Analysis of Mercury Content in Bivalves in the Marine Waters around the Bone Bolango River Estuary

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Abstract

This study aims to analyze the content of mercury (Hg) in Bivalve in the marine waters around the mouth of the Bone Bolango river, Gorontalo City. The method used in this research is descriptive method. Sampling was done by purposive sampling by dividing the research location into 3 stations, namely Station 1 (mouth of the Bone Bolango River) Station 2 (Kelurahan Tanjung Kramat) Station 3 (Kelurahan Leato Utara). Measurement of mercury content (Hg) was carried out at the Fishery Product Quality Testing and Development Center (BPPMHP) Gorontalo City, Gorontalo Province using the Atomic Absorption Spectrophotometer (AAS) analysis method. The results showed that, there were 3 types of bivalves found in the research location, namely *Hiatula* sp, *Lionconcha* sp, *Tridacna* sp. The results of the analysis of the mercury content in the Bivalve samples found at the research location have not exceeded the maximum contamination threshold allowed for consumption with values for Station 1 ranging from 0.7022 - 0.8949 ppm, Station 2 ranging from 0.2593 - 0.3852 ppm and Station 3 ranging from 0.0998 - 0.8056 ppm.

Keywords: mercury; bivalve; estuary; Bone-bolango River.

I. Introduction

The river is a source of water that has long been used by humans for various activities to support life, but in line with development, many river functions are increasingly diverse along with the progress of civilization. The decline in river quality is caused by the entry of various waste products from various human activities, including mining and agricultural activities, which causes changes in the quality of river water (Yuliati, 2010).

One of the sources of pollution in the waters is artisanal gold mining (PETI), which is carried out by the community in several areas. This happens because the miners use mercury to get the gold. Mining activities in the upstream river can have a negative impact on heavy metal pollution into the sea, namely mercury in the aquatic environment, especially aquatic biota. The lower reaches of the river are widely used by the majority of the population as fishing grounds.

PETI activities are also exist in Gorontalo Province, including in Bone Bolango Regency. One of the rivers in Gorontalo Province which is indicated to be polluted by mercury is the Bone River. According to Balihristi (2013) in the Environmental Status Report of Bone Bolango Regency, the mercury content in Bone River waters is 0.008 mg / L. The mercury comes from the gold processing by the mining community who dumps waste containing mercury into the Bone Bolango River. This certainly affects the biota in rivers and in the sea which is the mouth of the river flow. The Bone Bolango River flows into the sea waters of Gorontalo City.

The areas of Gorontalo City that directly affected by Bone Bolango river water are Talumolo, Tenda, North Leato, Pohe and Tanjung Kramat. The Talumolo and Tenda areas are port areas and Pohe is the area adjacent to Pertamina, so that fishing activities are mostly in the North Leato and Tanjung Kramat areas. One of the commodities caught in

these two waters is nike fish. In addition, another commodity that is often taken by local people for consumption is shellfish (Bivalve).

Based on the results of research by Doe, et al, (2014) that the mercury content in the waters of Tanjung Kramat has passed the permissible threshold and in the waters of North Leato, only two of the eight samples taken have passed the allowable limit. The mercury content in the mouth of the Bone River at low tide has exceeded the maximum level, especially at the bottom of its waters and at high tide levels of mercury both on the surface and at the bottom of the waters are still in good condition.

Shellfish or bivalves can accumulate metal more than other aquatic animals because of their sedentary nature and filter their food (filter feeder) and are slow to avoid the effects of pollution. Therefore, Bivalve is good for monitoring metal contamination in the aquatic environment (Fauziah, 2012).

Mercury is a heavy metal that is very poisonous. Its existence in the environment must be known as early as possible to avoid things that are not desirable. For the sake of food safety in aquatic biota, a study was conducted on the analysis of heavy metal content in Bivalves around the Bone Bolango River Estuary waters.

II Research Methods

The sampling location for Bivalve was in the marine area around the mouth of the Bone Bolango River. Map of sampling locations in the marine area around the mouth of the Bone Bolango river, Gorontalo City.

