nevertheless, low pH conditions are generally considered more detrimental to aquatic life than elevated pH levels (Ariani et al., 2019). The lower abundance observed at Station 2 may be associated with greater environmental pressure resulting from its proximity to shrimp aquaculture ponds. Habitat alterations, reduced mangrove vegetation cover, and the potential input of organic waste from aquaculture activities may have affected the distribution and abundance of bivalves at this station. According to Basmalah et al. (2022), the occurrence and abundance of bivalves are strongly influenced by environmental conditions, including substrate type, salinity, nutrient availability, and anthropogenic disturbances within their habitats. Consequently, habitat degradation caused by human activities may adversely affect the persistence of bivalve communities. The low abundance of bivalves in mangrove ecosystems may also be linked to local anthropogenic activities, such as mangrove deforestation and the disposal of domestic waste. These activities can reduce mangrove density and coverage, thereby decreasing the input of organic matter that serves as an important food source for bivalves. As a result, reductions in habitat quality and food availability may contribute to declines in bivalve abundance (Rahmi et al., 2017).

Polymesoda expansa was represented by 19 individuals (18.09%) and was classified as having moderate abundance, whereas *Anadara granosa* was represented by only 9 individuals (8.57%) and was categorized as having low abundance. The lower abundance of these two species compared to the other recorded species may be associated with less favorable habitat conditions, including differences in substrate characteristics and the influence of human activities in the surrounding area. In addition, *Anadara granosa* was found exclusively at Station 1, suggesting that this species may possess a narrower environmental tolerance and may be less capable of adapting to the conditions at Station 2, which was located near shrimp aquaculture ponds. According to Arramadani et al. (2026), the abundance of *Anadara granosa* is influenced by several environmental factors, including substrate characteristics, organic matter content, salinity, and water stability. This species tends to be more abundant in habitats characterized by fine-grained sediments rich in organic matter and relatively stable hydrological conditions, as such environments provide favorable conditions for its growth, development, and survival.

The species abundance index (R) value of 0.64 indicates that the abundance of bivalve species in the mangrove ecosystem of Pinotu Village is relatively low. This low abundance may be associated with anthropogenic activities occurring in and around the mangrove area, including continuous harvesting of bivalves and the conversion of mangrove forests into shrimp aquaculture ponds. Such activities can reduce both the extent and quality of natural bivalve habitats, thereby contributing to declines in population size and species abundance. According to Mahmudin et al. (2022), the conversion of mangrove areas into aquaculture ponds can lead to severe coastal erosion and sedimentation. The expansion of aquaculture activities may threaten the sustainability of mangrove ecosystems and the organisms that depend on them, particularly benthic communities. Benthic organisms inhabit the bottom substrates of aquatic environments and are commonly associated with mangrove ecosystems, where they play important ecological roles in nutrient cycling and ecosystem functioning.

CONCLUSIONS

Based on the results of this study, the abundance of bivalves in the mangrove ecosystem of Pinotu Village, Toribulu District, Parigi Moutong Regency, Central Sulawesi, Indonesia, was classified as low, as indicated by a species abundance index (R) value of 0.64. A total of four bivalve species comprising 105 individuals were

recorded. *Polymesoda erosa* and *Polymesoda bengalensis* were the dominant species and exhibited high relative abundance, whereas *Polymesoda expansa* showed moderate relative abundance and *Anadara granosa* exhibited low relative abundance. Differences in bivalve abundance between sampling stations suggest that environmental factors, including substrate characteristics, mangrove vegetation density, and the intensity of human disturbances, may influence the distribution and abundance of bivalve populations within the mangrove ecosystem.

Acknowledgements: The authors would like to express their sincere gratitude to Tadulako University for the institutional support and facilities provided during the conduct of this research.

