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Composition and Communities Distribution of Strombidae and Muricidae in Gili, Tanjung Luar Region

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Abstract

Gili Bembek and Gili Pasir Located in Tanjung Luar, East Lombok. These territory areas have been used for capture fisheries and aquaculture. Gili Pasir and Gili Bembek have a wealth of marine organisms, one of them are gastropods. Strombidae and Muricidae are Gastropod families that have high economic value, but not much has yet to be researched for use. Strombidae and Muricidae have an operculum called onica in their bodies, this part has potential as a fragrance and coloring agent. The purpose of this study was to determine the species composition, distribution, and similarity index of Strombidae and Muricidae in several Gilis in the Tanjung Luar region. This research was conducted in June 2020. The data were collected using the transect quadratic plot method which has 6 transects. The stasions of this research were determined using a purposive sampling *method*. The results found 10 species of Strombidae and 3 species of Muricidae. The calculation of community structure analysis shows that the number of Strombidae and Muricidae in Gili Pasir is higher than Gili Bembek, 11,733 ind/m2 and 10,133 ind/m2, respectively. The diversity index (H') for Gili Pasir and Gili Bembek, respectively, is 1.744 and 1.282 which are in the medium category. The similarity index of the Strombidae and Muricidae species as indicated by the Similarity Index (ISS) reached 0.761 at both locations and the included categories because the number of the same species between the two stations was more than half of the total species found at station I. The results of the calculation of the Morista index were consecutive for Gili Pasir and Gili Bembek are 1.86 and 1.79 which indicate a clustered distribution.

Keywords: Composition; Distribution; Strombidae; Muricidae; Operculum; Gili Pasir; Gili Bembek; Tanjung Luar.

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1. Introduction

Tanjung Luar is located at Keruak East Lombok Regency. Tanjung Luar coastals are widely used for marine tourism, development of fisheries resources, both capture fisheries and aquaculture. Few tourist boats cross through this area to several Gili such as Gili Pasir, Gili Bembek, Gili Sunut, and Gili Petelu. The Name of Gili for the people of Lombok island is used to refer to small islands. Small islands according to Law no. 27 of 2007 concerning Management of Coastal Areas and Small Islands, Gili means an island with an area smaller than or equal to 2,000 km2 and the unity of ecosystems. The coastal areas of Gili Pasir and Gili Bembek are used for capture fisheries, KJA cultivation (Lobster, Grouper) and seaweed.Gili Pasir and Gili Bembek have a diversity of marine life, one of them are molluscs. Molluscs are the second largest phylum after Arthropods with a total of 80,000-100,000 species, Molluscs have soft body that are protected by calcareous shells within various sizes, shapes and colors [18]. The largest class of phylum mollusca is Gastropods. Gastropods have a univalve shell and an organ looks like a radula that used to catch prey . Gastropods have a part of the body called the operculum, which is often used both as a key character for identification and for commercial use by humans [24]. The operculum which means small lid (plural: opercula) is a calcareous structure in many types of gastropods. The operculum of the Gastropod Strombidae has long been used as an incense material in ancient Jewish traditions and Arab culture. The operculum used as an incense mixture is called onycha. The types of strombidae that produce onycha are *Strombus tricornis* and *Lambis truncate*. The operculum of the Muricidae family is used as a dye.This research was conducted in Gili Pasir and Gili Bembek, based on a preliminary research survey it is known that the two dyke have differences related to community activities. Gili Pasir is used as a *mada'* place while Gili Bembek is used as a place for pets to find food so that it is not used as a mada' place by the community. Research on the composition and distribution of Strombidae and Muricidae communities that have the potential to be used as a mixture of fragrance and dye products has never been carried out in Gili Tanjung Luar area. Based on the description above, it is important to carry out this research so that the composition, abundance, dominance, diversity index and distribution of the Strombidae and Muricidae communities in the Gilis in the Tanjung Luar area are known

2. Material and method

This research was conducted in June 2020 at Gili Pasir and Gili Bembek. The tools and materials used were stationery, sample bottles, petri dishes, camera, label paper, loop, ruler, plastic ziplock, roll meter, refractometer, transect, square plot, pH indicator, thermometer, tweezers, measuring cup, 70% alcohol, formalin 4%, aquades, Strombidae and Muricidae.The determination of stations used a purposive sampling method based on the different activities on the two Gilis. Data were collected using the transect quadratic plot method. Square plots measuring 1 m x 1 m are placed alternately along the transect [7]. The length of the transect is 50 m, with a distance between the squares of the plots of 10 m and the direction of the transect is perpendicular to the shoreline. Then at each station using 3 transect lines for data collection. The identification of various species by identifying their morphological characteristics, namely shell shape, shell color and operculum shape. Strombidae and Muricidae samples obtained were identified using the gastropod identification book Compendium of Seashells by Abbot and Dance, 1998, Field guide to Lombok Island by Matsuru and his colleagues 2000.