Station 1 is located in Kelurahan Talumolo and Tenda and is further divided into 2 substations. Station 2 is located in Tanjung Kramat Village with 4 substations. While Station 3 is located in North Leato Village with the number of substations 4. Samples obtained from the research location are directly below to the laboratory and will be analyzed for mercury content which will be carried out at the Quality Control and Testing Center Fishery Products (BPPMHP) Gorontalo City, Gorontalo Province.

The tools used during the study are: tools for bivalve collection like glove, plastic bag, knife, cool box and labelling; diving apparatus, camera; boat and GPS gadget.

This research is a descriptive study. The sampling method is purposive sampling. Sugiyono (2007) in Wahyudi (2014) explains that the purposive sampling method is a sampling technique carried out deliberately based on certain considerations.

Descriptions of results are presented in tables and graphs and an analysis is carried out based on the literature and the results of previous studies. The parameter observed was the concentration of mercury (Hg) levels in Bivalve in the marine waters around the mouth of the Bone Bolango River, Gorontalo City. According to Sugiono (2008), descriptive research is research conducted to determine the value of the independent variable, either one or more (independent) variables without making comparisons, or connecting with other variables.

III Results and Discussion

3.1 Research site

Bone River is one of the large rivers flowing from the East to the West of Bone Bolango Regency, Gorontalo Province. Administratively, the Bone River has a length of 119.13 Km² which crosses the Bone Bolango Regency area and its downstream area is in Gorontalo City and empties into the waters of Tomini Gulf. This river is a sub-permanent type with a linear shape and is included in the Bolango River watershed area (Balihristi, 2013). The map of the sampling location is presented in Figure 1.

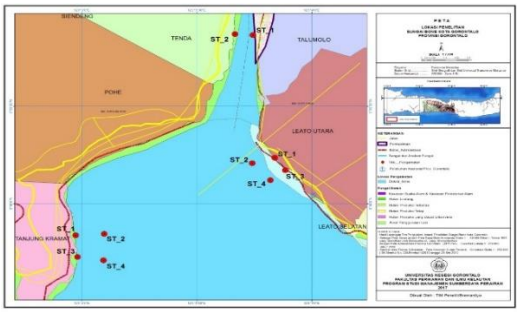

Figure 1. Map of the research site.

3.2 Bivalves found in research site

The bivalves that found at the study site were tested for mercury content. From the results of sampling at the research location, several types of bivalves were obtained at each observation station. The types of bivalves are presented in Table 1.

Table 1. Kinds of Bivalve found in research site

No	Kinds	Sta. 1	Sta. 2	Sta. 3
1.	*Hiatula* sp	✓	-	-
2.	*Lionconcha* sp	-	✓	✓
3.	*Tridacna* sp	-	-	✓

3.3 Mercury content analysis

Testing of mercury content in Bivalve samples was carried out at the Gorontalo City Fisheries Product Development and Testing Center (BPPMHP) using an Atomic Absorption Spectrophotometer (AAS) tool. The results of the analysis based on observation stations are presented in Table 2.

Table 2. Result of mercury content test on the Bivalve samples

Stations	Sampling code	Pick locatior	Hg content (ppm)	Max. threshold (SNI.7387.2009)	Criteria (SNI.7387:2009)
Sta. 1	S1/Ss1	Left bank	0.7022	1.0	Below threshold
	S1/Ss2	Right bank	0.8949	1.0	
Sta. 2	S2/Ss1	Near coast	0.2593	1.0	Below threshold
	S2/Ss2	Near reef	0.3280	1.0	
	S2/Ss3	Near coast	0.3852	1.0	
	S2/Ss4	Near reef	0.3817	1.0	
Sta. 3	S3/Ss1	Near coast	0.1410	1.0	Below threshold
	S3/Ss2	Near reef	0.4220	1.0	
	S3/Ss3	Near coast	0.0998	1.0	
	S3/Ss4	Near reef	0.8056	1.0	

3.4 Mercury content analysis

Station 1 has a mercury content in the SI / Ss1 sample of 0.7022 ppm, and at SI / Ss2 of 0.8949 ppm. The two samples obtained are high compared to samples at other stations. This is due to several factors, including that in the upper reaches of the river there are mining activities and in the lower reaches of the river the sampling locations are in the middle of a dense settlement, so that the level of mercury pollution in the waters is high (Balihristi, 2013). In addition, the mouth of the Bone Bolango River is also a meeting point between several rivers flowing from the direction of Bone Bolango Regency, namely the Bone River, Bolango River and Tamalate River. From the samples obtained at S1 / Ss1 Stations (Talumolo Village) and S1 / Ss2 (Tenda Kelurahan), it shows that the mercury content in both locations is still below the permissible threshold. As

SNI 7387 (2009) states that the limit of contamination of heavy metals in the body of Bivalves which is safe for consumption is 1.0 ppm.

