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e-mail:jppi.puslitbangkan@gmail.com
JURNAL PENELITIAN PERIKANAN INDONESIA
Volume 31 Nomor 1 Maret 2025
p-ISSN: 0853-5884
e-ISSN: 2502-6542
Nomor Akreditasi RISTEK-BRIN: 148/M/KPT/2020

ANALISIS EKOSISTEM ANTARA PANTAI WISATA DAN NON-WISATA: BERDASARKAN STRUKTUR KOMUNITAS *Ocypode* sp.

ECOSYSTEM ANALYSIS BETWEEN TOURIST AND NON-TOURIST BEACHES: BASED ON THE COMMUNITY STRUCTURE OF Ocypode sp.

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Teregistrasi I tanggal: 05 Mei 2024; Diterima setelah perbaikan I tanggal: 27 Februari 2025;
Disetujui terbit tanggal: 4 Maret 2025

ABSTRAK

Penelitian ini bertujuan untuk menganalisis perbedaan ekosistem pantai wisata dan non-wisata berdasarkan struktur komunitas *Ocypode* sp. Analisis komunitas dilakukan pada dua lokasi: Pantai Loang Baloq (wisata) dan pantai Setangi (non-wisata). Metode line transect dipilih untuk pengumpulan sampel. Pada setiap lokasi dibuat tiga stasiun, dimana pada setiap stasiun terdapat lima kuadran pengamatan. Koleksi data fisiko-kimia perairan terdiri dari kecerahan, pH, suhu, TDS, dan EC (konduktivitas). Selain itu dilakukan pendataan aktivitas manusia sekitar pantai dengan menggunakan kriteria tertentu: 1) jarak pantai ke pusat kota; 2) keberadaan hotel/bangunan sekitar pantai; 3) keberadaan sampah fisik; 4) frekuensi pengunjung; dan 5) keberadaan fasilitas umum. Sampel *Ocypode* sp. diidentifikasi kemudian dianalisis secara deskriptif yang terdiri dari: 1) kepadatan, 2) kepadatan relatif, dan 3) indeks diversitas. Ditemukan 5 spesies kepiting hantu (*Ocypode* sp.) di Pantai Loang Baloq dan Setangi: *Ocypode kuhlii*, *Ocypode jousseame*i, *Ocypode pallidula*, *Ocypode ryderi*, dan *Ocypode japonica*. Kepadatan dan keanekaragaman spesies *Ocypode* sp. tertinggi ditemukan di Pantai Setangi (non-wisata). Fisiko-kimia perairan Pantai Setangi menunjukkan kualitas yang lebih baik dibandingkan Pantai Loang Baloq. Demikian pula dengan karakteristik aktivitas manusia di area pantai yang teramati. Dapat disimpulkan bahwa faktor fisiko-kimia dan aktivitas manusia mempengaruhi kepadatan dan diversitas *Ocypode* sp.. Selain itu, berdasarkan analisis kepadatan dan diversitas *Ocypode* sp., pantai Setangi (non-wisata) memiliki kualitas ekosistem yang lebih baik dibandingkan pantai Loang Baloq (wisata).

Kata kunci: Ekosistem; ***Ocypode*** **sp.; Pantai wisata; Pantai non-wisata; Struktur komunitas**

ABSTRACT

This research aims to analyze the differences between tourist and non-tourist beach ecosystems based on the community structure of Ocypode sp. Community analysis was carried out at two locations: Loang Baloq Beach (tourism) and Setangi Beach (non-tourism). The line-transect method was chosen for sample collection. At each location, three stations were created, and at each station, there were five quadrants. The water physico-chemical data collection consists of brightness, pH, temperature, TDS, and EC (conductivity). Apart from that, data was collected on human activity around the beach using certain criteria: 1) distance from the beach to the city center; 2) the existence of hotels or buildings around the beach; 3) the presence of physical waste; 4) visitor frequency; and 5) the existence of public facilities. Samples of Ocypode sp. were identified and then analyzed using density formulas, relative density, and diversity index. There are five species of ghost crab (Ocypode sp.) at Loang Baloq and Setangi Beach: Ocypode kuhlii, Ocypode jousseamei, Ocypode pallidula, Ocypode ryderi, and Ocypode japonica. The highest density and diversity of Ocypode sp. are found at Setangi Beach (non-tourist). The physico-chemistry of Setangi Beach waters shows

