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

PROCEEDINGS

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
2016

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ISBN : 978-602-97522-2-9

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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

ACKNOWLEDGMENT

The following personal and organization are greatfully

acknowledgment for supporting

"The 2nd International Seminar of Basic Science 2016"

Hotel Mutiara Ambon

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THE STUDY OF WATERS QUALITY AT ROSENBERG STRAIT, TUAL CITY, MALUKU

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ABSTRACT

The aim of this study is expected to provide information about the waters condition at the Rosenberg Strait, Tual, Maluku. This research was conducted in 2014. Water samples were collected from the surface and near the base layer waters among 10 stations. For chemical and heavy metal content, samples were collected from the surface and near the base layer waters, and physical properties, samples were collected for surface waters. Samples were analyzed for phosphate, nitrate, pH, dissolved oxygen, temperature, salinity, and heavy metal. The results showed that the water quality at Rosenberg Strait is still good for the interests of marine life.

***Keywords*: Waters, Waters quality, Rosenberg Strait, marine life**

INTRODUCTION

Monitoring and controlling the quality of marine waters in Indonesia impacting ecologically or economically related to the Quality Standard reference used for seawater quality. Standard Quality Standards derived from the quality criteria that are currently not clearly measurable and specific so that it will have an impact on marine life and humans directly. In addition, the control process of the marine environment against pollutants is still stagnant because they have not measured under the conditions of today, one example that is in the waters of the Rosenberg Strait.

Rosenberg Strait used as a case study locations in this study because they indicated they begin to experience marine pollution due to the many inputs various kinds of waste from activities on land and existing activities in the sea waters. Rosenberg Strait pressure from human waste pollution in particular human activities result that drift from the Rosenberg Strait that can disrupt the hydrological conditions in these waters. The final results of this study are expected to provide information on the conditions Strait Rosenberg.

MATERIALS AND METHODS

The study was conducted in the waters of the Rosenberg Strait, Tual, Maluku, in March, May, August, September, October and November 2014 among 10 stations (Figure 1.). Samples of the sea water taken at the surface and near the base layer using Water Sampler, and stored in polyethylene bottles. Sample is then filtered with Millipore filter paper 0.45 µm. The content of nutrients phosphate and nitrate were analyzed using UV-Vis spectrophotometer with a wavelength of 885 nm to 543 nm for phosphate and nitrate. Heavy metal analysis carried out in the Laboratory of Engineering Environmental Health and Communicable Disease Control Ambon in May 2104. It also carried out measurements of

physical and chemical properties of sea water more the temperature is measured with a thermometer, salinity with refractometer, pH with a pH-meter and DO with DO-meter.

