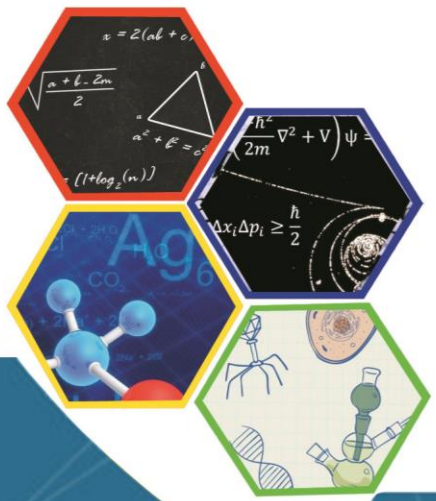
PROCEEDING

The 2nd International Seminar of Basic Science

Natural Science For Exploration The Sea-Island Resources

Ambon, May 31st 2016



Organized by

Faculty of Mathematics and Natural Science

Pattimura University

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The 2nd International Seminar of Basic Science

"Natural Science for Exploration The Sea-Island Resources"

Poka-Ambon, 31st May 2016

Mathematic and Natural Science Faculty
Universitas Pattimura
Ambon
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2nd edition

Welcoming Address By The Organizing Committee

Today, We have to thank the The Almighty Allah SWT for the implementation of this international seminar. This is the second seminar about Basic Science in The Faculty of MIPA Pattimura University. The seminar under the title “Natural Sciences for Exploration the Sea-Island Resources” will be carried out on May 31st 2016 at Rectorate Building, Pattimura University. There are 200 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

My special thanks refer to the rector of Pattimura University and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, S.Pd., M.Si. I also would like to express my deepest gratitude to Prof. Amanda Reichelt-Brushett, M.Sc., Ph.D. ; Kazuhiko Ishikawa, Ph.D. ; Nicolas Hubert, Ph.D. ; Prof. Dr. Kirbani Sri Brotopuspito ; Prof. Dr. Marjono, M.Phil. ; Gino V. Limon, M.Sc., Ph.D. as the keynote speakers.

The last, We hope this international seminar usefull for all of us, especially Mollucas People and very sorry if any mistake. Thank you very much.

Dr. La Eddy, M.Si.
Chairman of Organizing Committee

Opening Remarks
By Dean of Mathematic and Natural Sciences Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 18th anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title "Natural Sciences for Exploration the Sea-Island Resources". The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

Prof. Dr. Pieter Kakisina, S.Pd., M.Si.
Dean of Mathematic and Natural Sciences Faculty

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"The 2nd International Seminar of Basic Science 2016"

Hotel Mutiara Ambon

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PROCEEDINGS
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THE RELATIONSHIP BETWEEN PHYSICAL-CHEMICAL FACTORS AND DIVERSITY OF SEA URCHIN (ECHINODEA) IN THE KAMPUNG BARU COASTAL OF BANDA ISLAND CENTRAL MOLUCCAS

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ABSTRACT

Sea urchin is one of the marine species with high economic value. It also plays an important role in maintaining the equilibrium of ecosystem in its habitat. There are many ecological differences found in intertidal zone such as sandy area, rocky area, and muddy estuaries. The aim of this research was to determine the relationship between physical-chemical factors and diversity index of Sea urchin at kampung baru coastal, Banda Island Central Maluku. The belt transect method was the sampling method used in this research. The research area was divided into three stations with 225 m-distance between stations. The area of each station was 1000 m^2 where three lines transects each with 50 m long were placed perpendicular to the coastline starting from the highest tide to the lowest tide. Each transect was separated by a distance of 50 m. At each transect, five 1m x 1m square plots were placed alternately with the 10 m distance between the plots. The physical and chemical factors were measured at the time of high tide, whereas the observation of Sea Urchin was done at the time of low tide. The results of the research show that the index of diversity is in the low category and the diversity values are in a range of 0.279 to 0.497 with a uniform distribution pattern. The result of the research also shows that there is no correlation between the physical-chemical factors and the diversity of Sea Urchin on Kampung Baru coastal area, Banda Island.

