



Diversity of Bivalve Species in the Intertidal Zone of Lande Beach, Motion Makmur Village, Sampolawa Sub-District

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ABSTRACT

This study aims to determine the types of bivalves in the intertidal zone of Lande Beach, Gerak Makmur Village. This research is classified as quantitative descriptive research using the search method. The research has 3 stages, namely the observation stage, the sampling stage at the research location, and the identification stage. The data obtained were then analyzed descriptively including body shape, color, pattern and body size. Based on the results of research conducted in the intertidal zone of Lande Beach, Gerak Makmur Village, Sampolawa District, 7 families and 8 species of bivalves were found, namely *Fragumunedo*, *Tridacnacrocea*, *Tranchycardium rogium*, *Spondylus versicolor*, *Pinctada maxima*, *Anandara gubernaculum*, and *Atrina vexillum*.

Keywords: *Diversity, Intertidal, Sampolawa*

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INTRODUCTION

Indonesia is an archipelago of islands surrounded by vast oceans. Indonesia has a larger sea area than land area. Its marine waters cover 3,257,483 km², while its land area is 1,922,570 km² and its total coastline of 81,497 km² is the longest in the world. Thus, when compared to other countries, Indonesia's waters have a fairly high biological wealth.

Sampolawa Sub-district is a sub-district in South Buton Regency which has the largest area of around 153.57 km² consisting of 16 villages, one of which is Gerak Makmur Village (Asman dkk., 2023). Gerak Makmur Village or commonly called Lande is part of the Sampolawa sub-district of South Buton Regency (Minarti dkk., 2023). This village has a coastline of + 860 meters extending from east to west. One of the beaches is supported by diverse animal and plant conditions (Abbott dkk., 2021). The beach consists of a substrate of seagrassy sand, rocky sand, and coral. One of the marine biota diversity found on the beach is bivalves.

Bivalves or commonly called shellfish, are the second largest class in the mollusc phylum after gastropods. This group of animals has a long history related to its fossil findings (Roshayanti dkk., 2023). The oldest known species of bivalves date back to the Cambrian period, more than 500 million years ago (Mustajab dkk., 2023). Bivalves are characterized by the presence of a pair of shells, both of which are connected by an elastic ligament on the dorsal part and resemble a hinge (Ulum dkk., 2023). when viewed from its abundance in marine and fresh waters, from cold habitats to the tropics, from shallow waters to deep absal zones, bivalves are classified as biota that are successful in their adaptation.

Bivalves are one of the biological resources that have long been utilized by most Indonesian people both locally and on a large scale (Pamungkas & Halimah, 2023). Although it has been widely utilized, basic data on the distribution patterns and diversity of bivalves are still very limited, even when compared to its close relatives, the Gastropoda Class which has been widely studied (Zarkasyi, 2016).

Based on observations made by researchers at Lande beach, there are several species of bivalves (Mutalib & Dylan, 2021). However, people do not know clearly about the types of bivalves that exist in that location. Based on this background, researchers are interested in conducting research on "Bivalve Species in the Intertidal Zone of Lande Beach, Gerak Makmur Village, Sampolawa District".

RESEARCH METHODOLOGY

This research is classified as quantitative descriptive research using the cruising method. Sampling was carried out by exploring the intertidal zone at Lande Beach, Gerak Makmur Village with a research location length of + 860 meters (Arsul dkk., 2021). This research was conducted from November to December 2020 in the intertidal zone of Lande Beach, Gerak Makmur Village, Sampolawa District, South Buton Regency (Mudinillah & Rizaldi, 2021). The population in this study were all types of Bivalves found in the intertidal zone at Lande Beach, Gerak Makmur Village, Sampolawa District (Gusvita & Alon, 2021). Samples in this study are the types of Bivalves obtained in the intertidal zone of Lande Beach, Gerak Makmur Village, Sampolawa District.

