The Content of Lead (Pb) at The Water and Lobster (*Macrobrachium rosenbergii* L.) in Water of Alalak River on West Berangas Area

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**Abstract.** The aim of this research was to know how the content of lead in the river, the meat and the shell of lobsters at the Alalak River of Berangas Area. The kind of this research was descriptive research, which was to describe something of the condition according to nature. Instruments used consists of some tools and materials. The tools were: *Atomic Absorption Spectrophotometry*, bucket, and stoppered glasses and water and lobsters as materials. The method of this research was a descriptive method. Procedures of this research were to take off the water, and lobster samples are done with direct observation in the field which consisted of four sampling points. The water samples were entered into the bucket, and the lobster samples were entered into the stoppered glasses. Technical measurement of Pb at the water and the meat, as well as the skin of the lobsters, using the *Atomic Absorption Spectrophotometry* tool. The Pb content tests of water were done at the Health Laboratory of Banjarmasin, whereas Pb content tests of the meat and the skin of lobsters were done in the Basic Laboratory of MIPA Banjarbaru. The results showed that the Pb contents in water were average of 0.0208 mg/l. It was below the threshold of quality standard (0.3 mg/l) based on regulation of South Kalimantan Governor No. 05 in 2007. The averages of Pb contents in the meat of lobsters were 5.147 mg/Kg, and in the skin of lobsters were 15.02 mg/Kg. The Pb content of the meat and the skin of the lobsters were upper the threshold of quality standards (0.1 mg/Kg) based on decision of Dirjen POM no. 03725/VII/1989. So, people should reduce to consume the lobsters from Alalak River especially communities of Berangas and its around areas.

1. **Introduction**
Alalak River was a part of the Martapura River, which connects between Marpura River with Barito River. Alalak River has an important function for communities because the Alalak River can be used for varying necessaries of the households. The necessaries of the households were to cook rice, wash clothes, take a bath, and defecate. The other, this river could be used as a tool for water transportations for communities to look for basic necessities of life. Some activities of communities could produce organic and inorganic wastes at the water of Alalak River. Those activities are a port of boats, a traditional market, a solar sail, and a chemical fertilizer sale. They could become the source of the lead (Pb).

[1] said that the sources of natural Pb pollution occurred from volcanic explosions and forest fires. Nonnatural sources of Pb were human activities, particularly referring to the Pb emission from the industries and transportation. Pb emissions as the major sources were from ore and processing metals,
as well as leaded aviation gasoline. Furthermore, sources of Pb were the paint off houses, hard drinks which not register, and cosmetic materials [2]. In addition, [3] said that Pb concentration in sediment correlated well with Pb concentration in the suckers.

[4] stated that Pb is one of the most abundant heavy metals, and its toxic effects caused environmental and health problems. Its stability in contaminated site and complexity of mechanism in biological toxicity influenced mental retardation when existing with an abnormal concentration in body fluid. Pb concentration of sediment in the dry season was higher than that in the rainy season [5].

Soluble Pb in the water of that river could be absorbed into bodies of water organisms passed through respiration systems directly or passed through a food chain of tracks indirectly. Increasing concentration of Pb in the bodies of water organisms could occur when those organisms which were exposed Pb continuously. Moreover, accumulation of Pb could occur in the body of organisms, for example, lobsters. If the people consumed lobsters that contained Pb of high concentration in a long time, the concentration of Pb could more increase in the people's bodies. This could damage the health of people because Pb has various negative effects on the people. One of the negative effects of the Pb on the people was the Pb could give the poison effect toward various kinds of the functions of some organ bodies. One of them was to obstruct the system of hemoglobin formation and caused damage to the brain [6].

According to preliminary observation (2013) found that one of the water organisms in the water of Alalak River was lobsters. The lobsters were the food sources that be liked by communities because of their nice taste and their contents of high proteins. [7] said that environmental and ecological condition was likely to be impacted the abundance of lobster *Panulirus Homarus* at Khadiyatapanam fishing ground. So we made us be sure there were many lobsters in the background water.

Recently, the presence of Pb in the lobster bodies which lived at the water of Alalak River not be known by communities. The research about the content of Pb in the water and the body of lobsters did not ever be done. Hence, researchers were interested in giving any information to the communities about how the content of Pb in the water and the body of lobsters as preliminary data.

