

**Macroalgae Diversity in the Intertidal Zone of Ranca Buaya Beach,  
Ujung Genteng, Sukabumi****Galas Geraldine<sup>1\*</sup>, Zahra Nisaul Fitri<sup>1</sup>, Winda Nurlatifah<sup>1</sup>, Della Nasyifah<sup>1</sup>**<sup>1</sup>Biology Education Department, Faculty of Education and Teacher Training, Universitas Islam Negeri Sunan Gunung Djati, Bandung, Indonesia\*Corresponding Author e-mail: [galasgeraldine18@gmail.com](mailto:galasgeraldine18@gmail.com)**Article Info****Article history:**

Received 16 December, 2026

Revised 14 March, 2026

Accepted 13 May 2026

**Keywords:**

Macroalgae

Diversity Index

Coastal Ecosystem

Intertidal Zone

Ranca Buaya Beach

**ABSTRACT**

Macroalgae are multicellular photosynthetic organisms that play an important role in coastal ecosystems. This study aimed to identify the distribution of macroalgae at Ranca Buaya Beach, Ujung Genteng, West Java. Sampling was conducted using the line transect method with a transect length of 20 meters and a width of 20 meters, consisting of 9 quadrats. The line transect was combined with 1 × 1 meter quadrats placed along each transect line. Environmental parameters measured included temperature, pH, total dissolved solids (TDS), resistance, conductivity, hardness, dissolved oxygen, and salinity using a Water Quality Tester. Light intensity at each transect line was measured using a lux meter. The ecological indices calculated were the Shannon–Wiener diversity index, evenness index, and dominance index. The results showed the presence of 6 species belonging to 3 divisions of macroalgae: 3 species of Chlorophyta, 2 species of Rhodophyta, and 1 species of Phaeophyta. The calculation results indicated a Shannon–Wiener diversity index of 1.63, categorized as moderate, an evenness index of 0.91 indicating an even distribution, and a dominance index of 0.21 indicating low species dominance. Environmental factors such as light intensity, depth, and substrate influenced the abundance and distribution of macroalgae in the intertidal zone.

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Email: [galasgeraldine18@gmail.com](mailto:galasgeraldine18@gmail.com)**INTRODUCTION**

Macroalgae, or seaweeds, are multicellular photosynthetic organisms that dominate coastal zones and play key roles in marine ecosystems, both as primary producers and as habitat providers (Nguyen & Tran, 2024). Belonging to three major groups Chlorophyta (green algae), Phaeophyceae/Ochrophyta (brown algae), and Rhodophyta (red algae) macroalgae grow attached to hard substrates and contribute to various ecological functions, including sediment stabilization, nutrient cycling, and blue carbon sequestration in coastal areas. Dynamic coastal environmental conditions, such as tidal fluctuations, wave exposure, salinity variations, and anthropogenic disturbances including pollution and coastal land-use changes, make the identification of macroalgae in coastal regions essential as indicators of ecosystem health, biodiversity, and their potential biological utilization (Hanley et al., 2024).

Macroalgae play an important role in maintaining marine ecosystem balance as primary producers that support various marine organisms. They also serve as shelter and substrates for numerous species, including crustaceans, mollusks, echinoderms, and small



fish. Nevertheless, information regarding the diversity and potential of macroalgae in Indonesia remains limited. Previous studies have reported that environmental factors such as temperature, salinity, and substrate type significantly influence macroalgal diversity and community stability (Kamto et al., 2024). Therefore, environmental conditions are considered important factors affecting the abundance and distribution of macroalgae in coastal ecosystems.

Macroalgae are benthic organisms with both ecological and economic importance in aquatic ecosystems. A study conducted by Srimariana et al. (2020) on Tunda Island, Banten, identified 15 macroalgal species belonging to three major classes: Chlorophyceae, Phaeophyceae, and Rhodophyceae. The third station showed the highest Shannon–Wiener diversity index, reaching 2.44. Physicochemical water conditions, particularly temperature, salinity, substrate type, and nutrient availability, strongly influenced macroalgal diversity. The distribution of macroalgae in the intertidal zone was closely associated with environmental gradients, where species of the genera *Caulerpa*, *Halimeda*, and *Padina* showed significant dominance on mixed sand–coral substrates with high nitrate concentrations.

