

Abundance of Echinoderms on the Coast of Tanjung Balak Island of Palaes Village in North Minahasa, Indonesia

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DOI: <https://doi.org/10.52403/ijrr.20240911>

ABSTRACT

The phylum Echinodermata is one of the phyla that has an important ecological role. It has a role in the food chain in coral reef and seagrass ecosystems as a detritus eater. Its economic benefits can be used as raw materials for medicine, food ingredients, and as souvenirs for tourists. North Sulawesi as part of the "Coral Triangle" is a suitable habitat for members of this phylum. Echinodermata on the Coast of Tanjung Balak Island have not been recorded in the database; therefore it is important to conduct this research. The method used is *purposive random sampling* with square (1 m x 1 m). The results of the study identified the echinoderms in this location, namely *Echinometra mathei*, *Protoreaster nodosus*, and *Archaster tipicus*.

Keywords: Tanjung Balak Island, Asteroidea, Echinoidea, Echinodermata

INTRODUCTION

Echinodermata is defined as an animal with spiny skin, has a radially symmetrical body shape and a skeleton containing lime. All animals belonging to this phylum have a radially symmetrical body shape and most have an inner skeleton made of lime (Kimbal, 1983). Echinodermata are divided into five classes, namely Asteroidea (Sea Stars), Echinoidea (Sea Urchins), Crinoidea

(Sea Lilies), Ophiuroidea (Brittle Stars), and Holothuroidea (Sea Cucumbers) (Yusron, 2013). It is estimated that there are 6,500 species of echinoderms and more than 13,000 species in the form of extinct fossils (Hedler et al., 1995).

The Echinodermata phylum is one of the main components of marine biodiversity and has an important role in carrying out its functions in the ecosystem (Supomo and Arbi, 2010), playing a role in the food chain in coral reef and seagrass ecosystems as detritus eaters. Its economic benefits can be used as raw materials for medicine, food ingredients, and also as souvenirs (Suparna, 1993). Most of the remaining Echinoderms today are members of the subphylum Eleutherozoa. These species are all free-living, can move freely, and are not attached to a substrate from larvae to adults, one of the members of this group is Echinoidea. On the coast, members of the sea urchin play an important role as beach cleaners in connection with their feeding activities, so that their existence can be assumed to be important as water bioindicators. Several types of sea urchins in the Echinoidea class such as *Diadema setosum*, *Echinometra mathei* (Rahayu, 2016; Suryanti and Ruswahyuni, 2014; Wirda, 2013) Echinoids are strikingly colored and abundant marine benthos (Uthicke et al., 2009). Some play important ecological roles as grazers (e.g., Carreiro-Silva and

McClanahan, 2001; Herrera-Escalante et al., 2005). Therefore, variations in population density of echinoid species impact ecosystems. The Asteroidea class has the highest diversity compared to other classes, reaching almost 1,900 species, and around 940 species of Echinoidea that have been known in the world (Kohlberg and Schories, 2016). Indonesia and its surroundings in the Indo-West Pacific region, Asteroidea (87 species), Echinoidea (84 species), Holothuroidea (141 species), Ophiuroidea (142 species), and Crinoidea (91 species) are spread.

Previous studies conducted in North Sulawesi such as Tanamon Waters, Sinonsayang District (Tahe et al., 2013), Rompis et al. (2013) in Meras Beach identified 8 species of echinoderms, Supono and Arbi (2010) found 31 species in Kema waters, Bitung. There are still many coastal areas that do not have information about members of the Echinodermata Phylum so that research is needed on members of the Echinodermata Phylum, especially in the Asteroidea and Echinoidea classes spread across the Coast of Tanjung Balak Island, North Minahasa Regency.

The abundance of Echinodermata is greatly influenced by physical and chemical factors in each region. Several researchers have suggested that the highest diversity of Echinodermata is found in coral reef areas,

but its presence can also be found in mangroves and seagrass (Rompis et al., 2013). In general, each type has a specific habitat, such as *Holothuria scabra* which is often found in sandy or muddy sand areas that are overgrown with seagrass (Ariyanto, 2016)

MATERIALS AND METHODS

This research was conducted in North Sulawesi. Location of Tanjung Balak Island, Palaes Village, North Minahasa Regency (Figure 1). This island has never been used as a location related to the survey of the Phylum Echinodermata, Class Echinoidea and Asteroidea. The research time was May 2023. The research was conducted at the lowest ebb. The method used was the random sampling method using a 1m x 1m plot with 10 plots on each transect. Four transect we use for this experiment. Identification of Echinodermata species was carried out visually or by looking directly at the observation location by paying attention to characteristics such as: body size, shape, and completeness of organs and body color. Identification was carried out using books, namely Clark and Rowe (1971), Raghunathan et al. (2013), and the WoRMS website (2023). Data analysis for abundance using the abundance formula according to Odum (1994).