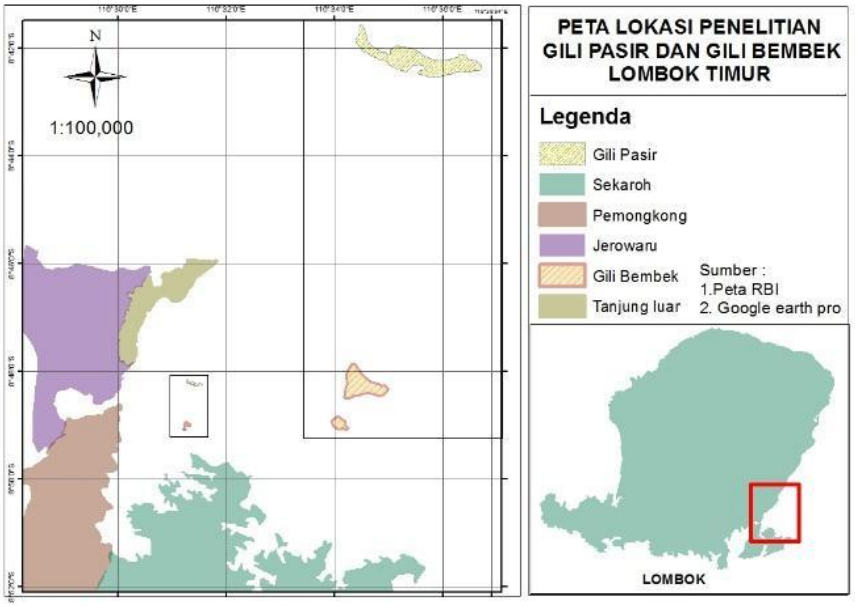

Figure 1: Research location map

Similarity Indeks Sorensen (ISS)

$$ISS = \frac{2C}{(s1+s2)}$$

ISS : Similarity Index Sorensen

c : Total number of species which found in all habitat

s_1 : Total number of species in habitat 1

s_2 : Total number of species in habitat 2

Distribution

$$\boldsymbol{id = N\frac{\sum x2 - \sum x}{(\sum x)2 - \sum x}}$$

Id : Morista index dispersion

N : Total number of plot kudran (m^2)

$\sum x$: Total number of species in plot kuadran (ind)

$\sum x^2$: Total number square of species in plot kuadran (ind)

Diversity Index

$$H' = -\sum_{i=1}^{s} (p_i)(\ln p_i)$$

H : Shannon's diversity index

S : Total number of species in the community

Pi : Proportion of S made up of the species i

Dominance indeks

$(C) = \sum (ni/N)^2$

C : Dominance index species

ni: Number of certain species

N: Total number of all species

3. Result and Discussion

3.1 Diversity species and morphology of Strombidae and Muricidae

Tanjung Luar has several small islands (Gili), including Gili Pasir and Gili Bembek which are used as a place for fishing, cultivation, and tourist attractions. The results of this research, Gili Pasir (station I) and Gili Bembek (station II) found 10 species of Strombidae and 3 species of Muricidae.

Figure 4

Distribution and Habitat Characteristics

Strombidae were more commonly found at station I because the substrate was dominated by muddy sand and overgrown with 8 species of seagrass, namely *Syringodium isotifolium, Halophila ovalis, H. minor, Cymodocea rotundata, Halodule uninervis, H. pinifolia, Thalassia hemprichi,* and *Enhalus acoroides* [21]. The distribution of Strombidae occupies a certain area in the seagrass beds, such as *S. urceus* attached *Halophila* sp leaves. The individuals found in the square plot are generally in groups containing two or more individuals of the same relative size, except in *Strombus labiatus* where small and large sizes are found. According to [12] that Strombidae life is mostly found in seagrass areas of the type *Halophila* sp, *E. accoroides, T. hemprichii,* and *C. rotundata*. Strombidae are commonly found in seagrass ecosystems because they cannot be separated from their roles as spawning ground, nursery ground, feeding ground, and rearing ground for aquatic biota [13]. Seagrass ecosystems also have primary and secondary productivity with great support for the abundance and diversity of aquatic biota [2]. Strombidae are sessile biota that live relatively sedentary at the bottom of the waters, which feed on detritus from seagrass and microorganisms in sediment layers [6]. Sedimentation and substrate conditions are important factors in determining the distribution and population size of Strombidae and Muricidae. While the aquatic substrate is an important factor that determines the distribution and density of benthic organisms, both in terms of the size of the substrate texture and the content of organic matter [5].

