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Comparison of brittle star (Echinoderm: Ophiuroidea) diversity and species composition between two substrates in the intertidal zone

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Abstract. *Maulidia S, Atmowidi T, Wirawati I, Priawandiputra W. 2025. Comparison of brittle star (Echinoderm: Ophiuroidea) diversity and species composition between two substrates in the intertidal zone. Biodiversitas 26: 2189-2197.* Brittle stars are essential species in marine ecosystems. These macrozoobenthic organisms help clean the sea of organic particles and serve as food for demersal fish. However, further research on brittle stars in the intertidal zone of West Java, Indonesia is needed, particularly on two different substrates: seagrass and coral. This study examined the diversity and composition of brittle stars in the intertidal zone of West Java at Ujung Genteng Beach, Sancang Beach, and Pangandaran Beach. The quadrant transect method was used for sampling, with 30 plots at each station on each beach. Each plot measured 2×2 m, with a distance of at least 2 m between plots. We identified 12 species of brittle stars. *Ophiocoma erinaceus* and *O. scolopendrina* were found at all sampling locations, with *O. scolopendrina* is the highest abundance. A species previously unreported in Indonesia, *O. anaglyptica*, was found on coral substrates, and *Ophiactis savignyi*, a fissiparous brittle star that reproduces asexually, was found at Pangandaran on seagrass substrates. Pangandaran Beach exhibited the highest diversity (H': 1.4), with corals being the most important substrate for brittle star habitat. In contrast, the highest Evenness Index was found at Sancang Beach with seagrass substrates (E: 0.89). This indicates that brittle stars are most abundant at Pangandaran Beach but were more evenly distributed at Sancang Beach.

Keywords: Coral, diversity, Ophiuroidea, quadrant-transect, seagrass

INTRODUCTION

Brittle star (Ophiuroidea) is a class of the phylum Echinodermata, with 2,111 confirmed species (Lee et al. 2019; Stöhr and O'Hara 2021). Research on Ophiuroidea in West Java, Indonesia, has reported species such as *Ophiocoma scolopendrina*, *O. erinaceus*, and *Ophiomastix annulosa* (Tarigan et al. 2020; Triacha et al. 2021). Brittle stars inhabit a wide range of depths, from the intertidal zone to the deep sea. Ophiuroidea species are commonly found on the ocean surface, either hidden behind corals or freely living in the open sea (Sanvicente-Añorve et al. 2021). In the intertidal zone, brittle stars occupy diverse habitats, including seagrass beds, macroalgae, coral reefs, and hard rocky substrates (Setiawan et al. 2018; Triacha et al. 2021).

As macrobenthic organisms in marine ecosystems, brittle stars play crucial roles such as filtering organic particles and functioning as suspension feeders (Sanvicente-Añorve et al. 2021). They also serve as prey for demersal fish (Nurdiansah and Supono 2017). Naturally, typically benthic, brittle stars prefer sheltered habitats like dead corals or mud-covered rocks due to their negative phototactic behavior. Morphologically, they have a disk-shaped body with pentaradial symmetry, surrounded by arms that extend and move flexibly, often featuring one or tentacle shields. Their body is protected by a calcareous shell (ossicle), which may be adorned with granules or spines (Clark and Rowe 1971).

Brittle star populations are commonly found in coral reef ecosystems, particularly within crevices of coral structures (Setiawan et al. 2022). Several families of brittle stars are commonly found on coral reefs, including Ophiocomidae, Ophiothricidae, Ophiolepididae, Ophiodermatidae, Ophionereidae, and Ophiomyxidae (Setiawan 2013).

The intertidal ecosystem, shaped by tidal movements, is a marine habitat characterized by limited spatial coverage, but a greater variety of environmental factors compared to other ecosystems. This diversity contributes to the high biodiversity observed in intertidal areas (Setiawan et al. 2019). *Ophiomastix annulosa* is commonly found in waterlogged zones of intertidal ecosystems, although its population density is relatively low (Setiawan et al. 2018). Substrates function as surfaces or mediums that provide living spaces for organisms (Setiawan et al. 2019). Seagrass, a flowering plant uniquely adapted to live submerged in seawater, is a vital component of coastal ecosystems. This substrate plays a crucial role in supporting primary productivity and serves as foraging and nursery habitats for various marine organisms (Kawaroe et al. 2016). Coral reefs are integral to tropical aquatic ecosystems, providing critical support to the organisms they host while also

contributing to nearby ecosystems, such as seagrass meadows and mangrove forests (Subhan et al. 2024).

Previous research on brittle stars in Indonesia has focused on the distribution of brittle stars along the coast of Garut (Paujiah et al. 2018), habitat preferences on Pancur Beach in Alas Purwo National Park (Setiawan et al. 2018), and the diversity of Ophiuroidea in Yogyakarta (Tarigan et al. 2020), as well as the diversity of brittle stars in Talise, North Sulawesi (Nurdiansah and Supono 2017). However, no studies have yet been conducted on brittle star diversity and composition in the intertidal zone of the southern coast of West Java. The southern coastline of West Java, Indonesia, encompassing Ujung Genteng, Sancang, and Pangandaran beaches, features intertidal zones with abundant seagrass and coral substrates. These areas are directly exposed to the Indian Ocean, which is characterized by strong wave action. Seagrass and coral ecosystems provide critical habitats for brittle stars, offering essential shelter, food sources, and contributing to the maintenance of ecological balance within these coastal ecosystems. This research aims to fill this gap by examining the diversity and species composition of brittle stars in these two substrate types: coral and seagrass. This study also establishes a taxonomic inventory, which is an essential step for monitoring biodiversity (Boissin et al. 2016).

