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Nematocytes in the Coral Species *Acropora formosa* on Kasiak Island, Pariaman City, West Sumatera

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ABSTRACT

This research was conducted in January 2024 on Kasiak Island, Pariaman City, West Sumatra Province. This research aims to identify nematocytes found in the body tissue of the *Acropora formosa* coral. The method used in this research is a survey method with direct observation and sampling in the field. Determination of the type of nematocytes from *A. formosa* coral was carried out using an Olympus microscope with an objective lens magnification of 10X40 (400) at the Marine Biology Laboratory, Faculty of Fisheries and Marine, Universitas Riau. Of the 25 main types of nematocytes known in the phylum Cnidaria, one type was found in this species. The results of the research show that there is a type of *Holotrichous isohiza* in the *A. formosa* coral. This type of nematocyte is thought to be used to attack and kill prey.

Keywords: *Acropora formosa*, *Holotrichous isorhiza*, Nematocysts, Kasiak Island

1. INTRODUCTION

Indonesia has around 51,000 km² of coral reef ecosystems spread throughout the coastal and marine areas of the archipelago. Indonesia is right in the center of the coral triangle. The region is a coral reef with the world's highest marine biodiversity, with an area of Indonesian coral reefs reaching 39,583 km or around 45.7% of the total 86,503 km² (Karwati et al., 2018).

Coral reefs are one of the most abundant marine resources in Indonesia. As inhabitants of marine ecosystems, Indonesian coral reefs occupy the top ranking in the world for their area and richness of species. Coral reefs consist of significant massive deposits of calcium carbonate mainly produced by corals (phylum Cnidaria, class Anthozoa, order *Madnepora/ Scleractinia*) with a small quantity of addition from calcareous algae and other organisms that emit calcium carbonate (Thamrin, 2017). Corals are invertebrate animals that belong to the Phylum Coelenterata (hollow animals) or Cnidaria.

Corals are small individuals called polyps connected by living tissue and can share food. The order *Scleractinia* is a group of coral fauna belonging to the phylum Cnidaria as the main fauna that forms coral reef ecosystems. Cnidae are stinging cell organs from the fauna of the phylum Cnidaria, which are found in the outermost body tissue (ectoderm); they can release stalks or threads from their capsule and then emerge from the ectodermal tissue when there is a threat from the surrounding environment (Yue et al., 2020).

Nematocytes are explosive cells commonly found in animals from the Phylum Cnidaria (for example, jellyfish, sea anemones, corals, and hydrae). Each of these cells contains nematocytes that secrete thread-like tubules that produce a paralyzing or stinging effect on the target animal. Special cells containing nematocysts are used by cnidarians to capture their prey and defend their prey from predators (Fautin, 2009).

Several nematocyte studies on *Scleractinia* coral species have been conducted in Indonesia, including Paruntu (2013) on the corals *P. eydouxi*, *P. verrucosa*, and *P. woodjonesi*. According to Gagu et al. (2019), The coral species *Acropora divaricate*, *A. florida*, and *Pocillopora* sp, which are *scleractinia* coral species, are included in the cnidarian film at Tontayuo Beach, Gorontalo. One area with good coral reefs is the Sumatra Island region, specifically in West Sumatra Province, which has many islands, such as Kasiak Island. Recently, this ecosystem, famous for its very high diversity and fertility, has been increasingly threatened by changes in various aquatic environmental factors. However, there are also fishing activities in this area, such as

fishing using nets, which can result in damaged and broken coral reefs.

Research on nematocytes in *A. Formosa* coral is considered important in determining the types of nematocytes found in coral and in better understanding the use of nematocytes in corals for self-defense, assuming there is still a lack of data and references.

2. RESEARCH METHOD

Time and Place

This research was carried out in January 2024. The samples taken in this research were located on Kasiak Island, Pariaman City, West Sumatra Province, as shown in Figure 1.