Despite the ecological importance of macroalgae, information regarding macroalgal diversity and distribution in the coastal waters of West Java, particularly in the intertidal zone of Ranca Buaya Beach, remains limited. Previous studies in Indonesia have generally focused on macroalgal diversity in small islands and protected coastal waters, while studies linking macroalgal ecological indices with physicochemical parameters in transitional coastal environments are still scarce. Ranca Buaya Beach has unique coastal characteristics influenced by wave exposure, rocky substrates, and transitional environmental conditions that may affect macroalgal community structure. Therefore, research on macroalgal diversity and its relationship with environmental parameters in this area is important to provide baseline ecological data for future coastal management and conservation efforts.

Nutrient availability is one of the main controlling factors for macroalgal growth. Increased nitrate and phosphate concentrations can significantly enhance macroalgal biomass, even by up to 45% under eutrophic conditions. These findings are consistent with the principal component analysis reported by Srimariana et al. (2020), which indicated that stations with higher abundance and diversity were associated with higher nutrient concentrations. The interaction of these physicochemical factors shapes distinct macroalgal communities at specific locations.

Therefore, this study aims to identify macroalgal diversity in the coastal area of Ranca Buaya Beach, Ujung Genteng, West Java, analyze species abundance and distribution at each observation station, calculate ecological indices including the Shannon–Wiener diversity index, evenness index, and dominance index, and examine the relationship between physicochemical water parameters (temperature, pH, total dissolved solids, and light intensity) and macroalgal communities.

## **METHOD**

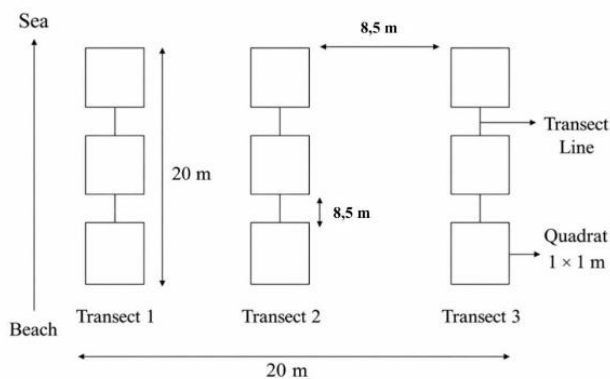
The study was conducted on Saturday, November 8 to Sunday, November 9, 2025, in the coastal area of Ujung Genteng Beach, located in the western part of Java Island and administratively belonging to West Java Province, Indonesia. This research was a preliminary study (pilot study) or short-term observation conducted over a two-day period. Data collection was carried out at one observation station consisting of three transect lines, with the coordinates of the first transect at  $-7.349673, 106.402730$ , the second transect at  $-7.349634, 106.402736$ , and the third transect at  $-7.349559, 106.402894$ . Sampling was conducted under different tidal conditions, with sampling on the first day carried out during low tide from midday to late afternoon, while sampling on the second day was conducted during high tide from morning to midday.

This study involved two types of observations, namely *in situ* and *ex situ* observations. *In situ* observations were conducted directly in the field to assess macroalgal abundance and to measure water quality parameters, including dissolved oxygen, resistance, water conductivity, total dissolved solids, salinity, hardness, water temperature,

and light intensity. Meanwhile, ex situ observations were carried out at a field identification post to identify macroalgal species.

Macroalgal data collection in the littoral zone was conducted using a line transect method combined with quadrat sampling (quadrant transect). The study area was divided into three line transects, each measuring 20 m in length, with a total study area width of 20 m. The transects were laid out in straight lines from the littoral zone toward the offshore area, with a 10 m distance between transects. Along each transect line, 1 × 1 m quadrats were placed at 8 m intervals. The layout of the study area and transect design is shown in Figure 1.

Environmental parameter measurements were conducted to determine the relationship between environmental conditions and the macroalgal ecosystem. The measured parameters included dissolved oxygen, resistance, conductivity, total dissolved solids (TDS), salinity, hardness, pH, water temperature, and light intensity. Measurements of dissolved oxygen, resistance, conductivity, TDS, salinity, hardness, pH, and water temperature were performed using a Water Quality Tester at the sampling site on November 8, 2025, at 13:00 (local time). Light intensity was measured using a lux meter at each transect line on November 9, 2025, at 08:00 (local time).



