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Analysis of Lead Heavy Metal has to do with water quality Around the Tallo River Estuary in Makassar Indonesia

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Abstract : This research aims to identify of heavy metal content of lead relation to water quality Around the Tallo River Estuary in Makassar. The research was conducted in May-June 2018 with 3 observation stations. Taking samples of water, fish and sediment implemented for the measurement of lead metal. Measurement of water parameters done in the place of observation (pH, temperature, dissolved oxygen, and salinity). All data obtained were analyzed descriptively.
The results showed that heavy metal content of lead around the Tallo River Estuary show that lead content in fish the sample is already on the threshold because it has exceeded 0.008 ppm but the sample water is still below the threshold that is below 0.05 as required by Minister of Environment of The Republic of Indonesia No.51 /MenKLH/2004. The content of lead in sediment is still relatively high. The quality of sea water in the observation location is still relatively good, except oxygen is rather low and nitrite is rather high.
Keywords : Lead, Water quality, Estuary, Tallo.

Introduction

Coastal waters are where rivers flow, both large rivers and small rivers. Thus, coastal waters become a place gathering of pollutants carried by the river[10]. Tallo River Estuary is one of the river estuaries in the city of Makassar, where there are many around it residential area, Makassar City warehousing center and there are many industrial activities so that this area becomes very vulnerable against heavy metal pollution such as lead.

Heavy metals will mix in the waters through the absorption process and dilution before settling on the base substrate. Contamination of heavy metals in sediment will last for a long time even when the source of the pollution is gone [8].

Causes of pollution in waters one of them is caused because the entry of heavy metals into the waters in amounts far above normal. Heavy metal has character which is easy to tie and settle in the

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bottom of the waters then accumulates in the sediment, therefore heavy metal content in sediment higher than in water [5].

Lead in basic sediments can return to the surface of the water because of the stirring process like port activities or change in density which causes the release of heavy metal ions to the waters [8].

This research aims to identify heavy metal content of lead relation to water quality Around the Tallo River Estuary, Makassar City, Indonesia.

Method

The research was conducted in May-June 2018 with 3 observation stations namely Station 1 is a location around the mangrove forest, Station 2 is a location in the Makassar Tallo River Estuary and Station 3 is a station located near the Paotere Fish Landing Site of Makassar.

Taking water, fish and sediment samples carried out for the measurement of lead metal done 2 times namely the beginning and end of the study, while water sampling is done once a week. Samples that have been obtained are then taken to the laboratory for analysis. Measurement of water parameters is carried out in place (pH, temperature, oxygen and salinity) to support research results.

Water sampling is carried out at each observation station. Water samples of 600 ml taken directly from the surface of the water by using a sample bottle [5]. Water samples are put into the cool box, then brought to the laboratory for lead metal testing [1]. Taking of sediment sample carried out at each observation station as much as 500 g is taken at a depth of ± 20 cm to analyze lead metal content. All data obtained analyzed using descriptive analysis. and the results are interpreted through images, then the results of the analysis are compared with quality standards.

Results and Discussion

Lead Content

Lead content in fish

Results of research regarding lead content in fish bodies in 5 observation stations is shown in Figure 1. Lead content in fish samples the highest is obtained at station 3 which is the location near the Paotere Fish Landing Site is 0.07277 ppm, following station 2, the location near the estuary of the Tallo river that is 0.06582 ppm, and the lowest is at Station 1, where the location around the mangrove forest is 0.05565 ppm. According to the Minister of Environment Decree of the Republic of Indonesia No. 51 / MenKLH / 2004[7], the lead threshold for biota is 0.008 ppm. Thus the lead content in biota especially in fish relatively high because it is above 0.008.