***Keywords*:** Diversity, Distribution patterns, Sea urchin

INTRODUCTION

Maluku province with an area of approximately 92.4% water, has the potential of marine and coastal resources are very supportive of regional development. Maluku waters have marine fisheries production amounted to 477 484 tonnes / year in 2012. One of the waters in the Moluccas which has a wealth of marine life and has become an attraction for tourists is the Banda Islands waters. Bodies village of Kampung Baru is one of the waters in the island of Banda Central Maluku district that has a wealth of marine life is abundant. Substrate conditions in these waters is rocky, rocky and sandy surrounded by seagrass. In the coastal village of Kampung Baru are numerous marine biota, among which are Crustace, gastropods, bivalves, echinoderms, sea cucumbers, starfish and others. Urchin is one of the biota is very important for the people in the village of Kampung Baru utilize gonadnya to be consumed daily. The existence of sea urchins on coral reef ecosystems provide significant

impact on the ecological balance. In general, including sea urchins always hide under or dicelah crevices on the reef or the reef.

The diversity of environmental factors can be seen from the difference in the physical environmental factors that influence the formation of the type or characteristics of the community of organisms and their habitats. A large number of ecological difference can be seen in the intertidal zone to be the beach area is sandy, rocky or muddy estuary with the substrate.

Differences in all types of beach can be understood through the parameters of the physical and biological environment that is centered on the main changes and the relationship between biotic components (physico-chemical parameters of the environment) and abiotic components (all components of the organism or organisms) associated therein. From the diversity of these factors it takes a special adaptation that should be owned by the biota that are in the area of intertidal to be able to survive the environmental conditions are quite extreme which some environmental parameters such as temperature, salinity, oxygen levels, and habitat may change significantly (Nurfitriana, 2012).

Until now, research on the Relationship of Physical Chemistry Factor To The Diversity and Distribution Pattern Fur Pig (Echinoidea) in the Coastal village of Kampung Baru Central Maluku district has not been done. Therefore, the authors were interested in doing research on the Relationship of Physical Chemistry Factor To The Diversity and Distribution Pattern Fur Pig (Echinoidea) in the Coastal village of Kampung Baru Central Maluku regency.

The purpose of this study was to determine the relationship of chemical physical factor on the diversity and distribution patterns Bulu Babi (Echinoidea) in the Coastal Areas of the village of Kampung Baru Central Maluku regency.

MATERIALS AND METHODS

Type of Research

This type of research is observational and descriptive quantitative, using a quadratic linear transect method (Suhardi, 1998). Quadratic linear transect method is a method that uses the ecological transect lines are placed perpendicularly shoreline with a combination of plot at each of the transect line.

Time and Location Research

The research was conducted on the seashores of Banda's village of Kampung Baru Central Maluku regency. The identification process is done from the ground up samples of research using sea urchins identification book that refers to Clark and Rowe (1971).

Tools and Materials

The tools used during the study include raffia, cameras, stationery, sample jars, gloves, rope meter, plastic buckets, thermometer, refraknometer, pH meter, DO meter, meter roll, and identification books Sea urchin refers to Clark and Rowe (1971).

The materials used for the study include sea urchins are found, distilled water and 4% formalin to preserve the samples of sea urchins.

Work procedures

Determination Stations

Determination of the research station is determined by the length of the coastline of the village of Kampung Baru is ± 900 m, then:

1) The area is divided into three sampling stations with a distance of 225 m between the stations. The area of each station is 1000 m².
2) At each station placed third transect line with a length of 50 m vertically coastline starting from the highest to the lowest ebb tide spaced transects 40 m.
3) On each transect placed fifth observation plots alternating with 1x1 m2 and the distance between the observation plots of 10 m.