**Figure 1.** Layout of the Macroalgae Research Site

Ecological index analysis included the diversity index, evenness index, and dominance index. Species diversity was calculated using the Shannon–Wiener diversity index. The diversity index ( $H'$ ) is used to measure the level of species diversity within a community or ecosystem. This index assesses species diversity by considering the relative distribution of each species within the population. A higher  $H'$  value indicates a higher level of diversity within the community.

Where  $H'$  represents the diversity index, indicating the level of diversity within the community, with higher values reflecting greater species diversity;  $N_i$  is the number of individuals of the  $i$ th species in the observed community;  $N$  is the total number of individuals of all species in the community; and  $\Sigma$  denotes summation, meaning that the values for all species in the community are summed (Tripathi & Shankar, 2014). The diversity index was calculated using the following equation:

$$H' = - \sum \left( \frac{n_i}{N} \ln \frac{n_i}{N} \right)$$

Notes:

$H'$  = Diversity index

$n_i$  = Number of individuals of species  $i$

$N$  = Total number of individuals



The Evenness Index (E) is used to measure the extent to which individuals of different species are evenly distributed within a community. This index describes the level of uniformity or irregularity in the distribution of individuals among species in an ecosystem. A higher E value indicates a more even distribution of individuals among species within the community. Where E represents the evenness index, indicating the degree of species evenness within the community, with higher values reflecting greater uniformity among species. H' represents the diversity index obtained from previous calculations, where higher H' values indicate greater community diversity. S represents the total number of species observed in the community (Tom C.J. et al., 2003). The evenness index was calculated using the following equation:

$$E = \frac{H'}{\log_2 S}$$

Notes:

E = Evenness index

H' = Diversity index

S = Number of species

The Dominance Index (C) formula is used to measure the level of dominance of a species within a community. This index reflects the extent to which a single dominant species influences the community compared to other species within the ecosystem. A higher C value indicates a greater dominance of a particular species in the community. Where: C = Dominance Index, indicating the degree of species dominance within the community. Higher values of C represent stronger dominance by a species. Ni = Number of individuals of the i-th species in the observed community. N = Total number of individuals of all species in the community (Roswell et al., 2021). The dominance index was calculated using the following equation:

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

Notes:

C = Dominance index

ni = Number of individuals of species i

N = Total number of individuals

## RESULTS AND DISCUSSION

Macroalgae diversity at Ranca Buaya Beach, Ujung Genteng, is influenced by the surrounding aquatic environmental conditions. The results of the water quality assessment, presented in Table 1, show the key characteristics of the study site. The measured parameters included dissolved oxygen of 15.8 mg/L, total dissolved solids (TDS) of 324 mg/L, salinity of 3.06 ppt, and a water pH of 7.76. These physicochemical characteristics are essential because variations in environmental conditions directly affect the diversity and composition of macroalgal species found in a given aquatic ecosystem.

**Table 1.** Results of Water Quality Measurements in the Study Area

No	Environmental Parameter	Result
1	Dissolved oxygen (mg/L)	15.8
2	Resistance (Ohm)	20,567
3	Conductivity (μS/cm)	49,3

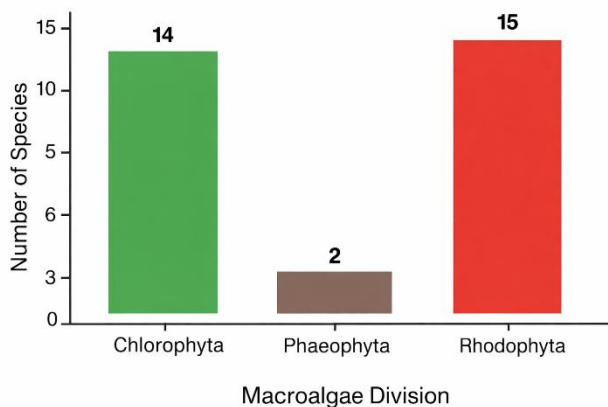


No	Environmental Parameter	Result
4	TDS (mg/L)	32,4
5	Salinity (ppt)	3.06
6	Hardness (mg/L)	246
7	pH	7.76
8	Water temperature (C)	29,1 C
9	Light intensity (Lux)	4.014