Research Instruments

Tools

The tools used in this study can be seen in the following table:

Table 3.1 tools used in research

No	Tool Name	Function
1.	Stationery	Recording research data
2.	Camera	Sample documentation
3.	Jar	Storing the sample
4.	Thermometer	To measure water temperature
5.	Strimin paper	Research sample idler
6.	Universal Indicator	To determine the acidity of seawater

Materials

The materials used in this study are:

Table 3.2 Materials in the study

No	Chart Name	Benefits
1.	Bivalves	As a research sample

Research Procedure

The procedure in this research consists of several stages, as follows:

1. Observation Stage

The observation stage is the initial stage before the research is carried out, namely with the aim of knowing information and an overview of the object to be studied.

2. Sampling Stage at the Research Location

Sampling was carried out in the intertidal zone of Lande Beach, Gerak Makmur Village (Farid, 2023). Each sample obtained / found is stored in a jar that has been labeled. In addition, measurements of environmental parameters were also carried out which included substrate, water temperature and pH (Nida dkk., 2023). Observation of environmental parameters was carried out twice when first starting sampling and after all samples were found.

3. Identification Stage

Each sample obtained was then identified on the coast of Lande Beach, Gerak Makmur Village, Sampolawa District (Zarnuji, 2023). The morphological characteristics of the samples observed include body shape, body color, shell pattern and size (Teguh dkk., 2023). For identification refers to the identification book Recent & Fossil Indonesia Shellas (Bunjaminn, 2015) and Journal (Sjafaraenan. 2009; Umagap, et al. 2018; Ginting, 2017; Sitompul, 2020; Rukanah, 2019; Rastania et al, 2017) and relevant articles.

RESULT AND DISCUSSION

Based on the results of research on the types of Bivalves in the Intertidal zone of Lande Beach, Gerak Makmur Village, 8 (eight) species of Bivalves were found.

Table 4.1 Regarding the types of Bivalves in the Intertidal zone of Lande Beach, Gerak Makmur Village

No	Famili	Species	Tipe substrat			Total
			Sandy seagrass	Rocky Sand	craggy	
1	Cardiidae	<i>Fragum unedo</i>	+	-	-	7
		<i>Trachycardium rokusum</i>	+	-	-	16
2	Tridacnidae	<i>Tridacna crocea</i>	-	-	+	8
3	Spondylidae	<i>Spondylus versicolor</i>	-	+	-	24
4	Pteriidae	<i>Pinctada maxima</i>	-	+	-	12
5	Arcidae	<i>Anandara gubernaculum</i>	-	+	-	20

6	Corbiludae	<i>Polymesoda erosa</i>	+	-	-	3
7	Pinnidae	<i>Atrina vexillum</i>	+	-	-	5

Based on the table above, the types of bivalves in the intertidal zone of Lande Beach, Gerak Makmur Village were found as many as 8 (eight) species belonging to 7 (seven) families, overall there are 3 (three) types of substrates namely sandy seagrass, rocky sand and coral (Afifah dkk., 2023). On sandy seagrass substrates, 4 (four) species were found, namely *Fragum unedo*, *Trachycardium rogium*, *Polymesoda erosa* and *Atrina vexillum* (Amirudin dkk., 2022). There are 3 (three) species found on rocky sand, namely, *Spondylus versicolor*, *Pinctada maxima*, and *Anandara gubernaculum*. While the craggy substrate has 1 (one) species, namely *Tridacna crocea*.

