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The Analysis Contents of Copper (Cu), Iron (Fe), Zinc (Zn), and Tin (Pb) In the Body of shellfish at Langkak river Gampong Pulo Nagan Raya regency

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Abstract
The rivers of Langkak are located near Nagan Raya, the conditions of the circumstance in watering found out the plantation palm oil belongs to the firm and the people. Not only the creek but also all activities of the people throwing waste such as industrial waste, coal mining activities and also the shop can be causing metal-contaminated river conditions. This research aims to investigate the level of metal accumulation iron (Fe), Zinc (Zn), Copper (Cu), and Tin (Pb) on the shellfish found in the Langkak river Nagan Raya region. The methodology used is Explorative survey in three stations was conducted on October- November 2019. The accumulative analysis metal using SSA and the collected data further was conducted by used Analysis Varian (ANOVA) to indicate the accumulative differences on each station. The results showed that the accumulative level on average entirely the iron (67,239 mg/kg), zinc ((8,805mg/kg), cooper (1,790mg/kg) and tin does not accumulative. The result of ANOVA showed that the significant score (P-Value) < 0, 05. The conclusion of this research the most accumulated metal is iron with levels 67,239 mg/kg. Thus, tin does not accumulate, likewise, the result ANOVA showed that there is no significant accumulated metal in shellfish for each research station.

Keywords: Accumulation, Metal, shellfish

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I. Introduction

Nagan Raya is one of the regions in Aceh Province that have rivers that have the potential to develop their biota. One of the rivers in the Nagan Raya regency is Langkak River at Gampong Pulo. This river has a very important role in supporting the needs of the community, one of which is as a source of income for the community, such as shells found in the Langkak river which are consumed by the local community, however, the current condition of the Langkak river is of great concern because of the large amount of waste that is disposed of directly. to the river, such as workshop waste, coal waste, home industry waste, and other waste which are feared to affect the biota in the river, and based on interviews conducted with local communities, recently people who consume these shellfish experience a symptom of stomach ache which is most likely caused by the river's polluted. The waste from these wastes can affect the turbidity, color, and smell of the water in the Langkak River, which is not like a standard condition as a quality standard for water that is fit for consumption. Then coal waste containing copper Cu, Fe, and Zn will also affect the condition of the bioindicators in the Langkak River. Shellfish can be used as a bio-indicator in determining the level of environmental pollution that occurs in rivers. The presence of pollutants can affect the life of the shells which can be seen from the shape of the body, there are various abnormalities in the shells which cause death in the shells (there are no shells in heavily polluted waters). Based on the content of water pollutants, shellfish mortality is not only caused by a single factor but can be caused by several factors at once. Shellfish is one of the aquatic organisms that live permanently, tend *filter feeder* able to reproduce under high ecological pressure according to their nature, in their growth, shellfish can accumulate heavy metals in their bodies if they live in waters contaminated with heavy metals. The high metal content in shellfish is due to the activity of disposing of household waste, agricultural waste which uses a lot of pesticide fertilizers Increased activity in industry as well as the activity of dumping other domestic waste containing heavy metals into the waters so that it accumulates in shellfish bodies (Sunti et al., 2012 in Triantoro et al., 2017). The purpose of this research is to determine the metal accumulation in shellfish that live in the Langkak River, Nagan Raya Regency by using shells that have been living in the waters of the Krung Langkak River.

II. Materials And Methods

Place and Time of Research

The research was conducted in the area of Langkak River, Gampong Pulo, Nagan Raya Regency. Meanwhile, the analysis of metal accumulation was conducted in the Baristan laboratory. This research was conducted in October - November 2019

