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Bioakumulation Heavy Metals Lead (Pb) and Cadmium (Cd) Seagrass (*Enhalus acroides*) in Waai and Galala Island Ambon

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Abstract

All sea life's potential as one of the indicators of the level of pollution in the waters, one of them is *Enhalus acroides*. The results showed that in the waters of the Waai and Galala contained impurities of lead and cadmium, especially on *Enhalus acroides* which is one of the sea life that consumed by the people who lived around the coastal region.

***Keywords*:** (Enhalus acroides; Cd; Pb)

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1. Introduction

Central Maluku region, precisely in the Galala and Waai has many natural resources potential sea biodiversity for society as alternative food sources, such as seagrass, or better known as the Seagrass. Seagrass is a flowering plant that is already fully adapted to life under the surface of sea water. Seagrass live in shallow water a bit gritty, often also found in coral reef ecosystems. Just as the grass on the Mainland, seagrass also forms a wide and lush fields on the seabed that is still reachable by sunlight with adequate level of light energy for growth [1]. The seagrass is often also found in sea waters of mangrove forests and coral reefs. Observations showed that the growth of seagrass in Waai is better than in the Galala, this is caused by the level of pollution in Galala bigger compared to Waai.

Lately the dangers posed by heavy metals is a very prominent environmental issues. Various hazardous waste currently generated by human activities, and poses a problem in handling. This is because the form of the various waste and has diverse levels anyway. Nature basically has a mechanism to reduce the negative effects of the buildup of heavy metals on ecosystems, however often happens the buildup of heavy metals that exceed the ability of nature to process it. It can cause hazard consecutively, given the interdependencies between the components of ecosystems in nature [2].

Heavy metals known to accumulate in the body of an organism, and remain in a prolonged period of time, as poison. The event was widely publicized and stand out due to heavy metal contamination is pollution of mercury (Hg) which causes Minamata in Japan Minamata desease and pollution of cadmium (Cd) which caused the Itai-itai disease and cancer of the liver Jinzo River on the island of Honsyu Japan. Absorption of lead in the body very slowly, so the accumulation and the basis of progressive poisoning. Lead poisoning led to high levels of lead in the aorta, liver, kidneys, pancreas, lungs, bones, spleen, testes, heart and brain [3,4].

Results of the research conducted by Inswiarsi [5], about a study of the levels of heavy metals in the waters of West Nusa Tenggara indicate that seagrass has a good ability of accumulate certain kinds of heavy metals such as lead, nickel, cadmium, chromium, iron, and arsenic. In addition, the same study about seagrass as sea cleaner plants carried out by Rinawati [6], indicate that seagrass has the ability in absorbing heavy metals, particularly lead, cadmium, and iron. Both of these research results is a basic framework for researchers to do the same, but studies on species of seagrass that serve as the ingredient of consumption society in waters Waai and Galala, so that research results can serve as the ingredient information for the public about safe or whether seagrass consumed metal levels of severity.

2. Material and Methods

This research is a research comparased ex-post facto aimed at knowing the difference levels of heavy metals (Pb and Cd) on the roots, leaves, and fruit of seagrass (*Enhalus acroides*) as a result of exposure to the heavy metal element lead (Pb) and cadmium (Cd) in the Galala and Waai island Ambon. Levels of the heavy metal element lead and cadmium at the roots, leaves, and fruit of seagrass in laboratory biology at UMM Malang four times of Deuteronomy.

The sample in this research is a plant species of seagrass *Enhalus acroides* residing in Waai and Galala. Samples taken as much seagrass 1 kg wet weight for each plant organs are root part 1 kg, 1 kg of the leaf, and 1 kg fruit. Sampling is based on the needs of researchers to conduct testing the levels of heavy metals (Pb and Cd) by using atomic absorption spectrophotometry in the laboratory biology at UMM with a dry weight of plant organ sampled at least 500 gr and heavy ash at least 10 g [7].