2. Materials and methods

This research used a descriptive survey method [8]. Sampling was done by observation, namely direct observed to the field. This research was located at the Alalak River in the West Berangas Area, Baito Kuala Regency. We prepared tools and materials. The tools which be used were Kemmerer Water Sampler, fishing tools, stoppered glasses, jerigen, Atomic Absorption Spectrophotometry, cool box, and digital camera. The materials used were water samples and lobsters. The research procedure was done to observe the study of the area. Then, We established the four sampling points, namely : 1) At the estuary of Alalak River near the quay of boat port, 2) At the Alalak River near the traditional market, 3) At the Alalak River near the sale of solar bake materials, and 4) At the Alalak River near the sale of chemical fertilizers. Location of the research in Alalak River could be seen in picture 1 and picture 2 below, that were:
We took the water samples at the four sampling points by using Kemmerer Water Sampler of 2/3 in depth from the surface river [9] and entered them into the jerigens. We set on the fishing tool at the four sampling points to take samples of lobsters (approximately 150 gram), then We put them to the sterile stoppered glasses. The processed taking of water samples and lobsters were documented by using a digital camera. Then, the water samples in the jerigen and the samples of lobsters in the stoppered glasses were entered into the cool box. We analyzed the Pb contents in the water samples and then compared them with the threshold of the quality standard according to the Governor Regulation of South Kalimantan of the number : 05 in 2007. Next, We analyzed the lobster samples which were in the cool box by using the machine of Atomic Absorption Spectrophotometry (AAS). Then, We examined the Pb contents in the meat and skin of lobsters in the laboratory. The last step was to compare the Pb concentrations with the threshold of quality standard according to Director Manager of the POM No. 03725/B/SK/VII/1989.

3. Results

3.1. Pb contents at the Alalak River

The result of Pb contents at the water in Alalak River in the West Berangas can be shown in table 1 and figure 2 below, namely:

| Sampling points at: | Pb contents at the Alalak River (mg/L) | The threshold of Pb at the River according to Governor Regulation of the number 5 in 2007 (mg/L) |
|---------------------|----------------------------------------|-------------------------------------------------------------------|
| Estuary of River near quay of boat port | 0.0111 | |
| In the River near the traditional market | 0.0136 | 0.3 |
| In the River near sale of solar bake material | 0.0179 | |
| In the River near sale of chemical fertilizer | 0.0407 | |
| **Average** | **0.0208** | |

*) Threshold of Pb according to PerGub No 5, 2007 about River
3.2. Pb contents in the meat of lobsters at the Alalak River in West Berangas area
The results of measuring Pb at the meat of lobsters can be seen in table 2 and figure 3 as follows:

| Sampling points at                          | Pb contents at the meat of lobsters (mg/Kg) | The threshold of quality standard of Pb at the lobster meat * (mg/Kg) |
|--------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|
| Estuary of River near quay of boat port    | 5.93                                       |                                                                     |
| In the River near the traditional market   | 5.30                                       | 0.1                                                                |
| In the River near sale of solar bake material | 4.63                                         |                                                                     |
| In the River near sale of chemical fertilizer | 4.73                                         |                                                                     |
| **Average**                               | **5.14**                                   |                                                                     |

*) Threshold of quality standard of Pb at the meat according to SK.Dirjen POM No. 03725/SK/VII/19

3.3. Pb contents at the shell of lobsters in the water of Alalak River
The results of measuring Pb at the skin of lobsters can be seen in table 3 and picture 4 as follow:

| Sampling points at                          | Pb content at the skin of lobsters (mg/Kg) | The threshold of quality standard of Pb at the skin of meat lobsters * |
|--------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|
| Location                        | Pb Concentration (mg/Kg) |
|--------------------------------|--------------------------|
| Estuary of River near quay of boat port | 12.40                    |
| In the River near the traditional market | 14.20                    |
| In the River near sale of solar bake material | 16.90 0.1               |
| In the River near sale of chemical fertilizer | 16.60                   |
| **Average**                   | **15.02**                |

* Threshold of quality standard of Pb at the skin of meat according to SK.Dirjen POM No. 03725/SK/VII/1989

4. Discussion

4.1. Pb contents at the water of Alalak River

Results of Pb contents at the Alalak River of the West Berangas area in Barito Kuala Regency found that all of the measuring points on the study area were still under the threshold of environmental quality standard (0.3 mg/L) which be required. The average value of measuring Pb was 0.0208 mg/L. The other word, the results of measuring Pb at the water of Alalak River at the West Berangas were still very low. These were because to be assumed that the results of community activities produced wastes which be expelled to that water of activity results contained organic and inorganic waste materials such as the metal non-Pb. This is supported by the result of [10] research that water of Alalak River contained many metals of Cr⁺ dan Zn.

The other, the low Pb concentrations at the Alalak River, were assumed that the background of Alalak River less contained some background rocks. [11] said that average result of Pb isotope in sediment had a significant positive correlation with background rock.

The other statement said that the Contribution of Pb was could from the deposition of atmosphere from the petrol or industry sources and old paints [12]. Further statement [13] said that the highest Pb concentrations are found in the biggest industrial and runoff areas.