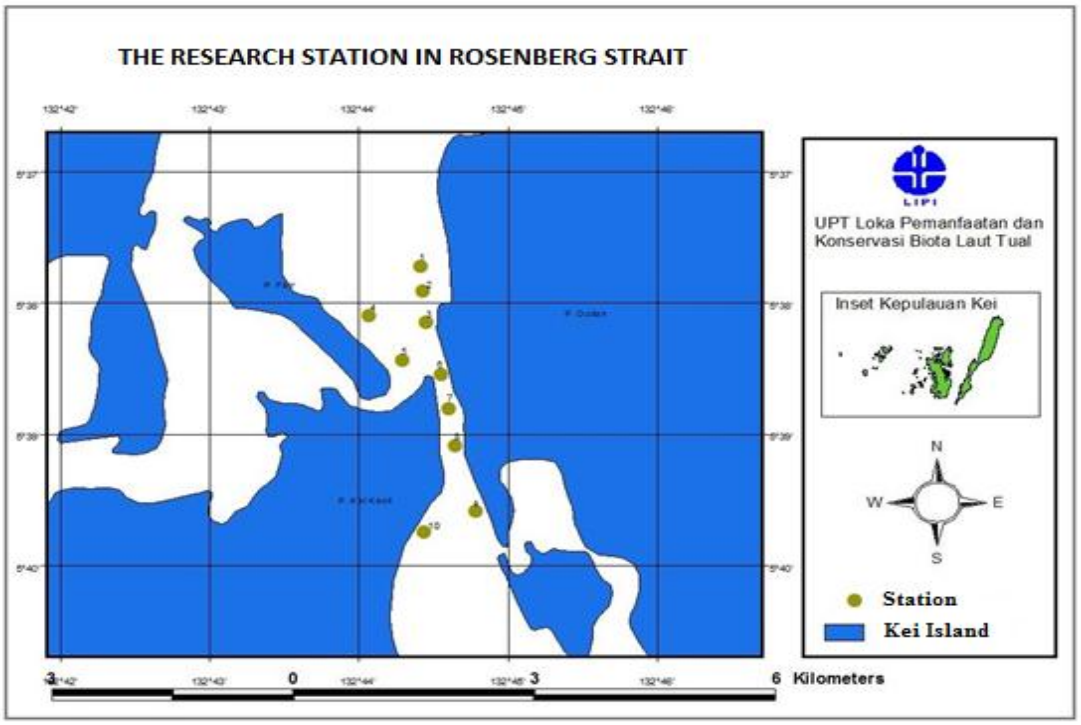

Figure 1. Map of the site

RESULTS AND DISCUSSION

Aquatic organisms can live in a body of water that has a pH value in the range of tolerance of a weak acid to weak base. The ideal pH for the life aquatic organisms in general ranged from 7 to 8.5. The condition of the acidic or alkaline will endanger the survival of the organism as it would lead to disruption of metabolism and respiration.

In addition, the very low pH will cause the mobility of various compounds that are toxic heavy metals higher, which would certainly threaten the survival of aquatic organisms. While the high pH will cause the equilibrium between ammonium and ammonia in the water will be disturbed, which rise above neutral pH will increase the concentration of ammonia is also profoundly toxic to the organism. The limits of tolerance of the organism to pH depending on the temperature, dissolved oxygen, and the content of ionic waters. Most of natural waters have a pH ranging from 6-9. Most aquatic biota are sensitive to changes in pH and the like pH value of about 7 to 8.5. From the results of research on the pH value of 10 sites is not much different from 7.691 to 8.407 with an average7.95. KMNLH (2004) establishes the Threshold Limit Value pH 7-8.5 ± 0.2 for biota. Thus the view of pH value water quality was good category. pH is important for determining the value of the usability of the well water for various purposes. For Indonesian, surface layer of waters has pH range between 6.0-8.5 (Romimohtarto, 2004). Thus pH Rosenberg Strait is still good for the interests of marine life.

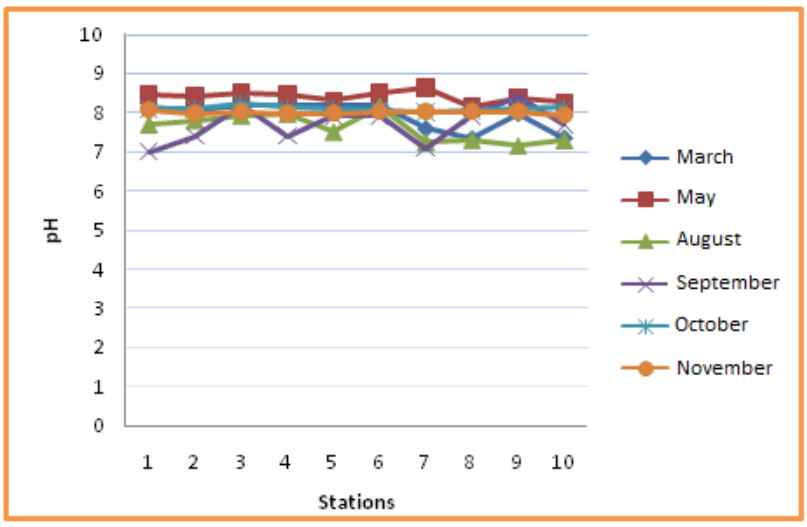

Figure 2. pH value for site

Salinity is the salt content of all ingredients are dissolved in 1,000 grams of seawater, assuming that all the carbonate has been converted to oxide, all of bromine and iod replaced with an equivalent chlorine and all organic substances undergo complete oxidation. Salinity has an important role and has a close bond with the life of aquatic organisms including fish, which are physiological salinity closely related to adjustment of the osmotic pressure of the fish.

