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Analysis of Lead (Pb) Metal Levels of Kepah Clam (*Meretrix* sp.) and its Correlation to Sediment Pb Levels on the Coastal District of Paiton

Analisis Kadar Logam Timbal (Pb) pada Kerang Kepah (Meretrix sp.*) dan Korelasinya Terhadap Kadar Pb Sedimen di Pesisir Kecamatan Paiton*

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Abstract. The coast in Paiton District has potentially contaminated with the heavy metal lead (Pb) due to its location near PLTU areas, fishing ports, tourism and residential areas. *Kepah* clam (*Meretrix* sp.) lives along the Paiton coast is susceptible to exposure Pb metal, therefore kepah used as a bioindicator of heavy metal pollution in waters. The aim of this research to analyze Pb levels of kepah and sediments on Paiton coast and also the correlation between kepah's Pb levels and sediment's Pb levels. Samples were obtained from three beaches, including Duta, Pondok Kelor, and TPI. Sea-water quality measured using physic-chemical parameters. Analysis Pb levels in kepah clams and sediments was performed using atomic absorption spectrophotometry method. Data was tested using Pearson correlation to determine correlation between kepah Pb and sediment Pb levels. Results showed that kepah Pb levels on the three beaches were 1.4 ± 0.1 ppm; 1.5 ± 0.2 ppm; and 1.5 ± 0.1 ppm, while sediment Pb levels on the three beaches were 2.1 ± 0.1 ppm; 2.3 ± 0.3 ppm; and 2.3 ± 0.1 ppm. Level of Pb in sediment and kepah clams were correlated positively, means the higher Pb content in the sediment, the higher Pb absorbed by the clams too.
Keywords: bioindicators; pearson correlation; pollution; beach

Abstrak. *Pesisir di Kecamatan Paiton berpotensi tercemar logam berat Pb karena lokasinya yang dekat kawasan PLTU, pelabuhan nelayan, pariwisata, dan pemukiman. Kerang kepah (Meretrix* sp.*) yang hidup di Pesisir Paiton rentan terpapar logam Pb, oleh karena itu kerang kepah dapat dijadikan bioindikator pencemaran logam berat pada perairan. Tujuan penelitian ini adalah menganalisis kadar Pb kerang kepah dan sedimen di pesisir Paiton serta hubungan kadar Pb pada kerang kepah dengan kadar Pb pada sedimen. Sampel diperoleh dari tiga Pantai, yaitu Pantai Duta, Pondok Kelor, dan TPI. Pengukuran kualitas air laut menggunakan parameter fisika-kimia. Analisis kadar Pb pada kerang kepah dan sedimen menggunakan metode Sprektrofotometri Serapan Atom. Data diuji korelasi pearson untuk mengetahui korelasi kadar Pb pada kerang kepah dengan kadar Pb sedimen. Hasil penelitian menunjukkan kadar Pb pada kerang kepah di ketiga Pantai berturut-turut 1,4 ± 0,1 ppm; 1,5 ± 0,2 ppm; dan 1,5 ± 0,1 ppm. Kadar Pb sedimen di ketiga Pantai berturut-turut 2,1 ± 0,1 ppm; 2,3 ± 0,3 ppm; dan 2,3 ± 0,1 ppm. Hubungan antara kadar Pb sedimen dengan Pb kerang kepah berkorelasi positif, artinya semakin tinggi kadar Pb di sedimen, maka semakin tinggi kadar Pb yang diserap oleh kerang kepah.*
Kata kunci: *bioindikator; korelasi pearson; pencemaran; pantai*

INTRODUCTION

Probolinggo Regency is one of the regencies in East Java Province which has 24 sub-districts, but only 7 sub-districts are included in the coastal area which is divided into 39 coastal villages with a total coastline length of 72,110 km (Sukandar *et al.,* 2016). Paiton District has a coastal area with a total coastline of 18.75 km spread over 8 villages. Due to its location in a coastal area, the availability of raw materials including fishery products in Paiton District is quite abundant, namely 7,176.04 tons (BPS, 2018). The large number of human activities makes the coast in Paiton District vulnerable to pollution because this coast is located close to the largest industrial power plant in East Java, agricultural areas, fishing ports, fish auction sites (TPI), and residential areas which allow waste to be disposed of into channels that empty into beach. One of the pollutants that is often found is heavy metals, one of which is lead (Pb).