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DOI: http://dx.doi.org/10.15578/jppi.31.1.2025.1-10

better quality than Loang Baloq Beach. Likewise, the characteristics of human activity in the coastal area were observed. It can be concluded that physico-chemical factors and human activities influence the density and diversity of Ocypode sp. In addition, based on the community structure of Ocypode sp., it is stated that Setangi Beach (non-tourist) has better ecosystem quality than Loang Baloq Beach (tourism).range of net profit obtained by fishermen per trip ranged from Rp 10,000.00 - Rp 110,000.00.

Keywords: Ecosystem; Ocypode* sp.*; Tourist beaches; Non-tourist beach: Structure of community

PENDAHULUAN

Indonesia's coastal areas have prosperous resource potential. Indonesia has a coastline of around 95,181 km and become the country with the second longest coastline in the world (Ministry of Maritime Affairs and Fisheries, 2019). This long coastline has the potential for enormous natural wealth. However, unfortunately, coastal and marine areas are often polluted by human activities (Darmawan and Ali, 2014). Waste pollution on the coast can cause damage to marine ecosystems, flora, and fauna. This is caused by various human activities such as tourism, littering, beach exploitation, illegal fishing, and so on. This fact is also stated by Ekawaty (2019) and Arianto et al., (2021), to fulfill human needs, activities arise that contribute to damage to the surrounding environment.

This problem certainly needs to be a concern because human activities that damage the ecosystem will have a negative impact on the environment and humans themselves. Increasing human activity has caused various problems, including environmental degradation, pollution, and waste problems (Akhtar, 2021; Ukaogo et al., 2020). For example, plastic waste can pollute marine and coastal flora and fauna, in turn destroying the balance of aquatic ecosystems (Dey et al., 2024; Worm et al., 2017). Coastal and marine pollutants that must be watched out for include oil, heavy metals, pesticides, and rubbish (Apriliani, 2017). Pollution of coastal ecosystems will have an impact on damaging the stability of the community of organisms living in the area (Yu et al., 2018).

Ghost crabs (*Ocypode* sp.) are one of the aquatic organisms that live on the coast. Although ghost crabs can live on the entire beach surface, they rely heavily on the supralittoral to mid-tidal zones to forage and build semi-permanent burrows (Barboza et al., 2021). This animal is a type of animal that eats everything or plant remains found on beaches or sand dunes. Ghost crabs eat a variety of foods, ranging from single-celled algae obtained by foraging in the water to being active predators of turtle and shorebird eggs and hatchlings (Elfandi et al., 2018; Paransa et al., 2019). On the other hand, ghost crabs also like dead biota and human food remains (Amin et al., 2021).

Ghost crabs have unique claws because the two claws are not the same size. The left claw is larger than the right claw (Gül & Griffen, 2020). The left claw is used to dig burrows as a place to live, while the right claw is used for eating. This animal can move quickly and is able to climb rocks, slippery surfaces, and jump over turbulent rocks on the coast (Springthorpe, 2016). Ghost crabs also have high adaptability through mimicry, changing their body color and blending with their surrounding environment. Ghost crabs are usually bright pink when they hatch and change color to grayish pink over a certain period of time (Hughes et al., 2014).

Ghost crabs have a central role in coastal ecology as decomposers in food webs due to their high bioturbation activity (Ishizaki et al., 2023). Bioturbation is the process of weathering soil and sediment carried out by animals or plants (Le Bayon et al., 2021; Zaharescu et al., 2020). The ecological role of ghost crabs includes increasing the distribution of soil oxygen, metabolizing nutrients, and increasing mineralization as a natural food source for various species of aquatic flora and fauna, supporting the carbon life cycle, and balancing the food chain (Kim et al., 2023). Apart from that, ghost crabs also have a close relationship with humans because they are often used for medicine and health foods. Thus, ghost crabs are also part of the cultural heritage of indigenous peoples.