Strombus turturella, S. canarium, S. radians, and *S. urceus* were found attached to the seagrass species *Halophila* sp. with a muddy sand substrate. This indicates that *S. turturella, S. canarium, S. radians,* and *S. urceus* may occupy a specific microhabitat in the seagrass ecosystem. The results of field observations of *Halophila* sp. have a small size are generally found roots buried in the substrate and only the stems and leaf blades that emerge to the surface. Strombidae utilize seagrass species *Halophila* sp. as a medium to attach the eggs to the leaves. The high density of strombidae species in seagrass *Halophila* sp. This is due to the feeding behavior of the strombus genus which forages on the top layer of the substrate, epiphytes on seagrass leaves and detritus on the substrate [6].

Strombus labiatus was found in seagrass species *H. ovalis* and *E. acoroides* with sand substrate. This shows that *S. labiatus* occupies a specific microhabitat in the seagrass ecosystem. According to [10]. E. acroides has thicker, wider and longer leaves, so it has a larger photosynthetic space per individual. This species has a leaf length of up to 1 meter. *S. luhanus, S. aurisdianae*, and *S. bulla* were found in *C. rotundata* and *T. hemprichii* seagrass species, but *T. hemprichii* were not suitable for Strombidae habitat. This is because the root system and rhizomes of the seagrass species of *Thalassia hemprichii* tend to be rough and hairy, thus disturbing the activities of basic organisms [12].

C. capucinus, C. ramosus and *D. margariticola* are Muricidae species found on corals (fractured corals and live corals) with sandy substrates. The family Muricidae belongs to the order Neogastropods. Neogastropods are a high-level gastropod group that has different types of food and eating behavior compared to mesogastropods and the opisthobranchia subclass [3]. From their diet, most of the neogastropods are carnivores, with varying levels of predatory activity and actively looking for prey. Generally, the Muricidae tribe eats / preys on live biota such as bivalves, gastropods, polychaetes, bryozoa, barnacles, and small crustaceans, but there are also several

species that eat carrion [11].

Physical and chemical characteristics of Tanjung Luar data collection station environment

Table 1

No.	Parameter	Stasiun I	Stasiun II
1.	Substrate type	Dominated by muddy sand and seagrass	Dominated by sand, coral fractures
2.	Suhu	28℃	29℃
3.	pH	8	7
4.	Salinitas	29‰	30‰

Based on table 1. shows the results of measurements of environmental physical and chemical parameters at the two research stations. The parameters measured were the type of substrate, temperature, salinity, and pH. Temperature measurement at each station, namely stations I and II, respectively 28ºC and 29C. This result is still within the normal range because the tolerance limit of Gastropods to ambient temperature is 25-31ºC. The pH measurement at station I has a pH value of 8 and station II has a pH of 7. These results indicate that this research station is still in the normal range, the normal pH range value is good for gastropod life, namely 5.8-8.1. The salinity measurement for station I is 29‰ and station II has a salinity value of 30‰. Salinity conditions are still good for the life of aquatic biota, including Strombidae, written by [9] which states that the Strombidae live in the salinity range between 27.0 - 33.3‰. This shows that the range of salinity that can be obtained from this study is still within the range of tolerance values. High and low salinity is influenced by air input, tides and large evaporation by exposure to sunlight [16]. The substrate condition for station I is muddy sand which is dominated by seagrass, while at station II, it is muddy sand which is dominated by coral fractures. These strombidae live in shallow water and are associated with bottom waters whose substrates are reef flats, sand, mud and seagrass beds. Strombidae are herbivorous and detritovorous organisms that inhabit tropical and subtropical waters, and inhabit intertidal areas to a depth of 5 m [17]. Meanwhile, Muricidae are mostly found living on corals in coastal areas with sandy substrates [8].