MATERIALS AND METHODS

Study area

This research was conducted in the intertidal zone of West Java, Indonesia, at three locations: Ujung Genteng Beach (Sukabumi District), Sancang Beach (Garut District), and Pangandaran Beach (Pangandaran District) (Figure 1). Sampling was conducted at different locations and times: at Ujung Genteng Beach in September 2022, at Sancang Beach in October 2022, and at Pangandaran Beach in January 2023. The sampling sites were chosen based on beaches with wide intertidal zones containing coral and seagrass substrates, extending approximately 80 to 100 meters from the shoreline. All three locations met the criteria, including having sufficiently long low tide periods that provided ample time for thorough sampling.

Procedures

Sampling techniques and preservation

The sampling technique employed was the quadrant transect method (Nurdiansah and Supono 2017; Tarigan et al. 2020), which involved two stations with different substrates and 30 plots at each station on each beach. Each plot measured 2×2 m, with a minimum distance of 2 m between plots (Samritin et al. 2019; Syukur et al. 2020). Sampling was performed by hand-picking individual brittle stars within each plot and data collection was recorded on a tally sheet (Fujita and Irimura 2015). Sampling took place during low tide. To determine the sampling times, we used the Magicseaweed application alongside direct field observations. At Ujung Genteng Beach, sampling at the first station began at 03.45 p.m. and continued into the evening, while at the second station it started at 08.05 a.m. and lasted until midday. At Sancang Beach, the first station sampling started at 11.00 a.m., and the second station at 01.48 p.m.

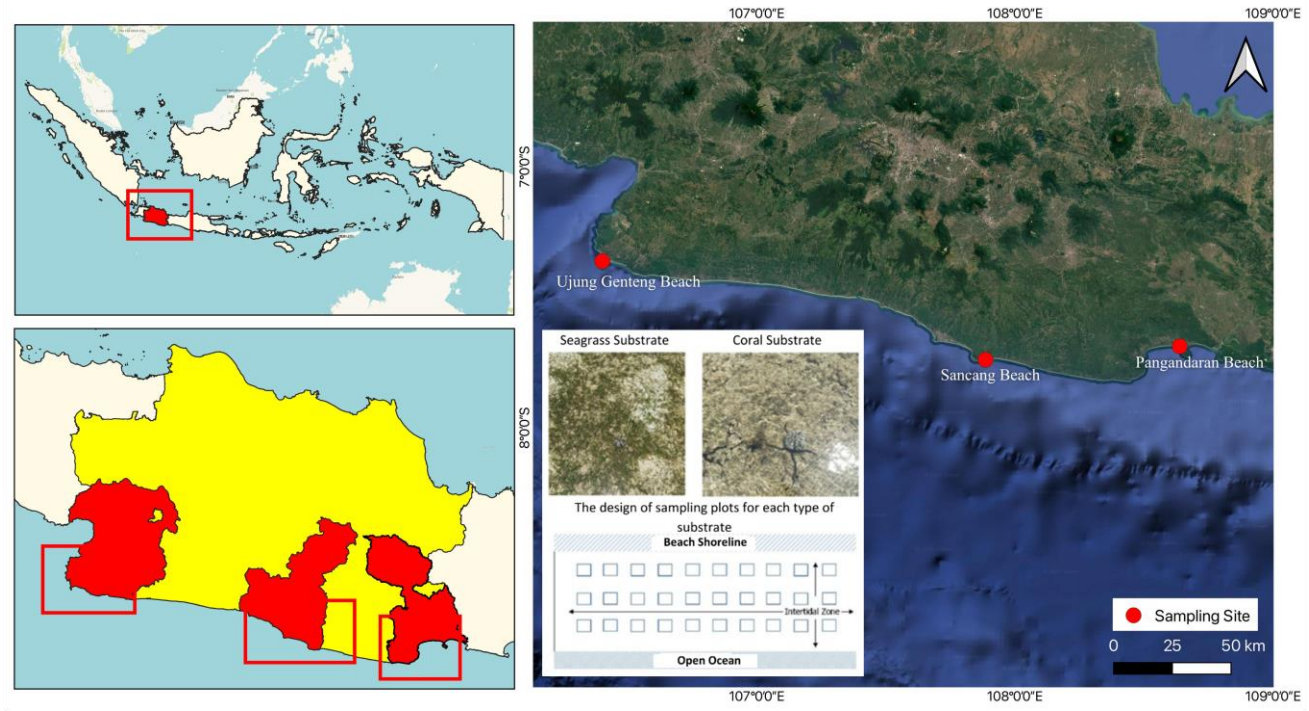

Figure 1. The research location of diversity and species composition of the brittle star in the intertidal zone of West Java, Indonesia