Although Pb contents at the water of Alalak River were still rather low, the concentrations of Pb will increase because of community activities produced waste continuously. Pb in the water could be absorbed into the bodies of water organisms, such as lobsters. A statement of [14][15][16] said that heavy metals such as Pb were an element non-biodegradable and had some toxic effects toward life organisms. That element could accumulate in the muscle of animals (for example, lobsters). This was cleared by [17] that Pb was a non-essential element in waters and foods. Furthermore, they said that Pb could accumulate in the kidneys and liver. [18] added that there was greater bioaccumulation for metals (for example Pb) when salinity decreased. It was dangerous for the bodies.
4.2. Pb contents at the meat of lobsters
The results of measuring Pb at the meat of lobsters (table 2) showed the various results. The average result of measuring Pb was 5.14 mg/Kg. All measuring of Pb was above the threshold of environmental quality standard (0.1 mg/Kg), which were required. These were assumed because there was an accumulation of Pb in the meat of lobsters.

The accumulation of Pb occurred because Pb was produced by community activities at the edge of Alalak River every time, so the content of that element was always increased its concentration. That element, together with the water could be absorbed into the bodies of detritus. The detritus could be eaten by various kinds of shrimps, such as lobsters. The concentration of Pb from the detritus bodies to lobster bodies could increase because there were different trophic levels of the organisms. The trophic level of lobster was higher than trophic level of detritus. These statements suited with the statement of [19] that there were four trophic levels existed in freshwater ecosystems namely: producer (plants), primary consumer, (aquatic insects and non-predatory fish), secondary consumer (invertebrate predators), and tertiary consumer (vertebrate predators).

People consumed the lobsters, which contained a high Pb concentration. They could experience various disruption of health. [2] stated that Pb was very poison and could influence each organ and organ system in human bodies. Other statements given by [20] said that Pb was toxic to shrimp Penaeus monodon than Zn, Cd, and Cu. The high consumption of shrimps (for example lobster) could lead to chronic disorders like renal failure, bone disorders, etc. [21].

4.3. Pb contents at the shell of lobsters
According to the results (Table 3) showed that all of the Pb concentrations in the skin of lobsters were above the threshold of quality standard, which was required. These Pb concentrations were higher than Pb concentrations at the meat of lobsters. The highest concentration was found at the Alalak River near the sale of solar bake materials, whereas the lowest concentration was found at the estuary of Alalak River near the quay of boat port.

High Pb Concentration in lobster organs could have some negative effects. [22] stated that the level concentration of heavy metals (for example Pb), which be needed over the criterion could cause hard toxicity. The other statement [23] said that Pb had any hard toxic effect on various organ systems include the kidney, liver, center nervous system and reproductive system.

There was the fact that big parts of people more like ate the meat than the shell of lobsters, except the lobsters in small sizes. The shell of the small sizes of lobsters could be eaten by people. So, they could be dangerous for the health of people. [24] said that the shell of the big sizes of lobsters was usually used for standard material for making the chips.

The Pb concentrations at the meat and shell of the lobsters in the Alalak River of west Berangas Area were high (average of Pb concentration in the meat and the shell of lobsters respectively were 5.14 mg/Kg and 15.02 mg/Kg). If the lobsters were consumed by people in a long time, the concentration of the Pb could more increase. So, It was not safe for people's health.

5. Conclusion
The Pb contents at the Alalak River in the West Berangas area of Barito Kuala Regency at the sampling points 1 to 4, respectively, were: 0.0111 mg/L; 0.0136 mg/L; 0.0179 mg/L; and 0.0407 mg/L. The average value was 0.0208 mg/L. These Pb values were still under the value of the threshold of environmental quality standard (0.3 mg/L), according to Governor Regulation of South Kalimantan of the number 05 in 2007. These Pb contents were still peaceful for use by people of fulfilling their needs.

The Pb contents at the meat of the lobsters at the Alalak River in the West Berangas area of Barito Kuala at the sampling points 1 to 4 were: 5.93 mg/kg; 5.30 mg/Kg; 4.63 mg/Kg; and 4.73 mg/Kg. The average value was 5.14 mg/Kg. All Pb values were above the value of the threshold of quality standard of meat (0.1 mg/Kg), according to Dirjen POM No. 03725/SK/VII/1989. These Pb contents were not peaceful for people of using the meat of lobsters as dairy consumption.
The Pb contents at the shell of lobsters at the Alalak River in the West Berangas area of Barito Kuala Regency from sampling points 1 to 4 were: 12.40 mg/kg; 14.20 mg/kg; 16.90 mg/Kg; and 16.60 mg/Kg. The average value was 15.02 mg/Kg. These Pb values were very above the value of the threshold of quality standard of the meat (0.1 mg/Kg), according to Dirjen POM No. 03725/SK/VII/1989.

6. References

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