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ANALYSIS OF LEAD IN SEAWEED AND WATERS IN BAJO ISLAND, DOMPU REGENCY, WEST NUSA TENGGARA

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ABSTRACT
Pollutant entries, either in organic or inorganic components, result in pollution and degradation of water quality. Lead (Pb) is heavy metals having the potential to become a pollutant. This research was located in waters of Bajo Island of Saleh Bay area, Dompu Regency, West Nusa Tenggara Province. This research was conducted in July 2017 using survey method (descriptive). Determination of the sampling point coordinates used GPS. Measurement of heavy metals used AAS (Atomic Absorption Spectrophotometry) method. The results of this study showed that lead (Pb) concentrations in seawater samples from 24 sampling sites ranged from 0.26 ± 0.00 mg/kg to 0.65 ± 0.01 mg/kg which indicated that lead (Pb) concentrations in waters of Bajo Island were beyond the threshold of 0.03 mg/L (Government Regulation No. 82/2001). In addition, seaweed samples from 4 different locations showed that lead (Pb) concentrations in sample 1 ranged from 2.34 ± 0.07 mg/kg, sample 2 ranged from 1.99 ± 0.07 mg/kg, sample 3 ranged from 1.02 ± 0.06 mg/kg, and sample 4 ranged from 0.56 ± 0.08 mg/kg in which all samples showed concentrations above the standard or beyond the threshold.

KEY WORDS
Pollution, heavy metal, lead, seaweed, waters.

Pollution is one of the problems faced in the present day, including water pollution. Water pollution is caused by two sources of pollution, i.e. the natural sources and the human-made sources. Natural sources of pollution include erosion of rocks, rain, and landslides. More pollution comes from human activities rather than natural processes. Human activities such as industry, transportation, and agriculture produce waste which can become pollutants (Siaka et al., 2016).

The decrease in water quality is caused by the presence of pollutants, both in organic and inorganic components. Dangerous heavy metals as an example of inorganic components become one of the parameters to be measured in this study.

The presence of heavy metals in waters has very dangerous effects on the organisms and human life, both directly and indirectly. This relates to the properties of heavy metals which are difficult to decompose, causing them to be easily accumulated in the aquatic environment for long periods of time (Ika, 2012).

Increasing numbers of domestic waste and industrial waste entering the waters result in water quality changes. One of the most worrying pollutants is heavy metals such as Pb, Cd, Cu, Hg, etc. Heavy metals in waters are difficult to be degraded and easily absorbed into the organism body (Siaka et al., 2016).

Heavy metals in waters have a very dangerous effect directly to the organism life and indirectly to human health. This relates to the properties of heavy metals which are difficult to decompose, causing them to be easily accumulated in the aquatic environment for long periods of time (Ika et al., 2012). Tarigan et al. (2003) state the normal lead (Pb) concentrations in seawater is 0.03 mg/L (Government Regulation No. 82/2001), while the

maximum permissible lead (Pb) concentrations in seaweed based on SNI No.7387-2009 is 0.5 mg/kg.

Lead (Pb) is heavy metals having the potential to become a pollutant, as it is a long-lasting compound in waters before it finally goes to the bottom or is absorbed by various physical and chemical reactions of waters (Rizkiana, 2017).

METHODOLOGY OF RESEARCH

Location and Time of the Study. The research was located in waters of Bajo Island of Saleh Bay area, Dompu Regency, West Nusa Tenggara Province. This research was conducted in July 2017 using survey method (descriptive). Determination of sampling point coordinates used GPS.

Stages of the research comprised determining the point of sampling location or research station and testing lead (Pb) concentrations on seaweed and seawater at each station.

Determination of Research Station. In the determination of research station, the method used in determining the location of the sampling point was purposive sampling. Purposive sampling is the process of determining the sampling location based on certain considerations. The considerations in this research included the similarity of the waters character, the easy access to location, and the effective time and cost based on the initial interpretation of the research location.