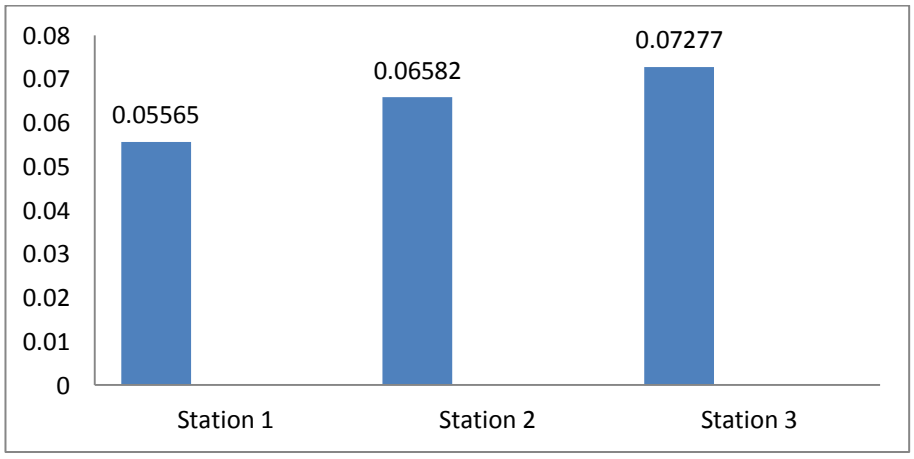

Figure 1. Average Lead on Fish at Each Station

The low value of lead metal in fish at station 1 allegedly caused due the ability of mangroves to actively avoid heavy metal inputs excess in waters and serves as a filter and has a typical natural treatment power through the root organ (Clark *et al*., 1998 *in* Kammaruzaman *et al*., 2008). Furthermore, heavy metal accumulation occurs at the root and is carried to other tissues and this process can limit the intake of air
into the network[2]..

Lead Water Content

Lead water content at 3 stations during the research can be seen in Figure 2. In Figure 2 shows the highest lead content obtained at station 3 is 0.0427 ppm, following station 1 is 0.03965 ppm and the lowest at station 2 is 0.03095 ppm. The results of this research are consistent with research conducted by[11] which states that the highest lead will be obtained at a location where there are many community activities in the industrial field, fisheries and transportation. However, the content of lead in water is still within the threshold required by Minister of Environment Decree of the Republic of Indonesia No. 51 / MenKLH / 2004[7], that is a maximum of 0.05 ppm.

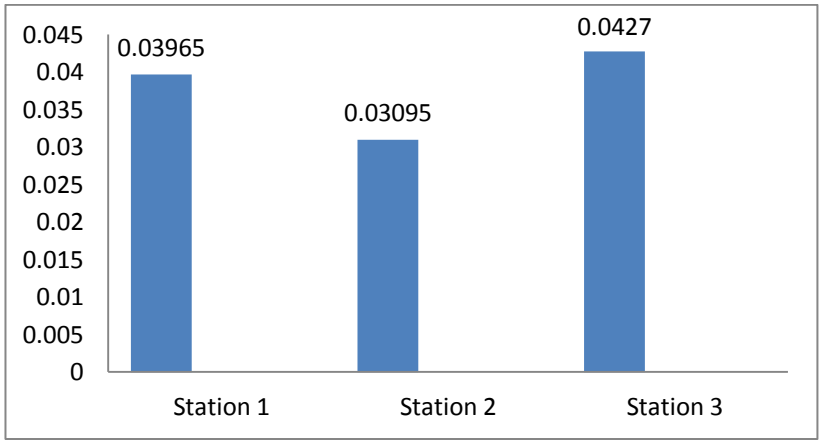

Figure 2. Average lead on water at Each Station

At station 2 has the lowest lead value allegedly due to the mixing of fresh and salt water at the station because of the ups and downs, so that water mobility continues continuously. While lead content at stations 1 and 3 is permanent. then it can be said, mangrove plants have genetic ability to detoxify heavy metals in their tissues[11], so that this vegetation has the ability to absorb heavy metals without experiencing interference. Mangroves can function as an absorbent of pollution materials, vehicle exhaust gas, industry, etc[11].

