

Exploration of Patellidae from Coastal Waters of Ambon Island, Indonesia

Dwien E. Pattipeilohy¹, Sintje Liline², Sriyanti A. I. Salmanu³, Tri Santi Kurnia^{4*}
*e-mail: trisanti@iainambon.ac.id

^{1,2,3}*Biology Education Study Program, Faculty of Teacher Training and Education
Pattimura University*

⁴*Department of Biology Education, Faculty of Tarbiyah and Teacher Training
Ambon State Islamic Institute*

ABSTRACT

Patellidae are gastropods that live in intertidal zones and sublittoral zones of shallow rocky shores because Patellidae are usually attached to boulders. Patellidae belongs to the order Archaeogastropoda and generally only has two genera, namely Cellana and Patella. Patellidae are also found in the waters of Ambon Island, namely in the Hukurila Village and Allang Village. This study aims to determine the type, morphometrics, density, and proximate levels of Patellidae in the waters of Ambon Island. Samples were taken using purposive sampling with cruising methods. The Patellidae are attached to the substrate. Samples from two locations were taken and put into plastic, and then the type and morphometrics were identified at the Basic Biology Laboratory of the Faculty of Teacher Training and Education, Pattimura University. Proximate levels were conducted at the Basic Chemistry Laboratory, Faculty of Mathematics and Natural Sciences, Pattimura University. This research was conducted from October 15, 2022, to November 15, 2022. Based on the results, two species of the Patellidae family were found in Ambon Island, namely *C. testudinaria* and *P. flexuosa*. The results of the calculation of morphometric Patellidae in the Waters of Ambon Island showed that the species *C. testudinaria* in the Waters of Hukurila Village has a larger morphometric characteristic size compared to the species *C. testudinaria* and *P. flexuosa* in the Waters of Allang Village. More individuals of *P. flexuosa* species were found in Alang village than *C. testudinaria* species, while many *C. testudinaria* species were found in Hukurila village. Based on the proximate analysis results, Patellidae from the waters of Ambon Island have nutritious and good nutritional content to be used as food ingredients.

Keywords: *Exploration, Patellidae, Ambon Island*

INTRODUCTION

Geographically, the waters of the Maluku Sea are classified as large waters, so they have rich resources and are good for the life of organisms (Rumahlatu & Leiwakabessy, 2017). Ambon Island is part of the Maluku region, Ambon Island waters have a diversity and uniqueness of marine animals that have very potential to be studied, one of which is mollusks. Mollusks are often found in the waters of Ambon Island one of them from gastropod classes. Gastropods are the

most diverse class of Phylum Mollusca, with thousands of species from 104 families (Dharma, 1992). Among these families, there is one family that has a Single-shelled shell often called a limpet, and attached to the rock that includes the Patellidae family (Lestari et al., 2021)

Patellidae are gastropods that usually eat the macroalgae on the rock surfaces. Patellidae play an important role in controlling algal coverage, and shaping ecological succession and biological

communities in coastal areas (Andriati & Rizal, 2020; Vafidis et al., 2020). Patellidae can be found at low tide or high tide because Patellidae are attached to the rocks. When the tide wets the rock, Patellidae will be moving for food (Vafidis et al., 2020). Patellidae are mostly found in the intertidal zone on a rocky coast (Witasari & Helfinalis, 2015). In the waters of Ambon Island, especially in Allang Village and Hukurila Village, several species of Patellidae species are found (Islami et al., 2018).

Local people in Ambon know Patellidae as "*Bia Bisol*" or "*Bia Piring*". They have been eating Patellidae for a long time. In Indonesia, including Maluku, specific studies on Patellidae are still very limited. Generally, the research conducted is not specific to Patellidae but rather general gastropod identification and ecology studies (Andriati & Rizal, 2020; Dharma, 2020; Islami et al., 2018). This causes information on the characteristics and nutrition of Patellidae to be unclear. Therefore, studying the characteristics and nutrition of Patellidae is very important. This information is useful as a reference for Patellidae in Ambon Island waters.