Measurement of Physical Chemistry Factor

Measurement of physical parameters of water chemistry done at high tide, and the factors that are measured include:

1) Temperature. The water temperature is measured using a mercury thermometer inserted into the water 10 minutes later to read the scale.
2) Salinity. Salinity waters is measured using a refractometer that is by sea water samples taken using a pipette. On the bottom surface of the refractometer has been cleared shed one drop of seawater samples, cover and read the scale pointer figures.
3) the pH of the water. pH was measured by using a pH meter by inserting electrodes into the part of the water sample. The pH value can be read on the scale of the pH meter.
4) Dissolved Oxygen (DO). DO (Dissolve Oxygen) was measured using a DO meter by dipping probe DO meters into the sea water.

Sampling

a) Samples were taken at low tide.
b) urchins that contained in the observation plots calculated the number of species and number of individuals to determine keankeragaman and its distribution pattern type.
c) urchins that have taken a count of individuals per species discovered for identification.
d) Taking individual examples of identification is based on morphology.
e) The urchins soaked in formalin 4%

Data analysis

The results of measurements of physical factors of the chemical diversity of sea urchins in the village of Kampung Baru Banda Island Corellasi person will be analyzed by using SPSS 21.0 product. To determine the index values of diversity, distribution patterns and the dominance index of urchins (echinoedea) using a formula according to (Soegianto, 1994).

RESULTS AND DISCUSSION

Results

Measurement of Physical Chemistry Factor in Coastal village of Kampung Baru Pulau Banda

a. Temperature

The results of temperature measurements in the coastal village of Kampung Baru in the third research station for research can be seen in Table 2.

Table 2. Results of Temperature Measurement in Coastal Kampung Baru

Observation time	Temperature (^oC)			Standard Quality Standards Bodies
	St. I	St. II	St. III	
Day 1	29,8	30,1	30,9	
Day 2	28,2	28,2	27,6	
Day 3	29,7	30,9	31,3	
Day 4	30,2	31,1	31,4	28-32^{o}C
Day 5	30,3	30,9	31,3	(Dobo, 2009)
Day 6	29,9	30,6	31,0	
Day 7	30,0	30,3	31,1	
Average	**29,7**	**30,3**	**30,7**	

Based on the results of measurements of the temperature at the time of the study, showed that the average temperature range during the study ranged 27,6-31,4^{o}C. The results of temperature measurements at each research station is still in the optimal range for the survival of sea urchins. This is consistent with the statement of Dobo (2009), that a good temperature for the growth of sea urchins range between 28-32^{o}C. Temperature has a role on the lives of sea urchins and other organisms, because it will affect physiological processes, type and spread of the organism (Dafni, 2008). The temperature of sea water is constantly increasing and the trend of temperature rise in tidal areas affected by the penetration of the strong sun. The average temperature values obtained in the study is the first station of 29,7^{o}C, station II of 30.3^{o}C and at stations III of 30.7^{o}C.

b. Salinity

The results of measurements of salinity during the study in the coast of the village of Kampung Baru Pulau Banda can be seen in Table 3.

Table 3. Results of Measurement Salinity in Coastal Kampung Baru

Observation time	Salinity ($^o/_{oo}$)			Standard Quality Standards Bodies
	St. I	St. II	St. III	
Day 1	32,8	31,9	33,5	
Day 2	29,0	29,2	29,2	
Day 3	32,9	32,0	32,2	
Day 4	32,4	32,3	31,9	30-40 $^o/_{oo}$
Day 5	32,6	32,9	31,7	(Roslita, 2000)
Day 6	32,6	32,3	31,5	
Day 7	32,4	31,8	31,5	
Average	**32,1**	**31,8**	**31,6**	

Based on the results of measurements of salinity during the study showed that the average range of salinity during the study ranged 29,0-33,5o / oo. The results of measurements of salinity at each station research is still in the optimal range for the survival of sea urchins. This is consistent with the statement Roslita (2000), that the sea urchins can live with salinity tolerance limit of between 30-40%. High and low salinity of the waters depends on the location of the water area, while the area directly adjacent to the mainland tend to have low salinity and capricious, contrary areas that relate directly to the open sea, salinity is high.The average salinity values obtained in this study is the first station of 32.1‰, the second station of 31.8 o / oo and the third station of 31.6 o / oo. Value salinity of sea water at the observation station affected by two things: 1) input streams that carry mineral salts from the mainland and 2) the exchange of water masses of the oceans, the Banda sea at the time of high tide.

c. The degree of acidity and wetness (pH)

Results pengukurun pH during the study are shown in Table 4.