In waters, lead metal (Pb) is an element that cannot undergo degradation or decomposition, so it can settle in sediment. Lead metal (Pb) has the ability to remain in waters for a long period of

time before the absorption process in waters occurs due to physical-chemical reactions, ending up deposition. Therefore, lead metal (Pb) is referred to as a type of heavy metal which has the potential to be a contaminant (Sarong *et al.,* 2015). The presence of free organic material coated on the surface of the sediment causes the deposition of heavy metals in the sediment in the waters (Maslukah, 2013). Based on research by El Nemr *et al.,* (2016) explained that heavy metals that enter water bodies will settle, this is what causes the concentration of heavy metals that accumulate sediment to be higher than the concentration of heavy metals that accumulate in these waters.

Lead metal (Pb) can accumulate in the human body by absorption through aquatic organisms, one of which is shellfish. Shellfish are organisms that have the ability to filter feeders or the ability to filter food from material suspensions in waters and sediments, this is what causes the shellfish's body to absorb heavy metals (Lee *et al.,* 2022). If humans consume shellfish contaminated with heavy metals, it can damage the biochemical system and can pose a serious threat to health in the human body (Tanhan *et al.,* 2022). Lead metal (Pb) will have a negative impact if it moves in the human body, such as hampered hemoglobin synthesis, damage to the nervous system, and even disability in babies (Pratiwi, 2020). This shows that lead metal has a negative effect on shellfish if consumed continuously by humans. Therefore, the bioaccumulative nature of shellfish means that shellfish must be consumed with caution. The maximum standard limit for lead (Pb) metal contamination that accumulates in shellfish refers to SNI (Indonesian National Standard) 7387:2009, namely 1.5 mg/L. If the shellfish is declared to be below the maximum standard limit, then the shellfish is classified as safe for human consumption.

Research on the metal lead (Pb) which accumulates in shells and sediments on the coast of Probolinggo Regency and its surroundings has not been widely reported. Yona *et al.,* (2016) reported the results of their research that there were levels of lead (Pb) metal that accumulated in the shellfish species *Hiatula chinensis* with an average of 0.427 ppm found on the Pasir Panjang Coast, Lekok District, Pasuruan Regency. Considering that lead metal (Pb) is very dangerous and has the potential to be toxic to humans and it is quite rare to carry out further research related to the analysis of heavy metals, especially lead (Pb) in shells and sediments in the Coastal District of Paiton, research on the analysis of lead metal (Pb) will be carried out contained in shellfish that are easily found in this location, namely kepah clam (*Meretrix* sp.) and sediments on the coast of Paiton District. This research was carried out to analyze levels of lead (Pb) and the correlation between kepah clams (*Meretrix* sp.) and sediments on the coast of Paiton District.

MATERIALS AND METHODS

This study was carried out observationally on the coast of Paiton District, Probolinggo Regency, East Java in November-December 2023. The sampling location was carried out in the afternoon from 14.30 WIB to 16.00 WIB when sea water was receding by 50 m in the intertidal area. Sampling locations on beaches were determined based on field surveys that had been carried out and using a purposive sampling method with considerations based on the characteristics and sources of pollution on each beach. Sampling of kepah clam (*Meretrix* sp.) and sediment, as well as measurements of physical-chemical parameters were carried out on 3 beaches, each beach consisting of 3 stations, namely at Duta Beach, Pondok Kelor Beach, and the Fish Auction Place (TPI) in Paiton District , Probolinggo Regency, East Java (Figure 1). Analysis of lead (Pb) metal levels in kepah clam and sediment samples was carried out at the Nutrition Laboratory, Department of Health Nutrition, Faculty of Public Health (FKM), Airlangga University.

