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CONTENT OF HEAVY METALS LEAD (PB) AND CADMIUM (CD) IN SEDIMENTS IN TANJUNG OYSTER WATERS, SELATAN KONAWE

La Ode Alirman Afu [1*], Absalom Luturmas [2]
[1] Faculty of Fisheries and Marine Sciences, Halu Oleo University, Kendari
[2] Faculty of Fisheries and Marine Sciences, Patimura University, Ambon

*Correspondence:
alirman@uho.ac.ac.id

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ABSTRACT

The waters of Tanjung Tiram Village are one of the places for community coastal area activities, such as ship traffic, ship repair, and the construction of steam power plants that have the potential to cause pollution to the coastal environment so that it can reduce the quality of the environment in the area. This study aims to determine the content of heavy metals lead (Pb) and cadmium (Cd) in the sediment. Sampling was carried out in March 2021 at 4 (four) stations selected by purposive sampling. The samples were analyzed for heavy metal content of Pb and Cd using AAS (*Atomic Absorption Spectrophotometry*). The results of the analysis of the Pb content in the sediment ranged from 8.7416 to 8.4460 mg/L and the Cd content ranged from 0.3760 to 0.6338 mg/L, exceeding the maximum quality standard set by ANZECC/ARMCANZ.

INTRODUCTION

The waters of Tanjung Tiram Village are one of the waters located in Tanjung Tiram Village, North Moramo District, South Konawe Regency. These waters are widely used by the people of Tanjung Tiram Village and outside Tanjung Tiram Village, ranging from capture fisheries activities, fisheries cultivation, shipping, research, and tourism. In addition, in the last few years in the Tanjung Tiram coastal area, a Steam Power Plant (PLTU) with a capacity of 2 X 50 MW has been built.

The rapid population growth and industrial growth have resulted in an increase in the amount of waste generated. Heavy metals are hazardous pollutants because they are toxic if present in large quantities. The presence of heavy metals in waters can come from various sources, including mining, household activities, agricultural waste and industrial waste.

Heavy metals that enter the aquatic environment will have an impact on decreasing the quality of the aquatic environment (Zhang et al., 2009). Heavy metals are one of the factors in determining the status of water quality (Yayu et al., 2015). Heavy metals that have exceeded the threshold will cause losses, in addition to having an impact on fisheries in polluted waters, the health of the surrounding community will also be disrupted (Kusuma et al., 2015)

Heavy metals have properties that are difficult to degrade, easily dissolve in water, sediment, and can accumulate in the body of aquatic biota (Sarjono, 2009). Over time, heavy metals in the waters will fall and settle to the bottom of the water through a deposition process and accumulate, this causes heavy metals to become larger than the surface of the water (Aprilia, 2020). Sediment is a habitat for benthic biota and is one of the trap areas for

heavy metals (Umar et al., 2001; Munandar and Eurika, 2016). Heavy metals that settle to the bottom of the waters form complex compounds with organic and inorganic materials by adsorption and combination (Svavarsson et al., 2011).

The results of the above study mostly show that waters close to community activities such as industrial activities or ports have been polluted by heavy metals. The purpose of this study was to determine the concentration of heavy metals Cd and Pb in sediments in the waters of Tanjung Tiram, South Konawe.

METHODOLOGY

Sampling Location

This research was conducted in March 2021. Water and sediment samples were taken from the waters of Tanjung Tiram, South Konawe. This research was conducted at four stations selected by purposive sampling, namely the sampling technique by determining certain criteria (Sugiyono, 2008). This method was chosen in order to represent the condition of Tanjung Tiram waters. Each station has different characteristics, namely St. 1 as a residential area and mangrove forest, St. 2 facing the high seas, St. 3 in front of the fishing boat dock, and St. 4 ship repair locations and PLTU areas. The sampling locations are presented in Figure 1.

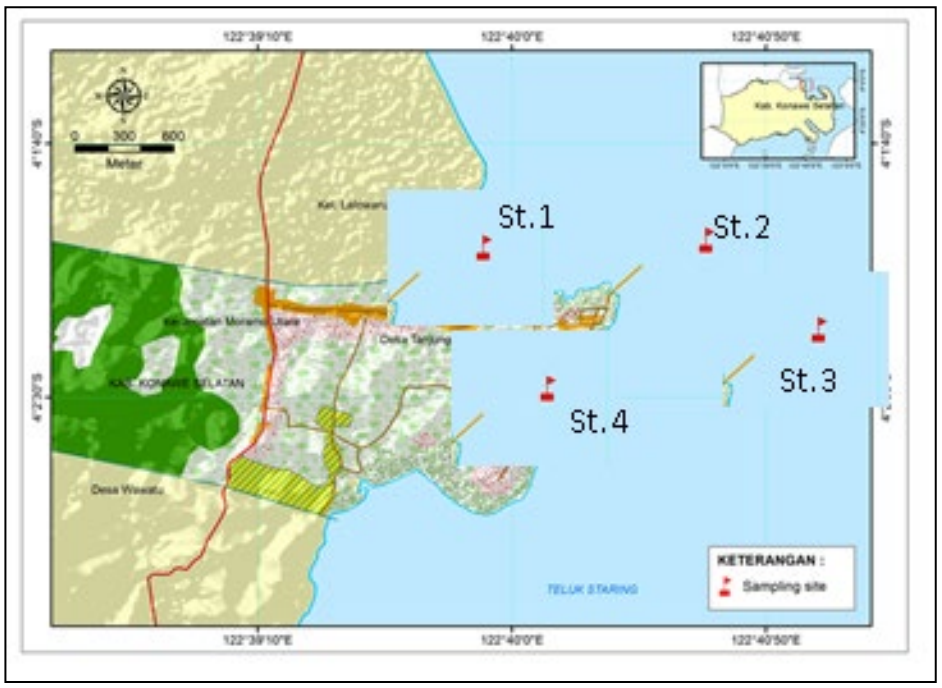

Figure 1. Map of sampling locations

Sampling technique

The water quality parameters measured were salinity, temperature, DO, and pH in situ and heavy metal parameters were carried out ex situ. The water and sediment samples were brought to the Environmental Laboratory of the Southeast Sulawesi Province Environmental Service for Pb and Cd analysis using the AAS (*Atomic Absorption Spectrophotometry*) method. The results of the analysis of Pb and Cd in sediments refer to the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) which are stated in the Water Quality Guidelines (2000) which state that the quality standards contain Pb is 50 mg/kg and Cd in