However, this lead content still meet the requirements of water quality standards according to Minister of Environment Decree of the Republic of Indonesia No. 51 / MenKLH / 2004 which requires a maximum lead of 0.005 ppm[7].

Sediment Lead Content

The content of lead in sediment during the study is shown in Figure 3. In Figure 3 shows the highest sediment lead content at station 3 is 18.1065 ppm, followed at station 1 is 10.9313 ppm and the lowest at station 2 is 7.5630 ppm.

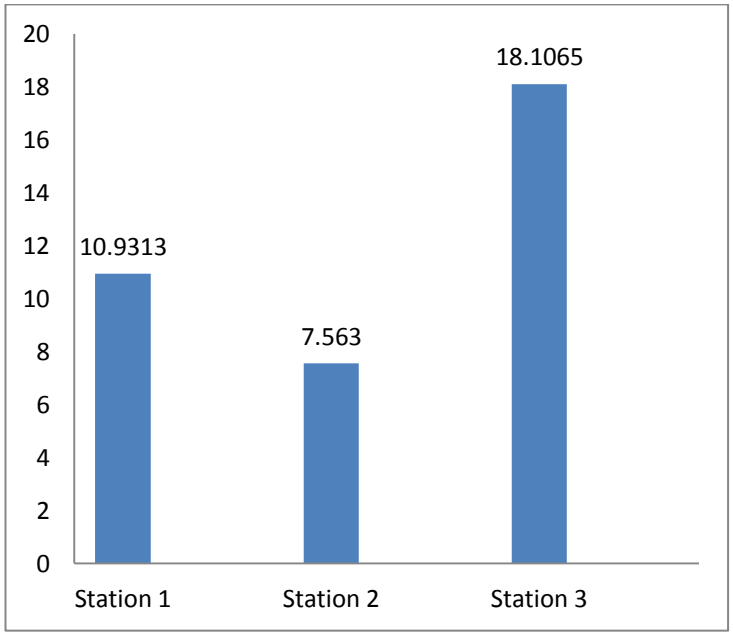

Figure 3. Average lead on soil at Each Station

The high content of sediment lead at station 3 is the location at the landing site fish of Paotere allegedly due to the location of the accumulation of heavy metal lead into the sediment. Furthermore, the low lead content at station 2 was allegedly caused by the occurrence of a water change process due to the effects of tides so that lead has not accumulated into the soil. The sediment content in this research is still lower compared to the results of previous research who conducts research on the content of lead and Hg metals in sediments in Mati river estuary, Badung Regency, Bali who found that the lead content obtained in sediment was 99.2442 ± 0.0031 mg / kg[12].

Water quality

pH of Water

The pH of water during the study can be seen in Figure 4. In Figure 4 shows the highest water pH obtained at station 2 which is the estuary of the Tallo river of 7.02, following Station 1 which is a location with mangrove forests is 6.96, and the lowest is at station 3 which is the location near the Paotere Fish Landing Site of Makassar.

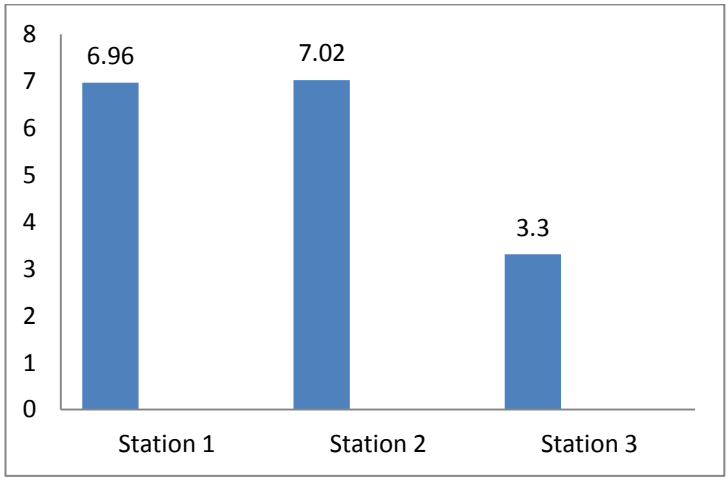

Figure 4. Average value of water pH for each station

The water pH value found in this research still lower than the results of previous research who conducted research on the accumulation of heavy metals Pb, CU and Cn in mangrove forests in Angke river estuary North Jakarta shows range from 7.53 to 7.68[2].