Samples of kepah clam and sediment were taken at 3 locations on Paiton District Beach at three stations with five plots each at each station (Figure 2). A sufficient number of kepah clams were taken using a shovel or by hand when the sea water was at low tide, then samples of kepah clams from the five plots were homogenized into one, then 250 grams were taken for one sample at each station and put into sample bags and labeled. Meanwhile, 250 grams of sediment samples were taken using a shovel, then sediment samples from the five plots were homogenized into one sample at each station and put into sample bags and labeled.

To determine the quality of the coastal waters of Paiton District, physical-chemical parameters were measured, including DO (Dissolved Oxygen), BOD (Biological Oxygen Demand), and sediment texture. DO (dissolved oxygen) measurements are carried out with a calibrated DO meter, then the probe is dipped in water until the DO value appears on the screen. BOD measurements were carried out by incubating seawater samples in dark Winkler bottles at a constant temperature of 20^{o}C for 5 days, then analyzing the DO concentration on day 5 (DO_5) and the BOD value was obtained from the

DO_0-DO_5 formula. Sediment texture analysis was carried out using the Soil Jar Test (FAO) method with a glass bottle filled with sediment up to half the height of the bottle, then filled with water until it was full and closed, the water and sediment were homogenized for several minutes and left for 24 hours until the sediment sample formed a sediment consisting of sand, mud and clay. The sediment formed is measured using a ruler and calculated in the formula (%) sediment texture, then adjusted to the sediment texture triangle (Aini *et al.*, 2016).

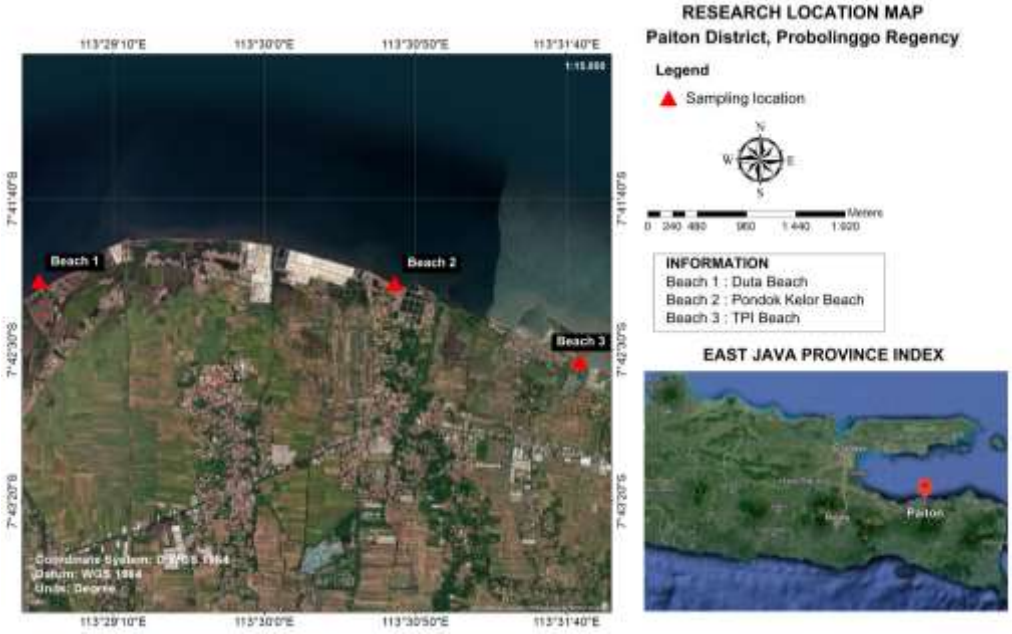

Figure 1. Map of sampling locations for kepah clam (*Meretrix* sp.) and sediment on the coast of Paiton District

