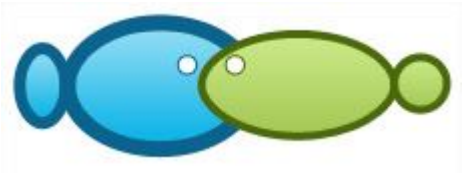

Biodiversity of gastropoda in the coastal waters of Ambon Island, Indonesia

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Abstract. Gastropods belonging to the mollusk phylum are widespread in various ecosystems. Ecologically, the spread of gastropoda is influenced by environmental factors, such as temperature, salinity, pH and dissolved oxygen. This research was conducted to determine the correlation between the factors of physico-chemical environment and the diversity of gastropoda in coastal water of Ambon Island, Indonesia. This research was conducted at two research stations, namely Station 1 at Ujung Tanjung Latuhalat Beach and Station 2 at coastal water of Waitatiri Passo. The results of a survey revealed that the average temperature on station 1 was 31.14°C while the average temperature of station 2 was 29.90°C. The average salinity at Station 1 was 32.02‰ whereas the salinity average at Station 2 was 30.31‰. The average pH in station 1 and 2 was 7.03, while the dissolved oxygen at station 1 was 7.68 ppm which was not far different from that in station 2 with the dissolved oxygen of 7.63 ppm. The total number of species found in both research stations was 65 species, with the types of gastropoda were found scattered in 48 genera, 19 families and 7 orders. The most commonly found gastropods were from the genus of Nerita and Conus. 40 species were found in station 1 and 40 species were found in station 2. The results of the analysis showed the diversity value was very high with the diversity average of gastropoda in station 1 as much as 3.64 and in station 2 as much as 3.60 and classified into moderate category. In addition, the results of the correlation analysis showed that there was a significantly positive correlation between physical-chemical environmental factors (temperature, salinity, pH and dissolved oxygen) and the diversity of gastropoda in Coastal Waters of Ambon Island.
Key Words: coastal area, diversity, gastropods, environmental factors, physio-chemical parameters.

Introduction. Gastropods belonging to the phylum of mollusks have the largest species reaching 100.000 species and spreading in almost all continents (Ruppert et al 2004; Strong et al 2008). Gastropoda can be found abundantly in sea water ecosystems, freshwater or estuary area (Galan et al 2015; Gregoric & de Lucia 2016; Miloslavich et al 2013; Maia & Countinho 2013; Ruppert et al 2004) and classified as detritus feeder (Liu et al 2014). The main characteristic of this organism is having a single shell, threaded, having a well developed head and equipped with tentacle, and having eyes and radula (Pyron & Brown 2016). In marine ecosystem, gastropoda can be found in the intertidal zone (O'Dwyer et al 2014) as well as in the deep sea (Ramirez-Llodra & Olabarria 2005; Braga-Henriques et al 2011). Asserted by Rahmawati et al (2015) that gastropoda are scattered on sandy clay sediments with high content of organic C. However, Ríos-Jara et al (2001) states that most of the mollusks which have important economic value are distributed in coastal waters.

Although it can found in a variety of habitats, the spread of gastropoda is highly correlated with the condition of the place of the living organisms, or instance the factors of physics, chemistry, and biology such as the texture of the sediment, temperature, salinity, pH, organic matter content and oxygen (Pyron & Brown 2016). The environmental factor is classified as the major factor that supports the life of gastropoda because of the low migration capabilities. Sharma et al (2013) reported that the physical and chemical conditions of the waters showed a significant effect on the diversity of the gastropoda in Indian waters. Garg et al (2009) examined the environmental factors of electrical conductivity, pH, alkalinity, phosphate, sodium and potassium on the diversity of gastropoda in India. Sahin (2012) examines the environmental factors such as, dissolved oxygen (DO), temperature, NO_2-N and NO_3–N, and its relation to the

distribution of gastropoda in Turkey. Salam & Nasar (2012) also examined the environmental factors such as temperature, pH, TDS, TSS, DO and BOD and its relationship with the diversity of gastropoda in Iraq. Similarly, Blanco & Cantera (1999) analyzed the environmental factors, such as DO, temperature, and pH which affected the vertical distribution of gastropods mangrove forests in Colombia. The results of these studies generally found that the diversity of gastropoda was influenced by environmental factors.