Table 4. Results of pH measurement in Coastal Kampung Baru

Observation time	pH			Standard Quality Standards Bodies
	St. I	St. II	St. III	
Day 1	6,9	7,1	6,9	5,0 – 8,0 (Romimmohtarto, 2007)
Day 2	6,5	6,5	6,5	
Day 3	7,0	7,0	7,1	
Day 4	7,0	7,0	6,9	
Day 5	7,1	7,1	7,0	
Day 6	7,0	7,2	7,0	
Day 7	7,1	7,1	7,1	
Average	**6,9**	**7,0**	**6,9**	

The degree of acidity and wetness (pH) expressed the intensity of acidity or the freedom of a body of water. pH is an important factor for controlling the activity and distribution of organisms that live in a body of water. Water conditions are highly acidic and very wet would endanger the survival of the organism as it would lead to disruption of metabolism and respiration.

Based on the results of measurements of pH at the time of the research showed that the average range of pH at the time of the study ranged from 6.5 to 7.1. Results of pH measurement at each research station is still in the optimal range for the survival of sea urchins. This is in accordance with the opinion of Romimohtarto (2007), that the pH that can support life urchins in waters ranging from 5.0 to 8.0.

The average pH values obtained in the third research station is the first station of 6.9, station II of 7.0 and at a third station at 6.9. Seawater pH changes in tidal areas is influenced by three things: the global climate, the substrate surface waters, and freshwater input.

d. Dissolved oxygen (DO)

DO measurement results in the study are shown in Table 5.

Table 5. DO Measurement Results in Coastal Kampung Baru

Observation time	DO (mg/l)			Standard Quality Standards Bodies
	St. I	St. II	St. III	
Day 1	7,0	6,1	6,2	
Day 2	7,4	7,2	7,5	
Day 3	6,6	6,4	6,1	
Day 4	7,0	6,6	6,0	5 – 8 mg/l
Day 5	7,0	7,1	6,0	
Day 6	6,6	6,6	6,1	
Day 7	7,0	6,5	6,1	
Average	**6,9**	**6,6**	**6,3**	

Based on the results of measurement of DO at the time of the research shows that the average range of DO at the time of the study ranged from 6.4 to 7.4 mg / l. DO measurement results at each research station is still in the optimal range for the survival of sea urchins .. Values of dissolved oxygen in waters should range between 5-8 mg/L. In general, dissolved oxygen values obtained in this study is the third station in the station I at 6.9 mg / L, station II at 6.6 mg / L and at station III at 6.3 mg / L. High and low values of dissolved oxygen in a body of water can be caused by the distribution of aquatic organisms, because the supply of oxygen in the process of photosynthesis and mobility using dissolved oxygen.

Classification and type of Pigs Fur Coastal village of Kampung Baru Banda Island Central Moluccas

Based on research conducted, the number of individual species of sea urchins are found in the coastal village of Kampung Baru Banda Island Central Maluku district is 608 people representing two families that Diadematidae (*Tripnesutes gratilla*, *Diadema setosum*) and Laganidae *(Staphecinus mirabilis),* are summarized in Table 6.

Table 6. Types of Fur Pig Species Found in Coastal Kampung Baru, Banda Island

Station	Substrate Type	Family	Species	Σ Individual
I	Silty sand, rubble and rocky	*Laganidae*	*Staphecinus mirabilis*	154
		Diametidae	*Diadema setosum*	17
II	sandy	*Diametidae*	*Diadema setosum*	191
			Tripneustes gratilla	28
		Laganidae	*Staphecinus mirabilis*	6
III	Sandy and muddy sand	*Diametidae*	*Diadema setosum*	195
			Tripneustes gratilla	17
		∑		**608**