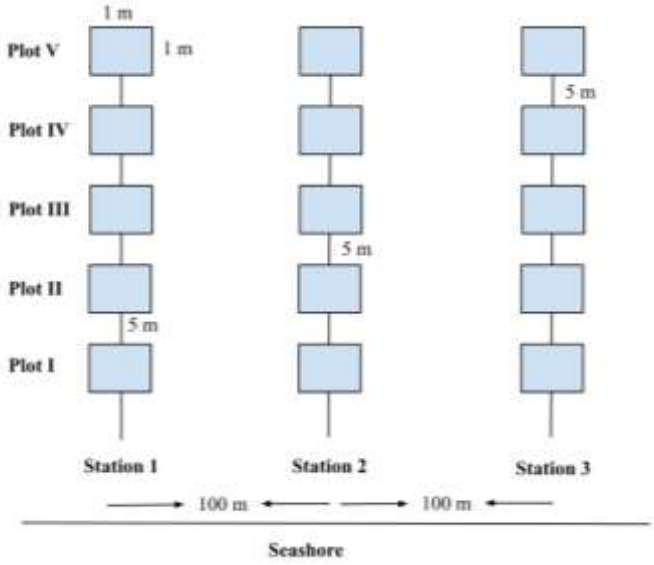

Figure 2. Sampling station plan

Analysis of lead (Pb) metal levels in the clam and sediment samples was carried out using dry digestion. The shellfish meat and sediment were each dried using an oven at 800°C until dry and ground using a mortar and pestle until they became powder. Then 1 gram of sample was weighed, each mixed in an Erlenmeyer flask with 50 ml of distilled water. After the dry digestion process, each dissolved shellfish and sediment sample was analyzed for its Pb metal content using an Atomic Absorption Spectrophotometer (AAS).

Data on lead (Pb) metal levels in kepah clam and sediments were analyzed quantitatively descriptively and compared with the quality standards SNI 7387:2009 and ANZECC/ARMCANZ:2000, then a Pearson correlation statistical test was carried out in IBM SPSS

statistics 26 software to comparing the relationship between levels of lead (Pb) in kepah clam (*Meretrix* sp.) and sediments. The results of the analysis of physical-chemical parameters are compared with the Sea Water Quality Standards for Marine Biota which refer to PP No. 22 of 2021.

RESULTS

Based on the research that has been carried out, in table 1 the levels of lead (Pb) in kepah clam (*Meretrix* sp.) are obtained with varying results. Pondok Kelor Beach and TPI Beach have the highest levels of lead (Pb) in kepah clam with an average of 1.5 ± 0.1 ppm and 1.5 ± 0.1 ppm respectively for each beach, while Duta has the lowest levels of lead (Pb) in kepah clam with an average of 1.4 ± 0.1 ppm. From the results of the three beaches, the levels of lead (Pb) in kepah clam at Pondok Kelor Beach and TPI Beach are right on the threshold of the maximum quality standard determined by SNI (Indonesian National Standard) 7387:2009, namely 1.5 ppm.

Table 1. Levels of lead (Pb) in kepah clam (*Meretrix* sp.) in the Coastal District of Paiton

Beach Location	Station	Levels of Pb (ppm)	Mean Levels of Pb ± SD (ppm)	Quality Standards (ppm)
Duta	1	1.304	1.434 ± 0.143 ≈ 1.4 ± 0.1	1.5
	2	1.411		
	3	1.588		
Pondok Kelor	1	1.282	1.447 ± 0.221 ≈ 1.5 ± 0.2	
	2	1.361		
	3	1.698		
TPI	1	1.620	1.466 ± 0.143 ≈ 1.5 ± 0.1	
	2	1.339		
	3	1.438		

Based on the research that has been carried out, in table 1 the levels of lead (Pb) in kepah clam are obtained with varying results. Pondok Kelor Beach and TPI Beach have the highest levels of lead (Pb) in kepah clam with an average of 1.5 **±** 0.1 ppm and 1.5 **±** 0.1 ppm respectively for each beach, while Duta has the lowest levels of lead (Pb) in kepah clam with an average of 1.4 **±** 0.1 ppm. From the results of the three beaches, the levels of lead (Pb) in kepah clam at Pondok Kelor Beach and TPI Beach are right on the threshold of the maximum quality standard determined by SNI (Indonesian National Standard) 7387:2009, namely 1.5 ppm.

