



**Research Article**

**Density and morfometric analysis of sia-sia (*Sipunculus nudus*) from Nusalaut island beach waters central Maluku**

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**ABSTRACT**

Sia-sia (*Sipunculus nudus*) has a shape resembling a worm, is an organism that usually lives in coastal areas, especially around seagrass areas, this biota tends to inhabit the bottom of the water especially in the substrate so that it is categorized as an infauna benthic organism and is able to inhabit areas with soft and hard substrates. This is a deskriptive type of research, to describe or describe information about the density and morphometrics of Sia-sia from the coastal waters of Nusalaut Island, Central Maluku. The results of the study on the density of Sia-sia on the island of Nusalaut, differ according to location, based on the results of the density calculation obtained. Each location shows the total average value of Absolute Density (KA) is 0,0063 ind/m<sup>2</sup> (Low) and Relative Density (KR) is 100%. The Absolute density level (KA) in Abubu Vilage is 0,0068 ind/m<sup>2</sup> (Low), the absolute density level (KA) in Ameth Village is 0,0064 ind/m<sup>2</sup> (Low) and the absolute density level (KA) in Akoon Village is 0,0058 ind/m<sup>2</sup> (Low), Based on the results of the Sia-sia morphometric research from Nusalaut Island, the Results vary from each village with Sia-sia morphometric average length of 12,14 cm, width 2,15 cm and weight of 31,6 g, followed by Akoon village with Sia-sia morphometric average length of 11.6 cm, width 2,21 cm, and a weight of 33,6 g, and the last one is Ameth Village with an average length of Sia-sia morphometric that is 13,02 cm, width 2,26 cm, and weight 36 g.

**Keywords:** sia-sia, density, morphometric

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**INTRODUCTION**

Indonesia has sea waters that are wider than land, therefore Indonesia is known as a maritime country. Indonesian marine waters are rich in various marine biota, both flora and fauna. The breadth and diversity of the living bodies inside all of which form the dynamics of life in the sea that are mutually sustainable (Bengen, 2001). Bappenas (2016) states that exploration and expeditions are still very much needed to reveal the existence and potential of Indonesian marine biota, especially for Eastern Indonesia. One of the potential resources that can be

utilized is Sipuncula. The presence of Sipuncula in coastal ecosystems is relatively less well known when compared to Polychaeta marine worms, because polychaeta have known uses and economic values, namely as bioindicators of pollution and natural food. It is different with Sipuncula of certain types that can be used as food ingredients, one of which is Sipuncula nudus (Pamungkas, 2010).

Sia-sia is known by different terms according to its distribution on each island, in the Bangka Belitung archipelago it is called Kekuak (Fakhrurrozi, 2011), on Morotai island it is Komoco, on Rhum island in (Banda islands) it is called Kariong (Pradina, 1993), in the Kei Islands, Southeast Maluku, it is called Kian, in Suli, Central Maluku, it is called utu tina, and on the islands of Nusalaut and Saparua, Central Maluku, it is called sia-sia. People on the island of Nusalaut, use the Sia-sia sea worm as a daily side dish for the community when the fish trouble season arrives. Sia-sia is usually consumed fresh (kohokoho, the general name for the Maluku people), fried, stir-fried in soy sauce, and satay. called colo-colo. Its body contains a large amount of sand, therefore it must be cleaned before consumption. In addition, not a few people do not know or know but have never tasted it (Riky et al. 2018; Silaban, 2012).

Sia-sia Fresh contains nutrients including protein, fat, carbohydrates, vitamins A, B1, B6, B12, E and minerals P, I2, C2, Mg, C which are almost equivalent to the nutritional content of fish (Ardean et al. 2018). in China sea worms have long been used as traditional medicine in treating tuberculosis, regulating stomach and spleen function, and restoring health caused by pathogens (Zhang & Zi, 2011). Morphologically, this animal is very similar to a worm (Worm-Like-looking). This biota is even called the peanut worm because its shape resembles an earthworm. In addition, some literature calls this animal the usegmented marine worm, the body is divided into the main body (trunk) and trunk (introvert) which are usually pulled inward and backward (Silaban, 2019). Sia-sia usually living in coastal areas, especially around seagrass meadows, this biota tends to inhabit the bottom of the water, especially in the substrate so that it is categorized as an infauna benthic organism and is able to inhabit areas with soft and hard substrates. On soft substrates, these biota tend to bury themselves in sandy and muddy areas. While on hard substrates, Siasia is able to live between coral crevices and also inhabits gastropod shells and empty tubes where polychaetes live (Culter, 1994).