Apart from its very important role in ecology and human life, ghost crabs are a bioindicator for assessing the stability of coastal areas (sandy beaches) (Kurnia & Satria, 2023; Checon et al., 2023). This is because ghost crabs are animals that are sensitive to ecological conditions such as water quality, nutritional content and pollution (Kim et al., 2023). Human activities also greatly affect the life of ghost crabs (Barboza et al., 2021). In addition, the bioturbation activity of ghost crabs makes it suitable for use as a bioindicator because bioturbation activity can cause changes in sediment texture which can be used as an indicator of ecological conditions and geological processes (Kurnia & Satria, 2023). Therefore ghost crabs are suitable for use as bioindicators of coastal waters.

Based on this explanation, this research aims to reveal the condition of the aquatic ecosystem on tourist and non-tourist beaches, through studying the community structure of ghost crabs.

MATERIAL AND METHODS

This research conducted in two different locations. The first location is Loang Baloq Beach, located in Mataram City, close to residential areas and urban centers, so it is busy with tourists. Meanwhile, the second location is Setangi Beach, North Lombok, far from residential areas and urban centers with minimal tourists. This research carried out in March–June 2023. The research location is shown in Figure 1.

This research was carried out using the Line Transect method by drawing a line 150 m along the coastline and in the tidal zone, which is 20 m. The total transect area used in this research was 3,000 m2. At each location, 3 stations or transects measuring 10 m by 10 m were made. Within the transect, 1 m x 1 m quadrants are placed. Quadrant installation is carried out in a zig-zag manner with a distance between plots of 1 meter. The number of quadrants in 1 transect is 5 quadrants. The distance between each station is 50 meters. The ghost crabs found will be counted and samples collected. This data will be used to analyze the density and diversity of the ghost crab community.

The measurements of physico-chemical factors in coastal waters were carried out. Sea water clarity is measured using a Secchi disk, water pH is measured using a pH meter, water temperature is measured using a water thermometer, and TDS and EC levels are measured using a TDS meter and an EC meter. Other tools and materials needed are stationery, buckets, small shovels, sample bottles or plastic, label paper, raffia rope, measuring tape, stakes, and fat as a crab attractant. Physico-chemical data is analyzed and used as secondary data to determine the quality of coastal waters. Apart from that, observations were made of the coastal environment. Observation criteria for the environment around the coast consist of several indicators: 1) distance of the location from the urban center; 2) existence of buildings around the coast; 3) cleanliness of the beach; 4) frequency of visitors; and 5) availability of infrastructure such as parking lots, toilets, and other facilities. To complete the observation data, interviews were also conducted with the surrounding community and/or beach management. Species identification was carried out at the Biology Laboratory, UIN Mataram, using an identification guide. Data on the number of individuals were analyzed using density, relative density, and diversity formulas.

- Density

$$D = \frac{ni}{A}$$

D : Type Density (individuals/km²).

Ni : Number of individuals of a species

A : Area of sampling area (km²)

- Relative Density

$$DR = \frac{ni}{\sum N} x100\,\%$$

DR : Relative Density (%)

Ni : Number of individuals

∑N : Total of all individuals

- Shanon-Wiener Diversity Index

$$H' = -\sum (Pi\ ln\ Pi)$$

While Pi= Ni/N

Information:

H’ : Diversity Index

Ni : Number of individuals of each species

N : Total number of individuals of all species

Criteria:

H' < 1: Low diversity

1 < H' < 3: Medium diversity

H > 3: High diversity.

RESULTS AND DISCUSSION

Results

Five species of ghost crabs (*Ocypode* sp.) were found on Loang Baloq and Setangi beaches, consisting of *Ocypode ryderi*, *Ocypode kuhlii*, *Ocypode jousseamei*, *Ocypode pallidula*, and *Ocypode japonica*. Of the total species found, 4 species were found on Loang Baloq beach, and 5 species were found on Setangi beach. The species found are shown in the Figure 2.