Table 2. Levels of lead (Pb) in sediments on the coast of Paiton District

Beach Location	Station	Levels of Pb (ppm)	Mean Levels of Pb ± SD (ppm)	Quality Standards (ppm)
Duta	1	1.956	2.111 ± 0.141 ≈ 2.1 ± 0.1	50
	2	2.145		
	3	2.231		
Pondok Kelor	1	1.989	2.273 ± 0.279 ≈ 2.3 ± 0.3	
	2	2.284		
	3	2.546		
TPI	1	2.209	2.275 ± 0.112 ≈ 2.3 ± 0.1	
	2	2.212		
	3	2.404		

Based on the results of the Pearson correlation statistical test of lead metal content (Pb) in kepah clam (*Meretrix* sp.) with lead metal content (Pb) in sediments in the Coastal District of Paiton which is presented in table 3, a significance level value of 0.039 was obtained which is smaller than α = 0.05 with a positive correlation coefficient of 0.692, so it was concluded that there was a significant relationship indicating a strong correlation between the Pb metal content of the kepah clam and the Pb metal content in the sediment. A positive correlation coefficient means that the higher the Pb metal content of the kepah clam, the higher the Pb metal content in the sediment. This is supported by the graph in Figure 3 which appears to be in the same direction between the trend of the shellfish's Pb

metal content and the trend of the metal content. Sedimentary Pb. If the trend of Pb metal content in kepah clam increases, then the trend of sediment Pb metal content also increases, and vice versa.

Table 3. Pearson correlation statistical test for Pb metal content in kepah clam and sediment

Beach Location	Station	Pb Metal Levels in Kepah Clam (ppm)	Pb Metal Levels in Sediment (ppm)	Pearson Correlation Index
Duta	1	1.304	1.956	0.692
	2	1.411	2.145	
	3	1.588	2.231	
Pondok Kelor	1	1.282	1.989	
	2	1.361	2.284	
	3	1.698	2.546	
TPI	1	1.620	2.209	
	2	1.339	2.212	
	3	1.438	2.404	

Note: D1: Station 1 Duta Beach; D2 : Station 2 Duta Beach; D3: Station 3 Duta Beach; P1: Station 1 Pondok Kelor Beach; P2: Station 2 Pondok Kelor Beach; P3: Station 3 Pondok Kelor Beach; T1: Station 1 TPI Paiton Beach; T2: Station 2 TPI Paiton Beach; T3: Station 3 TPI Paiton Beach