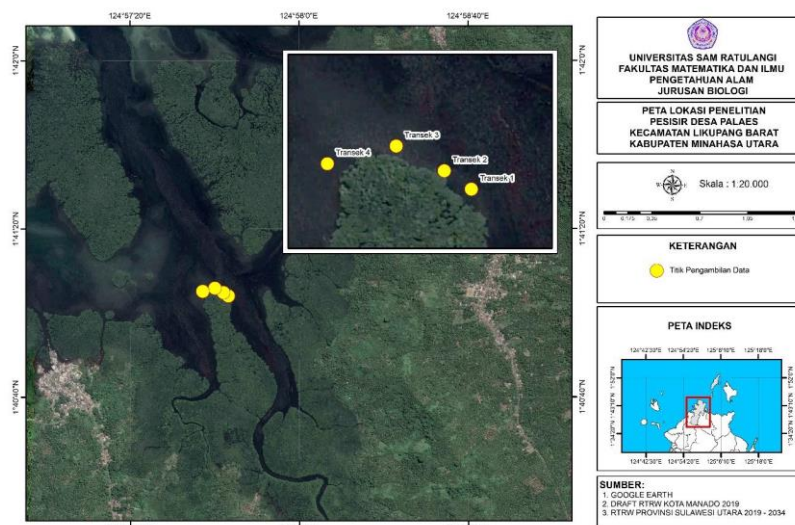


Figure 1. Research Location Map

RESULT

The types of Echinodermata distributed on the coast of Tanjung Balak Island are from

the Echinoidea Class, namely *Protoreaster nodosus*, *Echinometra mathei*, and *Archaster tipicus* (Figure 2).

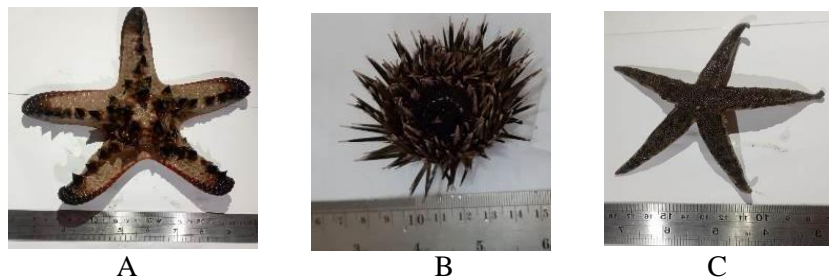


Figure 2. The Echinoderm found on Tanjung Balak Island: (A) *Protoreaster nodosus* (B) *Echinometra mathei* (C) *Archaster tipicus* (C)

Protoreaster nodosus Linn, 1758 was found to be orange with black and pale brown spines. This color is a common color as stated by Clark and Rowe (1971) color variations of this species can be found in pink, pale brown, green, and blue to white, body size ranges from 12-17 cm, when found in seagrass beds, hidden among seagrass beds of *Enhalus acoroides* (Figure 2A).

Echinometra mathaei Blainville, 1825 (Figure 2B) has a slightly round body, black body color, there are sharp primary spines that are slightly pale yellow. At the base there is a white ring. In the identified samples, it was found hiding in coral holes and there were coral fragments. This is supported by (Colin and Arneson, 1995) that this species can be found in rocky areas of coral fragments and hiding in rock holes. *Echinometra mathaei* is an Echinoidea belonging to the Echinometridae family with the characteristics of a round, slightly oval and black body shape with a body diameter of 3.2–4.4 cm and a body height of 2.1–3.9 cm. The primary spines are tapered and pale yellow. In general, there is a white ring at the base. The preferred habitat type is coral.

Archaster typicus Müller and Troschel, 1840 (Figure 2c) found at the research location has complete characteristics with five arms and is blackish brown in the aboral part and light brown in the oral part with tube feet. When found hidden in the sand, although the aboral part is still visible. According to Fortaleza et al. (2020), this type is usually buried in the sand. This type of spotted starfish clearly shows the modification of the spines on its aboral part, which is blackish in color. There are five arms and on the top of each arm there are protrusions that form a line. The oral part has tube feet on each arm and a mouth to take food. This starfish has 5 arms that range in length from 7-10 cm and have tube feet along their arms. the color of this species is light gray and likes to bury itself in the sand (Fortaleza et al. 2020). The color of this type of starfish is generally light gray and usually buries itself in the sand. Intertidal areas with sandy substrates *A. typicus* populations are found in.