Factors that affect the salinity:

1. Evaporation, the greater the rate of evaporation of sea water in an area, then the high salinity and vice versa in areas of low levels of evaporation of sea water, the region's low salt content.
2. Rainfall, a lot of rainfall in a sea area of the salinity of the ocean it will be low and vice versa fewer / smaller the rainfall will be high salinity.
3. Degree of river that flows to the sea, the more the river that empties into the sea, the ocean salinity will be lower, and vice versa fewer stream that empties into the sea, the salinity will be high.

Sea Water Quality Standard (KMNLH, 2004) establishes a salinity of natural salinity for marine biota, 33-34 ‰ for coral and seagrass, and up to 34 ‰ for mangrove. In the study of salinity values ranged from 30.7 to 32.79 ‰ with an average of 31.64‰. Based on the quality standard of the salinity in the waters is still suitable for marine life.

Nontji (1987), said temperature is an oceanographic parameters that have a very dominant influence on the lives of particular fish and marine resources in general. Hela and Laevastu (1970), almost all fish populations that live in the sea have the optimum temperature for life, then to determine the optimum temperature of a species of fish, we can surmise the existence of the fish, which can then be used for the purpose of fishing. According Nybakken (1988), most of the marine life is poikilometrik (body temperature is influenced by the environment) so that the temperature is a very important factor in regulating the process of life and spread of the organism. Nybakken correspond what was said in 1988 that the majority of marine organisms are poikilotermik (body temperature is highly influenced by the temperature of the surrounding water masses), therefore the distribution patterns of marine organisms closely follow the ocean temperature difference geographically.

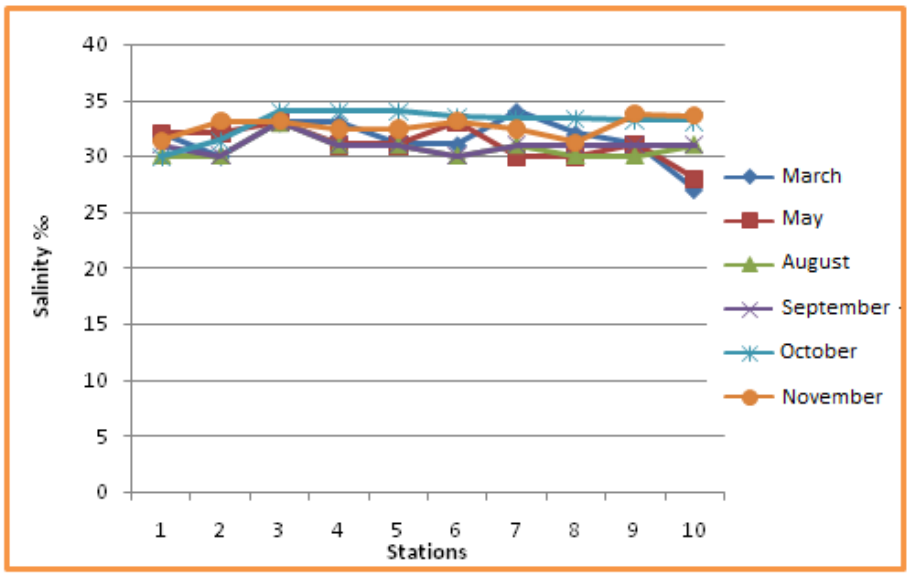

Figure 3. Salinity value for site

From Figure 4 it can be seen that in August the water temperature is quite low ranging between 26.3 - 27°C. This is due in August is the peak season occurred Eastern upwelling process in the Banda Sea in the Rosenberg Strait affect the temperature so that the water temperature is low. The average water temperature is 28.45°C, the lowest temperature occurred in August and the highest in the month of May 2014.