Dissolved Oxygen

The water dissolved oxygen content of each observation station can be seen in Figure 5. In Figure 5 shows the highest oxygen content obtained at station 3 is 4.62 ppm, following station 2 is 4.32 ppm and the lowest dissolved oxygen at station 1 is 3.92.

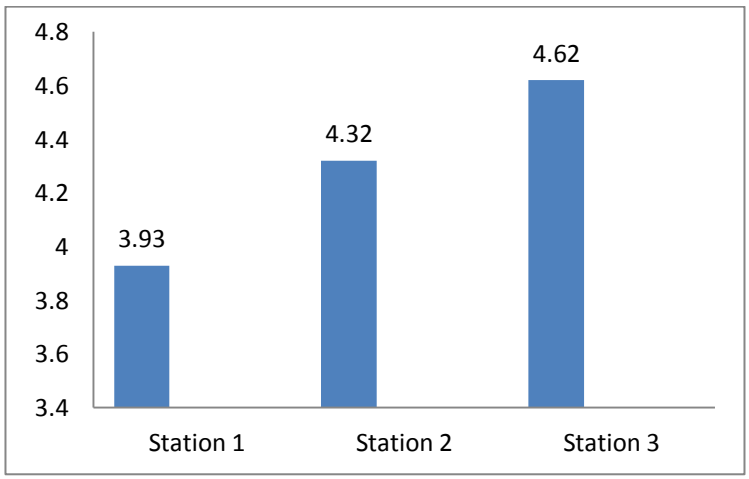

Figure 5. Average Oxygen Value (ppm) of Each Station

The results of this research are still lower than the results of research previous who found an average dissolved oxygen value of 5.18 ppm from 9 observation stations[8]. In areas that lack oxygen, or example due to contamination of organic materials, the solubility of heavy metals will be lower and easily settle[8].

Salinity

Water salinity during observation at all stations is shown in Figure 6. In Figure 6 shows the highest average water salinity value obtained at Station 1 which is a location near the mangrove forest and station 3 which is the location around the fish landing site of Paotere with an average value of 31 ppt and the lowest at station 2 which is the river tallo estuary with an average value of 24.4 ppt. The low salinity value at the river estuary because it is affected by influence of tidal. The results of this research are not much different from the results of research conducted previousshowed an average salinity value of 29.33 ppt[8].