Abundance and relative abundance analysis shown in Table 1. The highest abundance is the type *E. mathei* with the number 40.625%, *A. tipicus* with 34.375% and the low is *P. nodosus* with 25% relative abundance.

Table 1. Abundance and Relative Abundance

N	Species Name	Abundance (Ind/m ²)	Relative Abundance (%)
1	<i>Echinometra mathei</i>	1,3	40.625
2	<i>Protoreaster nodosus</i>	0,8	25.000
3	<i>Archaster tipicus</i>	1,1	34.375
	Total	3,2	100

DISCUSSION

The results analysis of abundance in Table 1 and Figure 3 showed that the abundance of *E. mathei* species is the highest at 40.625% with the number of individuals/m². Followed by the type of *A. tipicus* 34.375% abundance of 1.1 ind/m² and the lowest is *P.*

nodosus 25% with an abundance of 0.8 ind/m². *E. mathei* species are found hiding in holes or between corals, besides that in seagrass beds. Visually, the substrate in coastal locations is dominated by sand, coral and coral fragments that support the presence of *E. mathei* and *A. tipicus*.

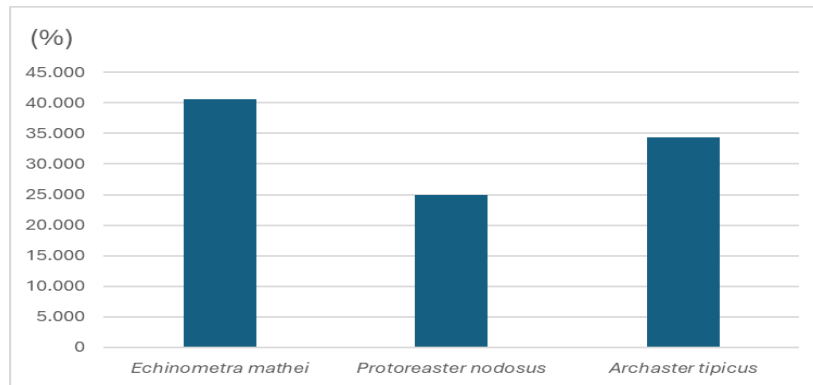


Figure 3. Relative abundance (%)

Tanjung Balak Island is one of the islands included in the administrative area of Palaes Village, West Likupang District, North Minahasa Regency, North Sulawesi Province. Description of the coast of this location, consisting of Mangrove, Seagrass and Coral Ecosystems. The dominating seagrass species is the *Enhalus acoroides* species. The results of research on the coast of Tanjung Balak Island show that the type of *E. mathei* represents the Echinoidea class, while the Asteroidea class is represented by *A. tipicus* and *P. nodosus*.

When compared with previous research in several locations, the number of species found is less than research on Meras Beach (Rompis et al., 2013) with four types of species in the Echinoidea Class and Asteroidea Class as many as three species. This is thought to be due to the condition of the substrate in the research location which is also dominated by sandy mud, and seagrass ecosystems and coral reefs that are not as extensive as those in Meras Beach which are sandy and have extensive seagrass ecosystems, and reef flats that are still good and wide. This is supported by (Hartati et al., 2018) that the bottom substrate consists of sand, coral and coral fragments which are habitats for Asteroidea

and Echinoidea species. In addition, the distribution of sea urchins also depends on substrate factors and food availability (Arhas et al., 2015). The same thing is also in accordance with Noviana et al. (2019) which states that the abundance of sea urchins in waters is influenced by differences in substrate.

CONCLUSION

There are three species of Echinodermata from the Echinoidea and Asteroidea classes found on the coast of Tanjung Balak Island, namely *Echinometra mathei*, *Protoreaster nodosus* and *Archaster tipicus* with the highest abundance of *E. mathei* (1.3 ind/m²) and the lowest *P. nodosus* (0.8 ind/m²).

Declaration by Authors

Acknowledgement: None

Source of Funding: Unsrat General Basic and Applied Research (Riset Dasar/Terapan Umum Unggulan Unsrat, RDTU3) 2023

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Marnix L.D. Langoy, Pience V. Maabuat, Adelfia Papu, Beivy J. Kolondam. Abundance of echinoderms on the coast of Tanjung Balak Island of Palaes Village in North Minahasa, Indonesia. *International Journal of Research and Review*. 2024; 11(9): 93-98. DOI: [10.52403/ijrr.20240911](https://doi.org/10.52403/ijrr.20240911)
