JURNAL PERIKANAN DAN KELAUTAN
Volume 28 No. 2, June 2023: 174-180

e-issn : 2721-8902
p-issn : 0853-7607

Population Structure of Bamboo Shell (*Solen lamarckii*) in the Intertidal Zone of Sri Tanjung Village, Rupat District, Bengkalis Regency

Struktur Populasi Kerang Bambu (Solen lamarckii) pada Perairan Pantai Desa Sri Tanjung, Kecamatan Rupat, Kabupaten Bengkalis

Nanang Tri Prastyo[1*], Syafruddin Nasution[1], Feli Feliatra[1]
[1]*Department of Marine Science, Faculty of Fisheries and Marine Universitas Riau*
Kampus Bina Widya KM 12.5 Simpang Baru, Binawidya, Pekanbaru, 28293
**email: nanang.tri2167@student.unri.ac.id*

Received
8 April 2023

Accepted
21 May 2023

Abstract

Research on the population structure of bamboo shells (*Solen lamarckii*) in the intertidal zone of Sri Tanjung Village, Rupat District, Bengkalis Regency was carried out in October 2021-March 2022. This study aimed to determine the population structure of bamboo shells and the relationship between the size of bamboo shells and the depth of bamboo shells in the sediment. The intertidal zone is divided into 5 subzones. Each subzone is placed in 3 plots measuring 1 x 1 m^2 along the transect line as a replication by drawing a straight line from the boundary of the highest tide area to the lowest low tide area. The results showed that the average population density of bamboo shells was 1.20 ind/m^2 or 12,000 ind/ha with the lowest density located in the highest tide area and the highest density located in the lowest low tide area. The distribution pattern of bamboo shells is uniform. The size of the most common bamboo shells found is 5.14-5.70 cm. The relationship between the size of the bamboo shells and the depth of the bamboo shells in the sediment is very weak.

Keywords: *Solen lamarckii*, Population structure, Sri Tanjung Village.

Abstrak

Penelitian tentang struktur populasi kerang bambu (*Solen lamarckii*) di zona intertidal Desa Sri Tanjung Kecamatan Rupat Kabupaten Bengkalis dilakukan pada bulan Oktober 2021- Maret 2022. Penelitian ini bertujuan untuk mengetahui struktur populasi kerang bambu dan hubungan antara ukuran kerang bambu dengan kedalaman kerang bambu didalam sedimen. Zona intertidal dibagi menjadi 5 subzona. Setiap subzona diletakkan 3 plot berukuran 1 x 1 m^2 di sepanjang garis transek sebagai ulangan dengan cara menarik garis lurus dari batas daerah pasang tertinggi hingga daerah surut terendah. Hasil penelitian menunjukkan kepadatan rata-rata populasi kerang bambu sebesar 1,20 ind/m^2 atau 12.000 ind/ha dengan kepadatan terendah terletak pada daerah pasang tertinggi dan kepadatan tertinggi terletak pada daerah surut terendah. Pola penyebaran kerang bambu bersifat seragam. Ukuran kerang bambu paling umum ditemukan 5,14-5,70 cm. Hubungan antara ukuran kerang bambu dengan kedalaman kerang bambu didalam sedimen sangat lemah.

Kata Kunci : *Solen lamarckii*, Struktur populasi, Desa Sri Tanjung

1. Introduction

Bamboo shells are a type of Mollusk from the Solenidae family with a long flat shape similar to bamboo as big as an adult's finger. Bamboo shells also have a knife-like shape, so they are also called knife shells, razor clams, or jack knives. Bamboo clams live by digging vertically in the sediment and will come to the surface at low tide. Bamboo clam is one of the biotas that can be found in the intertidal zone with sloping beach conditions and sandy sediments. The intertidal zone is divided into several subzones.

In Indonesia, bamboo shells are only found in several areas, including Jambi, Madura, East Kalimantan, Bengkulu, and also Riau (Ramadan et al., 2017). Sri Tanjung Village is one of the villages in Bengkalis Regency, Riau Province, which has abundant marine biological natural resources, one of which is bivalves or shellfish. One type of shellfish found in the waters of Sri Tanjung Village is bamboo shells. Bamboo clams (*Solen lamarckii*) are known by the people of Bengkalis as Sepahat.