Anandara gubernaculum

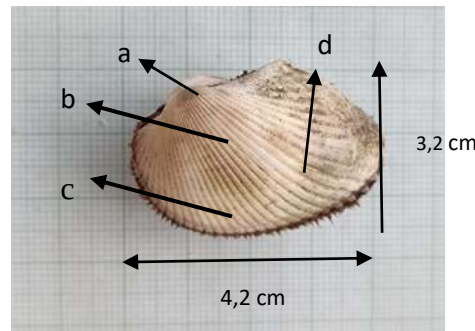


Figure 4.1 Anandara gubernaculum a) umbo b) surface c) fine hairs d) radial ribs (Personal Documents, 2020)

Description

Anandara gubernaculum has an asymmetrical shell shape. Both shells have a clear umbo, where this umbo is the starting point of shell enlargement (Pathurohman dkk., 2023). When viewed from the body surface there are radial ribs, the number of radial ribs is 31 lines (Alberty dkk., 2023). The entire body of this clam is covered by a shell that is associated with the dorsal clam with a hinge ligament (Muhammadong dkk., 2023). has a blackish brown shell color, and at the mouth of the shell many hairs are found, has a length of 4.2 cm and a width of 3.2 cm (Sitinjak dkk., 2023). *Anandara gubernaculum* lives on rocky sand substrates.

Classification

Kingdom: Animalia

Filum : Molluscs

Class: Bivalves

Order: Arcoidae

Family: Arcidae

Genus: *Anandara*

Species : *Anandara gubernaculum*

Fragum unedo

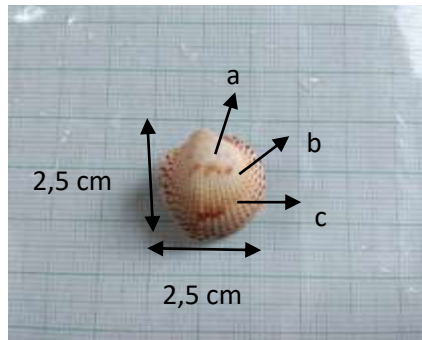


Figure 4.1 *Fragum unedo*. a) umbo, b) surface c) radial rib (Personal Documents, 2020)

Description

Fragum unedo has an oval or symmetrical shell shape. The umbo is the starting point of the shell enlargement (Arumi Sunarta dkk., 2023). When viewed from the surface of the shell body, there are radial ribs. The number of radial ribs is 36 in each valve, with widely spaced transverse scales that become coarser and more numerous on the anterior part of the shell (Hassan dkk., 2023). The hinge is solid. The cardinal teeth of the right valve are connected dorsally. The entire body of this clam is covered by a shell that is connected to the dorsal shell by a hinge ligament to open and close the shell. The shell color is creamy white with strawberry red scales, 2.5 cm long and 2.5 cm wide, and lives in sandy seagrass substrates.

Classification

Kingdom: Animalia

Filum: Mollusca

Class: Bivalves

Order : Cardiida

Family : Cardiidae

Genus : *Fragum*

Species : *Fragum unedo* (Sitompul, 2020)

Tridacna crocea

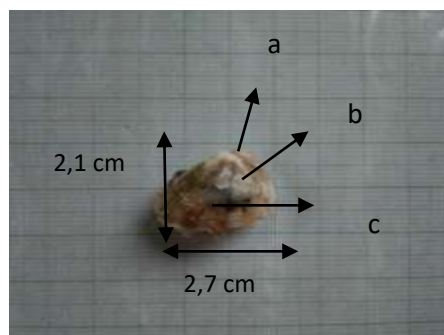


Figure 4.2 *Tridacna crocea*. a) umbo, b) surface c) scutes (Personal Documents, 2020)

Description

Tridacna crocea, has a non-symmetrical shape. *Tridacna crocea* is the smallest species of the family Tridacnidae. It has a bright mantle (generally blue) and has a white,

easy red, orange or pale yellow shell pattern (Herliani dkk., 2023). Viewed from the surface of the shell has folds (grooves), each valve has 5 prominent grooves that are interlocked with the grooves on the lower valve. Umbo is the center of shell growth. However (Hardana dkk., 2023), *Tridacna crocea*'s habit of digging the substrate makes the shell around the umbo smooth. Scutes are scales that have a shape like a bowl stenga (Adema dkk., 2023). Because of *Tridacna crocea*'s habit of digging in the substrate so that the valve does not have large scales (Arifuddin dkk., 2023). Byssal opening is a hole where the attachment organ (byssus) comes out to make it able to stick firmly to the substrate. It has a length of 2.7 cm and a sheet of 2.1 cm, living or attached to craggy rocks. Found in shallow waters that are still permeable to sunlight. The bottom substrate is mainly coral and sand.