Sampling at Pangandaran Beach began at 00.30 p.m. and continued into the afternoon, with a second session starting at 04.00 a.m. the following day. Environmental data were collected, including water temperature with a thermometer, salinity using a refractometer, and the geographical coordinates of the sampling sites were recorded with a GPS device. At each station, a sample was collected, labeled, and photographed, with images documenting the substrate where the sample was found. The samples were then placed in small plastic zipper bags with holes drilled into the surface and grouped by plot. These small bags were subsequently placed in larger plastic zipper bags for transport. Samples were preserved by soaking in 96% ethanol and stored in an airtight sample box. The samples were identified at the Invertebrates Laboratory of the Oceanographic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

Species identification

Brittle stars were identified through morphological examination, focusing on characteristics such as the shape of the papillae, tooth shape, presence of an oral disc, number of tentacle scales, body surface texture, and the shape of the arm spines. Identification was based on Clark and Rowe (1971), Hoggett (1991), and Hendler (2018), and was verified against the World Register of Marine Species (WORMS). Samples were examined using a Discovery V8 stereomicroscope, and photographs were taken of individual parts or the entire specimen, especially for smaller individuals. Species identification was confirmed by experts from the Research Centre for Oceanography, BRIN, the Laboratory of Ecologia Molecular, Microbiology Taxonomia (LEMITAX) at the Universidad of Guadalajara, Mexico, and the Department of Zoology at the Swedish Museum of Natural History, Sweden.

Data analysis

The diversity and species composition of brittle stars were analyzed by calculating species richness, the Shannon-Wiener Diversity Index (H'), and the Evenness Index (E) using PAST 4.03 software (Morris et al. 2014). Rarefaction was calculated using the online tool available at https://chao.shinyapps.io/iNEXTOnline/. Non-Metric Multidimensional Scaling (NMDS) was used to analyze species composition based on the Bray-Curtis matrix. At the same time, the Analysis of Similarity (ANOSIM) test was employed to assess differences in community structure across sampling locations by evaluating sample variation (Liang et al. 2025). Data from plots where brittle stars were absent were excluded from the analysis. Additionally, abiotic factors were measured during sampling to explore potential correlations between biotic and abiotic components at each sampling site.

RESULTS AND DISCUSSION

Sampling site observations

Ujung Genteng Beach is divided into several sections. The sampling sites for this study were located at Cibuaya and Ujung Genteng beaches. Cibuaya Beach is dominated by over 90% coral substrate, while Ujung Genteng Beach features more than 90% seagrass substrate in its intertidal zone. The intertidal zone on both beaches extends approximately 100 meters from the shoreline. Ujung Genteng Beach is a well-known tourist area located near residential zones.

Sancang Beach is located on the edge of the Leuweung Sancang Nature Reserve. Dense forest cover and several rivers obstruct direct access to the beach. However, a fishing village is located along the central part of the coastline. Sancang Beach also has seagrass and coral substrates that extend up to 80 meters into the intertidal zone.

Pangandaran Beach, located within the Pananjung Pangandaran Nature Reserve, is geographically divided into western and eastern sections. The research was conducted on the western side, which has both seagrass and coral substrates in the intertidal zone that extend up to 80 meters into the intertidal zone. The beach is relatively narrow and surrounded by coastal forests.

The sampling times differed across the three locations, which could have impacted the diversity and abundance of brittle stars, as seasonal shifts often affect environmental factors like water temperature, salinity, and light intensity. These changes can lead to variations in species presence and activity. However, since all sampling took place during low tide and under relatively consistent weather conditions, the influence of seasonal variation was likely minimized. To further reduce temporal bias, future studies could benefit from conducting simultaneous sampling at all locations.

Species identification

Based on the identification results, we recorded 1,170 individuals, 12 species, and 8 genera from six families of brittle stars: one species from the Ophiactidae, one species from the Amphiuridae, six species from the Ophiocomidae, two species from the Ophiodermatidae, and one species each from the Ophiolepididae and Ophiotrichidae. The species were found across both seagrass and coral substrates (Table 1). The genus *Ophiocoma* was present at all study locations, with *O. scolopendrina* and *O. erinaceus* being the most dominant species, found in the highest numbers.

Ophiactidae is represented by *Ophiactis savignyi* (Figure 2.A), which was found at Pangandaran. This small species has only a few oral papillae on each side of the jaw and square teeth. It possesses six arms and is the only fissiparous species observed in this study. *Ophiactis savignyi* is commonly found in coral and sponge habitats.

Amphiuridae was represented by *Amphipholis* sp. (Figure 2.B), found at Ujung Genteng. This species is small and light in color. It has infra-dental oral papillae on the oral side and a large radial shield on the adoral side. The disc is smooth, lacking granules or spinelets, and is cream-colored. *Amphipholis* sp. is typically found in association with *Ophiocoma* species along the arms (Boissin et al. 2016).