Some of the environmental factors that affect the distribution of gastropoda are temperature, salinity, pH and DO. Increased industrial activity has an impact on the increasing levels of CO_2 nearly 40% of the total of carbon dioxide in atmosphere. Increased level of CO_2 causes the seawater to become more acidic, increases the temperature, hypoxia or decreased DO in below the threshold tolerance as well as changes in salinity (Parker et al 2013). Llovel & Terray (2016) found that the water temperature continues to increase rapidly from year 2005 until year 2014. The increased water temperature is caused by the imbalance of energy in the atmosphere, so that it is accommodated in the sea (Abraham et al 2013). The changes in physico-chemical factors of the water will greatly affect the biological system of aquatic organisms, especially gastropoda. Gastropoda are known to only survive and adapt in a narrow temperature tolerance (Harley et al 2009) and lead to stress beyond the optimal temperature range, thus causing metabolic malfunctions (Nguyen et al 2012). Gastropoda which are Phylum of mollusks are also vulnerable to ocean acidification because the calcium carbonate shell clams erodes when exposed to low pH (Parker et al 2013) and excessive hydrogen ions in the ocean could interfere the formation of the shell (Orr et al 2005). Mollusks tend to have lower metabolic rates and cannot easily compensate the interference of pH (Wittmann & Pörtner 2013). Condition of chronic stress of sub-optimal conditions can result in decreased growth and reproduction, increased susceptibility to disease and decreased survival rate (Hooper et al 2014; Kroeker et al 2013; Byrne & Przeslawski 2013). The latest analysis has identified mollusk as one of the invertebrate taxa which are the most vulnerable in the changing ocean conditions (Wittmann & Pörtner 2013; Kroeker et al 2013).

Moluccas sea waters are classified as large bodies of water as well as having abundant resources. One of the abundant resources is gastropoda. Gastropoda in the waters of Moluccas are abundant with uniform distribution pattern. This is because the condition of the waters of Moluccas is classified as good for the life of the organism. However, the problem that commonly happens is the fluctuated water temperature due to climate change. The average temperature on the island of Ambon, Moluccas Islands (Indonesia) is 27.1°C with temperature variation of diurnal range of 5.8°C. The highest average temperature occurred in January and the lowest temperature occurred in June, respectively 28°C and 26°C (78.8°F) with a fluctuation range of 2°C between the months (ClimaTemps.com 2015). The monthly temperature fluctuations of less than 5°C indicate that the Ambon areas are categorized as hyperoceanic type, subtype extremely hyperoceanic (Kottek et al 2006). In addition, water climate changes, like the rainy season, will cause fluctuations in water quality, namely salinity, pH, and DO in the water. The precipitation average on the island of Ambon, Moluccas Islands (Indonesia) reaches 3,459 mm/year or 288.3 mm/month. The period of precipitation 181 days/year with the precipitation levels of more than 0.1 mm, where the highest precipitation occurs in November (638 mm) and the lowest occurs in June (114 mm). Department of Meteorology Climatology and Geophysics (2016) indicated that the Ambon area was categorized as medium rainfall (precipitation) areas (100-300 mm) until the beginning of January 2017. Precipitation causes agitation in the water column, so that it may cause upwelling that can cause the availability of dissolved oxygen becomes less.

Based on the description above, this research is important to be conducted in order to assess the diversity of gastropods and its correlation with environmental factors (temperature, salinity, pH, and oxygen) in coastal waters of the island of Ambon.

Material and Method. This research was conducted in July and December 2016 at two stations of coastal waters of the island of Ambon, namely in the coastal waters of

Waitatiri in Passo village (station 1) and in the waters of Ujung Tanjong in Latuhalat village (station 2) (Figure 1). The data were collected by using sampling technique to measure the environmental factors (temperature, salinity, pH, and DO in sea water) and the enumeration of the types of gastropods with in-situ.

The data collection was done during the lowest tide, beginning with determining the area of sampling, and after that making the vertical line transect from the limit of the highest tides as many as 10 transect lines (toward the ocean) with the distance between transect lines 50 m. 10 plots with a size of 1x1 m were made on each transect with the distance between the plots 10 m, so that there were 100 plots for each station of data collection.