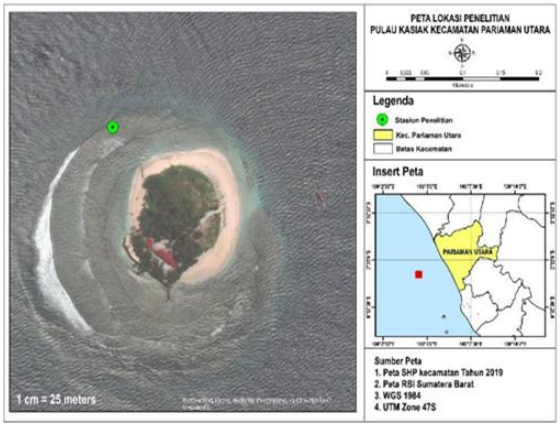

Figure 1. Research location

Method

This research was carried out using direct observation and sampling methods in the field. The data observed and measured are water quality measurement data (temperature, pH, salinity, and brightness). The samples taken were coral and taken to the Marine Biology Laboratory to observe the types of nematocytes in the coral under a microscope in each body tissue of the *A. formosa* coral.

Procedures

Sampling was carried out in the coral reef ecosystem area of Kasiak Island at a depth of ± 1-2 m at the lowest tide, which leads to the edge area 100 m from the island. Coral sampling was carried out using random free collection based on Gaffar et al. (2014), using a snorkeling set, rope, pliers, and chisels to obtain the coral species *A. formosa*.

Handling of coral samples, four coral polyps with a polyp length of ± 5 cm (Thamrin, 2017). The samples were fixed in 10% formalin and preserved for 24 hours. Coral samples were put into sample bottles and taken in a cool box to the Marine Biology Laboratory, Faculty of Fisheries and Marine, Universitas Riau, to determine the nematocyte type. Each species in the sample bottle was decalcified for three days using a mixture of 10% formalin and 10% acetic acid in a 1:1 ratio to obtain soft coral tissue. The soft coral tissue is soaked in running water for 24 hours by placing the sample in a gauze bag and soaking it in a bucket filled with tap water (freshwater) to remove the smell of acetic acid and formalin from the sample. After decalcification, the coral samples were stored in 70% alcohol for preservation.

Observations of nematocytes were carried out by taking decalcified soft coral tissue in a sample bottle containing 70% alcohol. Soft coral tissue is taken from small pieces with tweezers; from the small pieces, the smallest pieces are retaken with a dropper pipette and then placed on a glass slide and under a cover glass. Nematocytic cells were observed under an Olympus microscope with an objective lens magnifying 10X40 (400). Next, close-up photos of each type of nematocyst found for identification and documentation were taken with a Canon camera. Nematocytic-type findings can be identified using Muscatine's guidebook/journal. The data obtained is presented as tables and figures and discussed descriptively based on Muscatine (2012).

3. RESULT AND DISCUSSION

Water Quality

Measuring water quality is one way to determine whether an aquatic environment is good or bad. Water quality is also a limiting factor that can affect coral reef ecosystems. Table 1 shows the results of measuring water quality parameters on Kasiak Island, West Sumatra. Water quality measurements were carried out from 09.00 WIB to 12.00 WIB.

Based on Table 1, Kasiak Island's average water temperature is 33 ℃. Temperature is a limiting factor that greatly influences coral life and the lives of other animals associated with the coral reef ecosystem. Supriharyono (2003) explained that coral reef life has a temperature range between 25-34 ℃. This aligns with research by Suharsono (2008), stating that the temperature range that live coral can still tolerate in Indonesian waters is between 26-34 °C. In taking samples, the temperature rose at 12.00 WIB, allegedly because the weather was sunny and hot at the time of sampling, which resulted

in the temperature at 12.00 WIB being high. Meteorological factors that play a role in water temperature are rainfall, evaporation, air humidity, air temperature, wind speed, and intensity of sunlight.

Table 1. Water quality

Time (WIB)	Temperature (°C)	pH	Salinity (‰)
09.00	30	7	29
12.00	34	7	32
Avarage	33	7	30

Seawater's degree of acidity (pH) can be used to identify. Water's degree of acidity (pH) can disrupt metabolism and respiration if it becomes very alkaline or acidic. Marine waters are either acidic (pH>7) or alkaline. The measurement results show that the pH of seawater on Kasiak Island is 7, which can be categorized as good. According to Galfi et al. (2016), the pH of seawater is generally relatively stable, with a range between 7-8.4. The ideal pH limit for other marine biota ranges from 6.5 to 8.5.