Authors' Contributions: Conceptualization, Muslika Nifatun Umaya, Fatmah Dhafir, and Abd Rauf; methodology, Fatmah Dhafir, and Abd Rauf; analysis; writing original draft preparation, Syech Zainal, Rafiqa, and Sutrisnawati; writing review and editing, All authors.

Competing Interests: The authors declare that there are no competing interests.

REFERENCES

Ariani, N. D., Swasta, I. J., & Adnyana, P. B. (2019). Studi Tentang Keanekaragaman Dan Kemelimpahan Mollusca Bentik Serta Faktor-Faktor Ekologis Yang Mempengaruhinya Di Pantai Mengening, Kabupaten Badung, Bali. *Jurnal Pendidikan Biologi Undiksha*, *6*(3), 146–157.

Arramadani, C. K., Fauzi, M., & Prianto, E. (2026). Karakteristik Habitat dan Kelimpahan Kerang Dara (Anadara granosa) di Zona Intertidal Pantai Sepahat Kabupaten Bengkalis Habitat Characteristics and Abundance of Blood Cockle (Anadara granosa) in the Intertidal Zone of Sepahat Beach Bengkalis Regency. *Jurnal Akuatiklestari*, *9*(2), 229–237.

Asrianny, H. S., & Achmad, A. (2018). Identifikasi keanekaragaman dan sebaran jenis burung untuk pengembangan ekowisata bird watching di taman nasional bantimurung bulusaraung. *Jurnal Perennial*, *14*(1), 17–23.

Basmalah, L. M. F., Syukur, A., & Khairuddin, K. (2022). Bivalve Diversity Associated with Seagrasses in The Southern Coastal Waters of Central Lombok. *Jurnal Biologi Tropis*, *22*(1), 329–341.

Erika, A., Akhrianti, I., & Hudatwi. (2022). Identifikasi Jenis Bivalvia Pada Ekosistem Mangrove Di Sekitar Perairan Kota Pangkalpinang. *Journal of Marine Research*, *11*(4), 696–705.

Fatonah, C. N., Ningtias, R. A., Pertiwi, M. P., & Rostikawati, R. T. (2023). Keanekaragaman Spesies Bivalvia dan Gastropoda di Pantai Tanjung Rising Kepulauan Bangka Belitung. *Jurnal Ilmu Dasar*, *24*(1), 57–64.

Hermi, R., Irham, M., Rusdi, M., & Sarong, M. A. (2021). Study of bivalvia habitat in the mangrove area of Aceh Jaya District , Aceh Province Study of bivalvia habitat in the mangrove area of Aceh Jaya District , Aceh Province. *Journal Earth and Environmental Science*, *674*(1), 1–7.

Hilwan, I., & Rahman, A. N. S. (2021). Penyebaran Jenis Puspa (Schima Wallichii (Dc .) Korth) Di Resort Kawah Ratu , Taman Nasional Gunung. *Jurnal Silvikultur Tropika*, *12*(2), 86–94.

Indriyanto. (2019). *Ekologi Hutan*. Jakarta:Bumi Aksara.

Kurniawan, R. (2025). Analisis kelimpahan Bivalvia di kawasan Blok Jati Papak Taman Nasional Alas Purwo dan kontribusinya terhadap perekonomian lokal. *Jurnal Ilmiah Wahana Pendidikan*, *8*(4), 497–515.

Mahmudin., Sakaria, F. S., & Veranika. (2022). Dampak Perluasan Lahan Tambak Terhadap Keanekaragaman Makrozoobenthos Di Ekosistem Mangrove. *Jurnal Ilmu Lingkungan*, *20*(3), 546–552.

Manik, K. E. S. (2018). *Pengelolaan lingkungan hidup*. Jakarta:Kencana.

Mawardi, A. L., Yolanda, F., & Sarjani, T. M. (2021). Bivalvian Distribution Pattern Based On Habitat. *Jurnal Biotik*, *9*(2), 128–138.