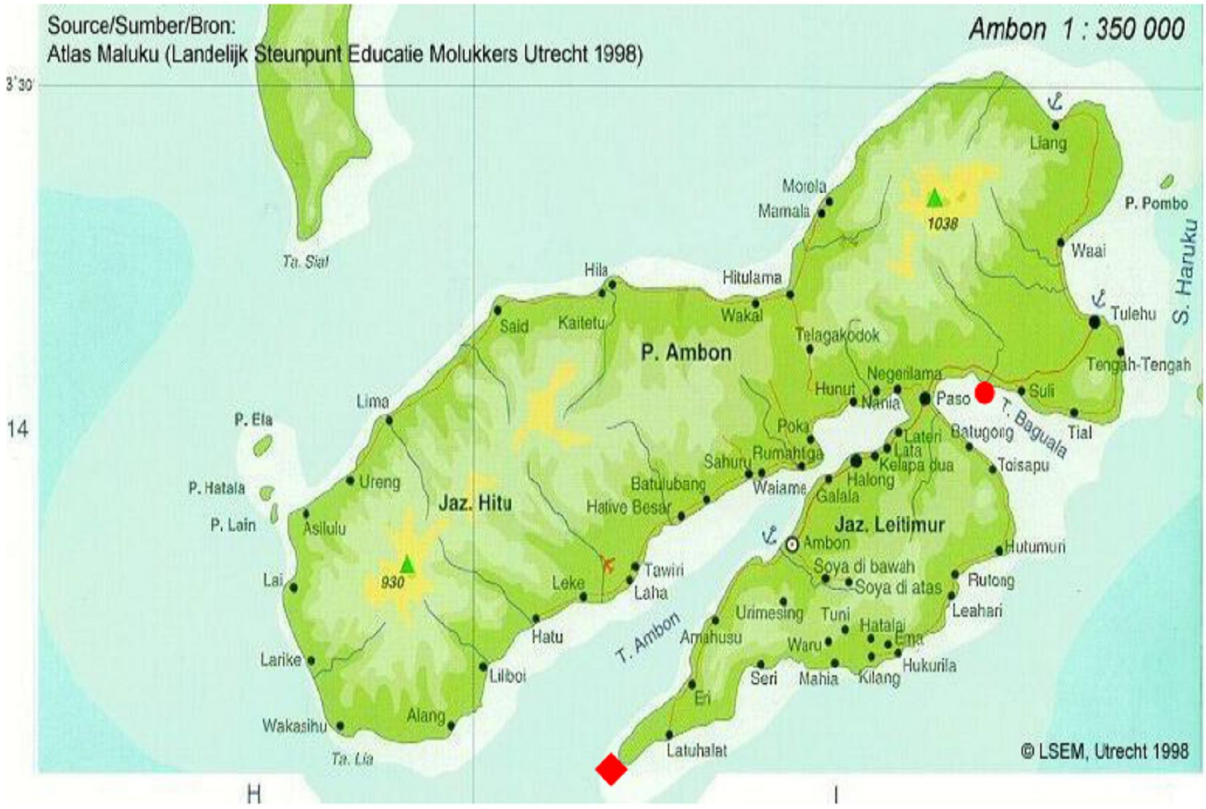

Figure 1. Map of research location (Note: ♦ - station 1, ● - station 2).

The measurement of the environmental factors (temperature, salinity, pH and DO) was done on each plot for 10 transect lines. The tools for measuring temperature, salinity, pH, and DO of sea water were thermometer, refragtometer, pH meter, and the DO meter respectively. The data collection for the types of gastropods was done by enumeration and taking pictures of each type of gastropods in the research locations. After that, each type of gastropods was identified using the identification books by Sabelli (1979).

The calculation of the diversity index of gastropoda was done descriptively by using the Shannon-Wiener formula, as follows:

$$H' = -\sum P_i \ln P_i \quad \text{(Ludwig \& Reynolds 1988)}$$

Where: $P_i = n_i/N$;

H' - Shannon–Wiener diversity;

n_i - total individuals species-I;

N - total number of individuals of all species, with the criteria of diversity, namely low ($H<2$) moderate ($2<H<4$), and high ($H>4$).

To examine the correlation between the environmental factors and the diversity of gastropoda, the available data were analyzed using multiple linear regression analysis.