Based on Table 6 shows that in the first station with the type of substrate muddy sand, rocky and rubble found two types of sea urchins are Staphecinus mirabilis sebanyak154 individual and *Diadema setosum* as many as 17 individuals. At the second station with a sandy substrate types found three types of sea urchins *Diadema setosum* ie a total of 191 individuals, *Tripnesutes gratilla* many as 28 individuals and *Staphecinus mirabilis* as many as

six people. While at the station III with the type of sandy and silty sand substrate found in two types namely sea urchins *Diadema setosum* many as 195 people and *Tripnesutes gratilla* as many as 17 individuals. In general, the *Diadema setosum* found in abundance in almost three research stations. Aziz (1996) revealed that *Deadema setosum* spread almost in all habitats, ie evenly zone sand flats, coral sea grass, mud, and crest. In the coastal village of Kampung Baru Banda islands found their seagrass ecosystems at station II and III. Seagrass species found in this study is the location of *Enhalus acoroides* and *Thalassia hempricii.*

Moreover, Diadema setosum found in abundance in the study due *Diadema setosum* has a long tube feet to be moved in several types of substrates. But compared to the other two species, *Diadema setosum* have tube feet and spines were longer so that they can live and move and perform daily activities on the type of substrate (Mustafa, 2008). *Staphecinus mirabilis* species in this study, only found in stations I and II, can not be found at station III. This is because the substrate type that tends to soft at the first station making it difficult for these species to adapt or to feed at this station. The low value of *Staphecinus mirabilis* is also due to these species live immersed myself in the sand so hard to find. According to Sugiarto (2007), members usually live Echinoidea immerse themselves dipasir dicelah rocks or the beach. Sea urchins *Tripneustes gratilla* in this study were obtained in very small quantities. This is because many types of sea urchins taken by local people for consumption as food because it has a high nutritional value and used fishing as a source of income.

Figure 1. Types of Fur Pig in Kampung Baru Village Aquatic Banda Island found (A) *Diadema setosum,* (B) *Staphecinus mirabilis* dan (C) *Tripneustes gratilla.*

Values Diversity and Distribution Patterns

High and low diversity of species is determined by the number of species and the total number of individuals. The results of calculation of the ecological index for the index of diversity and distribution patterns of sea urchins in the coastal village of Kampung Baru Banda Island Central Maluku district can be seen in Table 7.

Table 7. Value Index at the Third Ecology Research Station

Ecological index	Station			Average
	I	II	III	
Diversity (H')	0,325	0,497	0,279	0,367
Index Morisita	0,195	0,324	0,312	0,277
Distribution patterns (*Iδ*)	Uniform	Uniform	Uniform	Uniform

Based on the results in Table 5 shows that the value of diversity at the station I of 0.325, at station II amounted to 0.497 and the third station at 0.279. In general, the average of

diversity ranged from 0.279–0.497 and are in the low category, because according Walbar (2005) in Julianty (2012), when the diversity index is less than 1, then the species is classified as having a low diversity, but the value of the diversity of species more than 1, it shows the diversity of species is relatively modest, and if the value of the diversity of the species reaches 4, the high species diversity.

The low value of diversity in this study due to the human activity around the location of the study as removal of sand, marine life and activity of boats and boat. This is in accordance with the opinion of Odum (1998), which suggests that increased levels of stress or pressure on the environment such as adaptation leads to reduced species diversity. Koestoe (1999) in Walbar (2005) states that the level of diversity of a species from a body of water is influenced by many factors such as the type of substrate, the stability of the environment and food chain length. Michael (1994) adds that the level of keanekragaman species is determined by the number of species and the total number of species. The results of the analysis of distribution patterns of each species at all three stations showed that the coastal village of Kampung Baru Banda Island Central Maluku district as a whole urchins have a uniform distribution pattern. According Bakus (1990) states the pattern of distribution of species is determined by using the following indicators; if I <1 then the uniform dispersal patterns, if I> 1, the pattern of the distribution group, if I = 1, the pattern of random distribution.