Analysis of ghost crab density on Loang Baloq and Setangi beaches is detailed in Table 1

Figure 1. Research Locations: (a) Location 1: Loang Baloq Beach, (b) Location 2: Setangi Beach (Google Earth, 2023).

Figure 2. Ghost crab species found on Loang Baloq and Setangi beaches: (a) *Ocypode ryderi,* (b) *Ocypode kuhlii,* (c) *Ocypode jousseamei,* (d) *Ocypode pallidula,* (e) *Ocypode japonica*

Table 1 shows that there are four species of Ocypode found on Loang Baloq beach: *Ocypode kuhlii*, *Ocypode jousseamei*, *Ocypode pallidula*, and *Ocypode ryderi*, with a total of 46 individuals. Based on density analysis, the *Ocypode kuhlii* species has the highest density of 6,000 ind/km2, with a relative density of 20.45%. Meanwhile, the lowest density was found in the *Ocypode pallidula* species of 2,000 ind/km2, with a relative density of 6.82%.

Table 2 shows that there are 5 species of ghost crabs are found on Setangi Beach: *Ocypode kuhlii, Ocypode jousseamei, Ocypode pallidula, Ocypode ryderi*, and *Ocypode japonica*, with a total of 88 individuals. The species with the highest density is *Ocypode kuhlii* at 11,666.67 ind/km2 with a relative density of 39.77%, while the species with the lowest density is *Ocypode japonica* at 1,000 ind/km2 with a relative density of 3.41%.

Apart from species identification and the number of individuals of each species, the difference in the size of the ghost crabs found at the two locations is also interesting. Observations show that even though they are the same species, the size of the ghost crabs found on Setangi Beach is much larger than the ghost crabs found on Loang Baloq Beach. This is due to high disturbance in the environment due to human activities, resulting in the size and condition of ghost crabs being smaller and more vulnerable (Costa et al., 2022). The ghost crabs found on Setangi Beach also appear to be more active in looking for food on the surface of the sand and water. Apart from that, the availability of food for ghost crabs on Setangi Beach is also guaranteed because the abundance and diversity of small organisms (the food source for ghost crabs) carried by sea water are quite high.

Table 1. Density of ghost crabs at Loang Baloq Beach

No	Species	Total	Density (ind/km^2)	Density Relative (%)
1.	*Ocypode kuhlii*	18	6,000.00	20.45
2.	*Ocypode jousseamei*	12	4,000.00	13.64
3.	*Ocypode pallidula*	6	2,000.00	6.82
4.	*Ocypode ryderi*	10	3,333.33	11.36
Total		46		

Table 2. Density of ghost crabs at Setangi Beach

No	Species	Total	Density (ind/km^2)	Density Relative (%)
1.	*Ocypode kuhlii*	35	11.666,67	39,77
2.	*Ocypode jousseamei*	23	7.666,67	26,14
3.	*Ocypode pallidula*	10	3.333,33	11,36
4.	*Ocypode ryderi*	17	5.666,67	19,32
5.	*Ocypode japonica*	3	1.000,00	3,41
Total		88		

Table 3 shows the *Ocypode* species diversity index value on Loang Baloq beach of 1.03. This value indicates that the *Ocypode* community on Loang Baloq beach has a low level of diversity. The Ocypode diversity index value on Setangi Beach is 1.4, so it also has a low level of diversity. The low diversity on these two beaches can be influenced by several factors such as physico-chemical factors, level of water pollution, and human activities. The data on physico-chemical factors at the two research locations are detailed in Table 5.

Table 4 shows the results of the analysis of physico-chemical factors; temperature, pH, TDS (total dissolved solids), EC (conductivity), and water brightness at both locations, with different results obtained. The water temperature of both beaches is relatively the same, namely 31^{o}C, and the pH is on a scale of 7 (neutral). The TDS in Loang Baloq beach waters about 1,861.1 ppm, is much higher than the TDS at Setangi beach, 813 ppm. The conductivity of Loang Baloq beach is higher (4,825 µs/cm) than Setangi beach (1,626 µs/cm). On the other hand, the brightness level of Setangi beach waters is much higher (50 cm) than Loang Baloq beach (30 cm).