Table 1. Species and diversity index of brittle stars in the intertidal zone of West Java, Indonesia, based on their substrates

Family	Species	Pangandaran			Sancang			Ujung Genteng			Grand total
		C	S	Total	C	S	Total	C	S	Total	
Ophiactidae	*Ophiactis savignyi*		1	1							1
Amphiuridae	*Amphipholis* sp.							2		2	2
Ophiocomidae	*Ophiocoma anaglyptica*				16		16				16
	Ophiocoma brevipes		1	1							1
	Ophiocoma dentata		2	2							2
	Ophiocoma erinaceus	13	73	86	157	18	175	160	46	206	467
	Ophiocoma scolopendrina	63	78	141	106	48	154	96	187	283	578
	Ophiomastix annulosa	26	1	27							27
Ophiodermatidae	*Ophiarachnella similis*	68		68							68
	Ophiochasma stellata								1	1	1
Ophiolepididae	*Ophiolepis* sp.		2	2							2
Ophiotrichidae	*Macrophiothrix longipeda*		5	5							5
Total abundance		**170**	**163**	**333**	**279**	**66**	**345**	**258**	**234**	**492**	**1170**
Total species richness		4	8	9	3	2	3	3	3	4	12
Chao-1		4	9	9.33	3	2	3	3	3	4	12.75
Shannon Index		1.21	1.02	1.40	0.86	0.59	0.85	0.70	0.52	0.72	1.1
Evenness Index		0.85	0.35	0.45	0.78	0.89	0.77	0.67	0.56	0.51	0.25

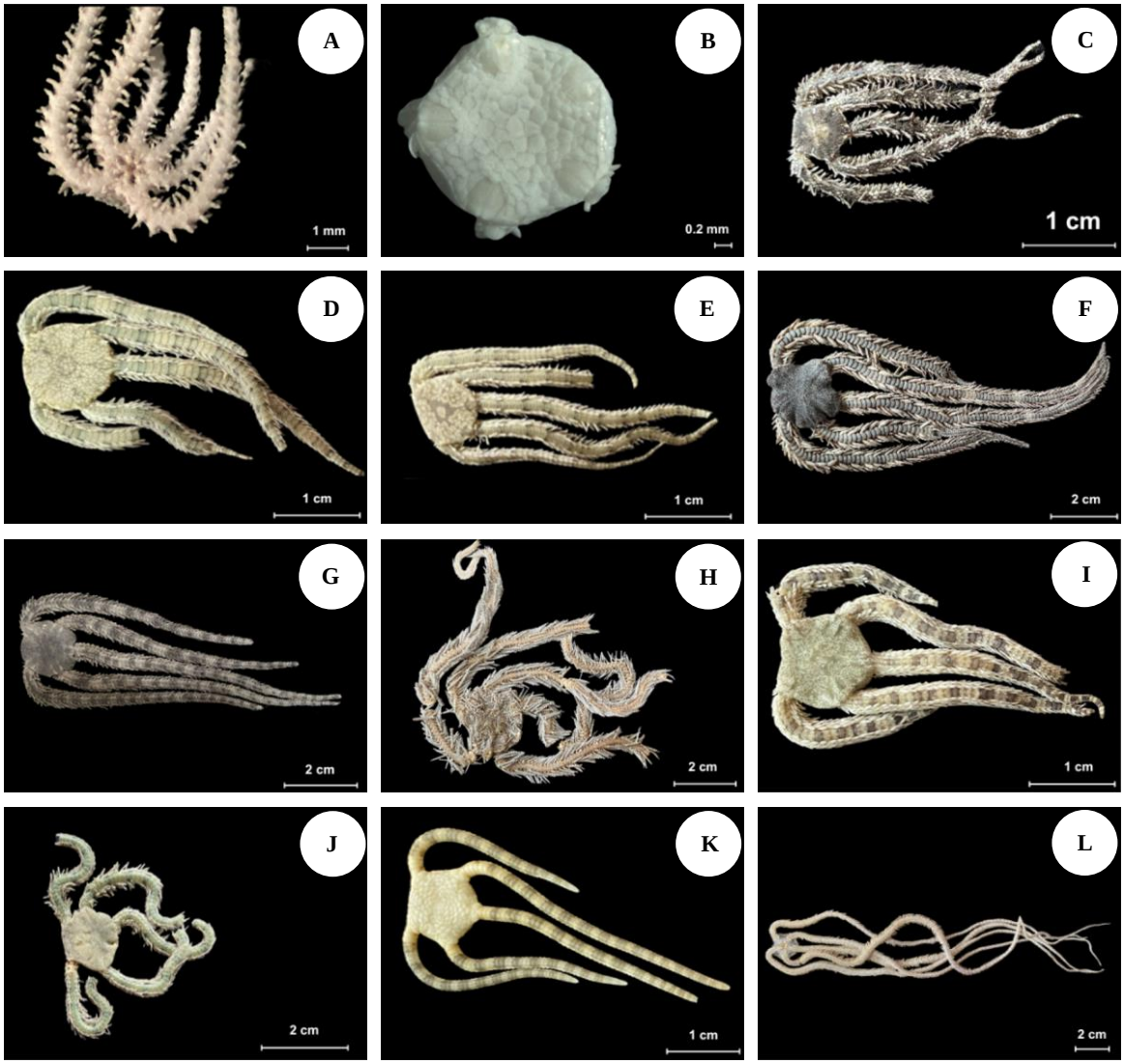

Figure 2. Species of brittle stars in the intertidal zone of West Java, Indonesia. A. *Ophiactis savignyi*; B. *Amphipholis* sp.; C. *Ophiocoma anaglyptica*; D. *Ophiocoma brevipes*; E. *Ophiocoma dentata*; F. *Ophiocoma erinaceus*; G. *Ophiocoma scolopendrina*; H. *Ophiomastix annulosa*; I. *Ophiarachnella similis*; J. *Ophiocasma stellata*; K. *Ophiolepis* sp.; L. *Macrophiothrix longipeda*