Community structure of Muricidae and Strombidae

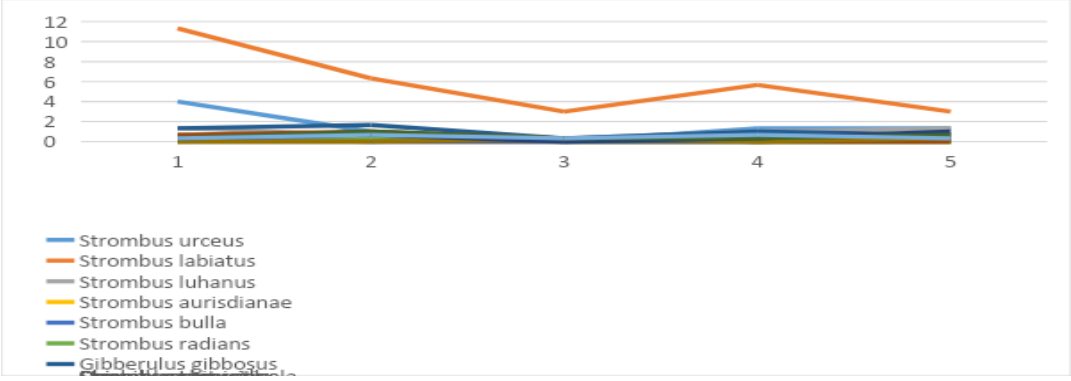

Figure 2: Average abundance of Strombidae and Muricidae at plot in Station I (Gili Pasir)

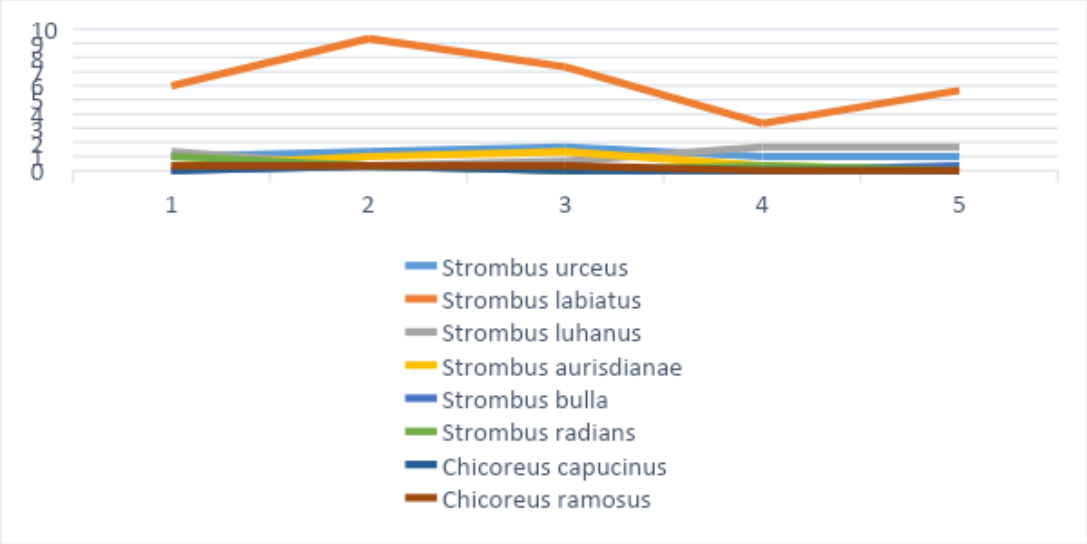

Figure 3: Average abundance of Strombidae and Muricidae at plot in stasion II

Based on Figure 2. at Station I (Gili Pasir) it can be seen that Strombus labiatus has the highest abundance value of 11,333 ind/m2 found in plot 1. The high abundance value of S. labiatus was found due to very supportive environmental conditions and suitable habitat. Water temperature in plot 1 28 C. This temperature range strongly supports the existence of gastropods, this is in accordance with the statement of [22], that the ideal temperature range for the growth and reproduction of gastropods is generally between 26 - 30°C. In addition, the salinity in plot 1 supports the presence of gastropods, which is 29‰. According to [1], gastropods generally tolerate salinity ranging from 25 - 40‰. The pH of the water in plot 1 is 8, this pH range strongly supports the presence of gastropods, this is in accordance with the statement of [24], that a good pH range for gastropods is between 7.1 – 8.0. The substrate in plot 1 is muddy sand overgrown with several types of seagrass. The abundance of *Strombus labiatus* in plots 3 and 5 was low, namely the abundance value of 3 ind/m2. This is because of the different substrates, plots 3 and 5 have sandy substrate with coral fractures. Station II has the highest abundance value, namely *S. labiatus* in plot 2 and plot 3 with an abundance value of 9,333 ind/m2 and 7,333 ind/m2, respectively, this is because plot 2 and plot 3 have the same substrate, namely muddy sand overgrown with seagrass. . Plot 4 has a muddy sand substrate which is dominated by coral fractures so that it is not suitable for the habitat of S. labiatus. In addition to the substrate factor, there are factors that cause the high value of S. labiatus abundance at station II due to community activities. S. labiatus found are relatively small in size so they are not taken by the community when doing mada'. In addition to having a high abundance value, this result is also supported by a high frequency value of a high presence frequency of 93% which means this species appears in 21 out of 30 squared plots.