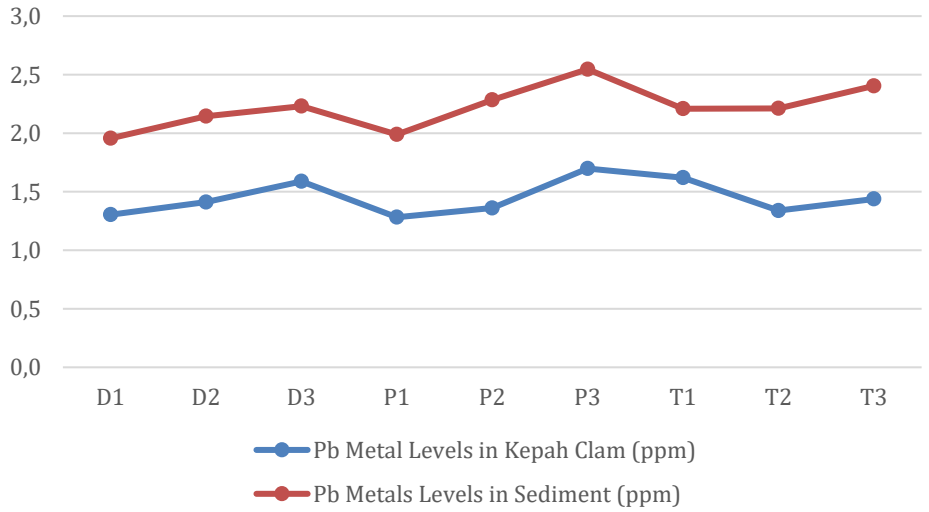

Figure 3. Correlation graph between Pb metal content in kepah clam and sediment Pb metal content; D1: Station 1 Duta Beach; D2 : Station 2 Duta Beach; D3: Station 3 Duta Beach; P1: Station 1 Pondok Kelor Beach; P2: Station 2 Pondok Kelor Beach; P3: Station 3 Pondok Kelor Beach; T1: Station 1 TPI Paiton Beach; T2: Station 2 TPI Paiton Beach; T3: Station 3 TPI Paiton Beach

Based on measurements of physical-chemical parameters on the coast of Paiton District which are presented in Table 4, we found differences in results for each beach at the three stations. The highest DO parameter is at station 1 Duta Beach at 8.7 ± 0.7 ppm and the lowest at station 3 Pondok Kelor Beach at 4.6 ± 0.6 ppm. The highest BOD parameter is at station 1 TPI Beach valued at 4.3 ± 0.5 ppm and the lowest at station 2 Duta Beach valued at 1.94 ± 0.5 ppm. The sediment/substrate texture parameters show the sand substrate type at Duta Beach and the sandy clay substrate type at Pondok Kelor Beach and TPI.

Table 4. Physical-Chemical Parameters of Coastal Water Quality in Paiton District

Beach	Physical-Chemical Parameters of Water Quality			
	Station*	DO (ppm)	BOD (ppm)	Sediment Texture
Duta	1	8.7 ± 0.7	2.5 ± 0.5	Sand
	2	6.8 ± 0.9	1.94 ± 0.5	Sand
	3	7.1 ± 0.8	2.0 ± 0.4	Sand
Mean ± SD		**7.5 ± 0.1**	**2.2 ± 0.3**	
Pondok Kelor	1	5 ± 0.2	3.3 ± 0.4	Sandy loam
	2	4.8 ± 0.2	3.1 ± 0.4	Sandy loam
	3	4.6 ± 0.6	3.0 ± 0.1	Sandy loam
Mean ± SD		**4.9 ± 0.3**	**3.1 ± 0.1**	

Beach	Physical-Chemical Parameters of Water Quality			
	Station*	DO (ppm)	BOD (ppm)	Sediment Texture
TPI	1	5.9 ± 0.7	4.3 ± 0.5	Sandy loam
	2	5.6 ± 0.8	4.1 ± 0.4	Sandy loam
	3	5.8 ± 0.2	3.7 ± 0.1	Sandy loam
Mean ± SD		**5.8 ± 0.3**	**4.0 ± 0.3**	

*) D1: Station 1 Duta Beach; D2 : Station 2 Duta Beach; D3: Station 3 Duta Beach; P1: Station 1 Pondok Kelor Beach; P2: Station 2 Pondok Kelor Beach; P3: Station 3 Pondok Kelor Beach; T1: Station 1 TPI Paiton Beach; T2: Station 2 TPI Paiton Beach; T3: Station 3 TPI Paiton Beach

DISCUSSION

The coast in Paiton District which has the highest levels of lead (Pb) in kepah clam (*Meretrix* sp.) and sediment is TPI Beach with lead (Pb) metal levels in kepah clam (*Meretrix* sp.) and sediment respectively 1.466 ± 0.143 ppm. This indicates that the metal lead (Pb) content in kepah clam (*Meretrix* sp.) at TPI Beach is still below the maximum threshold for the applicable quality standard referring to SNI (Indonesian National Standard) 7387:2009 of 1.5 ppm. The metal lead (Pb) level in the sediment at TPI Beach is 2.275 ± 0.112 ppm. These results indicate that the metal lead (Pb) content in the sediment at TPI Beach is still below the maximum threshold for quality standards referring to ANZECC/ARMCANZ:2000 of 50 ppm. This location is the largest fishing port in Paiton District. This port is used as a dock for fishing and fishing boats, ship preparation, and there is also a fish market. According to Haryono *et al.,* (2017) the high levels of lead (Pb) in the waters near the port are caused by the activities of passing ships, ship fuel in the form of oil which is accidentally spilled in the waters, as well as the washing and maintenance activities of fishing boats. become a source of pollution for the accumulation of lead metal (Pb) in waters. Not far from the TPI coast, approximately 6 km away, there is a Steam Power Plant (PLTU) which uses coal as fuel. Firman *et al.,* (2020) stated that the main fuel, namely coal, used for electricity generation, contains 11 heavy metal elements, one of which contains lead (Pb). According to Tretyakova *et al.,* (2021) coal waste that is thrown into open waters without being processed first causes the accumulation of the waste in sediment through certain physical-chemical processes. This can result in the release of toxic materials from sediment into aquatic biota.