Uniform spreading pattern obtained in this study due to the variation of environmental factors so that a species tend to look for areas with environmental factors suitable for uniform growth and the tendency by age, to protect themselves and there is no competition. This suggests that each species has a tolerance range (temperature and salinity) which is equal to the same environmental conditions. Odum (1998), states that a uniform dispersion pattern can occur because there is strong competition between species so as to encourage the sharing of the same space. Leksono (2007) revealed that the dispersal patterns describe the position of a species based on movement and displacement. Distribution of an individual may be limited by factors voting behavior habitat. In addition, other adaptations are suspected factors that influence the relationship is not significant, according to Morin in Leksono (2007) is the physiological stress level and food availability.

Factors relationship Physical Chemistry with Diversity and Distribution Pattern sea urchin

Based on the calculation results of multiple regression, variable diversity and physical factors chemical waters get constant (a) is 1.398 and the regression coefficient (b) variable physical factors chemical is a temperature of 0,007 (X1), Salinity 0.032 (X2), pH 0.294 (X3) and DO 0.077 (X4). Thus, the calculation can ditentukkan regression equation is Y = 1.398 + 0.007 (X1) + 0.032 (X2) + 0.294 (X3) + 0.077 (X4). This equation can be called a regression model to predict the dependent variable using independent variables as the predictor. The coefficient of determination (R2) obtained was 0.155, the correlation coefficient 0.393 and 0.732 Fhitung. To see the relationship of independent variables on the dependent variable, then the correlation analysis between diversity variables and variable chemical physical factor. From the results obtained correlation using SPSS correlation coefficient 0.393. By looking at the coefficient koralasi according Sugiyono (2001) can be stated that there is no relationship between the two variables.

There was no relationship between chemical physical factor value with the value keanakeragaman in this study also allegedly caused extensive observation area at each research station does not represent 10% of the total area sampled area.

In general, there is no relationship between the value of diversity Diadema urchins setosum, Tripnesutes gratilla and Staphecinus mirabilis by a factor of physical chemistry of water (temperature, salinity, pH and DO), because the value of physical factors-chemical waters of Kampung Baru island of Banda during the study between stations does not differ a little way so that the physical-chemical conditions between stations does not give effect to the diversity index at the water village of kampung Baru Banda islands. Differences in physical conditions-chemical which does not differ much between stations can be caused during the research intensity of the wind at the water village of Kampung Baru island of Banda is high enough to cause the movement of water in the village of Kampung Baru great consequence content of inorganic materials that accumulate in certain areas can carry over into other areas so that the chemical-physical condition in the village of kampung Baru become more homogeneous.

In addition, there is a low correlation between diversity index by a factor of physical chemistry in the new village Kampung Banda island is allegedly caused by taking species of sea urchins is only done one day, while the chemical physical factor measurements performed for seven days (one week). Furthermore, in order to prove the influence between these two variables, then tested the hypothesis by mambandingkan Fhitung and Ftabel as examiners. From the results of calculations using SPSS Fhitung value obtained was 0.732 and the value Ftabel is 0.583. Because the obtained value of F <F table (α = 0.05), then Ho is accepted and Ha rejected, so declared no significant difference between diversity variables and variable chemical physical factor. The results of this study indicated that physical factors do not affect the water chemistry diversity index urchins in the water village of Kampung Baru Banda island in Central Maluku.

Distribution of an individual may be limited by factors voting behavior habitat. According to Morin in Leksono (2007) there are other factors that influence adaptation insignificant relationship, is the physiological stress level and food availability.

CONCLUSION

Based on the results and discussion, it can be concluded that:

1. The value of diversity index (H ') in the coastal village of Kampung Baru Banda Islands are in the lower categories, where the average - average value of diversity ranged from 0.279 to 0.497.
2. The distribution pattern of sea urchins in the coastal village of Kampung Baru Pulau Banda is uniform.
3. There is a relationship between chemical physical factor with the diversity of sea urchins in the coastal village of Kampung Baru Banda Island.

In the coastal village of Kampung Baru Banda Island found 3 types, namely sea urchins Diadema setosum many as 403 people, Tripneustes gratilla as many as 45 people and as many as 160 individuals *Staphecinus mirabilis.*

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