3. Result

3.1. Characteristic of the research environment

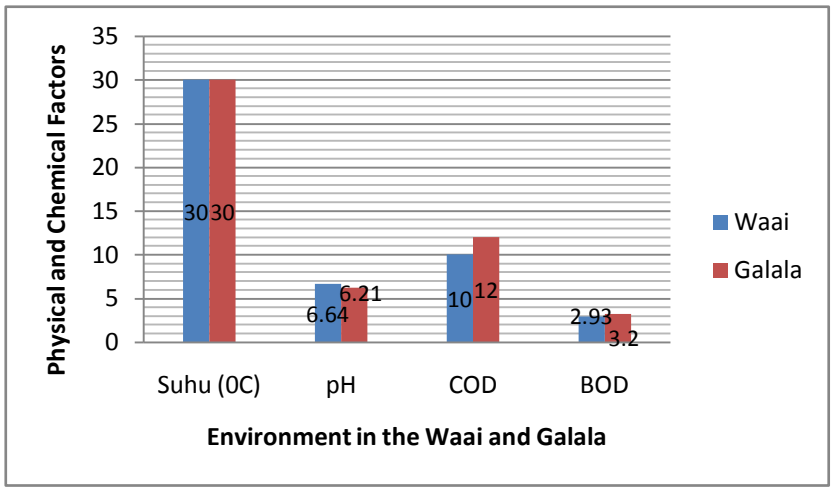

Fig. 1. The physical factor (temperature) and chemical factors (pH, BOD, COD) environment in the Waai and Galala

3.2 Measurement of the levels of lead (Pb) and Cadmium (Cd) waters in Waai

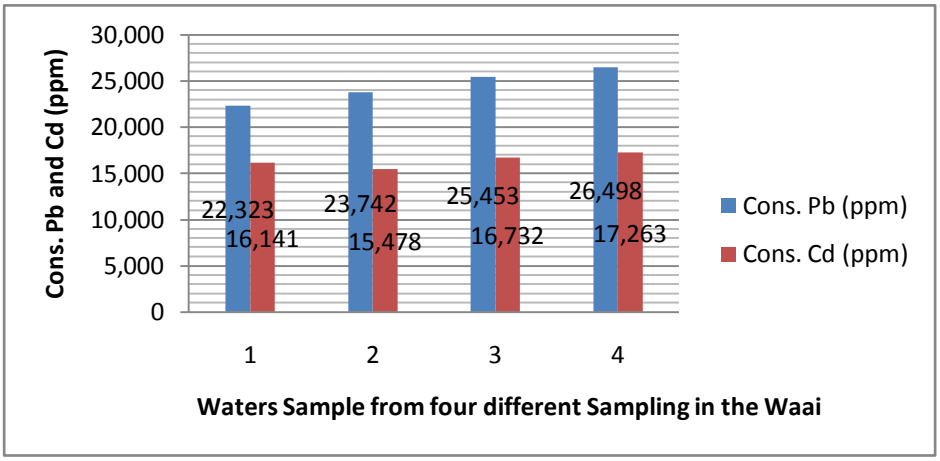

Fig. 2. Levels of Pb and Cd in waters sample from four sampling points in the Waai

3.3. Measurement of the levels of lead (Pb) and Cadmium (Cd) waters in the waters of Galala

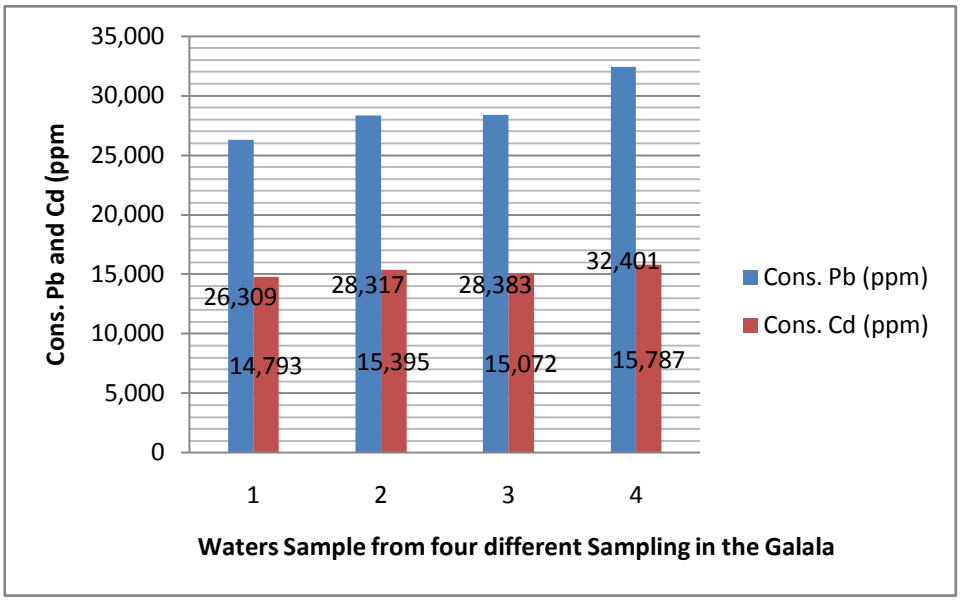

Fig. 3. Levels of Pb and Cd in waters sample from four sampling points in the Galala