Ophiocomidae, the most abundant family of brittle stars in this study, highlights the rich diversity of marine ecosystems. The genus *Ophiocoma* is predominantly represented in this family. *Ophiocoma anaglyptica* (Figure 2.C) stands out with its white and black striped color with white dots on the dorsal arm plates. *Ophiocoma brevipes* (Figure 2.D) is light in color, white or beige and green, and it has a dark line on the adoral side. *Ophiocoma dentata* (Figure 2.E) is similar to *O. brevipes*, but the disc is mixed brown with darker lines outlining each arm plate. It also has a smaller size than *O. brevipes*. Hence, these two species have different granulation densities. *Ophiocoma erinaceus* (Figure 2.F), the color of living animals is dark. Most species reach a large size, and granules cover the disk. *Ophiocoma scolopendrina* (Figure 2.G) has a brown color with a yellowish ventral side. *Ophiomastix annulosa* (Figure 2.H) is colored red brownish with grey on the aboral surface. Their arms have scattered blunt spines. They are commonly found under the massive corals.

Ophiarachnella similis (Figure 2.I) is green with a lighter color on the aboral surface. Its aboral surface is covered with small granules. *Ophiocasma stellata* (Figure 2.J) is green and has granules covering the entire aboral surface. *Ophiolepis* sp. (Figure 2.K) is characterized by its green color, with beige-striped arms. It has large plates covering the dorsal disc, surrounded by smaller plates. *Macrophiothrix longipeda* (Figure 2.L) is noted for its long arms, yellow coloration, and conspicuous black dots on the aboral surface.

Diversity analysis

A variety of species were identified, though most were represented by low individual numbers, except for the two dominant species, *O. scolopendrina* and *O. erinaceus*. Diversity analysis at each sampling location revealed that Ujung Genteng Beach and Sancang Beach exhibited low diversity, with Shannon-Wiener Diversity Index values of H': 0.72 and H': 0.85, respectively. This is primarily due to the limited presence of species other than the dominant ones. In contrast, Pangandaran Beach showed moderate diversity, with a score of H': 1.40. Although a wider variety of species was observed at Pangandaran, their low abundance contributed to the moderate diversity value.

The Evenness Index, which reflects the stability of species composition within the community, was highest at Sancang Beach (E: 0.78), indicating a balanced distribution among species. Conversely, Pangandaran Beach (E: 0.45) and Ujung Genteng Beach (E: 0.51) exhibited lower evenness scores, suggesting fewer stable communities. While Pangandaran Beach had the highest diversity index among the sampling locations, Sancang Beach recorded the highest Evenness Index, reflecting its relatively balanced species composition.

Analysis of species distribution

The results demonstrated the stability of the sample data, as verified through rarefaction analysis, which produced a stable linear curve (Figure 3). These findings suggest that the number of Ophiuroidea species collected in this study is already sufficient, as shown by the stable pattern of the rarefaction curve. If further sampling were conducted, it would likely produce similar results. Additionally, when looking at the diversity across different beach sites, the number of samples appears balanced, making it suitable for identifying the taxonomy of each individual in the samples. The variation between sampling locations is also well managed, indicating that the sampling in this study was both thorough and consistent. The distribution of brittle star species varied across the sampling locations, with *O. erinaceus* and *O. scolopendrina* being the only species found at all sites.