Strombus luhanus is one of the species belonging to the Strombidae family with low abundance values in plots 2 and 3 on Gili Pasir, respectively 0.333 ind/m2 and 0.667 ind/m2, but has a high presence frequency value of 87% the same as Strombus urceus which has a value of 87%. low abundance of 1 ind/m2 on plot 2 Gili Pasir, but has a presence frequency of 73%. The existence of mada' activities carried out by the community in Gili Pasir and Gili Bembek caused several species belonging to the Strombidae family such as S. canarium, lambis lambis, S. urceus to be of great interest to the community. In general, the Strombidae family is one of the

families included in the Gastropod class which is used by the community as food, causing the species to continue to decrease. Utilization activities carried out by the community continuously without regard to their impact on the environment will result in a decrease in resource potential and habitat degradation. The high frequency of the presence of S. luhanus and S. urceus proves that these species have a wide range, this is shown from the specimen collection results from a total of 30 plots, 13 squared plots were found for S. luhanus and 11 squared plots were found for S. urceus. The strombus genus itself is one of the mollusc species that has a wide distribution so that it can be found in a variety of varied ecosystems such as seagrass ecosystems with sandy or muddy substrate types. The genus Strombus lives on both coarse and fine sandy substrates and muddy sands and is protected from strong currents [22]..

Tabel 2: Diversity Index (H') of Strombidae and Muricidae in Gili Tanjung Luar

No.	Stasion	Nilai	
		C	H'
1.	Gili Pasir	1,744	0,288
2.	Gili Bembek	1,282	0,434

H' : Diversity index by Shannon-Wienner, C : Dominance index by Simpson

Based on the results of data analysis, the diversity index (H') of Strombidae and Muricidae in Gili Tanjung Luar region where Gili Pasir has a higher diversity index than Gili Bembek, namely the H' values for Gili Pasir and Gili Bembek are 1.744 and 1.282, respectively. This is because on the coast of Gili Pasir there are more species of Strombidae and Muricidae. The diversity index of Strombidae and Muricidae shows moderate diversity, meaning that the distribution of the number of individuals for each species is moderate, community stability is moderate and the distribution of the number of Strombidae and Muricidae found in that location is relatively even. This happens because the location is in a location that is overgrown with seagrass, where this ecosystem is a suitable place or habitat for the life of Strombidae. The value of H' is determined by the high diversity of species and abundance of mollusks in an area [19].

The diversity index is closely related to the dominance index. A community is said to have high species diversity if the community consists of many species and the number of individuals per species is evenly distributed. While dominance (C) is used to determine which species dominate a habitat [4]. The results showed dominance with a value of 0.28 for Gili Pasir and 0.4 for Gili Bembek. The results showed low dominance means that no species dominates. The low dominance index value indicates the evenness of the population of each species of Strombidae and Muricidae which also indicates the stability of the seagrass ecosystem in its habitat. According to [18], if the dominance is close to zero, it means that in the observed biota community structure, there are no species that extremely dominate other species. This indicates that the condition of the community structure is stable, the environmental conditions are quite prime and there is no ecological pressure (stress) on the biota in the habitat in question, whereas if the dominance is close to 1, it means that in the observed community structure, species that dominate other species are found. This reflects the community structure in an unstable state, ecological pressure occurs. According to [20], a community is said to have high

species diversity if the community is composed of many species with the same or nearly the same species abundance. On the other hand, if the community is composed of very few species and if only a few species are dominant, then the species diversity is low. High diversity indicates that a community has a high complexity because in that community there is a high interaction of species as well. So in a community that has high species diversity, species interactions will occur involving energy transfer (food webs), predation, competition, and the division of niches which are theoretically more complex.