Classification

Phylum: Mollusca

Class: Bivalves

Order: Eulamellibrachia

Family : Tridacnidae

Genus : *Tridacna*

Species: *Tridacna crocea* (Mudjiono, 1988).

Trachycardium rogosum

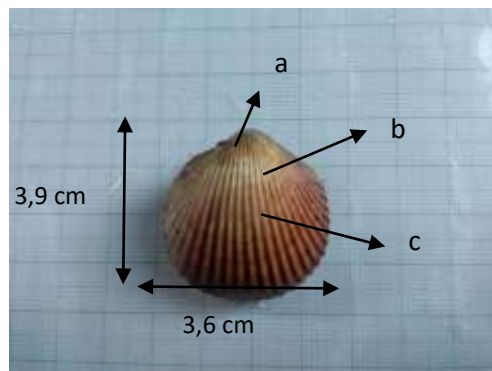


Figure 4.3 *Trachycardium rogosum*. a) Umbo, b) surface c) radial ribs (Personal Documents, 2020)

Description

Trachycardium rogosu has an equivalently shaped shell, increasing from oval to subtrigonal. It is heart-shaped when viewed from the anterior side. Umbo is very prominent, in the umbo is the starting point of shell enlargement. when viewed from the surface of the body there are radial ribs, of which the radial ribs number 36 in each valve. It has a thick brown shell with pronounced longitudinal grooves. The external ligament is more oblique than the posterior, 3.9 cm long and 3.6 cm wide, living in sandy seagrass substrate.

Classification

Kingdom: Animalia

Filum : Mollusca

Class: Bivalves

Order : Veneroida

Family : Cardidae

Genus : Trachycardium

Species : Trachycardium rokusum (Rukanah, 2019)

Spondylus versicolor

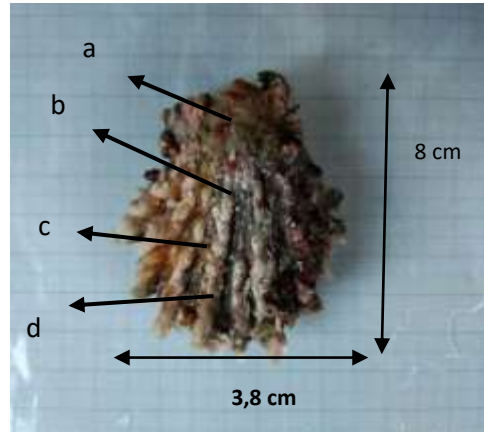


Figure 4.4 Spondylus versicolor a) umbo b) surface c) radial ribs d) protrusions (Personal Documents, 2020)

Description

Spondylus versicolor has a hard shell, consisting of two unequal parts (asymmetrical) where the right shell is generally larger and convex. on the surface of the shell has a sculptura of 8 hard radial bones and irregular protrusions between which there are smaller spines. It has a brownish black orange color and is 8 cm long and 3.8 cm wide. Lives on rocky sand substrate.