Several previous studies were conducted by Ulfa et al. (2020), in Apiapi Village. Apiapi Village is a lowland area with a sloping beach shape directly facing the waters of the Bengkalis Strait and has a beach substrate which is generally sand and mud, where bamboo shells can be found. In these coastal waters, you can find bamboo shells. The potential for biological resources of bamboo shells is interesting for further research considering the increasing demand and high economic value. The existence of excessive fishing activities by fishermen in search of bamboo shells continuously without regard to the sustainability of these shells can cause the extinction of bamboo shells in their habitat and disrupt the balance of these populations.

However, research on the population structure of bamboo shells in the coastal waters of Sri Tanjung Village, Rupat District, Bengkalis Regency has never been carried out. As well as the lack of information about bamboo shells, including information about their population, the authors conducted research on the population structure of bamboo shells in the coastal waters of Sri Tanjung Village, Rupat District, Bengkalis Regency.

2. Material and Method

2.1. Time and Place of Research

This research was conducted in October 2021 - March 2022. Sampling was carried out in the coastal waters of Sri Tanjung Village, Rupat District, Bengkalis Regency (Figure 1). Sample analysis was carried out at the Laboratory of Marine Biology and Marine Chemistry, Department of Marine Science, Faculty of Fisheries and Marine, Universitas Riau.

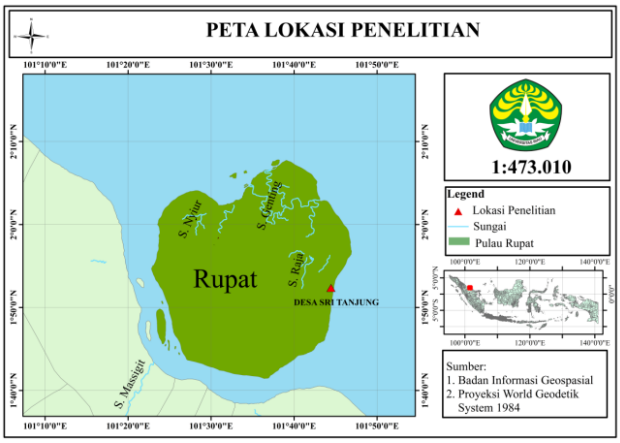

Figure 1. Map of research locations

2.2. Methods

The method used in this study was a survey method by observing the research area and sampling bamboo shells and measuring water quality parameters such as temperature, salinity, brightness, degree of acidity (pH), and current speed. Stations and research plots were determined based on field surveys.

2.3. Procedure

2.3.1. Determining Research Location

The sample is located in the intertidal zone in Sri Tanjung Village divided into 5 subzones. The width of the intertidal zone is measured from the lowest tide to the highest tide of about ±400 m. The intertidal zone is divided into 5 subzones which are located perpendicular to the coastline with a distance between subzones of ± 80 m. Subzone 1 is located at the highest tide (Upper zone) (excluding mangrove areas), subzone 2 is located near the highest tide, subzone 3 is located in the middle zone (Middle zone), subzone 4 is located near the lowest tide, and subzone 5 is at the lowest tide (Lower zone). Each subzone consists of 3 plots parallel to the coastline with a distance of ± 20 m from each plot and measuring 1 x 1 m^2 (Figure 2).

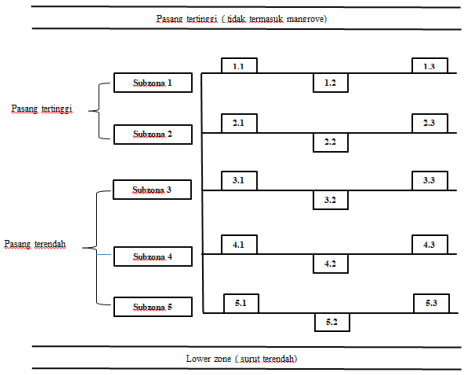

Figure 2. Sampling subzone plan

2.3.2. Sampling of Bamboo Shells

A sampling of bamboo shells was carried out at the lowest tides. Samples were taken in each 1x1m^2 plot using a spade, the substrate was excavated to a depth of 25-30 cm and then filtered using a 1 mm sieve so that all samples of small bamboo shells could be collected. To find out the vertical distribution of bamboo shells, it was done by sticking a 3 mm piece of iron in the holes where there were indications of bamboo shells. The iron is inserted into the hole until it touches the bamboo shells and then the depth of the hole is measured. After measuring the depth of the iron hole, it was plugged until it hit the bamboo shells and was lifted to the surface and then the length of the individual bamboo shells was measured.