The abundance and distribution of macroalgae in each transect were influenced by environmental factors such as light intensity, substrate type, and water conditions within the intertidal zone. *Ulva lactuca* was more frequently found in Transects 1 and 2, which were relatively shallow and exposed to higher light intensity. Green macroalgae generally require sufficient light for photosynthesis and growth in open waters (Beer, 2023). In contrast, *Boergesenia forbesii* was found in all transects, with the highest abundance in Transect 3, which had harder substrates and more stable water conditions. Hard substrates support macroalgal attachment and reduce the risk of thallus detachment caused by waves and currents, particularly in Rhodophyta species. Meanwhile, *Cladophora glomerata* was only observed in Transect 3, indicating its preference for calmer habitats with stable substrates. These findings suggest that differences in light intensity, substrate characteristics, and water movement influenced macroalgal distribution at the study site.

**Table 2.** Distribution of Macroalgal Species

Macroalgae Species				Species Distribution
Division	Species	Transect 1	Transect 2	Transect 3
Chlorophyta	<i>Ulva lactuca</i>	✓	✓	-
	<i>Boergesenia forbesii</i>	✓	✓	✓
	<i>Cladophora glomerata</i>	-	-	✓
Rhodophyta	<i>Eucheuma cottonii</i>	✓	✓	✓
	<i>Gracilaria edulis</i>	-	-	✓
Phaeophyta	<i>Padina pavonica</i>	✓	-	-



**Figure 2.** Abundance of Macroalgal Divisions in the Study Area



Based on Table 2, *Ulva lactuca* and *Boergesenia forbesii* were identified as members of the Chlorophyta division commonly found in intertidal coastal environments. The presence of *Ulva lactuca* in Transects 1 and 2 indicated its adaptability to shallow habitats with high light intensity, as green macroalgae generally require sufficient sunlight to support photosynthesis and growth. In addition, *Ulva lactuca* species play an important ecological role as primary producers and nutrient absorbers in coastal ecosystems (Beer, 2022). Meanwhile, *Boergesenia forbesii* was distributed across all transects, particularly in areas with more stable substrates and calmer water conditions, suggesting a broad ecological tolerance to varying environmental conditions. The distribution patterns of both species indicate that light availability, substrate characteristics, and hydrodynamic conditions strongly influenced macroalgal composition at the study site.

*Cladophora glomerata* is a green macroalga belonging to the Chlorophyta division that is commonly found in both freshwater and coastal waters with high light availability and nutrient levels. It has a coarse, branched filamentous structure with bright to dark green coloration and often forms dense mats covering substrates such as rocks, small corals, or coarse sediments. Its cylindrical cells with reticulate chloroplasts support efficient photosynthesis in clear waters with moderate to strong currents. This species is frequently associated with eutrophic environments rich in nutrients such as nitrogen and phosphate and is therefore often used as a biological indicator of nutrient pollution in aquatic ecosystems (Effendi et al., 2024).

*Eucheuma cottonii* is a red macroalga (Rhodophyceae) that is widely cultivated in Indonesia. It is primarily valued as a source of carrageenan, a polysaccharide commonly used as a stabilizer, thickening agent, gelling agent, emulsifier, and anti-crystallization compound in food, pharmaceutical, and cosmetic industries. This species typically grows in coastal areas with continuous water movement, particularly in intertidal to shallow subtidal zones, and can occur at depths of approximately 10-30 cm during the lowest tide. The quality of *E. Cottonii* is largely determined by its carrageenan content, which is influenced by growth conditions. Key parameters used to evaluate carrageenan quality include moisture content, yield, viscosity, and gel strength (Fathoni, 2020).

*Gracilaria edulis* is a red macroalga (Rhodophyta) of the family Gracilariaceae characterized by a cylindrical to slightly flattened thallus with irregular branching, a flexible texture, and a smooth surface. Its coloration ranges from bright red to brownish or purplish red depending on light intensity and water conditions. This species typically grows attached to hard substrates such as rocks or dead coral in shallow tropical and subtropical waters and can also adapt to lagoon and calm intertidal environments. Due to its rapid growth and high galactan polysaccharide content, *G. edulis* is widely cultivated as an important source of agar (Veeragurunathan et al., 2023).