Classification

Kingdom: Animalia

Filum: Mollusca

Class: Bivalves

Order : Pterioda

Family : Spondylidae

Genus : Spondylus

Species: Spondylus versicolor (Sjafaraenan, 2009)

Pinctada Maxima

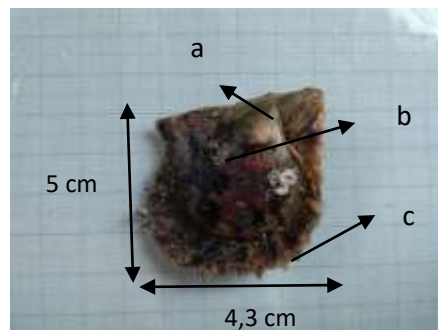


Figure 4.5 Pinctada maxima a) umbo b) surface c) spines (Personal Documents, 2020)

Description

Pinctada maxima has a pair of shells that are joined together on the back with a hinge to protect the soft inside of the body to avoid collisions or attacks from other animals. Has a body shape that is not symmetrical. The two hemispheres of the shell are not the same shape, one shell is more convex than the other. seen from the surface of the shell rather rough and hard, the front or ventral there are irregular spines. Has a brownish yellow color, 5 cm long and 4.3 cm wide. found on rocky sand substrates.

Classification

Kingdom: Animalia

Filum: Mollusca

Class: Bivalves

Order : Pterioida

Family : Pteriidae

Genus : *Pinctada*

Species: *Pinctada maxima* (Sjafaraenan, 2009)

Polymesoda erosa

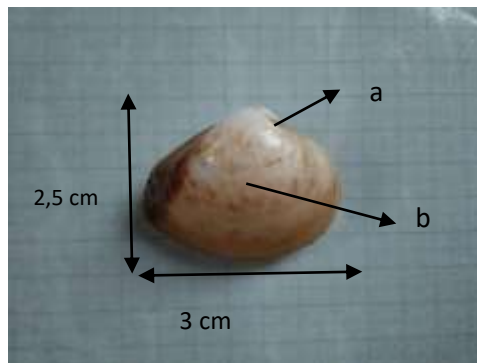


Figure 4.7 *Polymesoda erosa* a) umbo b) surface (Personal Documents, 2020)

Description

Polymesoda erosa has an oval shell shape and is slightly inflated, on the surface of the shell has a fine texture and has small hairs, the outside is blackish striped yellow, the top of the *Polymesoda erosa* shell has shiny brownish black curved lines, has a length of 3 cm and a width of 2.5 cm. found on sandy seagrass substrates.

Classification

Kingdom: Animalia

Filum: Molluscs

Class: Bivalves

Order : Veneroida

Family: corbiludae

Genus: *polymesoda*

Species: *Polymesoda erosa* (Rastania, et al., 2017).

Atrina vexillum

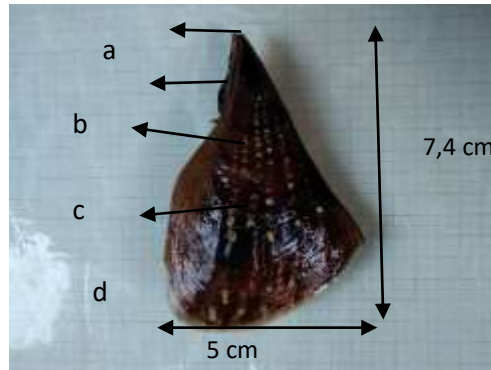


Figure 4.8 Atrina vexillum a) umbo b) byssus c) surface d) protrusions (Personal Documents, 2020)

Description

Atrina vexillum has an asymmetrical and bulging shape resembling a triangle or resembling an axe blade with a brownish black shell. The texture of the shell is smooth with a surface that has irregular protrusions. It has byssus hairs that are used to attach to the substrate in the sand. This clam can immerse its entire body and only leaves the tip of the shell open in the shape of a long line. The shell can open and close due to the presence of large and strong adductor muscles, a balanced shell covered with brown periostrakum, the anterior part of the shell to the joint is curved while from the anterior to the posterior part the shell is elongated and tapered. It is 7.4 cm long and 5 cm wide.