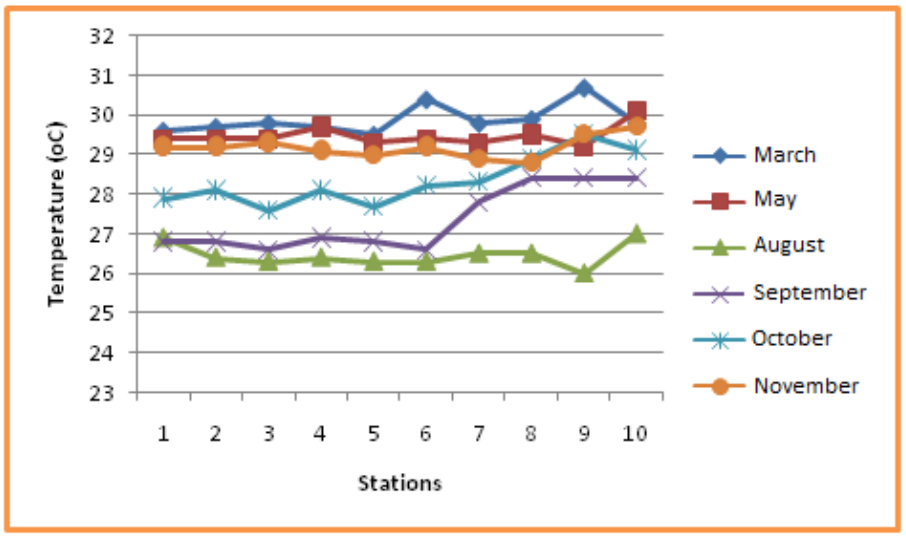

Figure 4. Temperature for the site

Dissolved oxygen is a limiting factor for the life of the organism. Changes in the concentration of dissolved oxygen can cause direct effects that resulted in the death of aquatic organisms. While the indirect effect is to increase the toxicity of pollutants that could eventually harm the organism itself. This is because dissolved oxygen is used for metabolic processes in the body and proliferate (Romimuhtarto, 1991). From the research results can be seen in the dissolved oxygen levels ranging from 4.6 to 5.40 ppm with a mean of 5.02

mg/l. The mean levels are relatively low. According Sutamihardja (1987) levels of oxygen at sea level is normal range is between 5.7–8.5 mg/L.

Threshold Limit Value (TLV) levels of dissolved oxygen for marine life is > 5 mg/L (MNLH Office, 2004). Threshold Limit Values for dissolved oxygen in the water mass value is relative, usually ranging between 6-14 mg/l (Connell et al., 1995). In general, the dissolved oxygen content of 5 mg/l with water temperatures ranging between 20-30°C relatively good for the life of the fish, even if the waters there are compounds that are toxic (uncontaminated) the oxygen content of 2 mg/l is enough to support life aquatic organisms (Riva'i et al., 1982). According Sutamihardja (1987), the oxygen levels in the waters lightly polluted sea in the surface layer is 5 mg/l, thus seen from dissolved oxygen levels can be said that these waters polluted by organic compounds. Thus the oxygen levels in the waters of this category lightly polluted.