Results and Discussion

Conditions of the physio-chemical environmental factors in the research ocation. The results of the measurement of physico-chemical environmental factors (Table 1) in both research stations showed that the average temperature in station 1 was 31.14°C while the average temperature of station 2 was 29.90°C. The average salinity in station 1 was 32.02 ‰ , while the average salinity in station 2 was 30.31 ‰ . The average pH in station 1 and 2 was 7.03 while the DO at Station 1 was 7.68 ppm which was not far different from that at Station 2 with 7.63 ppm. These results showed that the physical-chemical water factors in both stations were not much different.

Table 1

Condition of physio-chemical environmental factors in the research location

Transect	Average values for the environmental factors							
	Station 1				Station 2			
	Temp. (℃)	Salinity (‰)	pH	DO (ppm)	Temp. (℃)	Salinity (‰)	pH	DO (ppm)
1	31.15±0.03	32.01±0.03	7.04±0.01	7.69±0.01	30.01±0.01	30.10±0.01	7.02±0.01	7.62±0.02
2	31.11±0.01	32.01±0.03	7.04±0.01	7.68±0.02	29.97±0.02	30.31±0.02	7.03±0.01	7.62±0.04
3	31.16±0.04	32.02±0.02	7.04±0.01	7.7±0.01	29.89±0.01	30.34±0.01	7.02±0.03	7.62±0.04
4	31.14±0.02	32.02±0.02	7.03±0.02	7.68±0.02	29.87±0.04	30.33±0.01	7.02±0.02	7.63±0.01
5	31.12±0.01	32.02±0.02	7.03±0.02	7.68±0.02	29.87±0.02	30.34±0.01	7.03±0.03	7.62±0.01
6	31.18±0.05	32.03±0.01	7.03±0.02	7.68±0.02	29.87±0.03	30.34±0.01	7.02±0.03	7.63±0.01
7	31.16±0.04	32.02±0.02	7.04±0.01	7.7±0.01	29.88±0.03	30.34±0.02	7.03±0.02	7.63±0.02
8	31.13±0.01	32.01±0.03	7.05±0.01	7.7±0.01	29.87±0.03	30.34±0.03	7.03±0.03	7.62±004
9	31.15±0.03	32.02±0.02	7.04±0.01	7.7±0.01	29.86±0.03	30.33±0.01	7.02±0.04	7.62±0.04
10	31.12±0.01	32.02±0.02	7.03±0.02	7.58±0.09	29.87±0.03	30.33±0.04	7.02±0.04	7.61±0.02
Average	31.14	32.02	7.03	7.68	29.90	30.31	7.03	7.63

Station 1: The Coastal Waters of Ujung Tanjong Latuhalat village, Station 2: The Coastal Waters of Waitatiri Passo village.

Types of gastropoda collected. The results of the identification of the types of gastropoda on both stations showed that the number of species found in both the research station was about 40 species. There was a difference in the species found in station 1 and those found in station 2. Thus, the total number of the species found in both stations was 65 species (Table 2). This means that there were some species found in station 1, but they were not found in station 2, and vice versa.

The types of gastropoda found in both research stations were then grouped into the order of taxa (Table 3). The types of gastropods found were spread in 48 genera, 18 families and 6 orders. The most commonly type of gastropods was from the genus of Nerita and Conus.