2.3.3. Sediment Sampling

Sediment sampling was carried out to determine the condition of the existing substrate at each point using a PVC pipe to a depth of 20-30 cm. Then the sample is put into a plastic bag that has been labeled based on the sampling point. Then the samples were put into styrofoam for further analysis in the laboratory.

2.3.4. Sampling of Seawater

Analysis of seawater samples was carried out to determine the amount of total suspended solids (TSS). Sampling of seawater was carried out during high tide and 1 L of seawater samples were taken using a sample bottle, the water samples taken were then labeled according to the collection station. Once taken then save the sample into styrofoam for further analysis in the laboratory.

2.3.5. Water Quality Measurement

Water quality parameter data collection is carried out during high tide in the intertidal zone which is divided into 3 zones, namely the upper, middle, and lower zone. Water quality parameters measured in the Rupat waters are temperature, salinity, degree of acidity (pH), brightness, and current speed.

2.4. Parameters Observed

2.4.1. Population Density

According to Brower et al. (1989), the density of each species at each observation location is calculated using the following formula:

$$D = \frac{ni}{A}$$

Information:

D = Density of Species (Individual/m^2)
ni = Total number of individuals of the species (Ind)
A = Area of the sampled area (m^2)

2.4.2. Distribution Pattern

To find out the distribution pattern of the bamboo shell it was analyzed using the Morisita distribution index (Brower et al., 1989), namely:

$$Id = n\frac{(\sum x^2)\text{-}Ni}{Ni(Ni\text{-}1)}$$

Information:

Id = Morisita distribution index
Ni = total number of individuals per subzone
n = number of plots
$\sum X^2$ = sum of squared total individuals per subzone

With test criteria: Id = 1, The distribution of shells is random; Id < 1, the distribution of shells is uniform; Id > 1, the distribution of shellfish is clustered

2.4.3. Individual Size Frequency

The length of the sample obtained is divided into several classes concerning Sturges' formula (Sugiyono, 2008).

$$K = 1 + 3.322 \text{ Log } n$$

Information :

K = Many interval classes

N = Lots of data

2.4.4. Vertical Distribution

The vertical distribution must be measured by the size of each individual with the depth of the sediment. The length of the bamboo shell sediment depth was taken during field sampling by inserting a 3 mm piece of iron into the hole indicated by the presence of bamboo shells until it touched the bamboo shells, then the length of the depth was measured. The bamboo shells that had been brought from the research location to the Marine Biology Laboratory were then cleaned. After the bamboo shells are cleaned, individual measurements of the bamboo shells are then carried out. so that you can see the difference in the size of the bamboo shells with the depth of the sediment. After that, it is recorded and entered into the table that has been prepared.

2.5. Data Analysis

The data obtained in the form of calculations are presented in the form of tables and graphs and then discussed descriptively. A one-way ANOVA test was conducted to see whether there were differences in population density between study subzones. The ANOVA test was carried out using SPSS (Statistical Package for the Social Science) data processing software. While finding out the relationship the size of the bamboo shells with the depth of the bamboo shell holes was analyzed using the test simple linear regression using the Microsoft Excel application.

3. Result and Discussion

Sri Tanjung Village is a research area located in Rupat District, Bengkalis Regency, Riau Province. The area of the village is 4,204 ha with a population of 1,531 people. This village is directly adjacent to the Malacca Straits to the east, Sukarjo Mesim Village to the south, and Teluk Lecah Village to the north and west. Sri Tanjung Village has a tropical climate with a temperature of 30^0C and has a sloping beach directly facing the waters of the Malacca Strait. The beach substrate that is found is generally sandy and muddy, on the shoreline the substrate is muddy so that mangrove forests grow along the coast of Sri Tanjung Village. Sri Tanjung Village has abundant natural resource potential in the fisheries sector. So that many people whose livelihood is fishing. The results of calculating the average density of bamboo shells can be seen in Table 1.