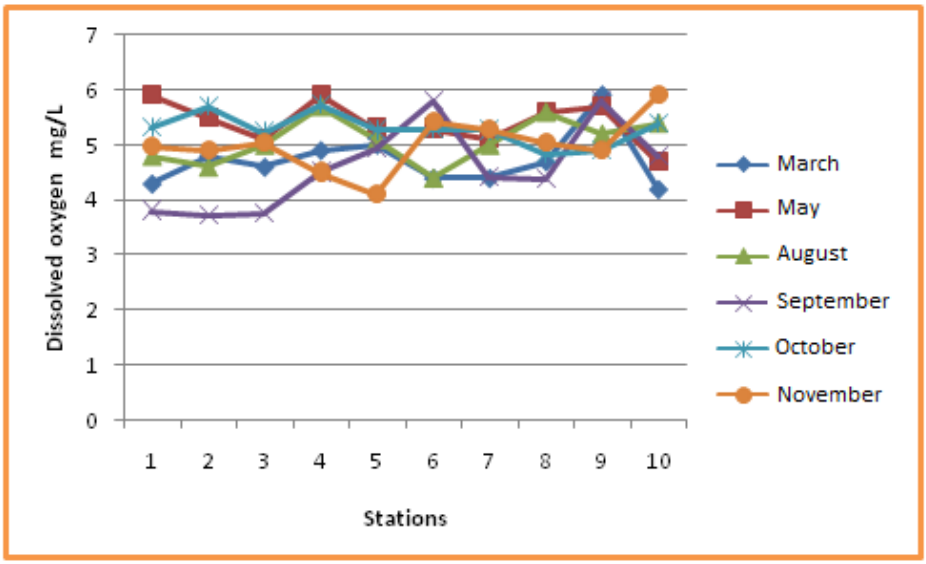

Figure 5. DO for the side

From Figure 6 and 7 can be seen, the highest nitrate content was found in August 2014. The average nitrate content in the surface layers of these waters is 0.0564 mg/L in May and 0.2033 mg/L in August 2014. While the layer near the base of the average nitrate content of 0.05919 mg/L in May and 0.1965 mg/L, this value is higher of the value of the threshold set by the sea water quality standard of 0.008 mg/L (KMLH, 2004), and much higher than the average nitrate levels in Natuna Islands 0.0062 mg/L (Muswerry, 2012). These data indicate that the Strait of Rosenberg is experiencing stress or nitrate form of nitrogen enrichment. Their nutrient enrichment would lead to a potential population explosion (blooming) very big algae. Blooming may cause appear the types of phytoplankton are toxic (red tide) which caused the death of fish. Obviously this is very harmful because it can affect the health and biodiversity of the local aquatic ecosystem. Source of increased nitrate levels generally are urban sewage, industrial and agricultural (Environment Canada, 2003). The condition of the waters near urban and although not an industrial area, the high levels of nitrates suspected because of the input from the ground in the form of human activity, mangrove forests and sea grass beds, in addition to the upwelling in the Banda Sea. Upwelling occurred in the Banda Sea in eastern season (June, July, August), but the initial upwelling have started to appear in May, causing the phosphate levels in May was also high.