Table 2

Types of gastropods obtained in the location of the data collection

No	Species	Location	
		Station 1	Station 2
1	*Naria boivinii*	-	+
2	*Monetaria annulus*	+	+
3	*Monetaria moneta*	+	+
4	*Monetaria caputserpentis*	+	+
5	*Lyncina lynx*	+	+
6	*Lyncina leviathan*	+	-
7	*Erronea caurica*	+	+
8	*Erronea xanthodon*	+	-
9	*Conus ebraeus*	-	+
10	*Dauciconus jorioi*	+	-
11	*Tenorioconus mappa jesusramirezi*	+	-
12	*Leporiconus glans*	+	-
13	*Magelliconus mgelliconus hilli* (var.)	+	+
14	*Tesselliconus eburneus crassus*	+	-
15	*Fulgiconus marielae*	+	+
16	*Calibanus furvus granifer* (var.)	-	+
17	*Stomatella monteiroi*	-	+
18	*Trochus rotus*	-	+
19	*Chlorodiloma crinita*	+	+
20	*Clanculus scotti*	-	+
21	*Turbo articulatus*	+	-
22	*Tectus fenestratus*	+	-
23	*Astralium stellar*	+	-
24	*Imbricaria olivaeformis*	-	+
25	*Mitra paupercula*	+	+
26	*Acanthina unicornis*	-	+
27	*Neorapana tuberculata*	+	+
29	*Ocinebrina nicolai*	+	+
30	*Hexaplex cichoreum*	-	+
31	*Pterochelus triformis*	-	+
32	*Morula anaxares*	+	+
33	*Nerita planospira*	+	+
34	*Nerita maxima*	-	+
35	*Nerita plicata*	+	-
36	*Nerita semirugosa*	+	-
37	*Nerita quadricolor*	+	-
38	*Neritina chrysocolla*	+	-
39	*Nerita fragum*	+	-
40	*Clithon faba*	+	-
41	*Clithon squarrosa*	-	+
42	*Clithon subrugatus*	-	+
43	*Microtralia insularis*	-	+
44	*Cidarina cidaris*	-	+
45	*Angaria delphinus*	-	+
46	*Microtralia insularis*	-	+
47	*Turritella gemmata*	-	+
48	*Turritella attenuate*	+	+
49	*Colpospira sinuata*	-	+
50	*Volutharpa ampullacea morchiana*	-	+
51	*Engina mendicaria*	+	+
52	*Pisania tritonoides*	+	+
53	*Pisania striata*	+	-

No	Species	Location	
		Station 1	Station 2
54	*Cantharus cancellaria*	-	+
55	*Gemophos tinctus*	-	+
56	*Monostiolum nigricostatum*	-	+
57	*Afer lansbergisi*	+	-
58	*Morus cerith*	-	+
59	*Cerithium muscarum*	+	-
60	*Oliva reticulata azona* (var.)	+	-
61	*Omphalius pfeifferi carpenteri*	+	-
62	*Lambis cristinae*	+	-
63	*Cymatium (Monoplex) krebsii*	+	-
64	*Cranopsis cucullata*	+	-
65	*Trumphis distorta*	+	-

Table 3

Composition of Gastropoda taxa found in the location of the data collection

Order	Family	Genus	Species
Littorinimorpha	Cypraeidae	Naria	*Naria boivinii*
		Monetaria	*Monetaria annulus* *Monetaria moneta* *Monetaria caputserpentis*
		Lyncina	*Lyncina lynx* *Lyncina leviathan*
		Erronea	*Erronea caurica* *Erronea xanthodon*
Vetigastropoda	Trochidae	Stomatella	*Stomatella monteiroi*
		Trochus	*Trochus rotus*
		Chlorodiloma	*Chlorodiloma crinita*
		Clanculus	*Clanculus scotti*
		Tectus	*Tectus fenestratus*
		Astralium	*Astralium stellar*
	Calliotropidae	Cidarina	*Cidarina cidaris*
	Angariidae	Angaria	*Angaria delphinus*
	Muricidae	Acanthina	*Acanthina unicornis*
		Neorapana	*Neorapana tuberculata*
		Ocinebrina	*Ocinebrina nicolai*
		Hexaplex	*Hexaplex cichoreum*
		Pterochelus	*Pterochelus triformis*
		Morula	*Morula anaxares*
Cycloneritimorpha	Neritidae	Nerita	*Nerita planospira* *Nerita maxima* *Nerita plicata* *Nerita semirugosa* *Nerita quadricolor* *Nerita fragum*
		Neritina	*Neritina chrysocolla*
		Clithon	*Clithon squarrosa* *Clithon subrugatus* *Clithon faba*
Eupulmonata	Ellobiidae	Microtralia	*Microtralia insularis*
Sorbeoconcha	Turritellidae	Turritella	*Turritella gemmata* *Turritella attenuate*
		Colpospira	*Colpospira sinuata*