Classification

Kingdom: Animalia

Filum: Mollusks

Class: Bivalves

Order: Pterioidea

Family: Pinnidae

Genus: *Atrina*

Species : *Atrina vexillum* (Ginting et al., 2017)

Based on the results of research on Lande beach, Gerak Makmur Village, Sampolawa Subdistrict with seagrass, rocky sand and craggy sand substrates, there are 7 families and 8 species. The types of bivalves found on seagrass substrates are sandy seagrass, rocky sand and craggy. On sandy seagrass substrates, 4 (four) species were found, namely *Fragum unedo*, *Trachycardium rogosum*, *Polymesoda erosa* and *Atrina vexillum*. Bivalve species found on rocky sand substrate are *Spondylus versicolor*, *Pinctada maxima*, and *Anandara gubernaculum*. While the type of bivalve found on the substrate is *Tridacna crocea*. According to Rendy (2019), Substrate is a surface or medium where living things are attached and grow. Each type of substrate has a different organic matter content, so that the substrate affects the habitat preference, distribution and composition of benthic animal species such as sea shells.

The results showed that the morphological characters of the types of bivalves found showed differences, starting from body shape, body color, body style. In addition, it also describes the body size of each sample.

The results of observations of the body shape of bivalves there are various forms owned by 8 (eight) species found on Lande Beach. The body shape is round/oval and not symmetrical. The round/oval shape consists of 3 (three) types of bivalves namely *Fragum unedo*, *Trachycardium rogosum* and *Polymesoda erosa*. While the unsymmetrical shell

body shape in bivalves consists of 5 (four) types, namely *Anandara gubernaculum*, *Tridacna crocea*, *Spondylus versicolor* and *Atrina vexillum* and *Pinctada maxima*. Sjafaraenan (2009) states that clams have two parts of the shell, both more or less symmetrical. The clam is also known as an umbo, recognizable as a large hump on the anterior and dorsal parts of each clam shell. The two halves of the clam shell are connected dorsally by a ligament consisting of a tensilium and a resilium. Both work together in the process of opening and closing the two sides of the shell. The bivalve class is a shelled mollusk that generally has bilateral symmetry by functioning its adductor and reductor muscles. On the dorsal part there are hinge teeth and ligaments, the mouth is equipped with a labial-palp, without jaws and radula. Its habitat is marine waters, brackish, lakes, rivers, ponds, and swamps (Astuti, 2009).

The results of observations on the color of the bivalve body are various colors owned by 8 (eight) types of bivalve members found at Lande Beach. The color of the bivalve body is one of the characteristics of the types of bivalves. *Anandara gubernaculum* has a blackish brown color, *Fragum undeno* has a shell color that is creamy white with strawberry red scales, *Tridacna crocea* is white, easy red, orange or pale yellow, *Trachycardium rogium* has a brown color, *Spondylus versicolor* has a brownish black orange color, *Pinctada maxima* has a brownish yellow color, *Polymesoda erosa* is shiny brownish black, *Atrina vexillum* is brown.

In addition to having body color, the types of bivalves found also have patterns on bivalves. The type of bivalve *Anandara gubernaculum* has a pattern on the ventral to dorsal blackish brown. The overall shape is not symmetrical, there are many small hairs found on the mouth and shell surface and there are radial ribs. *Tridacna crocea* has a bright coat (generally blue) and has a white, easy red, orange or pale yellow shell pattern. Viewed from the surface of the shell has folds (grooves), each valve has 5 prominent grooves that are interlocked with the grooves on the lower valve. *Trachycardium rogium* has a brown complexion with pronounced longitudinal grooves, the surface has radial ribs. *Spondylus versicolor* has a brownish-black orange color on the surface, the shell has a sculptura and is equipped with hard radial bones and irregular protrusions between which there are smaller spines. *Polymesoda erosa* has a pattern on the surface of the brownish black shell has a fine texture and has small hairs, the outside is yellow-black, the top of the *Polymesoda erosa* shell has shiny curved lines. *Atrina vexillum* has a brownish-black pattern on its surface. The texture of the shell is smooth with a surface that has irregular protrusions.