The results of the calculation of the Morisita distribution index at each station showed a clustered pattern. The distribution pattern at station I and station II is that the distribution pattern is clustered with the Morista index value being 1.86 and 1.79, respectively. The clustered distribution pattern is caused by two main factors, namely environmental factors and individual interaction factors in the population. Environmental factors that will occupy or gather in suitable habitat conditions for life. This pattern also indicates that organisms can only live well in certain locations due to differences in their response to the environment and the adaptability of an organism in the ecosystem [14]. This can be seen at station I, which has a higher distribution pattern index than station II. Station I has a variety of habitat conditions, dominated by muddy sand substrate overgrown with seagrass.

Individual interaction factors in the population, adult Strombidae found in squared plots, generally in pairs of relatively the same size, are thought to be reproducing. As the genus strombus has separate male and female reproductive organs. Fertilization is carried out internally where the union of the egg and sperm occurs in the female reproductive organs, before the eggs are released [6,9]. This is so that there is interaction between individuals to reproduce which causes them to gather in an area. According to [15] the clustered distribution pattern is due to the attractive interaction between the environment and the population and between individuals in the population, so that the number of individuals found in groups. In addition, the distribution pattern is clustered because the genus strombus is a relatively sedentary living macrozoobenthos and its movement is slow.

The level of similarity between the two observed stations was determined by the Sorensen Similarity Index (ISS). The Sorensen similarity index (ISS) is one of the indices used to calculate the similarity between two sample areas or plots based on their species composition. ISS values range from 0 to 1. ISS values close to 1 indicate that communities tend to be the same [4].

The ISS value of the two research stations is 0.76. The ISS value based on this observation has the same number of species between the two stations, more than half of the total species found at station I. A total of 6 out of 10 Strombidae species and 2 out of 3 Muricidae species were found at both stations. This explains that the two research stations have 76% in common when viewed from the Strombidae and Muricidae species found.

The factor that causes the level of similarity between the two research stations is not much different based on the species found because of the similarity of habitat between Gili Pasir and Gili Bembek. The physical and chemical characteristics of the environment on Gili Pasir and Gili Bembek have met the criteria for an ecosystem capable of being occupied by Strombidae and Muricidae. Habitat characteristics and environmental

conditions such as temperature, salinity, and pH that are almost the same will have a species composition and abundance of Strombidae and Muricidae that are not much different.

The results of the study found 10 species of strombidae, they are *S. urceus, S. labiatus, S. luhanus, S. aurisdianae, S. bulla, S. radians, G. gibbosus, S. canarium, S. turturella* and *L. lambis*. The operculum of these species have been used as a mixture of fragrance products (incense). The fishy smell of the operculum is traditionally removed with vinegar, alcohol and water. The cleaned operculum is then grind into a powder and used as an aroma fixative, the technique similar to that used in perfumes from plant resins. When burned, high-quality operculum smells like castor, while low-quality operculum smells like burnt hair. As for the Muricidae, three species were found, namely Chicoreus capucinus, Chicoreus ramosus, and Drupella margariticola. The type that can be used by the operculum as a mixture of dye products is Murex trunculus but was not found at both research stations.

The distribution of Strombidae and Muricidae in Indonesia is found in several areas, namely Central Maluku, Bangka Belitung, Riau, Papua, North Sulawesi, Tanjung Pinang, Lombok. In Lombok itself, there are several distribution areas of Strombidae and Muricidae, namely Sekotong, Gerupuk, Tanjung Luar, and Ekas

4. Conclusion

There were 10 species of Strombidae found in the two research sites, S. *urceus, S. labiatus, S. luhanus, S. aurisdianae, S. bulla, S. radians, G. gibbosus, S. canarium, S. turturella and L. lambis* 10 species were found on Gili Pasir, 6 species were found on Gili Bembek. There are 3 species of Muricidae were found, they are *C. capucinus, C. ramosus and D. margaticola*. 3 species were found at Gili Pasir and 2 species were found at Gili Bembek. Strombidae were found in seagrass species *Halophila sp., T. hemprichii and E. acroides* except *L. lambis* found in coral fractures. The Muricidae are found in corals and coral fractures. The abundance of Strombidae and Muricidae in Gili Pasir is higher than in Gili Bembek, the abundance values of Strombidae and Muricidae are 11,733 ind/m2 and 10,133 ind/m2.

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