MATERIALS AND METHODS

The type of this research is descriptive research. The target of this study was to identify the types of Patellidae in the waters of Ambon Island. The next target is to measure morphometrics, density, and proximate levels of Patellidae from the waters of Ambon Island. The samples were taken in two places, the Villages of Hukurila and the Villages of Allang.

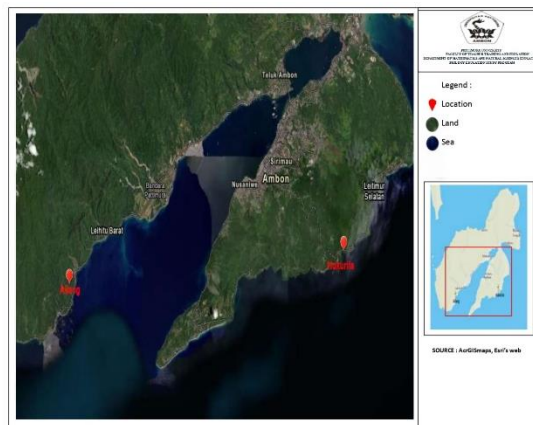


Fig. 1. Research Location Map (Source: AcrGISmaps, Esri's web)

Samples were taken using purposive sampling with cruising methods. This method steps by exploring the location or observation area according to a predetermined station (Widodo et al., 2023). Patellidae's density count was carried out on a total area of 150 m².

The Patellidae are attached to the substrate. Samples from two locations were taken and put into plastic, and then the type and morphometrics were identified at the Basic Biology Laboratory of the Faculty of Teacher Training and Education, Pattimura University. Proximate levels were conducted at the Basic Chemistry Laboratory, Faculty of Mathematics and Natural Sciences, Pattimura University. The research has lasted for a month, from October 15, 2022, to November 15, 2022. The data obtained were analyzed descriptively, namely presented in the form of tables and figures.

Identify the species of Patellidae using the literature study method, namely adjusting the characteristics of the specimen with information from related books (Wilson, 1993: Australian Marine Shells Part One, Wilson, 1993: Australian Marine Shells Part Two) and scientific articles (Dharma, 2020), as well as comparing the specimens found with images from World Register of Marine Species (<https://www.marinespecies.org/>).

Morphometrics is performed by measuring body parts which include total weight (BT), abductor length (PA), abductor width (LA), abductor height (TA), abductor-to-edge distance (JA), shell length (PC), shell width (LC), shell height (TC). Calculation of the density of the Patellidae using the formula (Bugaleng et al., 2016):

a. Absolute Density (ind/m²)

$$AD = \frac{\text{Total individual of a species}}{\text{Total Area}}$$

b. Relative Density (%)

$$RD = \frac{\text{The Density of a species}}{\text{total Species}}$$

Proximate analysis includes ash content, moisture content, protein content, fat content, and carbohydrates following the procedure of AOAC (2005), i.e., ash content and moisture

content test by gravimetric method, protein content test by Kjeldahl method, fat content test by soxhlet method, and test the levels of carbohydrates with the by difference method ([AOAC]. Association of Official Analytical Chemistry International, 2005; Kurnia et al., 2022).

RESULTS AND DISCUSSION

The results of this research with the purposive sampling and cruising method aimed at exploring the Patellidae of Ambon Island were carried out on the coastal waters of Hukurila Village and Allang Village. It has obtained data that includes identification results of types of Patellidae, morphometric measurement data, density calculation results, and proximate test results of Patellidae from Ambon Island, which can be presented and described as follows:

Table 1. Results of Identification of Patellidae Species from Ambon Island

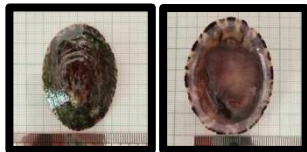
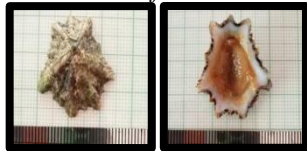
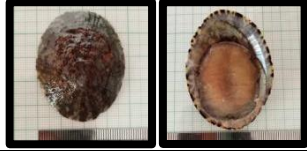
No	Location	Type	Description
1	Allang Village	<i>Cellana testudinaria</i>	Has a single shell and is oval. The outer color of the shell is greenish to yellowish brown. Has a striped pattern
			
		<i>Patella flexuosa</i>	Has a single shell with a rough shell surface and a jagged and uneven shell structure.
			
2	Hukurila Village	<i>Cellana testudinaria</i>	Has a single shell and is oval. The outer color of the shell is greenish to yellowish brown. Has a striped pattern
			

Table 1. Shows that in the waters of Allang Village, there were two (2) types of Patellidae, namely *Cellana testudinaria* and *Pattela flexuosa*. Meanwhile, in the waters of Hukurila Village, only one (1) Patellidae species

were found, namely *Cellana testudinaria*. Generally, the presence of Patellidae in water is very dependent on the substrate conditions that dominate coastal waters. Substrate condition of village coastal waters.

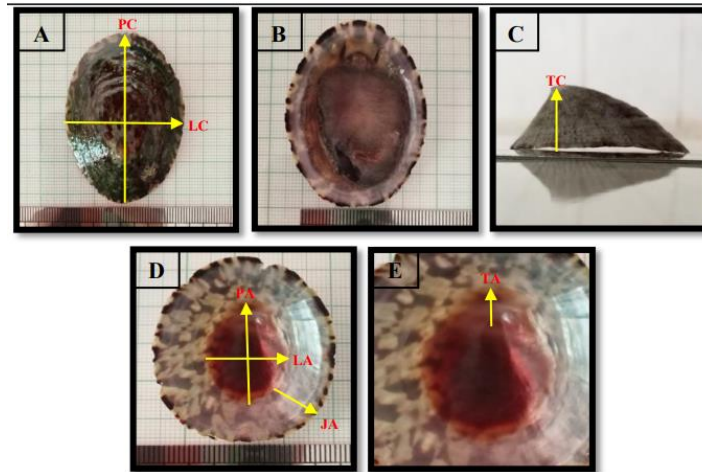


Fig. 2. Morphometric Character of Patellidae.

A. Dorsal view, B. Ventral view, C. Lateral view, D. Inside of shell, E. Abductor section. (Note: PC = Shell Length, LC = Shell Width, TC = Shell Height, PA = Abductor Length, LA = Abductor Width, JA = Abductor to edge distance, TA = Abductor Height)

The substrate in the waters of Allang Village tends to be rocky consisting of chunks of granite with a smooth texture and rough coral rocks, while the condition of the substrate in the coastal waters of Hukurila Village is rocky which is dominated by chunks of rock that have a slippery texture. This is what causes the different types of Patellidae in the two locations because the Patellidae natural habitat is in rocky waters (Guerra-García et al., 2004). In addition, the presence of types of mollusks in an area is also influenced by the substrate (Cappenberg et al., 2021).

The Patellidae that have been found in the waters of Allang Village and Hukurila Village will represent Ambon Island waters and will then be observed and measured for their morphometric characteristics. Observation results of Patellidae morphology from Ambon Island can be seen in Figure 1. From the morphological observations of Patellidae body parts, then the morphometric characters to be measured were determined. The results of Patellidae morphometric measurements from Ambon Island are presented in the tabular shape of Table 2.