3.4. Comparison of the levels of lead (Pb) and Cadmium (Cd) in OrgansEnhalus acroidesin the Waai and Galala

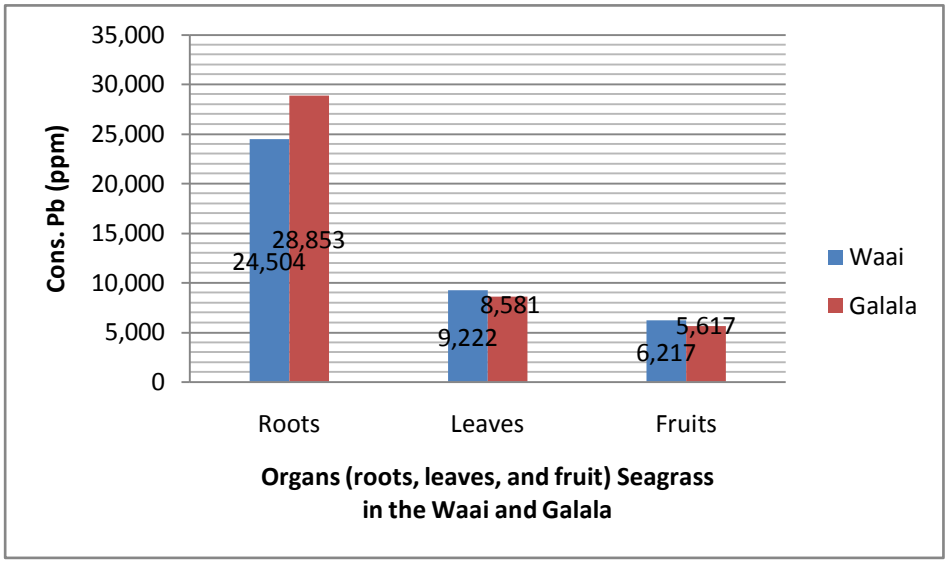

Fig. 4. The difference levels of Pb on the organs (roots, leaves, and fruits) seagrass in the Waai and Galala

Table 1. A summary of the differences of two lines of anava levels of heavy metals lead (Pb) in seagrass organs in the Waai and Galala

SK	**db**	**JK**	**KT**	**F_h**	**$F_{5\%}$**	**$F_{1\%}$**
Replay	3	6,525402	2,18			
Treatment	5	2055,222775	411,04	215,69**	3,29	5,42
L	1	6,43356	6,43	3,38	4,54	8,68
O	2	2015,859583	1007,93	528,91**	3,88	6,36
LO	2	32,929632	16,46	8,64**	3,88	6,36
Galat	15	28,585339	1,91			
Total	23					

From the results of the data analysis that has been done, retrieved $F_{analysis} > F_{table}$ (0.05), so the real difference test continues (BNT) on a significant level of 5%. The test results showed that that there are differences in the levels of Pb in roots, leaves, and fruit of seagrass in the Galala and Waai.

Table 2. A summary of the differences of two lines of anava levels of heavy metals lead (Pb) in Seagrass organs in Waai and Galala

SK	db	JK	KT	F_h	$F_{5\%}$	$F_{1\%}$
Replay (U)	3	0,340281	0,11			
Treatment	5	868,0840645	173,62	1083,81**	3,29	5,42
L	1	1,16072017	1,16	7,25*	4,54	8,68
O	2	864,8026544	432,40	2699,28**	3,88	6,36
LO	2	2,12068993	1,06	6,62**	3,88	6,36
Galat	15	2,4028685	0,16			
Total	23					

From the results of the data analysis that has been done, retrieved $F_{analysis} > F_{table}$(0.05), so the real difference test continues (BNT) on a significant level of 5%. The test results show that there are differences in the levels of Cd in roots, leaves, and fruit of seagrass in the Waai and Galala. Results of the analysis of the levels of lead in plants obtained from the seagrass in the Waai and Galala, indicating that the plants contain lead levels were very high. The seagrass plants analyzed the levels of the lead is the root, leaves, and fruit with atomic absorption spectrophotometry using a contrastive number of lead accumulation in different organs. The levels of lead at most plants accumulate on the seagrass is at root, then to the various parts of the leaf, and the least accumulate lead is in part the fruit of seagrass