Population density is the relationship between the number of individuals per unit area or volume of space occupied at a certain time. Odum (1996) states that the density value of a species depends on the ability of the species to occupy a large space or place so that it has the ability to reproduce more. This indicates that the habitat can be occupied by organisms in large numbers. Research on the population density of Sia has been done by previous researchers. However, the density of Sia-sia in the coastal waters of Nusalaut Island is not yet known, because no one has done this research before. Morphometrics is a method of measuring morphology including length, weight, and scale of physical condition based on body morphology standards that are adapted to Sia's life phase. According to Langer et al. (2013), the systematic morphology of an animal is determined by morphological measurements, namely length and weight so that it has authentic evidence and is the easiest to identify. Morphometric studies are a collection of measurement data that represent variations in shapes and sizes. Morphometric variations of a population in different geographical conditions can be caused by differences in genetic structure and environmental conditions. Therefore, the distribution and morphometric variations that appear are a response to the physical environment in which the species lives (Tzeng et al. 2000).

Sufficient morphometric data was obtained by selecting specimens that were considered to have established morphological characters (body size). The specimens used to be measured are at the young to adult level with a body size of 10-40 cm (Collins, 1985). Haryono (2001) states that each species has a certain geographic distribution which is controlled by the physical conditions of its environment. Therefore, the distribution and morphometric variation that appears is a response to the physical environment in which the species lives.

## METHODS

a) Density analysis procedure:

- Preparation

The series of activities before starting the research such as consultation, collecting references, and preparing the equipment used for research.

- Observation

After preparing everything needed in the research, the next step is to make observations in the field to get the appropriate research location.

- Determination of research locations and stations

Determination of the location and research station is done after the observation stage.

- Observation and sampling

Observations were made at the lowest tide. Vain observations and sampling were carried out using the observation method and the cruise method with the purposive sampling technique, then the plot to be used in this study was 1 x 1 m<sup>2</sup>, with an observation area of 100 x 50 m = 5000 m<sup>2</sup>.

b) Morphometric Analysis Procedure

Modification of work procedures from previous research (Ardean, 2018).

sample preparation

- Samples were taken in the waters of the villages of Akoon, Ameth and Abubu.

Morphometric Stage on Sia-sia

- After the sample has been prepared, the first thing to measure is the intact sample, the sample is measured using a ruler measuring 30-50 cm
- Then measure the width of the sample that is still intact, using a caliper.
- Then measure the total weight of the sample which is still intact, using a scale.

## RESULTS AND DISCUSSION

### 1. Description of Research Location:

Nusalaut Island or the island which is also called Nusahulawano Island (golden island) is a small island among six groups of islands in the Maluku region. Geographically, Nusalaut Island is bordered to the north by Saparua Island, to the south by the Banda Sea, to the east by the Seram Sea and Serua Island, and to the west by Molana Island. Most of the population on the island of Nusalaut make a living as farmers and fishermen. This is because most people live on the coast and have forests/hamlets that can be used as fields for farming. The total population on Nusalut Island is 6,185 people.

### 2. Description of Environmental Physical-Chemical Factors

Measurement of environmental physico-chemical factors in the coastal waters of the Nuslaut Island, especially in Ameth Village, Akoon Village and Abubu Village in this study included water temperature, water salinity levels, (pH) water, and substrate. the results of observations in the table below

**Table 1.** Description of Environmental Physical-Chemical Factors

Lokasi	Temperature °C	Salinity (‰)	pH	Substrate
Ameth	28,6-30,9	31,2-35,3	7,7-8,2	sand stone
Akoon	27,2-29,7	30,8-34,2	7,6-8,1	sand stone
Abubu	29,7-31,5	32,3-36,7	7,8-8,4	sand stone

#### 1. Temperature

Based on measurements made using a thermometer, the results show that the highest temperature is found in Abubu Village, which is in the range of 29.7-31.50C and followed by Ameth Village with values ranging from 28.6-30.9 0C. The lowest temperature measurement value is in Akoon Village, which is 27.2-29.70C.