The results of observations of bivalve body color there are various colors owned by 8 (eight) types of bivalve members found at Lande Beach. Bivalve body color is one of the characteristics of bivalve species. *Anandara gubernaculum* has a blackish brown color, *Fragum undeno* has a creamy white shell color with strawberry red scales, *Tridacna crocea* is white, easy red, orange or pale yellow, *Trachycardium rogium* has a brown color, *Spondylus versicolor* is orange brownish black, *Pinctada maxima* is brownish yellow, *Polymesoda erosa* is shiny brownish black, *Atrina vexillum* is brown.

In addition to having body color, the types of bivalves found also have patterns on bivalves. The type of bivalve *Anandara gubernaculum* has a pattern on the ventral to dorsal blackish brown. The overall shape is not symmetrical, there are many small hairs found on the mouth and shell surface and there are radial ribs. *Tridacna crocea* has a bright mantle (generally blue) and has a white, easy red, orange or pale yellow shell pattern. Viewed from the surface of the shell has folds (grooves), each valve has 5 prominent grooves that are interlocked with the grooves on the lower valve. *Trachycardium*

rogusum has a brown complexion with prominent elongated grooves, the surface has radial ribs. Spondylus versicolor has a brownish-blackish orange color on the surface, the shell is sculptured and equipped with hard radial bones and

irregular protrusions between which are smaller spines. Polymesoda erosa has a pattern on the surface of a brownish-black shell with a fine texture and small hairs, the outside is yellow-black, the top of the shell of Polymesoda erosa has a shiny curved line. Atrina vexillum has a brownish-black pattern on its surface. The texture of the shell is smooth with irregular ridges on the surface.

The results showed that the characters of the length and width of the bivalve shell body found showed variations. The characters in the measurement of bivalve body length are different. Anandara gubernaculum has a length of 4.2 cm and a width of 3.2 cm. Fragam unedo is 2.5 cm long and 2.5 cm wide. Tridacna crocea is 2.7 cm long and 2.1 cm wide. Tranchycardium rokusum is 3.9 cm long and 3.6 cm wide. Spondylus versicolor is 8 cm long and 3.8 cm wide. Pinctada maxima is 5 cm long and 4.3 cm wide. Polymesoda erosa is 3 cm long and 2.5 cm wide. Atrina vexillum has a length of 7.4 cm and a width of 5 cm.

The results of measuring environmental parameters at the research site can be seen in table 4.1 below:

Table 4.1 Measurement Results of Environmental Parameters of intertidal zone of lande beach

No	Parameters	Research station	
1	Substrate conditions	Dreamy sand	Rocky and craggy sand
2	Temperature	27°C	28°C
3	pH	7	8

Substrate

The substrate of Lande beach, Gerak Makmur Village, Sampolawa Subdistrict which is inhabited by the Bivalve class at this station has a substrate of seagrassy sand and rocky and craggy sand.

Temperature

Based on the table above, it can be seen that the temperature of Lande beach, Gerak Makmur Village, Sampolawa District is 27oC-28oC. According to Sinyo and Jaida (2013) states that the water temperature suitable for the life of organisms in the sea is between 27-37oC. So that the results of measuring water temperature on Lande beach are still in the range that can provide tolerance for biota to survive.

pH

pH value obtained at Lande Beach is 7-8. The pH value in these waters is classified as good to support biota life. According to Marbun (2017), pH is a limiting factor for organisms that live in waters. The ideal pH value for the life of aquatic organisms generally ranges from 7-8.5. pH greatly affects the biochemical processes of waters, such as nitrification.

CONCLUSION

Based on the results of research conducted in the intertidal zone of Lande beach, Gerak Makmur Village, Sampolawa Subdistrict, 8 (eight) species of Bivalves from 7 (seven) families were found, namely Fragam unedo, Tridacna crocea, Tranchycardium rokusum, Spondylus versicolor, Pinctada maxima, Anandara gubernaculum, and Atrina vexillum.

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