Human activities also greatly influence the lives of ghost crabs (*Ocypode*). The human activities in question include tourist activities, opening and managing tourist areas, residential areas, distance from beaches to urban centers, and so on. Analysis data on human activities on Loang Baloq and Setangi beaches have been summarized in Table 5.

Table 6 shows several criteria that show a picture of human activities in the coastal waters of Loang Baloq and Setangi. In general, human activity on Loang Baloq beach is significantly different from the activity seen on Setangi beach. The distance between Loang Baloq beach and the urban center is only 1/5 of the distance from Setangi beach to the city center. Loang Baloq Beach is said to be very crowded with visitors (10 times more) than the number of daily visitors at Setangi Beach. This is supported by the availability of supporting facilities such as toilets and bathrooms, prayer rooms, gazebos, clean water, and business and culinary centers on the beach (Fajriah, 2023). This is very different from Setangi Beach, which does not have public facilities. Apart from that, the relatively far distance between the location and residential areas (454.8 m) also shows the minimal human activity in the area when compared to Loang Baloq Beach, which is located opposite residential areas.

Discussion

Based on the data in Table 1 and 2, it can be seen that the *Ocypode kuhlii* species dominates the *Ocypode* community at Loang Baloq and Setangi Beach. *Ocypode kuhlii* is a species of ghost crab that varies in size (Yong and Lim, 2019). *Ocypode kuhlii* is very easy to find in both locations because of its characteristics of being able to survive in extreme and changing environmental conditions. This species has a fast reproductive cycle, so new individuals are formed quickly (Sakai, 2013). Apart from that, it also be seen that the total density of Ochypodes at Setangi Beach is much higher than at Loang Baloq Beach. This difference seems quite significant because the number of *Ochypode*, especially *Ocypode kuhlii* individuals on Setangi Beach is almost double the total number of individuals on Loang Baloq Beach. This difference can be caused by differences in physico-chemical factors and human activities in the coastal environment. In line with reports from Irwansyah et al. (2021), on non-polluted beaches, the *Ocypode kuhlii* species is often found because the food chain process in the ecosystem is still maintained, whereas on polluted beaches, this species is relatively rare. The data on table 4 also shows a unique condition,

because usually non-polluted habitats will show relatively high species diversity compared to polluted habitats with a high influence of human activities (Bai et al., 2019; Zhai et al., 2020). This is very likely influenced by a combination of physico-chemical factors, food, humans, and *Ocypode* predators. For example, steep beaches are not good for ghost crab communities (Lucrezi, 2015). However, to prove this, further research is needed.

Differences in physico-chemical factors on the two beaches can have an impact on the structure of the ocypode community. Water temperature can affect DO (dissolved oxygen) levels, organism metabolism, and the rate of chemical reactions in water. High-temperature water tends to have lower oxygen levels, so it can affect the life of a species (Lestariani, 2014). Normal sea water temperature for living organisms ranges from 22–30^{o} C (Dewi, 2020), while sea surface temperature generally ranges from 28–31^{o} C (Patty & Huwae, 2023). Based on this data, the temperature measured at both locations is relatively high for ghost crabs (31 ^{o} C). Temperature plays an important role in ghost crab biology because it influences physiological and metabolic processes important for survival, distribution limits, reproductive habits, and behavior (Barboza et al., 2021). Ocypode species generally cannot live in waters with high temperature fluctuations. Temperatures that are too high or too low can reduce the reproductive activity and daily activity of ocypodes (Roring et al., 2023).