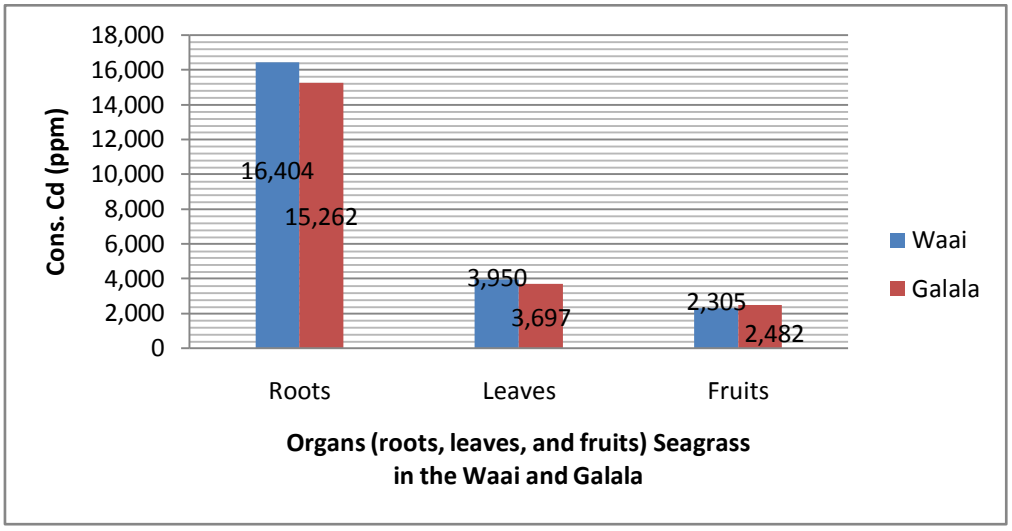

Figure 5. The difference Cd levels of Cd on the organs (roots, leaves, and fruits) seagrass in the Waai and Galala

The levels of lead at the roots, leaves, and fruit of seagrass obtained from respective Waai waters is 24,504 ppm; 9,222 ppm; and 6,217 ppm. Whereas the levels of lead at the roots, leaves, and fruit of seagrass obtained from respective Galala waters 28,853 ppm; 8,581 ppm; and 5,617 ppm. The levels of lead in plants the seagrass, both obtained from Waai and Galala nor very high and above the threshold of tolerance for human consumption. To be able to do the evaluation of exposure to metallic lead by Please note the normal limit and concentration levels of lead in the tissues and body fluids. From the few studies that have been done in the United States concluded that a daily intake of lead in the body and classified at the level of exposure is normally in the range of 350 µg/kg to 2000 µg/kg [8,9].

Results of the analysis of the levels of cadmium in plants obtained from the seagrass in the Waai and Galala, showed that the plant contained cadmium levels were very high. The seagrass plants analyzed the levels of the cadmium is the root, leaves, and fruit with atomic absorption spectrophotometry using a contrastive number of accumulation of cadmium in different organs. Most cadmium levels accumulated in plants is on the various roots of seagrass, then part of the leaves, and the least accumulate cadmium is in part the fruit of seagrass [10,11]

Levels of cadmium in the roots, leaves, and fruit of seagrass obtained from respective Waai is 16,404 ppm; 3,950 ppm; and 2,305 ppm. Whereas the levels of cadmium in the roots, leaves, and fruit of seagrass obtained from respective Galala waters 15,160 ppm; 3,697 ppm; and 2,482 ppm. Levels of cadmium in the seagrass, both plants obtained from Waai and Galala nor very high and above the threshold of tolerance for human consumption. Sea life such as seagrass has a system the anatomy is very strong in filtering the multifarious kinds of heavy metals. Because of its Habitat in the mud makes his nutritional absorption systems are associated with mud and heavy metals when it enters the body can harm the health of specific results in the deposition could be

toxic in the human body. A normal concentration of cadmium in blood is 10 μg/L, in people who live in areas with cleaner air, where the levels of dust cadmium no more than 20 g/m^3 [12].

4. Conclusions

There are differences in the levels of lead at the organ (roots, leaves, and fruit) seagrass (*Enhalus acroides*) between Waai and Galala, where lead levels of heavy metals present in most waters of Galala with percentage lead content difference is 7.23%. There are differences in the levels of cadmium in organs (roots, leaves, and fruit) seagrass (*Enhalus acroides*) between Waai and Galala, where metal cadmium levels found in most aquatic Waai with percentage differences in the content of cadmium is 5,83%.

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