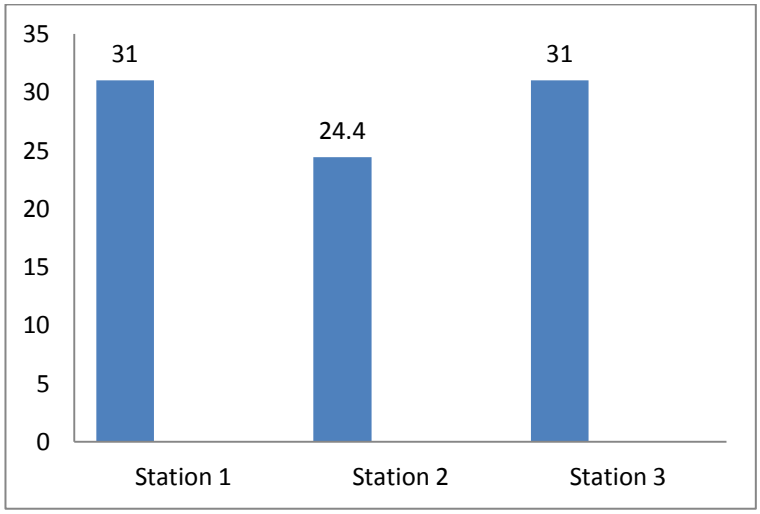

Figure 6. Average Salinity Value (ppt) of Each Station

Temperature

The results of temperature measurements during the research at 3 observation stations showed the highest average temperature obtained at stations 2 and 3 at 30.2^{0}C, while at station 1 the average water temperature is 29.8^{0}C. This temperature value is still higher than the findings of previous research who found the average water temperature around the Tanjung Bunga of 28^{0}C[11]. Similarly, the results of research conducted by Hamzah and Setiawan (2010) conducted research in mangrove forests at River Angke estuary North Jakarta with a temperature value of 28.5-29^{0}C.

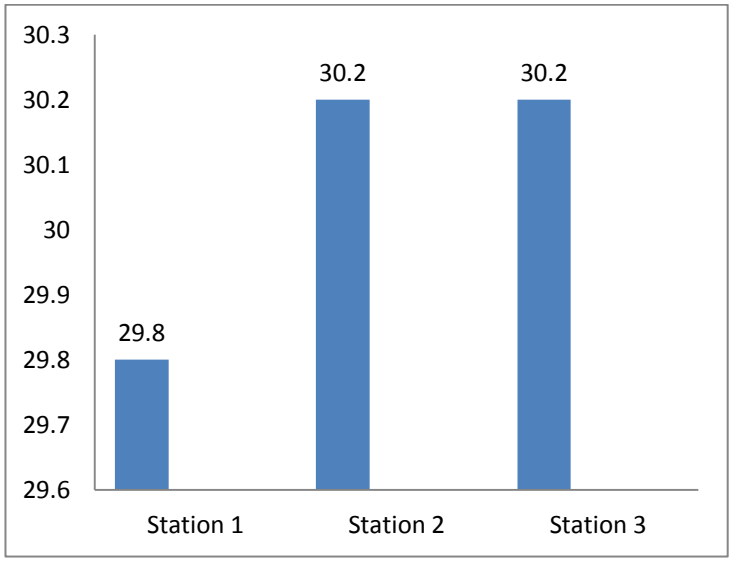

Figure 7. Average Temperature (^{0}C) of each station

According to previous research the water temperature will affect the solubility process of heavy metals entering the waters[9]. The higher the temperature of an aquatic, the solubility of heavy metals such as lead will also be higher, vice versa.

Ammonia (NH_3) Water

In Figure 8 shows the average value of ammonia content of the sample water of each observation station. Based on Figure 8 the highest average value of ammonia water samples at station 1 is 0.0189 ppm, following station 2 of 0.0130 ppm and the lowest at station 3 of 0.0115 ppm.