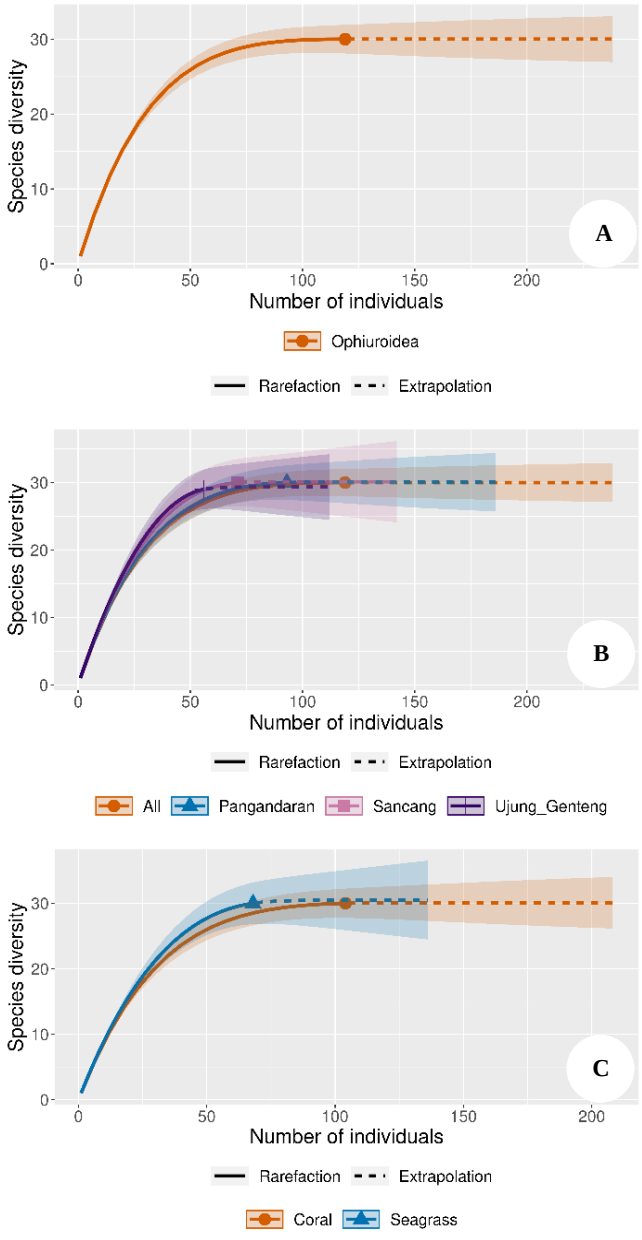

Figure 3. Rarefaction of species diversity. A. All sampling locations in West Java, Indonesia; B. Comparison between sampling locations (Ujung Genteng Beach, Sancang Beach, and Pangandaran Beach); C. Comparison between substrates

At Ujung Genteng Beach, two additional species, *Amphipholis* sp. and *O. stellata*, were identified, though they were neither common nor dominant (Figure 4). At Sancang Beach, *O. anaglyptica* was observed alongside the dominant species. In contrast, Pangandaran Beach exhibited greater species richness, with seven additional species found in low numbers: *O. savignyi*, *O. brevipes*, *O. dentata*, *O. annulosa*, *O. similis*, *Ophiolepis* sp., and *M. longipeda* (Figure 4). Among these, *O. similis* was the third most abundant species after *O. erinaceus* and *O. scolopendrina*. The findings indicate that brittle stars inhabit diverse substrates but are predominantly found in seagrass habitats (Figure 4). Only three species were observed across both substrate types.

Analysis of species composition

The Non-metric Multidimensional Scaling (NMDS) analysis revealed significant variation in brittle star species composition across the intertidal zones of West Java (Figure 5). Among the sampling locations, Pangandaran Beach exhibited the highest species variation and distinct species characteristics.

An Analysis of Similarity (ANOSIM) test further supported these findings, indicating high sample variation with a statistically significant result (p: 0.0001).

Environmental data

Abiotic environmental factors closely influence the diversity and abundance of brittle star species in the intertidal zone of West Java. Salinity measurements in the study area ranged from 30 to 35 ppt, aligning with the typical salinity range of tropical waters (32-34 ppt). The temperature at each sampling location varied between 28°C and 39°C, reflecting daytime sampling conditions.

Discussion

Brittle stars were found in high abundance along the southern coast of West Java, showing distinct species variations across sites. They were commonly observed on coral and seagrass substrates, with sampling methods tailored to suit each location. Their diversity appears to be strongly influenced by abiotic factors that help sustain their presence, especially in the dynamic intertidal environments of this coastal region.

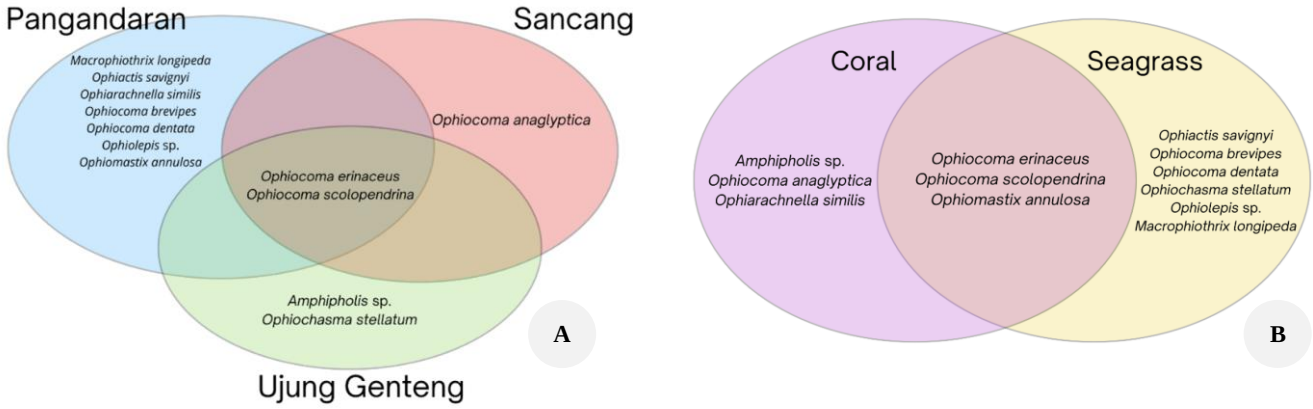

Figure 4. A. Species distribution of brittle stars in all sampling sites; B. Species distribution of brittle stars in each substrate