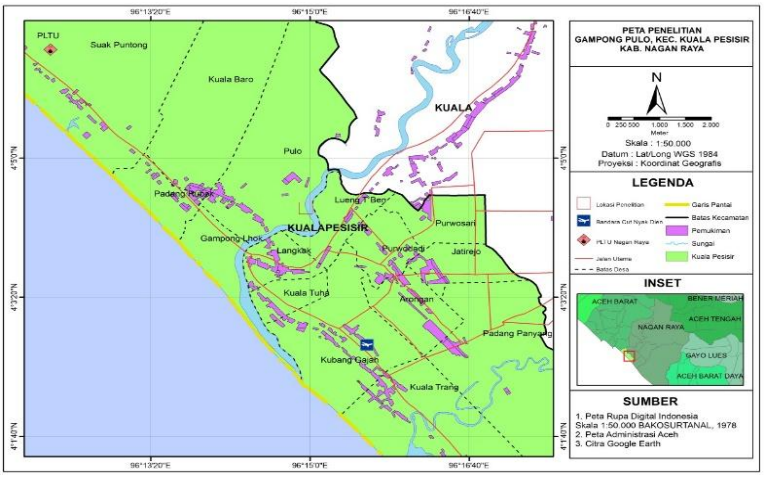

Figure 1. Research Location Map

Research Methods and Design

The method used in this research is an exploratory survey, consisting of 3 stations, and at each station, there are 3 sampling points, the determination of each sampling point is carried out by purposive sampling. Destructive sampling was carried out and was repeated 3 times. For more details, the station determination can be seen in Figure 2.

Figure-2 Sketches of Research Sites

The first station is the estuary where this location is closest and has been polluted by waste disposal. Station II is downstream which is starting to be polluted by waste disposal. Station III is the upstream farthest from the waste disposal location.

Research steps

The first stage conducted in this research is the preparation of tools and materials, next, the determination of stations and sampling points by purposive random sampling, then, sampling of shellfish is conducted at predetermined points at each station. Samples were taken as many as three shells at each point found at the station and after that data was taken of physical and chemical factors of river waters. The collected

samples are washed before drying or in the oven, after the sample is dry, afterward the sample is in the blander so that it is smooth. The refined sample was taken to Baristan for analysis of metal content using SSA. The data obtained will then be analyzed and the final stage in this research is making the final report.

Data Analysis Technique

Data analysis was performed by testing ANOVA to see the difference in heavy metal accumulation in each treatment. The data analyzed in this study is data derived from the AAS tool. The data will be displayed in Table and Graph form which determines the absorbance value and the concentration value of the copper metal content (Cu) Iron (Fe) Zinc (Zn) This regression concentration is obtained based on the regression value of the calibration curve (Supriatno and Lelifajri, 2009). The formula used to determine metal content is as follows:

$$\text{Kadar logam } {}^{mg}/_{kg} = \frac{Creg \times P \times V}{G}$$

Which:

Creg = concentration read (mg/L)
P = Reduction factor
G = Sample weight (Kg)
V = Volume of sample solution (L)

III. Results And Discussion

Accumulation metal contents of Copper (Cu) Iron (Fe) and Zinc (Zn) in the body of shellfish constitutes at Langkak River Gampong Pulo Nagan Raya

Based on the research result was conducted on mangrove shells (*Polymesoda sp)* constitutes in the waters of the Langkak river Gampong Pulo Nagan Raya Regency, it can be seen that the level of metal accumulation by mangrove shells at each station is different. This is due to various factors including environmental factors, industry, and community activities around the Langkak River Gampong Pulo, for detailed information, the differences in the accumulation metal contents for each station certainly shown in Table-1

Tabel-1. The result data accumulation metal content of Copper (Cu), Iron (Fe), Zinc (Zn), and Tin (Pb) in the body of shellfish constitutes at Langkak river Gampong Pulo Nagan Raya (mg/kg)

Test Parameters	Repetition	The result of a test			Averages
		Station 1	Station 2	Station 3	
Iron (Fe)	1	50,586	45,157	105,973	67,239
	2	50,703	45,130	105,973	
	3	50,469	45,184	105,973	
	Averages	50,586	45,157	105,973	
Zinc (Zn)	1	10,106	4,628	11,682	8,805
	2	10,140	8,054	11,660	
	3	10,073	1,201	11,704	
	Averages	10,106	4,628	11,682	
Copper (Cu)	1	0,508	1,793	3,069	1,790
	2	0,518	1,802	3,093	
	3	0,497	1,784	3,045	
	Averages	0,508	1,793	3,069	
Tin (Pb)	1	<0,0001	<0,0001	<0,0001	0,000
	2	0,000	0,000	0,000	
	3	0,000	0,000	0,000	