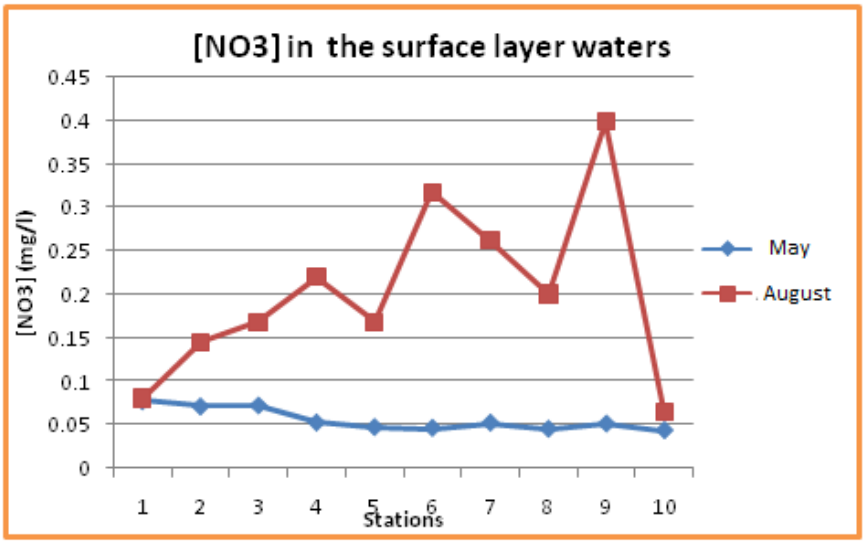

Figure 6. [NO_3] in the surface layer waters

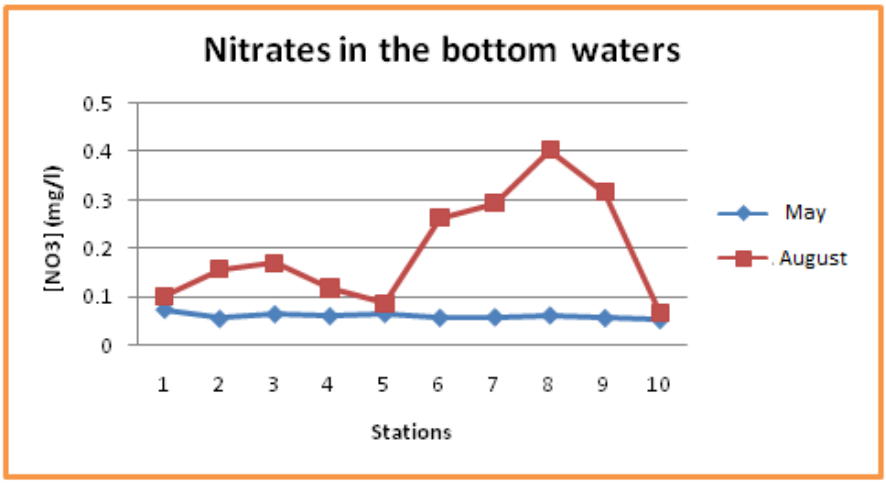

Figure 7. [NO_3] in the bottom waters

From Figure 8 and 9 can be seen in the content of nutrients in surface waters ranged phosphate <0.0005 to 0.0452 mg/L to 0.0212 mg/L average in May 2014 and in August an average <0.0005 mg/L. While the content of phosphate in layers near the bottom in May 2014 ranged from <0.0005 to 0.0419 mg/L with a mean of 0.0184 mg/L and in August ranged from <0.0005 to 0.0102 mg/L with a mean of 0.0019 mg/l. The highest phosphorus content encountered of May 2014. The phosphate content of nutrients is higher than the phosphate content found in normal ocean waters that is generally 0.01 to 1.68 ug.at/l (Sutamihardja, 1992). High phosphorus content can be caused by a high diffusion of phosphate from the sediment. Sediment is the main storage phosphor in cycles that occur in the oceans, generally in particulate form which binds to iron oxide and hydroxide compounds. Bound phosphorus compounds in the sediment can decompose with the help of bacteria or through abiotic processes produce soluble phosphate compound that can undergo diffusion back into the water column (Paytan and McLaughlin, 2007). Mean phosphate levels in the waters of the Strait of Rosenberg is higher when compared with the phosphate content in the Natuna Islands waters which ranged from 0.0019 to 0.0031 mg/L (Muswerry, 2012). High phosphate

levels may also be caused by currents and mixing (turbulence) due to the upwelling of water masses in the Banda Sea, which is believed to have started in May, so that the phosphate is in the bottom waters would be lifted to the surface layer.