Table 1. The density of Bamboo Shells in each intertidal subzone of Sri Tanjung Village, Rupat District, Bengkalis Regency

Subzone	Plot			Total	Density (ind/m^2)	Standard Deviation (±)
	1	2	3			
1	0	0	0	0	0.00	0
2	0	0	0	0	0.00	0
3	1	1	1	3	1.00	0
4	2	2	1	5	1.67	0.6
5	3	4	3	10	3,33	0.6
Average				18	1.20	

Density values in each subzone obtained different results. Subzone 1 and Subzone 2 it has a density value of 0 ind/m^2. Subzone 3 has a density value of 1.00 ind/m^2. Subzone 4 has a density value of 1.67 ind/m^2. Subzone 5 has a density value of 3.33 ind/m^2. The high-density value in subzone 5 is thought to be due to physical and chemical factors in the waters, namely the type of substrate in subzone 5 which has a type of substrate in the form of sand which is favored by bamboo shells. Bamboo shells prefer a sand substrate, presumably because the sand substrate has a larger water pore compared to the mud substrate. Larger pore water can help the movement of bamboo clams in the substrate to develop and find food. Other factors that are thought to also influence determining the density of bamboo shells are temperature, salinity, pH, brightness, current speed, dissolved organic matter, total suspended solids, and the catching of bamboo shells by fishermen. In subzone 5, the bamboo shells are submerged in seawater for longer, this helps the movement of the bamboo shells and increases the opportunities for the bamboo shells to take food directly from the seawater.

Trisyani et al. (2007) stated that knife clams prefer muddy sand sediment habitats. total suspended solids and catching bamboo shells by fishermen. In subzone 5, the bamboo shells are submerged in seawater for longer,

this helps the movement of the bamboo shells and increases the opportunities for the bamboo shells to take food directly from the seawater. The distribution pattern can be seen in Table 2.

Table 2. Distribution Pattern of Bamboo Shells in Coastal Waters of Sri Tanjung Village, Rupat District, Bengkalis Regency

Intertidal Zone	Morisita Distribution Index	Distribution Pattern
Subzone 1	0	-
Subzone 2	0	-
Subzone 3	0.0	Uniform
Subzone 4	0.6	Uniform
Subzone 5	0.8	Uniform
Whole	0.28	Uniform

Based on the research results, the distribution pattern of bamboo shells in the intertidal zone of Sri Tanjung Village is uniform. This distribution pattern can be influenced by water quality factors and competition, both competition for place and competition for food. This is supported by the research of Suhendra et al. (2017), organisms with a uniform distribution pattern are caused by almost the same environmental conditions in an area and competition for habitation and competition for food, so they are found not to live in groups. According to Astari et al. (2018), if the index is less than 1 (Id <1) it indicates that the distribution pattern of the bivalves tends to be uniform. This type of distribution pattern is caused by competition between individual shells, which encourages an even division of space. The distribution of length frequency of bamboo shells is shown in Figure 3. The most common length frequency was found around 5.14-5.70 cm, namely 22 individuals.

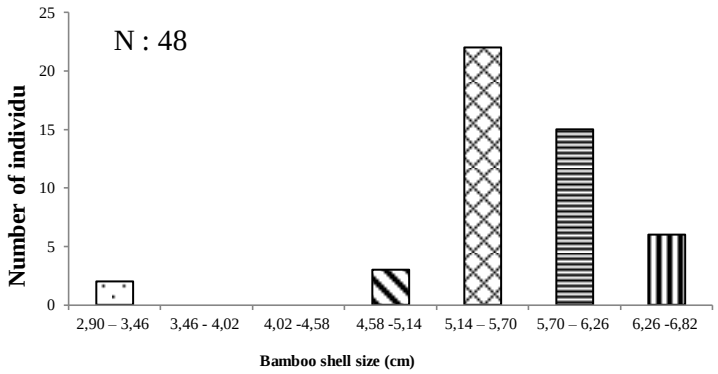

Figure 3. Frequency distribution of lengths of bamboo shells

The various levels of length size frequency distribution found are caused by bamboo shells having adaptability, a reproductive phase that continues every month, there are differences in the length of time they are submerged during high tide so that the bamboo clams do not only obtain food from inside the hole but can also filter food from the surface of the substrate or exposed at low tide, penetration of sunlight that is less than optimal due to turbidity and temperature which disrupts the availability of food sources for the bamboo shell, namely phytoplankton and natural and fishing mortality rates. Based on these conditions can be profitable for growth (larger size).

The linear regression relationship between the size of the bamboo shells and the depth of the bamboo shell holes can be seen in Figure 4.