Table 3.Ochypode diversity index (H') at Loang Baloq and Setangi Beach

No.	Location	H'
1.	Loang Baloq Beach	1
2.	Setangi Beach	1,4

The pH at both locations is 7 and is classified as neutral. Generally, aquatic organisms have a certain pH tolerance range for their growth and reproduction. Water pH is influenced by CO_2 levels and the photosynthesis of aquatic plants. The higher the CO_2 level, the higher the pH value. In order to support optimal growth of aquatic organisms, the normal pH in coastal waters should be in the range of 6.5-8 (EPA, 1982). However, in well-buffered waters, pH rarely experiences a drastic decrease below 6.5 or increases above 9, so it does not have a negative impact on the life of ghost crabs (Roring et al., 2023).

TDS is a measure of the total amount of dissolved substances in water, including salts, minerals, and organic materials. A high TDS value indicates pollution by industrial waste, agricultural, or urban activities. Therefore, the higher the TDS of the water, the lower the quality of the water (Sumarno, 2017). The normal TDS range for coastal waters is usually between 500 and 1,000 ppm (Hand, 2004). This range is the optimum range for the life of aquatic organisms and is used to assess water quality. Based on physico-chemical analysis, the TDS value at Loang Baloq beach is classified as very high and is outside the normal threshold (> 1000 ppm), so it can be stated that Loang Baloq beach is in a polluted condition. This certainly really disturbs the lives of Ocypods. Meanwhile, the TSD of Setangi beach is still in the normal range (<1000 ppm) and is not polluted.

EC (electrical conductivity) is a measure of water's ability to conduct electric current (conductivity). EC is influenced by ion levels in the water, and ion levels can provide clues about contamination by certain chemicals. High EC can be detrimental to aquatic organisms and reflect poor water quality (Irwan and Afdal, 2016). The acceptable EC range in coastal waters is usually between 100 and 500 µS/cm (Ullah et al., 2022). However, the EC measured in the coastal waters of Loang Baloq and Setangi has far exceeded the normal range (Loang Baloq = 4,825 µs/cm, Setangi = 1,626 µs/cm). This indicates that both beaches have been highly contaminated by pollutants (such as chemicals). This also illustrates that the water quality in both locations is classified as poor. However, to ensure this, more detailed chemical concentration measurements need to be carried out.

Water brightness refers to the clarity, or turbidity, of a body of water. Dissolved particles such as mud, sediment, and pollutants can reduce water clarity (Hoess & Geist, 2021). Low brightness can reduce the penetration of sunlight, which is important for photosynthesis (Ramanna et al., 2017). This can affect primary productivity and the entire aquatic ecosystem (Prakash, 2021; Henley et al., 2020). Physically, it can be seen that the waters of Loang Baloq Beach are very murky. This condition is exacerbated by the accumulation of organic and inorganic trash on the beach. In contrast to observations at Setangi Beach, the water conditions are clear and there is minimal rubbish. Based on the measurement results, the

Table 4. Physico-chemical measurements of waters

No.	Location	Parameter				
		Temperatur (°C)	pH	TDS (ppm)	EC (µs/cm)	Brightness (cm)
1.	Loang Baloq Beach	31,1	7.0	1.861,1	4.825	20
2.	Setangi Beach	31,7	7.05	813	1.626	50

Table 5. Analysis of human activities

No	Factor	Loang Baloq Beach	Setangi Beach
1.	Distance to urban areas	2,501.12 m	13,204.61 m
2.	Availability of buildings around the beach	Yes	No
3.	Availability of public facilities	Yes	No
4.	Frequency of visitors	>500 person/day	<50 person/day
5.	Distance of location to residential areas	50.69 m	454.8 m

brightness of the waters at the two locations differs quite significantly, with the brightness of the waters at Setangi Beach being higher than at Loang Baloq Beach. This shows that the levels of dissolved particles on Setangi Beach are minimal and the water quality is better than at Loang Baloq Beach. The presence of dissolved compounds in sea water and rubbish on the coast can influence the density and diversity of ghost crabs (Soares-Gomes, 2023; Laitano et al., 2022). The presence of trash can be considered a threat to ghost crabs. Coastal water conditions that do not match the ideal environmental conditions required can affect the growth and development of ghost crabs. It can even threaten the survival of ghost crabs in the environment.