*Padina pavonica* is a brown alga distributed in warm to tropical marine waters. It has a fan-shaped thallus divided into two lobes, with coloration ranging from whitish to brownish, and attaches to substrates using rhizoid holdfasts. Extracellular calcium carbonate deposits are commonly present on the ventral thallus surface and appear as distinct bright bands, which represent a characteristic morphological feature of this species (Benita et al., 2018).

Within the Rhodophyta division, *Eucheuma cottonii* was more abundant in Transects 2 and 3, while *Gracilaria edulis* was only recorded in Transect 3. The dominance of Rhodophyta in these transects was likely influenced by more stable water currents, firmer substrates, and relatively deeper waters compared to Transect 1. Red macroalgae generally prefer stable environmental conditions because strong substrate attachment is important to withstand wave action and maintain nutrient absorption. In addition, Rhodophyta are able to grow optimally in waters with relatively stable salinity and sufficient light penetration, conditions commonly found in clearer offshore intertidal areas. The location of Transect 3, which was farther from freshwater influence and closer to open marine conditions, likely provided more suitable environmental conditions for the growth of *Eucheuma cottonii* and *Gracilaria edulis*. (Veeragurunathan et al., 2023).



Within the division Phaeophyta, *Padina pavonica* was only recorded in Transect 1, indicating that this species was more adapted to shallow intertidal areas with higher light exposure and suitable hard substrates such as rocks or coral fragments. Brown macroalgae generally require stable substrate conditions for attachment and sufficient sunlight to support photosynthesis and thallus development. The presence of *Padina pavonica* only in Transect 1 suggests that environmental conditions in this transect were more favorable compared to the other transects. Overall, the abundance pattern presented in Table 2 indicates differences in species composition along the intertidal gradient. Chlorophyta tended to dominate areas with higher light intensity and fluctuating environmental conditions, whereas Rhodophyta and Phaeophyta were more commonly associated with stable substrates and calmer water conditions. This distribution pattern demonstrates that each macroalgal group occupied different ecological niches according to environmental characteristics at the study site. (Sandy, Indrayani, & Yasidi, 2021). Its presence in these two transects indicates the suitability of the environmental conditions found in slightly deeper and more stable areas. Overall, the abundance pattern presented in Table 2 indicates a shift in species composition from the shallow nearshore zone toward more stable areas farther from the coastline. Chlorophyta tend to dominate areas with high light intensity, whereas Rhodophyta and Phaeophyta are more frequently found in areas characterized by hard substrates, clear waters, and stable currents. This pattern illustrates how each species occupies distinct ecological niches along the intertidal gradient (Setiawati, Nurzaman, Mutaqin, Budiono, & Abdiwijaya, 2017).

The physical and chemical parameters measured at the study site influenced the distribution and diversity of macroalgae across the transects. Water pH values ranging from 7.7–8.0 and temperatures close to 29 °C were still suitable for macroalgal growth in tropical coastal environments. These conditions supported the presence of several macroalgal groups, including Chlorophyta, Rhodophyta, and Phaeophyta, at the observation site. However, differences in environmental conditions among transects affected species composition. Transects located in shallower areas with higher light exposure were dominated by Chlorophyta species such as *Ulva lactuca*, whereas transects with more stable substrates and calmer water conditions supported the presence of Rhodophyta species such as *Eucheuma cottonii* and *Gracilaria edulis*. In addition, *Padina pavonica* from the Phaeophyta division was only found in Transect 1, indicating its preference for specific substrate and light conditions. These findings demonstrate that environmental parameters directly influenced macroalgal distribution patterns at the study site. (Syahdan & Tony, 2023).

The distribution of macroalgae at the observation site was relatively diverse, although salinity values were within a lower range, approximately 3.06 ppt, with a conductivity of 49.3 and TDS of 32.4. These conditions indicate that the study area was brackish and represented a transitional aquatic environment. The presence of species such as *Ulva lactuca*, *Boergesenia forbesii*, and *Cladophora glomerata* across several transects suggests that members of the division Chlorophyta possess greater tolerance to fluctuations in salinity and dissolved solids. This finding is consistent with a macroalgal biodiversity study conducted in the Thousand Islands, which reported that salinity, TDS, and overall water quality are major determinants of macroalgal abundance, particularly for species with high osmotic tolerance (Handayani et al., 2023).