Sampling. Water sampling at each station was done by using sample bottle and continued with seaweed sampling at each point of seaweed farming already exists in Bajo Island waters. Lead (Pb) concentrations in each sample of waters and seaweed were analyzed in the laboratory using Atom Absorption Spectrophotometer (AAS) method.

Analysis of Heavy Metals with AAS (Atomic Absorption Spectrophotometer)

The heavy metal analysis was conducted at the Chemical Laboratory, Faculty of Mathematics and Natural Science, Universitas Brawijaya Malang. The analytical procedures were carried out in accordance with those already in the laboratory. Measurements of heavy metals used AAS (Atomic Absorption Spectrophotometry) method and the tool was the spectrophotometer. Siaka et al., (2016) stated that water samples were taken and added by concentrated nitric acid to pH of 2. Samples of seawater were filtered and analyzed for lead (Pb) concentrations with AAS. Seaweed samples were taken at each specified point and stored in a cool box. The samples were dried to a constant weight and grounded into powder. The sample powder was weighed for 1 gram and added by a reverse aqua regia solution made from a mixture of HNO3 and HCl with a ratio of 3:1. The mixture was digested with ultrasonic bath at 600° C for 45 minutes and then placed into hotplate at 1400° C for 45 minutes. The mixture was filtered and diluted with distilled water up to 25 mL. The solution was analyzed for lead (Pb) concentrations with AAS.

RESULTS AND DISCUSSION

Distribution of Lead (Pb) in waters of Bajo Island. The results of lead (Pb) measurements in seawater samples taken from 24 sampling sites ranged from 0.26 ± 0.00 mg/kg to the highest of 0.65 ± 0.01 mg/kg. The distribution of lead (Pb) in waters of Bajo Island can be seen in Figure 1. Yellow and green areas indicate the low level of lead (Pb) concentrations, whereas orange and red areas indicate the high level of lead (Pb) concentrations.

The lead (Pb) level tested indicated that lead (Pb) concentrations in waters of Bajo Island were beyond the normal lead (Pb) concentrations threshold in seawater of 0.03 mg/L (Government Regulation No. 82/2001). As can be seen on the map, higher lead (Pb) distribution level compared to other stations were at stations 3, 4, 5, 6, 7 and 10, areas which cannot be separated from the effect of daily activities in the surroundings. Station 3 is an area very close to the settlements and small river estuaries. Stations 7 and 10 are areas close to docks, ponds, settlements and are inter-island transportation routes.