#### 2. Salinity

Based on the results of salinity measurements carried out using a refracto meter, the results showed that the highest salinity was found in Abubu Village, which ranged from 32.3-36.70/00 and followed by Ameth Village with values ranging from 31.2-35.30/00. The lowest salinity value was found in Akoon Village, which ranged from 30.8-34.20/00.

#### 3. pH

Based on the results of pH measurements carried out using a pH meter, the results show that the highest pH is found in Abubu Village which ranges from 7.8-8.4 and is followed by Ameth Village which ranges from 7.7-8.2. The lowest pH value was found in Akoon Village, which ranged from 7.6-8.1.

#### 4. Substrate

Based on the results of visually observing the substrate by observing the sediment surface in 3 villages, the results showed the same results, namely sandy rock.

#### Density sia-sia of Nusalaut Island

The results of the calculation of the waste density from the coastal waters of the island of Nusalaut can be seen in Table 2 below.

**Table 2.** Density of sia-sia in Nusalaut Island

Village	KA (ind/m <sup>2</sup> )	KR (%)
Ameth	0,0064	100
Akoon	0,0058	100
Abubu	0.0068	100

Based on the results of density calculations obtained, each location shows the total average value of Absolute Density (KA) is 0.0063 ind/m<sup>2</sup> (Low) and Relative Density (KR) is 100%. The absolute density level (KA) in Abubu Village is 0.0068 ind/m<sup>2</sup> (Low), the absolute density value for Ameth Village is 0.0064 ind/m<sup>2</sup> (Low) and the absolute density level (KA) in Akoon Village is a value of 0.0058 ind/m<sup>2</sup> (Low).

#### Morphometric

The results of the measurement and calculation of morphometrics sia-sia from the coastal waters of the island of Nusalaut can be seen in Table 3 below.

**Table 3.** Morphometric analysis sia-sia of Nusalaut Island

Village	Length (Cm)	Width (cm)	Weight (g)
Abubu	12,14	2,15	31,6
Akoon	11,6	2,21	33,6
Ameth	13,02	2,26	36

Based on the results of sia-sia morphometric analysis from the Nusalaut island, the results vary from each village. Abubu Village with Sia-sia's morphometric average length of 12.14 cm, width 2.15 cm and weight of 31.6 g, followed by Akoon Village with Sia-sia's morphometric average length of 11.6 cm, width 2.21 cm and weighs 33.6 g, and the last one is Ameth Village with an average length of Sia's morphometric that is 13.02 cm, width 2.26 cm, and weight 36 g.

## DISCUSSION

Based on the measurement results of environmental parameters in the coastal waters of Nusalaut Island, especially in Ameth Village, Akoon Village and Abubu Village which include water temperature, water salinity levels, (pH) water, and substrate, the highest temperature is found in Abubu Village, which ranges from 29.7-31.50C and followed by Ameth Village with values ranging from 28.6-30.9 0C. The lowest temperature measurement value is in Akoon Village, which is 27.2-29.70C. The temperature in the sea is an important factor for the life of marine organisms. Water will regulate the body temperature control of organisms (Boyd, 2015). The best growth is obtained when the body temperature of aquatic animals approaches the temperature of their environment, because the energy normally required to regulate body temperature will be used for growth (Parker, 2012).

The results of the study regarding salinity measurements were carried out using a refracto meter, the results showed that the highest salinity was found in Abubu Village, which ranged from 32.3-36.70/00 and was followed

