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ANALYSIS OF THE LEAD (Pb) CONTENT IN SEDIMENT, SEA WATER AND BLOOD COCKLE *Anadara granosa* L. FROM THE COASTAL WATER OF MAKASSAR

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ABSTRACT

The research about analysis of the content of heavy metal lead (Pb) in sediment, sea water and blood cockle *Anadara granosa* L. from the caostal water of Makassar has been done. This research was aimed to figure out the Pb content in the sediment, the sea water and the blood cockle *A. granosa* L. The sample was taken by using Purposive sampling method. The samples preparation used composite method and Pb level in samples was determined by Atomic Absorption Spectrofotometric (AAS). The result showed that at Tanjung Bunga, the average of Pb content in the: sea water 0,289 ppm, sediment 0,609 ppm and blood cockle *A. granosa* L. 0,704 ppm. In the Mangara Bombang, the average of Pb content in the sea water 0,273 ppm but Pb level in the sediment and in the blood cockle *A. granosa* L. were not detected.

Keywords: Sea bivalves, Lead (Pb), AAS, Makassar.

INTRODUCTION

Coastal water of Makassar hold one of important role in traffic from and into Makassar city. Due to high demand on this area, water quality along Makassar coast is highly polluted. Complexity of activities along coastal area has implicated on huge amount of waste introduced to that area, including a heavy metal compound. Lead (Pb) is one of heavy metal compound that due to its widely used in domestic need and industry, can also contribute to pollution along coastal water (Payung et al., 2013). Along coast of Makassar, Tanjung Bunga and coast of Tallo areas are having high risk of water pollution, this due to fact that two big rivers are loaded into those areas and possibility of oil leaking from transport vessels.

The blood cockle *A. granosa* L. belongs to cardiidae family, is adopted to sand and muddy environment, known as one of clam that consumed by local people. Beside as source of protein, this clam is usually used as indicator to determine water quality at coastal area (Payung et al., 2013).

MATERIAL AND METHODS

Materials

Materials used in this study including HCl, sea water, sediment, blood cockle *A. granosa* L., pure Lead (Pb), filter paper Whatman, indicator solution, Alkaline Iodide, Aquadest, H_2SO_4, roll tissue, Natrium thiosulphate and Nitrate acid.

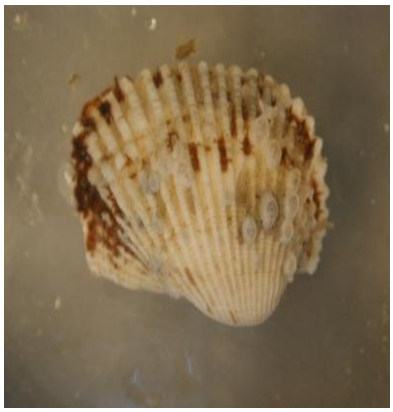

Figure 1. *Anadara granosa* Linneaus (own collection)

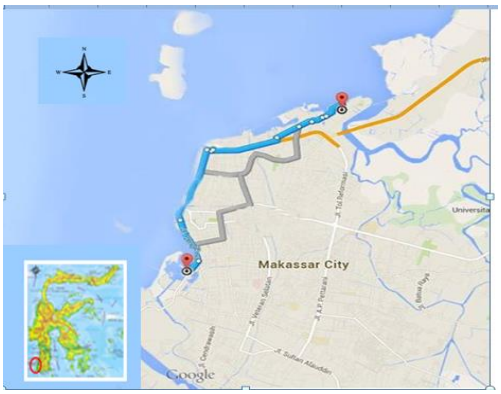

Figure 2. Location of sampling (St 1. Mangarabombang and St 2. Tanjung Bunga)

Sampling location

The blood cockle *A. granosa* was sampled at two locations: Station 1. Northern part of Makassar coast: Mangara Bombang (S 05°06'16,2" E 119°26'29,0") and Station 2 at the southern part of Makassar coast: Tanjung Bunga (S 05°08'58,4" E119°24'23,5") (Figure 2).

Data Analysis

Composite method was used in sample preparation (Herman, 2006). Lead compound in sample was determined quantitatively using Atomic Absorbance Spectrophotometer (AAS) (Yestyani, 2010).

RESULT AND DISCUSSION

Result

The result of lead content analysis of samples from St 1 Mangara Bombang and St 2 Tanjung Bunga areas are shown in Table 1.

Table 1. The result of lead content (ppm) in sea water, sediment and soft body of *A. granosa* from different locations

Sample	Location		EMD* N0 51 / 2004	Sample	Location		Sample	Location		EMD* N0 51 / 2004
	St 1	St 2			St 1	St 2		St 1	St 2	
Water	0.259	0.286	0.05	Sediment	<0.01	0.603	Clam	<0.01	0.658	0.008
	0.280	0.286			<0.01	0.604		<0.01	0.744	
	0.260	0.293			<0.01	0.653		<0.01	0.617	
	0.293	0.293			<0.01	0.578		<0.01	0.798	
Average	0.273	0.289			<0.01	0.609		<0.01	0.704	
Std	0.016	0.004			0	0.031		0	0.082	