Based on data showing differences in ghost crab density and physico-chemistry on Loang Baloq beach (tourist beach) and Setangi beach (non-tourist beach), it is indicated that ghost crabs can act as bioindicators of coastal waters. Ghost crabs have been widely used as a bioindicator species to determine the ecological impacts of human use of sandy beaches globally due to their strong response to anthropogenic and natural impacts, relatively large size, and easily observable behavioral characteristics (Gül & Griffen, 2018). The higher the density and diversity, the more suitable or better the quality of the ecosystem on the beach.

Differences in density and diversity of ghost crabs can occur due to human activities. Human activities around waters can result in disruption of organism habitats and stress on organisms (Mantiri et al., 2021). Organic and non-organic waste resulting from tourism activities causes pollution and changes in the quality of *Ocypode* habitat such as dirt, noise, discoloration, and odors which can disrupt the comfortable life of ghost crabs in their habitat. If their habitat is disturbed, ghost crabs will hide in their nests (Stevens & Ruxton, 2019). Human activities that disturb the nests, macro-habitat and diet of ghost crabs can reduce the density of ghost crabs in their habitat thereby changing the conditions of coastal ecosystems. The average diameter of ghost crab burrows becomes smaller on beaches with high disturbance (Costa et al., 2022). Habitat destruction also affects the existence and number of individual species, so it can affect diversity in an area (Widodo, 2011).

Apart from pollution problems, major human interventions on coastlines, such as physical modification, have an important impact on the dynamics of coastal ecosystems, because they reduce the natural habitat of organisms (Barboza et al., 2021). Differences in the distance from the beach to the city center, visitor density, availability of tourist facilities, and the distance of the beach from residential areas between Loang Baloq and Setangi beaches, can cause quite large differences in impacts on the coastal ecosystem. As stated by Soto et al. (2021) Relevant anthropogenic stress factors such as noise, pollution, human activity, and density of beach users influence ghost crab density. The lack of human activity on Setangi Beach means that the beach environment is still natural and clean, so there is no rubbish scattered on the beach sand or polluting the water. Thus, it can be said that physically Setangi Beach has suitable characteristics as a habitat for ghost crabs to live well, without any threats from human activities. Meanwhile, Loang Baloq Beach is close to urban centers and residential areas and has a high frequency of visitors, causing the beach environment to become polluted. The impact is that the density and diversity of ghost crabs on Loang Baloq beach is low, because the presence of rubbish and humans around the beach is a threat to ghost crabs. Human activities not only disturb the density but also the individual size of ghost crabs (Barboza et al., 2021; Nazarni, 2022).

An additional factor that can influence this is coastal vegetation. Beach vegetation is an

important habitat for ghost crabs to provide shelter, burrow stabilization, foraging areas, and protection from storms (Barboza et al., 2021). Maintaining coastal vegetation is critical to protecting ghost crabs and indirectly controlling erosion. Therefore, protection of ghost crab communities as an umbrella species and bioindicator is a good strategy for conservation and monitoring of coastal areas.

CONCLUSION

There are 5 species of ghost crabs found on Loang Baloq and Setangi beaches, consisting of *Ocypode kuhlii, Ocypode jousseamei, Ocypode pallidula, Ocypode ryderi*, and *Ocypode japonica*. The highest density at both locations was found in the *Ocypode kuhlii* species. The highest diversity is found at Setangi Beach, but the level of diversity is low. In general, it is found that the density and diversity of *Ocypode* communities are influenced by physico-chemical factors and human activities. The higher the level of human activity in a location, the lower the density and diversity of ocypods living there. The better the quality of the physico-chemical factors in the waters, the higher the density and diversity of *Ocypode* species found. Therefore, it can be stated that based on the analysis of the ghost crab community structure, Loang Baloq beach (functioning as a tourist beach) has worse water quality than Setangi beach (non-tourist beach).This research has not revealed the influence of food availability factors on the Ocypode community. Therefore, analysis of water and sediment chemical factors needs to be studied further to determine the extent of the influence of environmental chemistry on Ocypode life.

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