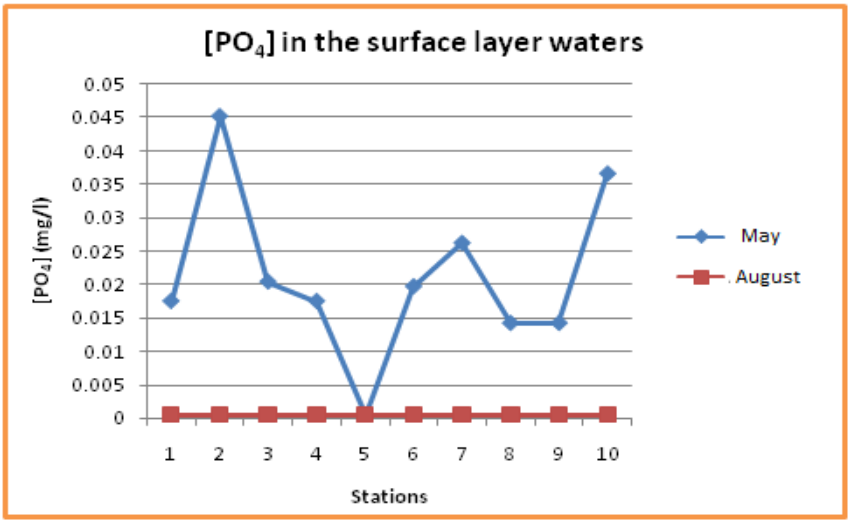

Figure 8. $[PO_4]$ in the surface layer waters

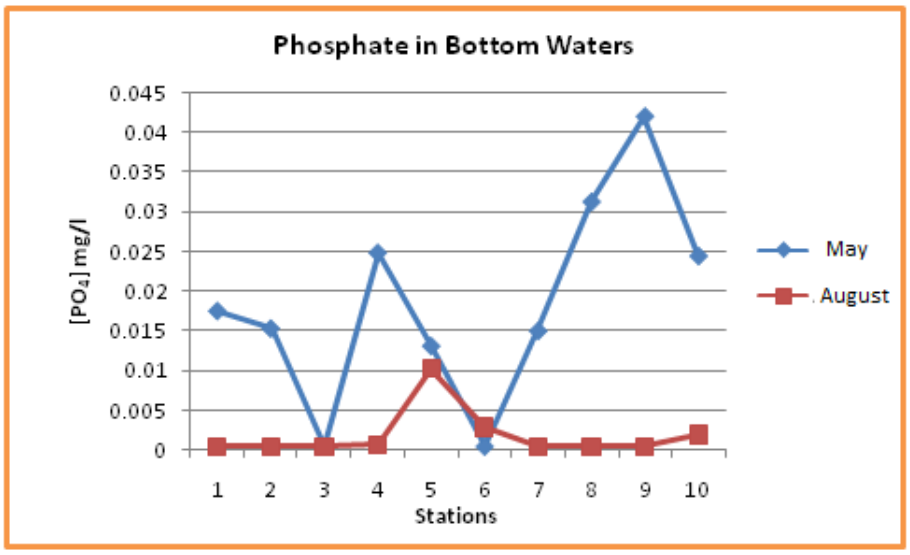

Figure 9. $[PO_4]$ in Bottom Waters

Observation of heavy metal elements in Rosenberg Strait has been done in May 2014. The result showed that heavy metal elements content in seawater is lower and still below the threshold value states by government.

Table 1. Levels of Heavy Metals (mg/l) In the Rosenberg Strait

Stations	Hg	Pb	Cd	Cu	Zn	Cr
1	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
2	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
3	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
4	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
5	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
6	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
7	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
8	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
9	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
10	<0,001	<0,004	<0,001	<0,015	<0,007	<0,004
Max	**<0,001**	**<0,004**	**<0,001**	**<0,015**	**<0,007**	**<0,004**
Min	**<0,001**	**<0,004**	**<0,001**	**<0,015**	**<0,007**	**<0,004**
St. Dev	**0**	**0**	**0**	**0**	**0**	**0**
Mean	**<0,001**	**<0,004**	**<0,001**	**<0,015**	**<0,007**	**<0,004**

Heavy metals have power levels or different toxins depending on the type, the chemical and physical properties of heavy metals. Ministry of State for Population and the Environment 1990 in Marganof (2003) split the group of heavy metals based on the nature of toxicity in three groups, the which are toxic high consisting of the elements Hg, Cd, Pb, Cu, and Zn; a toxic medium composed of elements Cr, Ni, and Co; and low toxic in nature consisting of the elements Mn and Fe (Sanusi, 2006). Sutamihardja et al. (1982) sort by the chemical nature and physics, the level or the toxicity of heavy metals on aquatic animals can be sorted (from high to low) as follows: mercury (Hg), cadmium (Cd), zinc (Zn), lead (Pb), chromium (Cr), nickel (Ni) and cobalt (Co), while According Darmono (1995) list the order of toxicity, the highest to the Lowest against the humans who consume fish are as follows: Hg^{2+}> Cd^{2+}> Ag^{2+}> Ni^{2+}> Pb^{2+}> AS^{2+}> Cr^{2+} Sn^{2+}> Zn^{2+}.

CONCLUSION

The results of this study concluded that the quality of the waters of the Rosenberg Strait is still good for marine life but need to be monitored continue because these waters to be impacted by the rapid development in coastal areas .

ACKNOWLEDGEMENTS

Thanks to technicians in Techical Implementation Unit for Marine Biota Conservations in Tual - Indonesian Institute of Sciences (LIPI) – Southeast Maluku.

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Design By : Hanter Olong