Table 2. Results of Patellidae Morphometric Measurements from Ambon Island

No	Species	Station	Average Value							
			BT	PA	LA	TA	JA	PC	LC	TC
1	<i>Cellana testudinaria</i>	Allang Village	2,2	14,1	8,7	4,0	6,1	24,9	19,8	5,5
		Hukurila Village	3,4	18,2	11,2	4,2	8,1	32,8	26,6	7,5
2	<i>Patella flexuosa</i>	Allang Village	1,5	13,0	8,7	4,6	5,9	25,8	21,1	6,3

Based on the results of calculating the morphometric average Patellidae from Ambon Island waters which were represented from two research stations, namely Allang Village waters and

Hukurila Village waters, the results obtained were that the largest shell length (PC) was the species *Cellana testudinaria* from Hukurila Village waters, namely 32,83mm, then 28.82mm for the *Patella*

flexuosa species from Allang Village waters and the smallest is the *Cellana testudinaria* species from Allang Village waters, namely 24.88mm. The largest total weight (BT) was for the *Cellana testudinaria* species from Hukurila Village waters, namely 3.41g, then 2.23g for the *Cellana testudinaria* species from Allang Village waters and the smallest was the *Patella flexuosa* species from Allang Village waters, namely 1.49g.

Then, for the largest abductor length (PA), the *Cellana testudinaria* species from Hukurila Village waters is 18.16mm, then 14.07mm for the *Cellana testudinaria* species from Allang Village Waters and the smallest is 13.03mm for the *Pattela flexuosa* species from Allang Village Waters. For the largest abductor width (LA), the species *Cellana testudinaria* from Hukurila Village Waters is 11.21 then 8.73mm for the *Cellana testudinaria* species from Allang Village Waters and the smallest is the *Patella flexuosa* species from Allang Village Waters. Then for the largest abductor height (TA) size is the *Patella flexuosa* species from Allang Village Waters which is 4.64mm, then 4.16mm for the *Cellana testudinaria* species from Hukurila Village Waters, and the smallest is 4.03mm for the *Cellana testudinaria* species from Allang Village Waters.

Then, for measuring the abductor distance (PA) to the edge of the body, the largest was found in the *Cellana testudinaria* species from Hukurila

Village Waters, namely 8.14mm, then 6.13mm for the *Cellana testudinaria* species from Allang Village Waters and the smallest was 5.90mm for the *Patella flexuosa* from the waters of Allang Village. The largest shell width (LC) measurement was found in the *Cellana testudinaria* species from Hukurila Village Waters, namely 26.60mm, then 21.10mm for the *Pattela flexuosa* species from Allang Village waters, and the smallest, namely 19.78mm for the *Cellana testudinaria* species from Allang Village Waters. For the last measurement, namely shell height (TC). The largest shell height measurement value was found in the *Cellana testudinaria* species from Hukurila Village Waters, namely 7.54mm then 6,

The morphology of the *Patella* shell can vary between locations due to the strong influence of environmental features, namely the degree of exposure to desiccation and the intensity of wave action (Belmokhtar et al., 2022). In addition, similar morphology with variations in body size of species in the genus *Pattelidae* can be identified through geometric morphometrics measurements (Echeverry et al., 2020). Morphometrics study data and individual density of *Pattelidae* are very important for resource management efforts in Ambon Island waters (Tuapattinaya et al., 2021). The results of calculating the density of *Pattelidae* from Ambon Island can be seen in Table 3.

Table 3. Calculation results of Patellidae Density from Ambon Island

Station	Species	Total Individual	AD	RD
Allang Village	<i>Cellana testudinaria</i>	13	0,086	6,231
	<i>Pattela flexuosa</i>	194	1,293	93,695
	Total	207	1,379	100
Hukurila Village	<i>Cellana testudinaria</i>	310	2,067	100
	Total	310	2,067	100