by Ameth Village with values ranging from 31.2-35.30/00. . The lowest salinity value was found in Akoon Village, which ranged from 30.8-34.20/00. Salinity affects production and distribution, length of life and migration orientation. Salinity is a very important factor that gives organisms the ability to adapt to the environment. As [sidiq et al. \(2015\)](#). [Nontji \(2002\)](#) states that the high and low salinity values in the sea are influenced by several factors, such as evaporation water circulation patterns, rainfall and river flow. Based on the results of pH measurements carried out using a pH meter, the results show that the highest pH is found in Abubu Village which ranges from 7.8-8.4 and is followed by Ameth Village which ranges from 7.7-8.2. The lowest pH value was found in Akoon Village, which ranged from 7.6-8.1. Seawater has a very large buffering capacity to prevent changes in pH. A slight change in pH from the natural pH will give an indication of a disturbed buffer system. This can cause changes and imbalances in CO<sub>2</sub> levels that can endanger the life of marine biota ([Rukminasari et al., 2014](#)). High and low pH is influenced by fluctuations in O<sub>2</sub> and CO<sub>2</sub> content, not all living things can withstand changes in pH values, for that nature has provided a unique mechanism so that changes do not occur but in a slow way. A pH level less than 4.8 and greater than 9.2 can be considered polluted ([Sary, 2006](#)).

Based on the results of visually observing the substrate by observing the sediment surface in 3 villages, the results showed the same results, namely rocky sand. In coastal areas that have a sandy bottom substrate, very few living organisms are found. Because the sand beach does not provide the right substrate for organisms to attach to, due to the waves that continuously move the basic substrate particles. Groups of organisms that are able to adapt to sand substrate conditions are macro infauna organisms (1-10 cm in size) which are able to dig burrows in the sand, and micro meiofauna organisms (0.1-1 mm in size) which live among sand grains in interaction space ([Riniatsih, 2009](#)).

The results of the calculation of the density of sia-sia from the coastal waters of the island of Nusalaut based on the results of the density calculation obtained, each location shows the total average value of Absolute Density (KA) which is 0.0063 ind/m<sup>2</sup> (Low) and Relative Density (KR) that is 100%. The absolute density level (KA) in Abubu Village is 0.0068 ind/m<sup>2</sup> (Low), the absolute density level (KA) in Ameth Village is 0.0064 ind/m<sup>2</sup> (Low) and the absolute density level (KA) in Akoon Village is 0.0058 ind/m<sup>2</sup> (Low), indicating that the area has good conditions as a place to live and there has been no significant competition for space, food or a place to live for Nat. The results of the density of the three villages are classified as low because they are at number 0, which is 0 - 1 Low, 1-2 moderate and > 2 High on the density index. Absolute Density (KA), which is the data obtained is the number of density estimates in the form of the number of individuals of a species per area containing the species, and Relative Density (KR), is the density calculation data obtained from the density of a species per the total density of all species and times 100%, Krebs (1978). The difference in population density is due to different environmental conditions at each research station, while the difference in population in each observation is due to the influence of weather and high and low sea waves ([Azmi et al., 2017](#)). Based on observations, there are several environmental factors that determine the presence of sia-sia such as the state of the substrate, the power of the waves and the high and low sea water during the waves.

Based on the results of the futile morphometric analysis from the island of Nusalaut, the results vary from each country. Negeri Abubu with an average waste mofometric length of 12.14 cm, a width of 2.15 cm and a weight of 31.6 g, followed by Akoon Country with an average waste mofometric length of 11.6 cm, a width of 2 .21 cm and a weight of 33.6 g, and the last one is the Land of Ameth with an average length of wasted mophometric that is 13.02 cm, width 2.26 cm, and weight 36 g. According to [Doherty & McCarthy \(2004\)](#) states that components that have the same coefficient are an indication of size variation and components that have positive and negative coefficients are indicative of shape variations. Normal salinity of water ranges from 28-32 ([Perainginangin et al., 2015](#)). The pH value in normal waters is between 7.6-8.4 ([Nursaiful, 2004](#)). The basic substrate is the main factor affecting the life, development and diversity of Macrozoobenthos ([Hynes, 1976](#)).

## CONCLUSION

Based on the results of the futile morphometric analysis from the island of Nusalaut, it can be concluded that there are variations from each village. Abubu Village with an average waste mophometric length of 12.14 cm, a width of 2.15 cm and a weight of 31.6 g, followed by Akoon Village with an average waste mophometric length of 11.6 cm, a width of 2 .21 cm and a weight of 33.6 g, and the last one is Ameth Village with an average length of wasted mophometric that is 13.02 cm, width 2.26 cm, and weight 36 g.

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