Pangaribuan, R. Y., Mulya, M. B., & Noorsheha. (2022). Keragaman Bivalvia di Pantai Sialang Buah Sumatera Utara. *Jurnal Aquarine*, *9*(2), 72–82.

Putra, E. I., Nurdiansyah, S. I., Safitri, I., & Nurrahman, Y. A. (2022). Struktur Komunitas Bivalvia Di Desa Pemangkat Kota , Community Structure Of Bivalvia In Pemangkat Kota , Village , Pemangkat District , Sambas Regency. *Jurnal Oseanologia*, *1*(1), 1–8.

Rahmi, S., Adriman., & Eni, S. (2017). Struktur Komunitas Bivalvia pada Ekosistem Mangrove di Teluk Buo, Kecamatan Bungus, Kabupaten Teluk Kabung, Padang, kawasan Mangrove di Desa Bedono Kecamatan Sayung Kabupaten Demak. *Journal of Maquares*, *7*(2), 172–179.

Samson E., & Kasale, D. (2020). Keanekaragaman dan Kelimpahan Bivalvia di Perairan Pantai Waemulang Kabupaten Buru Selatan. *Jurnal Biologi Tropis*, *20*(1), 78–86.

Sani, L. H., Candri, D. A., Ahyadi, H., & Farista, B. (2019). Struktur Vegetasi Mangrove Alami dan Rehabilitasi Pesisir Selatan Pulau Lombok. *Jurnal Biologi Tropis*, *19*(2), 268–276.

Shahra, F. D., Jayanthi, S., Sentosa, Z. S. G. F., Ayu, M., & Syahputra, M. K. (2023). Keanekaragaman Mollusca Sebagai Indikator Kualitas Air di Kuala Langsa, Aceh Mollusca Diversity as an Indicator of Water Quality in Kuala Langsa, Aceh. *Jurnal Pendidikan Sains & Biologi*, *10*(1), 49–57.

Situngkir, F., Pringgenies, D., & Sedjati, S. (2022). Determinasi Bivalvia dan Gastropoda Yang Terdapat Di Pantai Binasi, Sorkam, Kabupaten Tapanuli Tengah. *Jurnal Moluska Indonesia*, *6*(2), 70–78.

Supratman, O.., Sudiyar, & Farhaby, A, M. (2019). Kepadatan Dan Pola Sebaran Bivalvia Pada Ekosistem Padang Lamun Di Perairan Pulau Semujur, Kepulauan Bangka Belitung. *Jurnal Biosains*, *5*(1), 14–22.

Tritama, R., & Akhrianti, I. (2022). Studi Keanekaragaman Bivalvia Pada Zona Intertidal Di Pantai Kota Pangkalpinang Study Of Bivalve Diversity In The Intertidal Zone On The Coast Of Pangkalpinang City. *Journal of Tropical Marine Science*, *5*(1), 55–62.

Tala, W. S., Aba, L., & Rostita. (2022). Keanekaragaman Spesies Bivalvia Di Zona Intertidal Pantai Desa Nepa Mekar, Kecamatan Lakudo Kabupaten Buton Tengah. *Jurnal Penelitian Biologi Dan Kependidikan*, *1*(1), 45–52.

Yuliana, E. Y., Afiati, N., & Muskananfola, M. R. (2020). Analisis Kelimpahan Bivalvia di Pantai Prawean Bandengan , Jepara berdasarkan Tekstur Sedimen dan Bahan Organik. *Journal Of Maquares*, *9*(1), 47–56.

Zahroh, A., Riani, E., Anwar, S., Manajemen, D., Perairan, S., Perikanan, F., & Bogor, I. P. (2019). Analisis Kualitas Perairan untuk Budidaya Kerang Hijau di Kabupaten Cirebon Provinsi Jawa Barat. *Jurnal Pengelolaan Sumberdaya Alam Dan Lingkungan*, *9*(1), 86–91.

THIS PAGE INTENTIONALLY LEFT BLANK