The salinity of Kasiak Island's waters is 29-32%, with an average of 30.3%, indicating that the salinity on Kasiak Island is classified as usual for waters and is suitable for coral growth. Coral reefs and the organisms in them cannot survive salinity that deviates from normal seawater salinity, namely 32-35% (Thamrin, 2017)

Nematocyte Type

In observations carried out on the coral species *A. formosa*, the *H.isorhiza* nematocytic type was found, which can be seen in Figure 2.

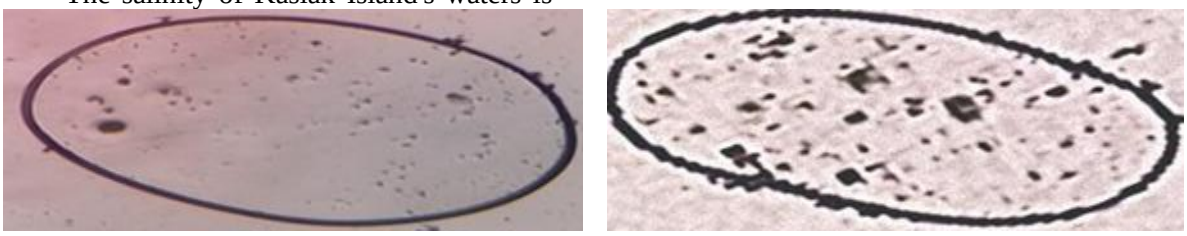

Figure 2. Nematocyte type *H.isorhiza* with magnification (10x40)

Based on observations on soft coral *A. formosa* tissue on Kasiak Island, West Sumatra, the *H.isorhiza* nematocytic type was found. This is in line with research conducted in the Malalayang Beach area, Manado, by Paruntu (2013), who saw the HI nematocysts type in the body tissue of *P.eydouxi* and *P. woodiness* corals but not found in the body tissue of *P. verrucosa* coral, while MpM is the nematocyte type is specific to the genus *Pocillopora* because it is found in all three species observed.

Gagu et al. (2019) also conducted research on nematocytes, which states that *A. florida* has main nematocyte types, namely HI and MpM, while *A.divaricate* only has the *microbasic p-mastigophore* (MpM) nematocyte type. This is followed by Nusi et al. (2021), which states that *Pocillopora sp* has at least two types of nematocysts: HI and MpM. This is likely to cause the differences obtained from research regarding nematocyte types, possibly due to differences in sampling locations, making nematocytic types different from findings of other nematocyte types.

This study found the nematocytes in *Scleractinia* coral tissue from the coral *A. Formosa* with type HI nematocytes from 4 *A. formosa* coral polyps. As for the differences in coral nematocyst types, both in the current and previous research, it is likely due to differences in the kinds of coral studied. Nusi et al. (2021) stated that the HI type is a type of nematocyte rarely found in reported coral body tissue, while the MpM nematocyte type is the most dominant and is specific for *Pocillopora* and *Acropora* types. The research found that the HI nematocyte type in the coral species *A.formosa* is included in the *Acropora* genus.

The nematocytes in this study were found in Sclerentinia coral tissue from *A. formosa* corals with the *H. isorhiza* nematocyte type finding. The type of nematocyte found belongs to the *Stomocnidae* group. Namely, it has poison that penetrates the body of its prey. According to research conducted by Sagrang (2021), the presence of *H. isorhiza* nematocysts is used by

cnidarian fauna as a means of defense and attacks nearby prey, which can damage the body tissue of the attacked fauna, and MpM in corals is used as a tool to defend itself from predators.

HI is a type of nematocyst used by Cnidarian fauna to protect and attack nearby prey, which can damage the body tissue of the fauna it attacks (Den Hartog, 1997). In this study, the type of HI nematocyte in the coral studied, namely *A. formosa*, may be used for self-defense against predators. Thamrin (2017) stated that nematocytes are the densest epidermis layer at the tips of the tentacles. Nematocytes are found in the epidermis layer in adult corals' and planula larvae's epidermis.

Corals have a very close relationship with water parameters, and this environmental factor causes the release of zooxanthellae from the coral body, which causes the coral to turn white. This event is known as coral bleaching. The dominant factors causing coral bleaching include rising and falling sea water temperatures above or below the threshold, where corals can tolerate temperatures around 36-40°C. The general influence of changes in environmental conditions on corals, including a sudden decrease in salinity, will cause stress on corals, which is caused by a reduction in salinity and affects the growth, ability to reproduce, and survival of corals (Moberg in Thamrin, 2017).