Order	*Family*	*Genus*	*Species*
Neogastropoda	Buccinidae	Volutharpa	*Volutharpa ampullacea morchiana*
		Engina	*Engina mendicaria*
		Pisania	*Pisania tritonoides*
			Pisania striata
		Cantharus	*Cantharus cancellaria*
		Gemophos	*Gemophos tinctus*
		Monostiolum	*Monostiolum nigricostatum*
		Afer	*Afer lansbergisi*
	Cerithiidae	Morus	*Morus cerith*
		Cerithium	*Cerithium muscarum*
	Olividae	Oliva	*Oliva reticulata azona* (var.)
	Turbinidae	Omphalius	*Omphalius pfeifferi carpenteri*
		Turbo	*Turbo articulatus*
	Strombidae	Lambis	*Lambis cristinae*
	Ranellidae	Monoplex	*Cymatium (Monoplex) krebsii*
	Fissurelidae	Cranopsis	*Cranopsis cucullata*
	Pseudolividae	Trumphis	*Trumphis distorta*
	Mitridae	Imbricaria	*Imbricaria olivaeformis*
		Mitra	*Mitra paupercula*
	Conidae	Conus	*Conus ebraeus*
			Dauciconus jorioi
			Tenorioconus mappa jesusramirezi
			Leporiconus glans
		Tesselliconus	*Tesselliconus eburneus crassus*
		Magelliconus	*Magelliconus magelliconus hilli* (var.)
		Fulgiconus	*Fulgiconus marielae*
		Calibanus	*Calibanus furvus granifer* (var.)

The number of species found in both research stations was still more than the results of the research conducted by David (2013), who found as many as 86 species in 16 sampling locations in India, and Mohanraj et al (2015) who found as many as 40 species from three different islands in Karsuvar, India. Jumawan et al (2015) found 31 species belonging to the class of gastropoda on the island of Mindanao, Philippines. This means that the coastal waters of the island of Ambon have the highest number of species of gastropods.

The high number of species in both the research stations indicated a high diversity of gastropods. The average diversity of gastropoda in station 1 was 3.64 and the average diversity in station 2 was 3.60 (Table 4).

Table 4

Diversity of gastropods

Station 1		*Station 2*	
Transect	*H'*	*Transect*	*H'*
1	3.66	1	3.60
2	3.66	2	3.61
3	3.66	3	3.61
4	3.65	4	3.61
5	3.62	5	3.59
6	3.64	6	3.60
7	3.64	7	3.62
8	3.64	8	3.60
9	3.64	9	3.60
10	3.64	10	3.58

Based on the classification by Ludwig & Reynolds (1988), it can be concluded that the diversity of gastropoda in both research stations was categorized as moderate.

The diversity of gastropoda which is categorized as moderate could mean that there are variations in the characteristics of gastropoda at all hierarchy of life, ranging from molecule until ecosystem (Mouchet et al 2010; Morris et al 2014). The diversity of gastropoda can also explain some aspects of the community structure or ecosystem like variations of functional character, complexity of food chain, and the number o functional species in an ecosystem (Mason et al 2005). The analysis of such diversity is beneficial to determine the environmental conservation policies. Cadotte et al (2011) explains that the main objective of conservation and restoration is to maintain biological diversity and ecosystem services provided by this diversity. The advantages of the diversity measurement are because the information about the species has been included. A high diversity indicates a variety and density of organisms. Based on those opinions, it can be concluded that gastropods in the coastal waters of Ambon Island have high variations and density.

The correlation between physio-chemical factors and the diversity of gastropoda. The data of physio-chemical environmental factors and the diversity of gastropoda on both research stations were analyzed using linear regression statistics. The results of the regression analysis showed that the factors of temperature, salinity and DO had an effect on the diversity of gastropod in coastal waters of Ambon Island (Table 5).

Table 5

Results of Linear Regression Analysis

Independent variables	*B Standardized coefficient*	*t-test*	*Prob (sig t)*	*Alpha*	*Note*
Temperature	0.928	10.591	0.000	0.05	Significant
Salinity	0.887	8.140	0.000	0.05	Significant
Ph	0.645	3.582	0.002	0.05	Significant
DO	0.824	6.171	0.000	0.05	Significant