sediment is 1.5 mg/kg.

RESULT

Water Quality of Tanjung Tiram

The water quality of a water area can affect the life of the biota that live in it. Water quality has a role in the toxicity of a heavy metal pollutant in aquatic biota. The water quality parameters measured included temperature, pH, DO and salinity. The parameters of the four observation stations can be seen in Table 1.

Table 1. Results of Water Quality Measurements in the waters of Tanjung Tiram

Parameter	Station			
	1	2	3	4
Temperature (^{0}C)	30.5	30.2	31.5	32.1
Salinity (‰)	30.6	30.2	34.1	30.8
DO (mg/L)	6.3	6.9	8.1	6.7
pH	7.01	7.11	7.22	7.13

Heavy Metal Content of Pb and Cd in Sediment

The presence of heavy metals, both from natural sources and from anthropogenic sources in sediments in aquatic systems is one of the most important environmental problems. Heavy metals in the waters can be adsorbed into the sediments quickly, resulting in pollution that has an impact on the ecosystem in estuarine waters (Liu et al., 2011).

The heavy metal content in sediment is always higher than in water. This is related to the nature of heavy metals which tend to form complexes, then settle and be bound in sediments. (Chauba et al., 2007). Saeed & Shaker (2008), also mentions that the accumulation of heavy metals in sediments is higher than in water, because sediment acts as the last reservoir for all contaminants and organic matter that will descend from the ecosystem above it.

Table 2. Results of analysis of Pb and Cd content in sediments in Tanjung Tiram waters

Station	Pb level (mg/L)	Cd level (mg/L)
St. 1	8,4660	0.3760
St. 2	8,231	0.5432
St. 3	7,894	0.5957
St.4	8.7416	0.6338

DISCUSSION

The average sea surface temperature in the waters of Tanjung Tiram is in the range of 30.02 ^{0}C - 32.1 ^{0}C. An increase in temperature will affect the increase in metals in marine biota. This is in accordance with Haryono et al (2017) which states that if the waters are polluted by heavy metals, the toxicity of heavy metals to aquatic biota will increase as the temperature increases. Salinity in St. 1, 2 and 4 are below the quality standard stipulated by the Decree of the Minister of the Environment No. 51 of 2004. This is in accordance with Effendi (2003) which states that in coastal waters, the salinity value is strongly influenced by

fresh water input. Salinity values in waters that are relatively low will affect the toxicity of heavy metals. Dissolved oxygen measurement results have a range of 6.3 – 8.1 mg/l. The difference in DO value at each station is due to the stirring of water caused by waves and ship activity. This is in accordance with Effendi (2003) which states that dissolved oxygen levels fluctuate daily (diurnal) and seasonally. The pH value of each station ranged from 7.01 to 7.22. When compared with the Decree of the Minister of the Environment Number 51 of 2004 concerning Water Quality Standards for Marine Biota, the pH in Tanjung Tiram waters is in accordance with the established quality standard of 7-8.5. This is also in accordance with Novianto et al (2012) which states that water with a pH between 6.7-8.6 is very supportive of the life and development of aquatic organisms normally. The difference in the value of heavy metal content in the sediment at each station is influenced by the different pH values at each station. The higher the pH, the more metal will settle to the bottom of the water. This is in accordance with Haryono et al (2017) which states that the high metal content can be seen from the relatively alkaline pH value (pH = 7.9 - 8.2), at that location the metal will be difficult to dissolve and settle to the bottom. waters.

Pb levels in sediments in Tanjung Tiram waters ranged from 8.2416–8.7460 mg/l. Station 3 has the highest Pb content. This high concentration can come from shipping activities, and oil spills. The quality standard guidelines from ANZECC/ARMCANZ (2000) state that the highest limit of Pb content in sediments is 50 mg/l, so that the results of Pb content in Tanjung Tiram waters are still safe for use. biota life. According to Faizal & Yuanita (2017), the life of biota is also influenced by sediment, namely sediment transport and dissolved sediment (TSS) which is the place for biota to live, so that sediment contamination will have an impact on the biota that live in it.

The Cd content in sediments in Tanjung Tiram waters ranges from 0.376–0.6338 mg/L. The highest level was at St 4 and the lowest was at Station 3. The four stations showed that the Cd content in the sediment had not exceeded the quality standard set by ANZECC/ARMCANZ (2000), namely 1.5 mg/L. The high Cd content at Station 4 is caused by the presence of a steam power plant and a ship repair place. The lowest Cd levels are in Station 1 which is a residential area and mangrove forest so that the Cd content will be lower because of the mangrove power which is able to cope with toxins and weaken the toxic effects of heavy metals (Heriyanto, 2011).

CONCLUSION

The content of heavy metals Pb and Cd in sediments in Tanjung Tiram waters from four observation stations was at the safe level determined by ANZECC/ARMCANZ (2000).

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