	Averages	0,000	0,000	0,000	

Based on the table above showed that the level of accumulation metal Iron (Fe) and Zinc (Zn) on shellfish in station 1 is 50,469 mg/kg for Iron (Fe), likewise, Zinc (Zn) is 10,106 mg/kg. This is because station 1 is in the estuary location which is the location most contaminated with waste from any community activities around the river. According to Rochyatun et al., (2006) the metal which was originally dissolved in river water is absorbed by fine particles *(suspended solid)* and by the flow of river water is brought to the estuary. River water meets tidal currents at the creek so that the fine particles settle in the creek. This causes the metal content in the estuary sediment to be higher than at station 3, therefore shellfish that live at station 1 experience a higher metal accumulation than shellfish at station 2.

Commonly the creek faced a sedimentation process, which the metal is difficult to dissolve endures a reduction process in the water column, over time it will go down to the bottom and settle in the sediment. This shows the presence of metal accumulation in high sediments (Rochyatun *et al., 2016).*

The level of metal accumulation Iron (Fe) and Zinc (Zn) on shellfish in station 2 lower than in station 1 and station 3, averages the metal accumulation iron and zinc on shellfish in station 2 are 45, 157 and 4, 628 mg/kg, It is caused by station 2 is located near the downstream part of the river which is precise nearby to the high seas so that metal levels will be conceded away by the tidal currents of seawater. According to *et al.,* (2016)

It is possible because the metal in the water undergoes a reduction process due to the influence of the tidal current pattern. Lower levels of heavy metals in seawater, not only the pollutants containing heavy metals do not harm the waters but also caused by the ability of the water itself to dilute high adequate pollutants. According to Hutagalung (1991), Metals have things that easily drag organic matter and for a long time settle on the bottom of the waters and unite with sediments. The statement as cited by Harahap (1991) states that metals have things that easily drag and settle on the bottom of the waters and blend with sediment. It indicates that, as time has gone the metal Fe and Zn will accumulate in the body of shellfish (Biota) lived and look for to eat.

The higher accumulated are the metal Iron and Zinc in station 3 with the level accumulation is 937 mg/kg also Zn is 11,682 mg/kg. Station 3 constitutes on the headwaters it is taken far from the people location of waste rubbish. The higher accumulation of ferrous metals at station 3 is caused by several ways, they are as follows: a large number of oil palm plantation activities in the upstream area causes a buildup of metal levels in the sediments the upstream, due to the shallow river conditions resulting in water circulation not running smoothly and the accumulation of sentiments in the upstream part (Male Y. T., *et al*, 2017), on the other hand,

shellfish are animals that live infauna, namely living in sediments. Shellfish looking for eating throughout *Deposit feeder,* i.e. taken feed in basic substrates (Fastawa *et al*, 2018). Sources of waste that contain a lot of metals usually come from agricultural, mining, industrial, and residential activities. (Male Y. T., *et al*, 2017).

The metal accumulation of Copper (Cu) mostly accumulated by shellfish constitutes on station 3 in the averages accumulation 3,069 mg/kg, likewise, on station 2 the metal Cu was accumulated are 1,784 mg/kg, and the lower level accumulated located at station 1 with the averages accumulation 0,508 mg/kg, the differences the metal accumulation Cu on each station caused by the different conditions around the waters.

Copper is one of the organic materials that can pollute river waters. Copper is an essential metal that is very influential on aquatic biota. Polluted biota is usually through the food chain, where the food is not completely melted. Sudarwin (2008) argues that metal (Cu)is a type of heavy metal that comes from leachate or is known as suspended and dissolved materials as a result of waste degradation, both organic and inanimate remaining.

The result from the analysis of metal accumulation Tin (Pb) on shellfish constitutes in Langkak river Gampong Pulo Nagan Raya states that there is no accumulation of the heavy metal Tin in the river or not detected. It is due to the nonappearance of a source of Tin metal in the locality of the Langkak River Gampong Pulo Nagan Raya.