4. CONCLUSION

Based on the research results, it can be concluded that the type of nematocyte contained in the *A. formosa* coral species' body tissue. Future research should examine the types of nematocytes of various kinds of Sclerectinia corals to determine the types of nematocytes found in the *A. formosa* coral species and show the dominant nematocytes of each *Sclerectania* coral species.

REFERENCES

Den Hartog, J.C. (1977). The Marginal Tentacles of *Rhodactis sanctithomae* (Corallimorpharia) and the Sweeper Tentacles of *Montastrea cavernosa* (Scleractinia); Their Cnidom and Possible Function. *Proceedings of The Third International Coral Reef Symposium, 1977* (pp. 463-469).

Fautin, D.G. (2009). Structural Diversity, Systematics, and Evolution of cnidae. *Toxicon*, 54: 1054–1064.

Gaffar, S., Zamanai, N.P., & Purwati, P. (2014). Preferensi Mikrohabitat Bintang Laut Perairan Pulau Hari, Sulawesi Tenggara. *Jurnal Ilmu dan Tekonologi Kelautan Tropis*, 6(1): 1-15.

Gagu, S., Darwasito, S., Wagey, B.Th., Rumengan, A.P., Rondonuwu, A.B., & Paruntu, C.P. (2019), Dimensi dan Komposisi Nematosit pada Karang *Seleractinia, Acropora florida dan Acropora divaricata* di Pantai Motandoi Selatan Kabupaten Bolaang Mongondow Selatan. *Jurnal Pesisir dan Laut Tropis*, 7(3): 227-233.

Galfi, H., Österlund, H., Marsalek, J., & Viklander, M. (2016). Indicator Bacteria and Associated Water Quality Constituents in Stormwater and Snowmelt from Four Urban Catchments. *Journal of Hydrology*, 539: 125-140.

Karwati, F., Rahmati, F., & Cyntia, I. (2019). Karakteristik Spesies Karang Famili Acroporidae Di Pantai Nipah Pulo Nasi Kabupaten Aceh Besar. In *Prosiding Seminar Nasional Biologi, Teknologi dan Kependidikan*, 6(1).

Muscatine, L. (2012). *Coelenterate Biology: Reviews and New Perspectives*. Elsevier.

Nusi, A.Y., Paruntu, C.P., Rumengan, A.P., Boneka, F.B., Mamangkey, N.G., & Lalamentik, L.T.X. (2021). Komposisi Tipe Nematosit Karang Scleractinia, *Pocillopora* sp dari Terumbu Karang Pantai Tontayou, Batudaa Pantai, Gorontalo *Jurnal Pesisir dan Laut Tropis*, 9(3):1-6.

Paruntu, C., Rifai, H., & Kusen, J.D. (2013). Nematosit dari Tiga Spesies Karang Scleractinia, genus Pocillopora. *Jurnal Perikanan dan Kelautan Tropis*, 9(2): 60-64.

Sagrang, A.M., Paruntu, C.P., Wagey, B.T., Roeroe, K.A., Ompi, M., & Wantasen, A. (2021). Komposisi Nematosit Karang Fungia, *Cycloseris vaugani* dari Terumbu Karang Pantai Malalayang, Manado. *Jurnal Pesisir dan Laut Tropis*, 9(3): 7-13.

Suharsono, S. (2008). *Jenis-Jenis Karang di Indonesia*. Jakarta. LIPI Press

Supriharyono, S. (2003). Does Marine Fishing Capture Decline in the North Coast of Central

Java?. *Journal of Coastal Development*, 7(1): 11-19.

Thamrin, T. (2017). *Karang Biologi Reproduksi dan Ekologi.* Pekanbaru: UR Press

Yue, Y., Xue, W., Yu, H., Li, R., & Li, P. (2020). Updated Descriptions of The Nematocysts of The Scyphozoan Jellyfish *Cyanea nozakii* Kishinouye, 1891 (Cnidaria, Scyphozoa). *Toxicon*, 187: 271-278.