Furthermore, in the Station 2 sample, the lowest mercury content was found in Substation 1, the mercury concentration was 0.2593 ppm, while the highest mercury content was found at Subststation 3, the mercury concentration was 0.3852 ppm. The results of testing the mercury content of the sample Station 2 showed that the mercury content in each sample was still low and the detected mercury content had not exceeded the maximum allowable contamination threshold.

The water condition of Station 3 is the sea area of Tomini Bay with sandy coral substrate conditions. The results showed that in the sample Station 3, Substation 3 had the lowest concentration of mercury, namely 0.0998 ppm, while the highest mercury content was found in Substation 4, the concentration of mercury was 0.8056 ppm. The results of testing the mercury content of the sample Station 3 showed that the mercury content in each sample was still low and the detected mercury content had not exceeded the maximum allowable contamination threshold. In the substation 4 sample, the mercury content was higher than the sample at Substations 1,2 and 3 because the sample size obtained was quite large. This is related to the size of Bivalves in accumulating mercury under different environmental conditions.

The results showed that the size of the small shellfish (<2.5 cm) had a lower mercury concentration value than the medium and large shells. Medium-sized clams (2.3 cm-3 cm) had a lower mercury concentration than large clams (> 3 cm). It means that the bigger the shell, the higher the mercury (Hg) concentration.

IV Conclusion and Suggestion

The types of Bivavia found in the waters around the mouth of the Bone Bolango River are Hiatula sp, Lionconcha sp, Tridacna sp.

The mercury content in Bivalve taken from the marine area around the mouth of the Bone Bolango River has not exceeded the maximum permissible level of contamination, so it can be said that the sea waters around Gorontalo City have not been polluted by mercury.

There needs to be periodic monitoring so that the condition of heavy metal mercury in the Bone River can be identified on an ongoing basis and there is a need for follow-up in overcoming river water pollution.

It is hoped that the community, especially those living around the riverbanks, will be able to prevent damage to the river ecosystem by not throwing garbage or household waste or mining waste into the river body.

References

Balihristi, 2013. Status lingkungan hidup daerah Provinsi gorontalo. Badan Lingkungan Hidup Riset dan Teknologi Informasi (Balihristi) Provinsi Gorontalo.

Doe, S, F, D, A. Femy, M, S. Citra, P. 2014. Kandungan Merkuri Di Wilayah Penangkapan Ikan Nike Di Kota Gorontalo. *Jurnal* Perikanan Dan Dan Ilmu Kelautan ISSN 2303-2200 Vol. 2(4):146-151.

Fauziah, A, R. Boedi, S, R. Yudi, C. 2012. Korelasi Ukuran Kerang Darah (*Anadara granosa*) dengan Konsentrasi Logam Berat Merkuri (Hg) Di Muara Sungai Ketingan, Sidoharjo, Jawa Timur. *Jurnal*. Of Marine And Coastal Science Vol. 1(1):33-44.

Sugiyono. 2008. *"*Metode Penelitian Bisnis*"*. Alfabeta. Bandung

Wahyudi, D, P. 2014. Analisis Persepsi Keberlanjuatan Perikanan Tangkap Skala Kecil Di Cisolok, Sukabumi, Jawa Barat. *Skripsi.* Sekolah Pasca Sarjana, Institut Pertanian Bogor.

Yuliati. 2010. Akumulasi Logam Pb Di Perairan Sungai Sail Dengan Menggunakan Bioakumulator Enceng Gondok. *Jurnal* Perikanan Dan Kelautan. Vol. 15(1):39-49.