St 1. Mangarabombang St 2. Tanjung Bunga

* EMD = Environment's Ministerial Decree No. 51/2004

As seen from Table I, the average Pb content in the sea water in St 2 Tanjung (0.289±0.004 ppm) is higher compare to St 1 Tallo (0.273±0.016 ppm). Furthermore, average Pb content in the sediment sample in St 2 is 0.609±0,031 ppm. On the other hand, Pb content in the sediment from Mangarabombang area is undetected by AAS (< 0.01 ppm). The higher content of Pb is found soft body of blood cookle *A. granosa* L. origin St 2 Tanjung is 0.704±0.082 ppm. This value is also over environmental standard that of 0.05 ppm. In addition, Pb content in the soft body of *A granosa* from Mangarabombang area is less than 0.01 ppm

The result of heavy metal content analysis indicates that both waters in Mangarabombang (0.289±0.004 ppm) and Tanjung area (0.273±0.016 ppm) are already contaminated with Pb. According to Indonesian State Minister for Environment's Ministrial Decree No. 51 Tahun 2004 on standard quality for seawater for maritime and tourism and maritime biota, these values did not meet the standards. Pb content in Tanjung Bunga area is higher than Mangarabombang area, this due to fact that high activities, both industries and domestic occur in Tanjung Bunga area. In addition Tanjung Bunga area is semi enclosed waters, hence sea water movement is relatively low. Therefore, heavy metal content is also high in this area.

This study shows different Pb content compared to result shown by Zulfikar et al. (2013). These author found Pb content in water of Tanjung Bunga around 0.556 ppm and in Tallo's areas was 0.395 ppm. The difference due to sampling time, Zulfikar eta al (2013) run sampling during dry season (Juli – August), hence Pb content may be higher. In this study, sample collection was conducted during rainy season (December). In this situation, abundance of fresh water hold important role in water dilution. Hence it may contribute to a less amount of Pb content in environment.

Pb content in sediment is expected higher than that of in water. In this study, Pb content at sediment from Tanjung Bunga is 0.609±0.031 ppm. On the hand, Pb content in sediment from Mangarabombang area less than 0.01 ppm (Table 1). This shows different trend to result indicated by Apriadi (2005). The latest author found, due to accumulation in substrate, heavy metal content is higher in sediment compared to sea water, Even though Pb content in sediment in particular from Mangarabombang area is less than 0.01 ppm, the metal was exist and the value is considerably undetected by AAS. Furthermore, heavy metal content in sediment can be diluted as water volume increase. Another, sampling location at Mangarabombang is quite far from harbor

According to Weroilangi (2012), characteristic of sediment along coastal of Tallo is considered save. However, due to sediment type (fine sediment) as high content of organic matter, sediment has a high potency to absorb metal. Previous findings at coastal areas concluded that Pb content in marine sediment is generally present in reduce phase in particular if total Fe and Mn are high. Reduce fraction tied to metal at Fe-Mn oxyde. Consequently, this will form a stable complex compound Fe and Mn *oxyde* (Turki, 2007 and Gao et al., 2008).

Payung et al. (2013) found Pb content at Tanjung Bunga waters between 9.003 and 12.112 mg/kg. Their sampling was done at the end of rainy season (March) 2013. High content of Pb in waters may due to a decrease in fresh water supply at the end of rainy season. They did not observe Pb content in sediment of Tallo area, therefore it cannot compare to the present study.

The soft body of blood cockle *A. granosa* from Tanjung Bunga area contains Pb of 0.704±0.082 ppm. This value is higher than one found by Payung

et al (2013). Pb content in *A. granosa* from Tallo area is less than 0.01 ppm. Based on the Indonesia Government Decree No. 51/Min of Envir/2004, standard Pb content in clam is <0.08 ppm. Therefore, *A. granosa* from Mangarabombang meet safety standard or save to consume.

Heavy metal compound cannot be form synthesized by human, animal as plant, so known as an essential compound (Duruibe et al., 2007). High content in soft body of *A. granosa* both from previous and present studies may due to several factors such as Pb content in habitat as stage from life cycle of animal. The longer clam stay in habitat, it may expose and accumulate as much Pb from environment. Pb can get into soft body of animal through food chain, gill and surface of skin. As filter feeder, accumulation of Pb into clam can be through water absorbance, particles and plankton. Detection of Pb inside soft body on clam may due to fact that animal cannot excrete metal, hence it being accumulated as increase metal concentration in habitat. This group is considerably low in movement or can stay longer at habitat that already expose to heavy metal. Weroilangi (2012) added, a total concentration of metal in the waters is not positively correlated to a response of living things. Previous studies on coastal waters has shown that Pb content in marine sediment is usually in reduced form especially when total Fe and Mn is high in sediment.

CONCLUSION

1. Pb content is higher in blood cockle followed by sediment and sea water.
2. Pb content in Tanjung Bunga is higher compared to Manggara Bombang area.
3. Pb content in all sample from Tanjung Bunga area as in sea water sample at Mangara Bombang exceed Environment' Ministrial Decree No. 51 / 2004 about water quality threshold. While Pb content in sediment and *A. granosa* from Mangarabombang area L. met the standard.

RECOMMENDATION

Further study is needed to compare lead content in water, sediment and blood cockle at sampling location at different season

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