The environmental factor that has a significant effect on the diversity of gastropoda is the water temperature. The results of the statistical analysis showed that there was a significant positive correlation between the temperature of the sea water and the diversity of gastropoda. This means that the gastropoda is very fond of aquatic environments with relatively high temperatures. Sokolova & Portner (2003) explain that gastropoda in the intertidal zone in tropical areas like water with a temperature of 28-30°C, but its metabolism may occur between a temperature of 25°C and 40°C. The results of the present research are consistent with the opinion of Garg et al (2009), who explains that there are two factors affecting the abundance of gastropods at high water temperature conditions. These factors are: (1) the number of decomposers is more on high water temperature so that organic matter and macrofit look at the bottom of the water; (2) an increase in water temperature will activate the decomposition of organic matter in the sediment. The results of the research by Matsukura et al (2009) on freshwater gastropods showed that low temperatures can cause osmotic stress in cells and cause intracellular damage. A research conducted by Zhang et al (2016) also found that low temperature (15°C) can affect the digestive, respiratory and excretion of gastropoda, *Nassarius festivus.*

Another factor affecting the diversity of gastropoda is salinity. The present research also found that there was a significant positive correlation between salinity and diversity of gastropoda. This means that gastropoda prefer high salinity water. Salinity is an environmental factor that greatly affects the vitality of marine organisms. Therefore, the stability of the population is determined by the organism ability to withstand the fluctuations in salinity waters (Javanshir 2013). Koprivnikar & Poulin (2009) explained

that marine organisms are generally resilient to salinity up to 35 psu or equal to 35 ppm. The results of this research showed that the average salinity of sea water at Station 1 was 7.68 ppm and the average salinity of station 2 was 7.63 ppm. This means that the salinity in both research stations was still within the range of tolerance, so that it did not disturb the physiological activity of gastropoda. A laboratory experience conducted by Samiei et al (2011) showed that the rate of metabolism of *Nassarius deshayesianus* (Issel, 1866) will decline if salinity is increased up to 41 psu. Xiao et al (2014) explains that salinity is the limiting factor of the distribution of aquatic organisms and its influence on physiological processes is like hemolymph osmolarity and the water content in tissues that can lead to death of the organism.

The next environmental factor is pH, which is also known to have an effect on the distribution of gastropods. The results of this research show that the pH factor has a correlation with the diversity of gastropoda. The results of the measurement of pH show that the average pH in station 1 and 2 was at 7.3 and shows a significant effect on the diversity of gastropoda. Positive correlation means that the higher the pH, the higher the diversity of gastropoda. Various researches have found that the increased acidity of sea water over the past decades has influenced a variety of aquatic organisms. Several other researches have found that acidic water will reduce the thickness of shell and increase metabolism *(*hipermetabolism) Bibby et al (2007), disorders of the ability to regulate haemolymph osmosis and ion concentration (Ewald et al 2009), increase the needs of energy, so cell size decreases, but the mass of the body increases (Harvey et al 2016).

Another environmental factor is the DO, which is also known to have an effect on the diversity of gastropoda. The results of this research indicate that there is a significant correlation between DO and the diversity of gastropods. The results of analysis showing a positive correlation means that the higher the level of the DO, the higher the diversity of gastropoda. Ekau et al (2010) explains that oxygen is one of the important elements in the metabolism of aquatic organisms. An extremely low concentration of DO will lead to hypoxia, thereby disrupting the various levels of biological systems. At the individual level, hypoxia can cause physiological changes and disrupt the life cycle, growth capacity, reproduction ability, and susceptible to disease. At the community level, hypoxia can cause changes in the density and distribution as well as damages the community composition by eliminating sensitive species as well as providing opportunities for tolerant species to grow more (Weisberg et al 2008). The research conducted by McClain & Rex (2001) found that the level of DO had a significant effect on the body size of gastropoda that live in the deep sea.

Conclusions. The diversity of gastropods in coastal waters of the island of Ambon (coastal waters of Waitatiri village and waters of Ujung Tanjong of Latuhalat Village are categorized as moderate ($2<H'<4$) with a number of species of gastropoda were found to be quite high (65 species, 48 genera, 18 families, and 6 orders). The high gastropoda species found is associated with the environmental factors corresponding to the life of gastropoda, namely temperature (ranging from 29.90 to 31.4^{o}C), salinity (ranging from 30.31 to 32.02 ‰), pH (ranging from 7.03 to 7.68), and DO (7.63 to 7.68 ppm). In addition, based on the analysis of the correlation, it was revealed that there was a significant positive correlation between physical-chemical environmental factors (temperature, salinity, pH, and DO) and the diversity of gastropoda in Coastal Waters of Ambon Island.

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