The coast in Paiton District which had the lowest levels of lead (Pb) in kepah clam and sediment was Duta Beach with levels of lead (Pb) in kepah clam was 1.434 ± 0.143 ppm. These results indicate that the levels of lead (Pb) in kepah clam (*Meretrix* sp.) at Duta Beach are still below the quality standard referring to SNI (Indonesian National Standard) 7387:2009 at 1.5 ppm. The metal lead (Pb) content in the sediment at Duta Beach was 2.111 ± 0.141 ppm. These results indicated that the metal lead (Pb) content in the sediment at Duta Beach is still below the quality standard referring to ANZECC/ARMCANZ:2000 of 50 ppm. This coastal location is a conservation area with the characteristic of having a mangrove forest covering an area of 13 hectares. Duta Beach is used by local residents by providing tourism facilities such as mangrove forest tours and motorized boat rental water tours which do not operate very often. According to Siaka *et al.,* (2016) a beach that uses gasoline-powered transportation facilities, such as fishing boats, motorized boats (speed boats), and water sports facilities has the potential to produce gas containing lead metal (Pb) which is released into the sea. sea. However, Harmesa, (2020) believes that mangrove plants are plants that have absorption properties and can absorb lead metal (Pb) in sea water, so that they can reduce heavy metal pollution in these waters. Irhamni *et al.,* (2017) also said that lead metal (Pb) absorbed in mangrove leaves undergoes a phytodegradation process which is a process where plants, such as mangrove leaves, break down contaminants with complex molecular chains into safe materials with a more complex molecular structure simple. This process can be beneficial for the growth of the plant. Therefore, the metal content in kepah clam and sediments at Duta Beach is quite low and in accordance with applicable quality standards.

The coast in Paiton District which had the second highest levels of lead (Pb) in kepah clam and sediment was Pondok Kelor Beach with levels of lead (Pb) in kepah clam was 1.434 ± 0.143 ppm. These results indicated that the levels of lead (Pb) in kepah clam (*Meretrix* sp.) at Pondok Kelor Beach were still below the maximum applicable quality standard threshold referring to SNI (Indonesian National Standard) 7387:2009 of 1.5 ppm. The level of lead (Pb) in the sediment at Pondok Kelor Beach is 2,111 ± 0.141 ppm. These results indicate that the metal lead (Pb) content in the sediment at Pondok Kelor Beach is still below the maximum threshold for quality standards referring to ANZECC/ARMCANZ:2000 of 50 ppm. This coastal location is close to residential areas, there is a lot

of rubbish on the shoreline and there is a ditch as a drainage channel for local residents' domestic waste which empties into the sea. Based on site observations, the water was mixed with foam which was thought to be soap, shampoo and detergent waste. According to Jaya *et al.,* (2013) domestic waste containing lead metal (Pb) can come from shampoo and soap. Some shampoo and soap products involve lead (Pb) compounds for their synthetic coloring variations. Pondok Kelor Beach is also used by some local fishermen to catch fish using motorized boat transportation. According to Nurfadhilla *et al.,* (2020) motorized fishing boats can contribute lead metal (Pb) contamination to water bodies because the use of boat fuel in the form of gasoline contains lead metal (Pb).