The differences in macroalgal distribution across transects can also be explained by the varying physiological adaptation capacities among divisions. Rhodophyta species such as *Eucheuma cottonii* and *Gracilaria edulis* were detected at low salinity levels, indicating their ability to adapt to brackish conditions. A study conducted in the coastal waters of Kei Kecil by Kadmaer (2020) reported that salinity has a significant relationship with macroalgal density, where low to moderate salinity still allows the growth of Rhodophyta due to effective osmoregulatory mechanisms. The conductivity and TDS values measured in this study support the availability of dissolved ions required by algae to maintain internal osmotic pressure.

In addition to the chemical characteristics of the water, other studies have shown that environmental stress caused by salinity fluctuations can affect physiological processes

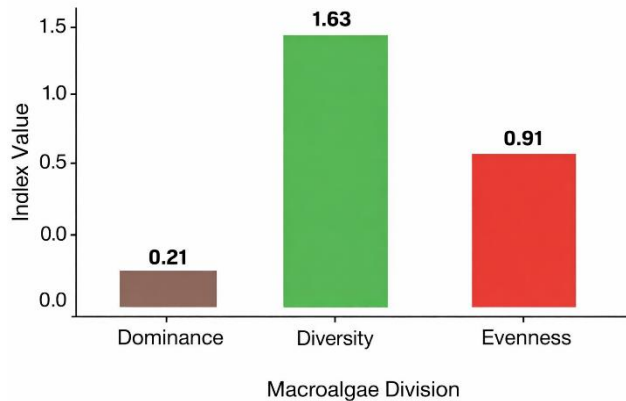


in macroalgae, such as photosynthesis and cellular homeostasis. An experimental study on the genus *Dictyota* by Muñoz et al. (2023) demonstrated that changes in salinity, whether hyposaline or hypersaline conditions, directly influence photosynthetic efficiency and the resistance of macroalgae to oxidative stress. Therefore, although the salinity at the study site was relatively low, the presence of macroalgae in certain transects was likely influenced by the specific capacity of each species to maintain its metabolic functions. This explains why only certain species, such as *Padina pavonica*, were able to persist under the measured environmental conditions.

The physical conditions of the waters at Rancabuaya Beach also indicate that a temperature of 29.1°C and light intensity reaching 4,014 lux provide an environment highly favorable for macroalgal growth. This finding is consistent with the study by Silaban (2024), which reported that the optimal temperature range for tropical macroalgae is between 15-30°C, while temperatures above 34.5°C may disrupt enzymatic activity and biochemical processes within the thallus. The relatively stable temperature within this optimal range appears to contribute to the occurrence of adaptive species such as *Ulva lactuca* and *Boergesenia forbesii*, which were more abundant in Transect 2—an area presumed to have the most ideal light exposure and water conditions. Light intensity also plays a significant role in the distribution pattern, particularly in Transects 2 and 3, where *Eucheuma cottonii* and *Gracilaria edulis* were more frequently observed. According to Silaban et al. (2024), high water clarity allows photosynthesis to proceed at an optimal rate, resulting in the dominance of species that require stable light conditions. The finding that *Gracilaria edulis* was only present in Transect 3 supports this concept, as this species tends to prefer areas with more stable salinity and sufficient light availability. Therefore, the combination of optimal temperature and high light intensity at Rancabuaya Beach appears to be a major factor regulating macroalgal distribution among transects. This finding is consistent with the literature, which emphasizes that temperature and light are two key parameters determining macroalgal distribution in tropical waters (Silaban, 2024).

The relatively high dissolved oxygen (DO) levels and slightly alkaline pH reflect the dominance of photosynthetic activity within the algal community. Wheeler (2022) reported that during daytime periods, significant increases in DO and pH occur concurrently with a decrease in pCO<sub>2</sub>, as a direct result of CO<sub>2</sub> uptake during photosynthesis. This finding emphasizes that algal metabolism plays a major role in regulating the diel chemical characteristics of aquatic environments. High DO levels indicate intense primary production, while a relatively alkaline pH suggests reduced accumulation of dissolved inorganic carbon due to the dominance of biological processes over respiration. Thus, elevated dissolved oxygen and slightly alkaline pH conditions represent a biogeochemically favorable environment that supports the continuity and intensity of algal community metabolism in coastal habitats (Wheeler, 2022).