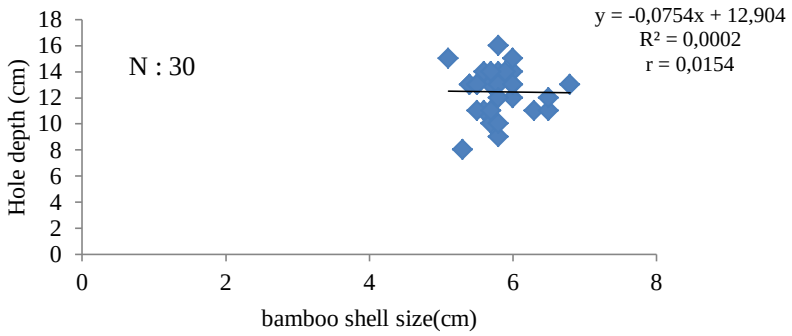

Figure 4.The relationship between the size of the bamboo shell and the depth of the bamboo shell hole

The results of observing the vertical distribution of bamboo shells in Sri Tanjung Village can be seen that bamboo shells have a length of 6.8 cm at a depth of 13 cm from the sediment surface, bamboo shells 6.5 cm

long at a depth of 11 cm from the surface of the sediment, bamboo shell length 6.3 cm is at a depth of 11 cm from the surface of the sediment, the length of the bamboo shell is 6.3 cm at a depth of 11 cm from the surface of the sediment, the length of the bamboo shell is 6 cm at a depth of 13 cm from the surface of the sediment, the length of the bamboo shell is 5.7 cm at a depth of 10 cm from the surface of the sediment and bamboo shells 5.1 cm long at a depth of 15 cm from the surface of the sediment. Based on the data above, the location of the bamboo shells is not affected by the size of the bamboo shells themselves (Ahyuni et al., 2014).

The results of the analysis of the sediment fraction obtained in Sri Tanjung Village can be seen in Table 3. Based on the table in subzone 1 (one) there is a silt sediment type, in subzone 2 (two) there is a sandy mud sediment type, in subzone 3 (three) there is muddy sand sediment, in subzone 4 (four) there are types of silty sand sediments and subzone 5 (five) there are sand sediment types. Bamboo shells are like muddy sand sediment habitats due to their elongated shell morphology. From this pattern, sand sediments are very possible to live in, because these sediments have larger pore water so the pressure generated is also greater. This pressure will make it easier for the shells to move in or out of the sediment (Subiyanto et al., 2013).

Table 3. Sediment Fraction in the Coastal Waters of Sri Tanjung Village, Rupat District, Bengkalis Regency

Subzone	Sediment Type			Type
	Gravel (%)	Sand (%)	Sludge (%)	
1	0.4	22,44	77,16	Muddy
2	0.58	26,4	73.01	Sandy mud
3	0.14	71.02	28,84	Muddy sand
4	0.79	74,53	24.68	Muddy sand
5	0.39	78,11	21.49	sandy

The calculation of sediment organic matter can be seen in Appendix 12. The results of the analysis of sediment organic matter content in the coastal waters of Sri Tanjung Village can be seen in Table 4.

Table 4. Organic sediment material in the Coastal Waters of Sri Tanjung Village, Rupat District, Bengkalis Regency

Subzone	Sediment Organic Material %
1	5,39
2	5,26
3	1.69
4	1.55
5	1.52
Average	3.08

Based on Table 4, the average sediment organic matter content is 3.08%, which is relatively high. This is due to areas containing mud substrate and mangrove vegetation causing high organic matter content. This is supported by the research of Ramadhan et al. (2017), the level of organic matter in waters is influenced by the source of the organic matter itself which comes from the mangrove litter around the coast. According to Sitorus (2008), the criteria for high or low sediment organic content are based on the following percentages: <1% = very low; 1-2% = low; 2.01-3% = moderate; 3.01-5% = high; > 5% = very high. The results of the analysis of suspended solids in the coastal waters of Sri Tanjung Village can be seen in Table 5.

Table 5. Suspended solids in Coastal Waters of Sri Tanjung Village, Rupat District, Bengkalis Regency

Subzone	Suspended Solids (mg/l)
1	116
2	98
3	85
4	59
5	56
Average	80.8

Based on Table 5, the average suspended solids (TSS) is 80.8 mg/l. The closer to the land the amount of suspended solids in the waters is also higher, this is presumably because the current speed is relatively weak which causes the deposition of silt and increases turbidity. High turbidity can increase suspended solids and disrupt light entering the water it can disrupt biota metabolism and reduce oxygen in the waters. Based on the Decree of the Minister of Environment No. 51 of 2004 for marine life, namely <80 mg/l. According to Wati et al. (2016), high levels of TSS come from all solid substances (sand, silt, and clay) or particles suspended in water and can be living (biotic) components such as phytoplankton, zooplankton,

The results of measuring water quality in the waters of Sri Tanjung Village can be seen in Table 6. Based on this table, the results of measuring water quality for the parameters of an average temperature of 30°C, an average of 24.6 ppt salinity, an average pH of 5, an average brightness - an average of 33.3 cm, and an average current speed of 0.04 m/s.