Based on the statistical tests obtained in this research, a Pearson correlation test was carried out between the Pb metal content of kepah clam and sediment, showing a positive relationship with a value of 0.692. The existence of this positive correlation relationship is proven by the graph in Figure 4.1, that the higher the Pb metal content in the kepah clam, the higher the Pb metal content in the sediment. On the other hand, the lower the Pb metal content in the kepah clams, the lower the Pb metal content in the sediment. Based on the coefficient interpretation index proposed by Riduwan (2004), the coefficient value of 0.692 is categorized as strong, so the correlation between the Pb metal content in the kepah clam and the Pb metal content in the sediment is in the strong category. According to Ambarwati *et al.,* (2022) this type of shellfish lives on sandy and muddy-sand bottoms in intertidal and sublittoral waters to a depth of approximately 20 m. This causes this type of shellfish to have the potential to accumulate heavy metals. Therefore, Kusuma *et al.,* (2022) believes that there is an increase in the accumulation of heavy metals, one of which is lead (Pb), in the bodies of clam, which occurs due to an increase in the metal content of Pb in the environment which is caused by several kinds of human activities on the coast, as well as the kepah clams is also permanently.

Based on measurements of physical-chemical parameters on the coast of Paiton District, the lowest DO parameter at station 3 Pondok Kelor Beach, which was 4.6 ± 0.6 ppm, was found to not meet the applicable quality standards referring to PP Decree No. 22 of 2021 concerning Sea Water Quality Standards for Marine Biota which should be >5 ppm. The condition of Pondok Kelor Beach is that there is a lot of domestic waste such as traces of detergent use which can be seen showing a lot of foam in the drain that empties into the Pondok Kelor sea. Budiawan *et al.,* (2019) added that detergent waste containing phosphate compounds can cause eutrophication which can reduce dissolved oxygen levels in waters. However, the DO values at Duta Beach and TPI Beach still meet the applicable quality standards. The highest BOD parameter is at station 1 TPI Beach, valued at 4.3 ± 0.5 ppm and the lowest at station 2 Duta Beach, valued at 1.94 ± 0.5 ppm, is known to meet the applicable quality standards referring to PP No. 22 of 2021 concerning Sea Water Quality Standards for Marine Biota worth less than 20 ppm. Hatta (2014) believes that the lower the BOD value, the lower the amount of organic matter in a body of water. Conversely, the higher the BOD value, the higher the amount of organic matter in a body of water. The sediment texture parameters obtained are that Duta Beach has a sand sediment texture, while Pondok Kelor Beach and TPI Beach have a sandy clay sediment texture. According to Nahak et al (2023), the type of substrate is one of the ecological factors that influences the life of macrozoobenthos, one of which is Bivalvia. Generally, these organisms tend to be abundant in muddy substrates/sediments and soft sediments. This is reinforced by Khalil *et al.,* (2018) statement that several species of Bivalves from various classes can grow and reproduce well on muddy substrates rich in organic material as their food source.

CONCLUSION

The levels of lead (Pb) in kepah clam (*Meretrix* sp.) in the Coastal District of Paiton except at Duta Beach (1.4 ± 0.1 ppm), are right at the maximum threshold of the quality standard set by SNI 7387:2009, namely at Pondok Kelor Beach 1.5 ± 0.2 ppm and TPI Beach 1.5 ± 0.1 ppm. The levels of lead (Pb) in sediments on the coast of Paiton District meet the quality standards set by ANZECC/ARMCANZ:2000, namely at Duta Beach 2.1 ± 0.1 ppm, Pondok Kelor Beach 2.3 ± 0.3 ppm, and Beach TPI 2.3 ± 0.1 ppm. The relationship between sediment metal lead (Pb) levels and lead metal (Pb) in kepah clam in the Coastal District of Paiton is positively correlated, meaning that the higher the Pb content in the sediment, the higher the Pb levels absorbed by kepah clam. The increase in the accumulation of lead (Pb) in the body of the kepah clam occurs due to an increase in the metal Pb content in the environment which is caused by several types of human activities on the coast, and the kepah clam is also sedentary.

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