In the waters of Allang Village, there are 207 individuals *Patellidae*,

among them 13 individuals for *Cellana testudinaria* and 194 individuals for the

species *Patella flexuosa*. The density of the *Cellana testudinaria* species in the waters of Allang village is low (lacking) because it only has 0.08 per m² density and is relative to 6.28%. The species of *Patella flexuosa* in the waters of Allang Village is less dense (less) because it only has a density value of 1.29 individuals /m² with a relative density of 93.71%. Then for Patellidae in the waters of the Village of Hukurila, 310 individuals belonging to the *Cellana testudinaria* species. The density of the *Cellana testudinaria* species in the waters of the village of Hukurila is also low (low) because it only has a high value of 2.0 individuals /m² with relatively 100% density. Therefore, the density of the *Cellana testudinaria* species in Ambon Island waters is low (low) because it has a high value of 2.15 individuals /m². The density of the species *Patella flexuosa* in Ambon Island waters is also low (lacking) because of only 1.29 individuals /m² density.

Based on the result, the density of Patellidae on Ambon Island is low. Data and information about the density of Patellidae species are closely related to the condition of the population. The condition of the population is closely related to the potential utilization of Patellidae as a food source. In addition, quantitative information on density can be part of the description of the structure and composition of the Patellidae community from Ambon Island waters (Sari et al., 2018).

After knowing the results of species identification, morphometrics, and density, the Patellidae samples from Ambon Island waters were tested for proximate content. This is done to determine the nutritional content contained in Patellidae meat. Knowing the nutritional content, information, and potential of Patellidae as a food source for humans can be available and useful for the community and the government.

Table 4. Patellidae Proximate Test Result

Proximate Composition	Species	
	<i>Patella flexuosa</i>	<i>Cellana testudinaria</i>
Protein Content	20,06%	23,24%
Fat Content	0,32%	0,28%
Carbohydrate Content	0,61%	0,90%
Water Content	77,22%	73,65%
Ash Content	1,76%	1,77%

Based on the data in Table 4, the percentage of protein and carbohydrates in the *Patella flexuosa* species is lower than the protein content in the *Cellana testudinaria*. This is because the substrate or place where mollusks live can affect the nutritional content of each mollusk species (Moniruzzaman et al., 2021). The difference is 3.18% for protein content and 0.29% for carbohydrate content. Meanwhile, the fat content and water content in the *Patella flexuosa* species were higher when compared to the fat and water content in the *Cellana testudinaria* species. The difference for each is 0.04% for the fat content, and the difference for the water content is 3.57%. The ash content of the two species is almost the same because the difference is only 0.01%.

Water levels of each biota vary considerably because of different habitats or environments. Moreover, protein levels also affect the water content of a material. The relationship is that if the protein content in a material is high, it will also be directly proportional to the water content of the material or vice versa (Asari et al., 2021). This matches matching results of the proximate analysis shown in Table 4, which indicates the protein and water contents of the *Cellana testudinaria* species are higher than those of the *Patella flexuosa* species.

Generally, the levels of fat and carbohydrates in Patellidae are very small, because they are only 0.28% and

0.90% for the *Cellana testudinaria* species, and 0.32% and 0.61% for the *Patella flexuosa* species, respectively. The content of fat and carbohydrates is always present in almost all types of food. Therefore, it is very important to analyze the levels of fat and carbohydrates in a food ingredient so that the caloric needs of a food ingredient can be calculated properly. The calorie ratio between carbohydrates and fats is quite different. As much as 1 gram of fat will be equivalent to 9 kcal, while 1 gram of carbohydrates and protein is equivalent to 4 kcal (Pargiyanti, 2019). Therefore, the low fat and carbohydrate content makes Patellidae very potential as a healthy food ingredient for diets.

CONCLUSION

Based on the description of the results and discussion of the exploration of Patellidae from the waters of Ambon Island, the conclusions can be drawn:

1. There are two species of Patellidae, namely *Cellana testudinaria* and *Patella flexuosa*.
2. The species *Cellana testudinaria* in Hukurila Village waters had larger morphometric characteristics compared to the species *Cellana testudinaria* and *Patella flexuosa* in Allang Village waters.
3. The density of Patellidae in the waters of Ambon Island is relatively low.

Patellidae from the waters of Ambon Island have good nutritional content for healthy food sources.

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