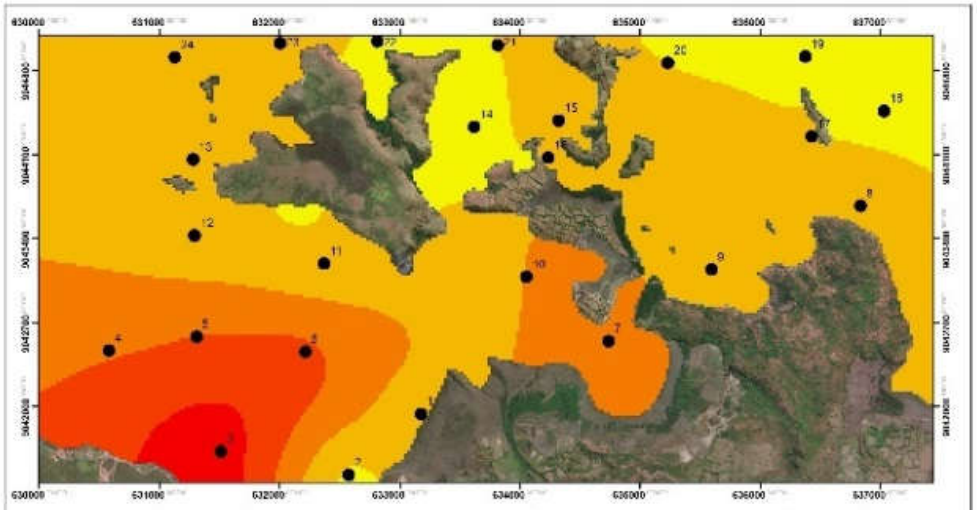

Figure 1 – Distribution of lead (Pb) in waters of Bajo Island

Ma'rifah et al. (2016) state waters around the harbors have high lead (Pb) concentrations due to never-ending human activity around them. Chen et al. (2007) also confirm that the use of ship fuel also become one causes of lead (Pb) entry into waters. Generally, fuel oil has tetraethyl additives containing lead (Pb) to improve the quality. Consequently, wastes from these ships cause high lead (Pb) concentrations in waters (Rochyatun et al., 2006). Therefore, it was expected that lead (Pb) concentrations at stations 3, 4, 5, 6, 7 and 10 were higher compared to other stations. The existence of seaweed in waters can be threatened by the occurred pollution. Seaweed as aquatic organisms can be impacted by the pollution of seaweed habitat, especially pollution from lead (Pb). The presence of heavy metals in waters can cause heavy metals to be absorbed by seaweed (Siaka et al., 2016).

Lead (Pb) concentrations on seaweed. The result of laboratory test using Spectroscopic Absorption Atom (SSA) method on seaweed samples from 4 locations showed different lead (Pb) concentrations as presented in table 1.

Table 1 – Test Results of Lead (Pb) on seaweed

Code	Parameter	Analysis results/ Level (mg/kg)	Method
Sample 1	Pb	2.34 ± 0.07	AAS
Sample 2	Pb	1.99 ± 0.07	AAS
Sample 3	Pb	1.02 ± 0.06	AAS
Sample 4	Pb	0.56 ± 0.08	AAS

Source: Laboratory Test Results.

The maximum permissible lead (Pb) concentrations in seaweed based on SNI No.7387-2009 is 0.5 mg/kg. The analysis result showed that lead (Pb) concentrations in sample 1 ranged from 2,34 ± 0,07 mg/kg, sample 2 ranged from 1,99 ± 0,07 mg/kg, sample 3 ranged from 1,02 ± 0,06 mg/kg and sample 4 ranged from 0,56 ± 0.08 mg/kg. From laboratory test results, all samples showed concentrations above the standard or beyond the threshold.

Lead (Pb) is heavy metals receiving major attention in health. Food poisoning or contaminated air by dangerous toxic properties of lead (Pb) had impacted a large number of people (Ika, 2012). Lead (Pb) is also one of the heavy metals that have high toxicity to humans because it can damage brain development in children, trigger blockage of red blood cells, cause anemia, and affect other limbs. Lead (Pb) can be accumulated directly from water and from sediments by marine organisms (Pramono, 2008). The ability of seaweed in absorbing lead (Pb) can be harmful when accumulated in seaweed and then consumed by humans (Siaka et al., 2016).

CONCLUSION

The measurement results of lead (Pb) concentrations in seawater samples from 24 sampling sites ranged from 0.26 ± 0.00 mg/kg to the highest of 0.65 ± 0.01 mg/kg which indicated that lead (Pb) concentrations in waters of Bajo Island were beyond the normal lead (Pb) concentrations threshold in seawater of 0.03 mg/L (Government Regulation No. 82/2001). In addition, the seaweed sample tests from 4 different locations showed different lead (Pb) concentrations. Lead (Pb) concentrations in sample 1 ranged from 2.34 ± 0.07 mg/kg, sample 2 ranged from 1.99 ± 0.07 mg/kg, sample 3 ranged from 1.02 ± 0.06 mg/kg, and sample 4 ranged from 0.56 ± 0.08 mg/kg in which all samples showed concentrations above the standard or beyond the threshold. The maximum permissible lead (Pb) concentrations in seaweed based on SNI No.7387-2009 is 0.5 mg/kg.

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