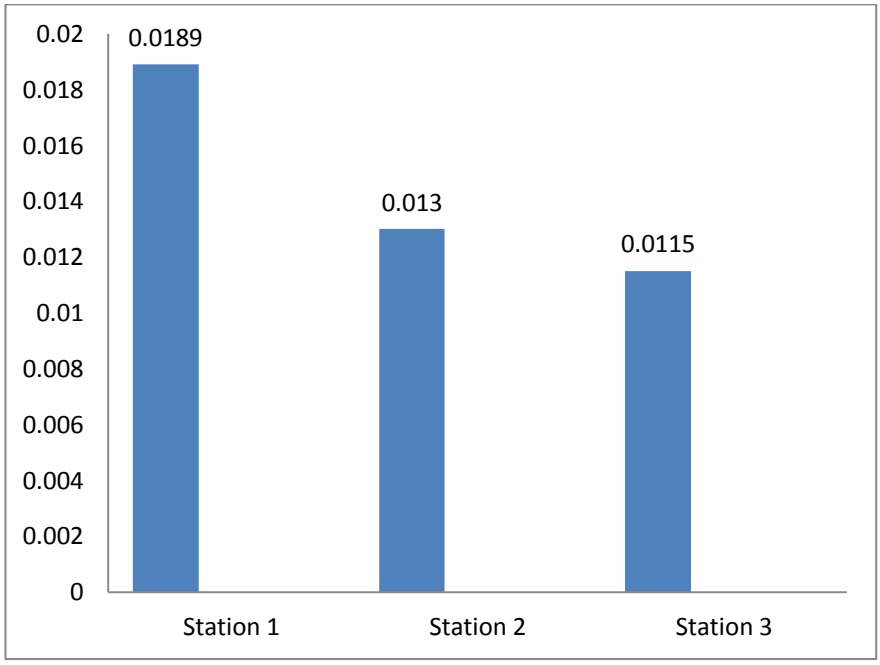

Figure 8. Average value of ammonia content (NH_3) for each station

According to Minister of Environment Decree of the Republic of Indonesia No. 51 /MenKLH/2004 concerning sea water quality standards for marine tourism, the maximum ammonia content is 0.3 ppm. Thus, the ammonia content for the three stations is still relatively low when compared to the highest ammonia value allowed[7].

Nitrite (NO_2) Water

Nitrite (NO_2) is an intermediate form between ammonia and nitrate (nitrification) and between nitrate and nitrogen gas (denitrification). Herefore, nitrite is unstable in the presence of oxygen [4]. The presence of nitrite illustrates the ongoing biological process of changing organic matter which has a low dissolved oxygen level.

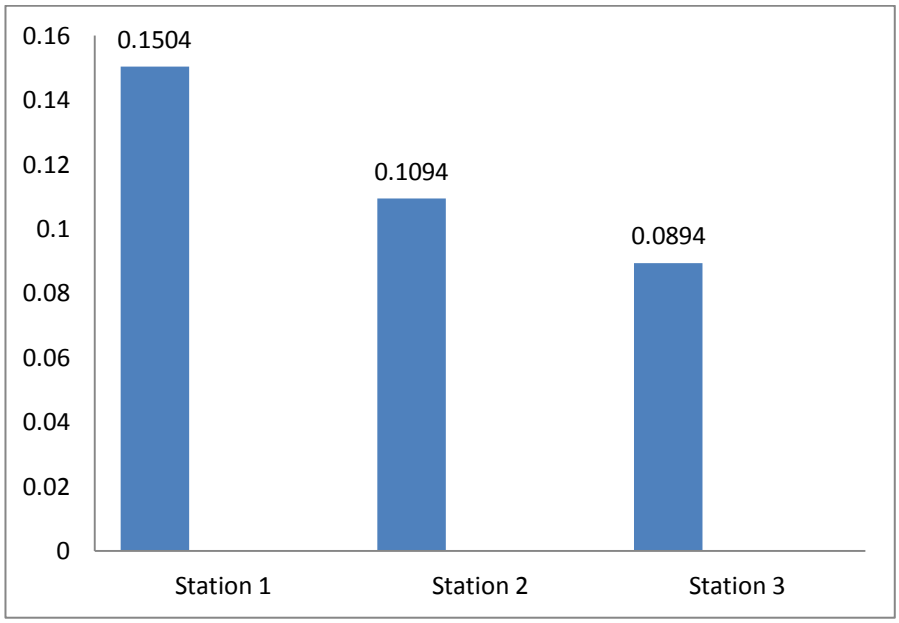

Figure 9. Average Value of Sample Water Nitrite of Each Station

The nitrite content of the sample water at the observation site which is composed of 3 stations is shown in Figure 9. In Figure 9 shows the value of nitri content of water samples from the three highest observation stations obtained at station 1 of 0.15034 ppm, following station 2 of 0.10934 ppm and the lowest at station 3 of 0.08934 ppm. Thus the nitrite content of the Tallo River waters for all stations is high because nitrite content in waters that are more than 0.06 ppm is toxic for aquatic organisms[4]

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