Table 6. Water quality parameters in the Coastal Waters of Sri Tanjung Village, Rupat District, Bengkalis Regency

No	Parameter	Repetition			Average all over
		Upper	Middle	Lower	
1	Temperature (°C)	30	30	30	30
2	Salinity (ppt)	22	24	28	24,6
3	pH	5	5	5	5
4	Brightness(cm)	25	30	45	33,3
5	Current speed (m/s)	0.04	0.04	0.04	0.04

4. Conclusions

Based on the results of the research that has been done, it can be concluded that the lowest density of bamboo shells is found in the highest tide areas (subzone 1 and subzone 2), the highest density is found in the lowest low tide area (subzone 5) with an average of 1.20 ind/m^2 or 12,000 ind/ha. The dominant length of the bamboo shells is 5.14-5.70 cm. The distribution pattern of bamboo shells in the coastal waters of Sri Tanjung Village is uniform. The relationship between the size of the bamboo shells and the depth in the sediment is very weak.

5. Suggestion

It is hoped that for further research it is necessary to pay attention to the full moon tides with the population structure of bamboo shells in the coastal waters of Sri Tanjung Village, Rupat District, Bengkalis Regency.

6. References

Ahyuni, M., Izmiarti., Afrizal. (2014). Kepadatan Populasi dan Distribusi Ukuran Kerang *Contradens* sp. di Perairan Tanjung Mutiara Danau Singkarak, Sumatera Barat. *Jurnal Biologi Universitas Andalas,* 3(3):168-174.

Astari, F.D., Solichin, A., Widyorini, N. (2018). Analisis Kelimpahan, Pola Distribusi, dan Nisbah Kelamin Kerang Kijing (*Anodonta woodiana*) di Inlet dan Outled Danau Rawapening Jawa Tengah. *Journal of Maquares,* 7(2):227-236.

Brower, J.E., Zar, J.H., Ende, C.N.V. (1989). *Field and Laboratory Method of General Ecology*. Fourth Edition. 273. McGraw-Hill Publication Boston. USA.

Keputusan Menteri Lingkungan Hidup No. 51 tahun 2004. *Tentang Baku Mutu Air Laut.* Kantor Menteri Negara Lingkungan Hidup. Jakarta.

Ramadhan, M.F., Nasution, S., Efriyeldi. (2017). Karakteristik Habitat dan Populasi Kerang Bambu (*Solen lamarckii*) di Zona Intertidal Desa Teluk Lancar Kecamatan Bantan Kabupaten Bengkalis. *Jurnal Perikanan dan Kelautan*, 22(1): 36–43.

Sitorus, D.B.R. (2008). *Keanekaragaman dan Distribusi Bivalvia serta Kaitannya dengan Faktor Fisik-Kimia di Perairan Pantai Labu Kabupaten Deli Serdang.* Universitas Sumatra Utara. Medan. p 85.

Subiyanto, A., Hartoko., Umah, K. (2013). Struktur Sedimen dan Sebaran Kerang Pisau (*Solen lamarckii*) di Pantai Kejawanan Cirebon. *Journal of Management of Aquatic Resources,* 2(3): 65–73.

Sugiyono. (2008). *Metode Penelitian Kuantitatif Kualitatif dan RD*. Bandung: ALFABETA

Trisyani, N., & Irawan, B. (2008). Kelimpahan Lorjuk (*Solen lamarckii)* di Pantai Timur Surabaya. *Jurnal Ilmu Kelautan,* 13(2):67-72.

Ulfa, M., Nasution, S., Tanjung, A. (2020) Habitat Characteristics and Population Structure of Bamboo Shells (*Solen lamarckii*, Chenu 1984) in the Intertidal Zone of Apiapi Village, Bandar Laksamana District Bengkalis. *Jurnal Perikanan dan Kelautan,* 25(3): 184-193.