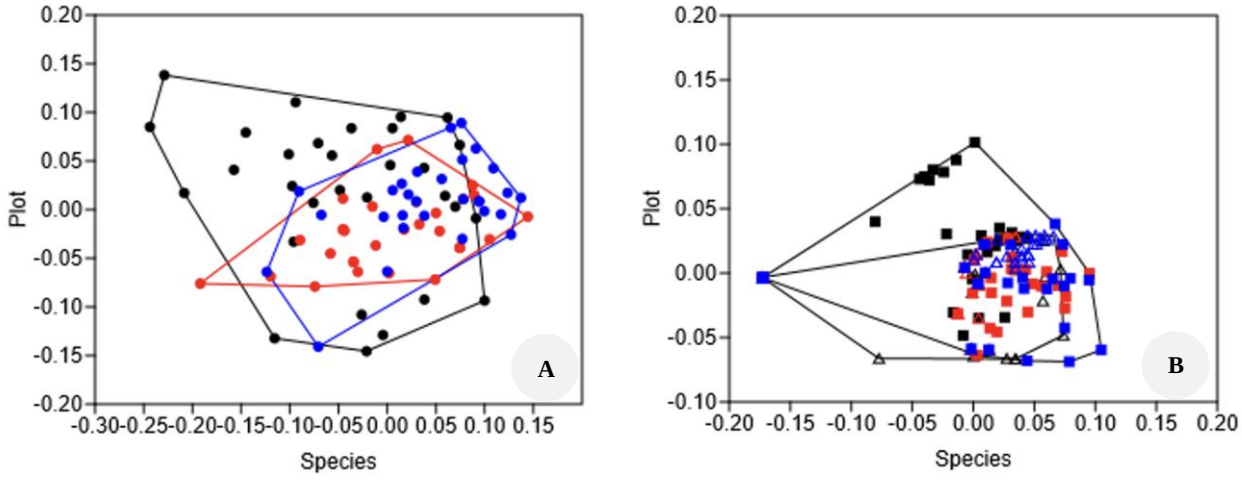

Figure 5. A. Analysis of Non-metric Multidimensional Scaling (NMDS) for species composition of brittle star in the intertidal zone of West Java, Indonesia, among sampling sites; B. Among substrates at all sampling sites. *Black: Pangandaran Beach; Red: Sancang Beach; Blue: Ujung Genteng Beach; ■: Coral; Δ: Seagrass

Brittle stars are strongly associated with seagrass and coral substrates, as reported by Nurdiansah and Supono (2017). Similarly, Setiawan et al. (2018) identified six species of brittle stars, predominantly from the genus *Ophiocoma*, in the intertidal zones of Alas Purwo National Park on eastern Java Island. The genus *Ophiocoma* is widely distributed in tropical and subtropical regions (Devaney 1973) and represents the most abundant large ophiuroids on coral reefs (Boissin et al. 2016).

Previous studies on the Rancabuaya Coastal Area of Garut, West Java, found brittle star communities dominated by *O. scolopendrina* (Paujiah et al. 2018). Consistent with those findings, this study observed that the intertidal zones of West Java are dominated by species of the genus *Ophiocoma* (Table 1). As members of the Ophiocomidae, *Ophiocoma* spp. are known to form dense populations on coral reef substrates (Oak and Scheibling 2006). Coral reefs provide critical shelter from strong waves and predators, making them ideal habitats for this genus.

Setiawan et al. (2018) further noted that *O. scolopendrina* has a broad distribution and forms aggregations within its territorial boundaries. This species has been identified as the most abundant brittle star on Cocos (Keeling) Island (Marsh 1994). In this study, *O. scolopendrina* was the most abundant species, frequently found under corals and rocks in shallow waters (Chinn 2006). The intertidal zones of West Java remain suitable habitats for this species, as indicated by its widespread abundance along the region's southern coastline.

Ophiocoma scolopendrina is prominent in coral reef ecosystems and thrives in habitats with sandy rock substrates and seagrass beds (Paujiah et al. 2018). These habitats support its survival by providing refuge from strong waves and predators. Furthermore, seagrass beds supply essential nutrients and organic matter, enhancing food availability and facilitating population growth (Oak and Scheibling 2006).

Ophiocoma erinaceus has been extensively reported in Indonesian waters, specifically in Java Island (Sriwahjuningsih et al. 2020; Tarigan et al. 2020; Triacha et al. 2021). This species thrives in tropical waters and is frequently found in the intertidal zone of West Java alongside *O. scolopendrina*. Despite their similarities, *O. scolopendrina* can be distinguished by its smaller body size and paler disc coloration. Both species exhibit dense aggregations, as observed at Pancur Beach (Setiawan et al. 2018).