Environmental conditions at Ranca Buaya Beach, characterized by neutral to slightly alkaline pH, stable temperatures around 29 °C, low salinity, and sufficient light intensity, indicate that the waters are conducive to macroalgal growth. The stability of these parameters is an important factor influencing macroalgal community structure (Rasyid, 2025). Although human activity at this site is relatively low, the presence of wood debris and plastic waste entering the intertidal zone may alter habitat conditions by covering substrates used for macroalgal attachment and increasing water turbidity due to wave movement. These disturbances may reduce suitable growing space and affect light penetration, potentially changing species composition and dominance patterns over time. Ecologically, changes in macroalgal composition can also affect the stability of intertidal ecosystems because macroalgae function as primary producers and microhabitats for various marine organisms. Therefore, efforts to maintain coastal cleanliness and reduce waste accumulation are important conservation measures to preserve macroalgal diversity and ecosystem balance in the coastal waters of Ranca Buaya Beach.



**Figure 3.** Ecological Indices (Diversity, Evenness, and Dominance) of Macroalgae at Ranca Buaya Beach, Ujung Genteng

Environmental conditions at Ranca Buaya Beach, characterized by neutral to slightly alkaline pH, stable temperatures around 29 °C, low salinity, and sufficient light intensity, indicate that the waters are conducive to macroalgal growth. The stability of these parameters is an important factor influencing macroalgal community structure (Rasyid, 2025). Although human activity at this site is relatively low, the presence of wood debris and plastic waste entering the intertidal zone may alter habitat conditions by covering substrates used for macroalgal attachment and increasing water turbidity due to wave movement. These disturbances may reduce suitable growing space and affect light penetration, potentially changing species composition and dominance patterns over time. Ecologically, changes in macroalgal composition can also affect the stability of intertidal ecosystems because macroalgae function as primary producers and microhabitats for various marine organisms. Therefore, efforts to maintain coastal cleanliness and reduce waste accumulation are important conservation measures to preserve macroalgal diversity and ecosystem balance in the coastal waters of Ranca Buaya Beach.

The evenness index (E) value of 0.91 indicates that, despite the relatively low species diversity, the distribution of individuals among species was fairly uniform. This high evenness suggests that no single species was overwhelmingly more abundant than the others. Sofiyana et al. (2023) reported that high evenness values often occur in communities with relatively few species but balanced proportions. Meanwhile, the dominance index value of 0.21 indicates that no macroalgal species dominated the community, resulting in a relatively even distribution of individuals among species. Low dominance values such as this suggest that the environmental conditions at the study site support the growth of several species without strong competitive pressure from any particular species (Silaban et al., 2024).

## CONCLUSION

This research demonstrated that the physicochemical conditions of the waters at Ranca Buaya Beach, Ujung Genteng, are key factors influencing the structure of the macroalgal community. Six species belonging to the divisions Chlorophyta, Rhodophyta, and Phaeophyta were identified, with their distribution affected by variations in depth, substrate type, and light intensity. The Shannon–Wiener diversity index value of 1.63 (moderate category), accompanied by high evenness (0.91) and low dominance (0.21), indicates that the ecosystem remains relatively stable and supports balanced coexistence among macroalgal divisions without significant competitive pressure. The findings of this study can serve as a baseline database for monitoring the environmental health of the Ujung Genteng coastal area using macroalgae as bioindicators. In addition, further studies on the bioactive potential of identified species, such as *Ulva lactuca* and *Eucheuma cottonii*,



are recommended to support sustainable community-based economic development through the utilization of marine resources.

#### **ACKNOWLEDGEMENTS**

The author would like to express sincere gratitude to the Biology Education Study Program at Sunan Gunung Djati State Islamic University Bandung for the facility support provided during the implementation of this research. Appreciation is also extended to the local village government for granting permission to conduct the study, as well as to all parties who contributed to the smooth data collection in the field.

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