Metal elements can come into the body of sea life in three ways, namely, through the food chain, gills, and diffusion through the coating surface. The higher the availability of Tin metal in the water, the higher the level of bioaccumulation and the rate of direct absorption for several metals depend on the level of availability (concentration) in their environment (Prasetya & Widowati, 2006 in Rahmawati et al., 2015)

Shellfish is one of the faunas or aquatic organisms that can accumulate metals. According to Philips (1980) in Hutagalung (1984) asserts that the types of mollusks (bivalves) and macroalgae are the most appropriate and efficient bioindicators. The process of transferring pollutants from sediment and water to water organisms or biota is known as bioaccumulation. Shellfish that have been contaminated or accumulated heavy metals will have an impact on humans who consume shellfish meat. One of the effects of consuming shellfish which accumulates heavy metals is kidney disorders, liver disorders, and even death (Filipus A. R. et al., 2018).

The different accumulation contents of Tin (Cu), Iron (Fe), and Zinc (Zn) in the body of shellfish constitutes at Langkak River Gampong Pulo Nagan Raya

The resulting research showed that the accumulation metal Copper (Cu), Iron (Fe), and Zinc (Zn) on each research station was differentiated. For more detail, you can see from the figure-3

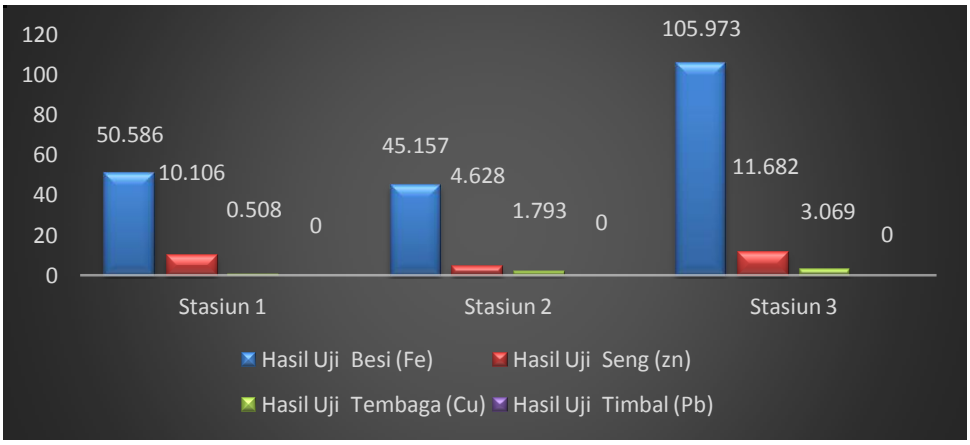

Figure-3 The Accumulation Metal for each Station (mg/kg)

The figure above shows that the metal content that accumulates the most in shellfish at each station is iron with the most accumulated levels of iron at station 3, while the content that does not accumulate in shellfish is Tin.

The test result of ANOVA was conducted using SPSS to investigate the different metal accumulation were tested on river Langkak Nagan Raya there is no difference in the level accumulation for each metal three years ago, the score Sig (P-Value) on each metal was tested < 0, 05.

Score Sig (P-Value) for metal Iron and Copper are 0,000 < 0, 05, Thus, from Sig. It concludes that the level of metal accumulation Iron and Copper on each station there is no significant score, Likewise, score Sig the test result of ANOVA to Iron metal is 0,011<0,05, Hence, there is no significant score. It's considerable that the level of metal accumulation Zn for every station there is no significant score.

IV. Conclusion

The research result is remarkable that the level averages accumulation metal in shellfish constitutes at River Langkak Nagan Raya regency for Iron (67,239mg/kg), Zinc (8,805mg/kg), Copper(1,790mg/kg), and also Tin was not accumulated The most accumulated metals are iron with the highest levels at station 3 while Zinc metal does not accumulate in the body of shellfish at river Langkak Nagan Raya, and the ANOVA statistical test results show that there is no difference in metal accumulation at each station with a P-value (Value) <0.05.

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