Other brittle star species were site-specific and observed at only one sampling location (Figure 4). Among these, *O. similis* was the most common species at Pangandaran Beach after *O. scolopendrina* and *O. erinaceus*. This species thrives on coral substrates and is not widely documented in the literature. Marsh (1994) first reported *O. similis* in the waters around Cocos (Keeling) Island in the Indian Ocean and noted its presence in Chapter 13 of Echinoderms of the Cocos (Keeling) Island. *Ophiomastix annulosa* has been recorded on coral reefs and mangrove substrates with sandy and muddy conditions, such as those at Basaan Beach, North Sulawesi (Budiman et al. 2014). In this study, *O. annulosa* was observed at Pangandaran Beach, demonstrating its ability to inhabit both coral reef and seagrass substrates. This species is nocturnal, preferring to avoid sunlight by hiding during the day.

Ophiomastix annulosa is widely distributed in Indonesian waters, ranging from Sulawesi to Java (Setiawan et al. 2018; Lesawengan et al. 2019). Notably, this study represents the first recorded occurrence of *O. anaglyptica* in the intertidal zone of West Java, Indonesia.

Macrophiothrix longipeda was the largest brittle star identified in this study (Figure 2.L). This species is often found in association with shrimp on coral reefs, where it provides camouflage to help shrimp avoid predators (Hendler et al. 1999; Marin et al. 2005). However, in this study, *M. longipeda* was also observed on seagrass substrates. Its behavior of burying itself in sand and coral, with only the tips of its arms exposed, enhances its concealment. *Macrophiothrix longipeda* has a broad distribution, extending to Australian waters (Hoggett 1991). Other brittle star species were found in small numbers at specific sampling sites. *Ophiocoma dentata* was found in seagrass beds in Pacitan, while *Ophiolepis* sp. was reported in Gorontalo waters (Yusuf and Kadim 2019). In this study, *Amphipholis* sp. was found at Ujung Genteng Beach, living on dead corals in the tidal zone.

Ophiactis savignyi is widely distributed, from Mexico and Australia to Malaysia. Previous studies have documented its presence in various regions, including an updated checklist of Ophiuroidea in the Central Mexican Pacific (Granja-Fernández et al. 2017), western Australian waters (Marsh and Morrison 2004), Johor Strait, Singapore (Fujita and Irimura 2015), Kepulauan Seribu, Indonesia (Triana et al. 2015), Kemantren Coast (Rahayu et al. 2019), and Penang, Malaysia (Teoh and Woo 2021). In this study, *O. savignyi* was found at Pangandaran Beach and has six arms with two oral papillae on each jaw. Within this genus, species with six arms typically reproduce asexually (fissiparous), while species with five arms reproduce sexually (Hendler 2018). Another species found in small numbers was *O. brevipes*, which was observed only at Pangandaran Beach. Previous research reported *O. brevipes* in sandy seagrass substrates (Marsh 1994).

The diversity of brittle stars in the intertidal zone of West Java was moderate, with a diversity index score of H': 1.1 (Hanibe et al. 2022). The diversity and evenness indices indicated that Pangandaran Beach had the highest diversity, while Sancang Beach exhibited the highest evenness. Previous evenness analyses of Ophiuroidea on the southern coast of West Java found depressed communities with scores of E: 0.25 or below 0.5 (Hanibe et al. 2022), likely due to the dominance of a few species. The ANOSIM score for this study was $p<0.05$, indicating significant variation in species composition between sampling locations (Clarke and Ainsworth 1993). The NMDS plot analysis (Figure 5), based on the Bray-Curtis matrix, showed distinct clustering of samples, indicating that the brittle star communities along the southern coast of West Java exhibit significant variation, particularly at Pangandaran Beach (Liang et al. 2025).

Abiotic factors, such as water temperature and salinity, play crucial roles in the presence and distribution of marine organisms (Samritin et al. 2019). Salinity in the intertidal zone of West Java, ranging from 30-35 ppt, supports marine life, as it falls within the standard range for tropical waters. Water temperature in the intertidal zone varies due to sunlight intensity, with temperatures ranging from 28-30°C in the morning and evening, and reaching 39°C in the afternoon (Flipkens et al. 2021). Salinity levels of 33 ppt in the waters of the southern coast of West Java are suitable for marine biota, although species must have specific tolerance limits to environmental conditions.

This study emphasizes the marine biodiversity found along the southern coast of West Java, with a particular focus on the diversity of brittle stars associated with coral and seagrass substrates, both of which serve as key habitats for these organisms. The relatively well-preserved seagrass meadows and coral reefs in the region's intertidal zones play an important role in sustaining brittle star populations. Several species were found exclusively on seagrass substrates, including *O. savignyi*, *O. brevipes*, *O. dentata*, *O. stellata*, *Ophiolepis* sp., and *M. longipeda*. Others, such as *Amphipholis* sp., *O. anaglyptica*, and *O. similis*, were recorded only on coral substrates. Additionally, species like *O. scolopendrina*, *O. erinaceus*, and *O. annulosa* were found on both types of substrates. Overall, brittle star diversity in this coastal region can be classified as moderate, with *O. scolopendrina* and *O. erinaceus* emerging as the most dominant species.

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