

## ***Bioaccumulation of Heavy Metals Lead (Pb) and Cadmium (Cd) in Timpakul Periopthalmodon schlosseri and Boleopthalmus boddarti in Kuala Tambangan Village***

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### **Abstract**

Heavy metals in aquatic ecosystems tend to collect in sediments and the bodies of aquatic biota through a diffusion process or through the food chain. This research was carried out to evaluate the bioaccumulation of lead (Pb) and cadmium (Cd) in the organs of sea bass *P. schlosseri* and *B. boddarti*, water, sediment, and small mud crabs as part of the food source. Sample collection was carried out purposively in Kuala Tambangan village. Heavy metal analysis was carried out on gills, skin, liver, kidneys and embalmed fish flesh. Surgical implants were analyzed by the ASS method. The results of the first test showed the highest metal content of Pb was 12.49 mg/kg and Cd was 5.30 mg/kg in the kidneys of *P. schlosseri*. In the kidneys of the *B. boddarti* species, the highest Pb content was 7.56 mg/kg and Cd 3.94 mg/kg. In the second test, the heavy metals Pb and Cd in the tympanic organs were not detected (<0.24 mg/kg) for all organs measured. Although most of the Pb and Cd metal contents were undetectable or still below the quality standards, Cd in the liver of *P. schlosseri* reached 0.364 mg/kg, exceeding the normal limit. The Pb metal content in tidal waters reached 0.07 ml/l and met the quality standard, while the Pb and Cd content in sediment and mangrove crabs was still below the quality standard, with some heavy metals not being detected.

**Keywords:** Bioaccumulation, metals, mudskipper fish.

### **INTRODUCTION**

Kuala Tambanga Village, located in Takisung Sub-district, Tanah Laut Regency, South Kalimantan, has an administrative area of 5,920 hectares. Kuala Tambangan villagers, for the most part, make their living as fishermen (Kuala Tambangan Village Profile, 2016). Discussions about the lives of fishermen involve aspects of boats, fuel waste, ship paint, and ship lubricating oil, which can have an impact on polluted waters. One of the impacts of pollution arising from these wastes is the presence of heavy metals.

The problem arising from the above description is the potential for heavy metal pollution in aquatic ecosystems. Although some heavy metals are required by the body, their toxic properties can cause negative impacts. Therefore, research is needed to assess whether the aquatic ecosystem of Kuala Tambangan village is polluted with heavy metals beyond the quality standard. If indications are found that the village waters exceed the standard limits, then the consumption of various types of aquatic biota becomes unsafe and has a negative impact on human health.

One of the biota found in the estuary of Kuala Tambangan village is the timpakul fish, with two main species, *Periopthalmodon schlosseri* and *Boleopthalmus boddarti*.

These fish have behavioral and physiological adaptations that resemble amphibians, allowing them to move effectively on land and water. The ability to breathe through the skin and the lining of the mouth and throat allows it to breathe air through its skin. In addition, these fish usually burrow into the sediment to avoid marine predators during high tide, especially when they nest (Polgar, 2008).

The water and sediment sampling process was carried out at three research sites, including the riverside harbor, behind the residential area, and the estuary. These samples were then identified and categorized for further research. Sampling of tymphakul fish and small crabs was also conducted deliberately, with the number and timing of collection arranged to reflect population variation.

Physico-chemical water quality data were measured at various times of the day, including temperature, pH, salinity, and dissolved oxygen. The Winkler method was used to measure dissolved oxygen. Measurements of heavy metals in water, sediment, small crabs, and tymphakul fish organs were carried out through a series of steps, including dry shaving, wet disinfection using microwave, and calibration curve reading on a graphite furnace atomic absorption spectrophotometer.

All of these steps are directed at collecting accurate and detailed data on the condition of the waters and biota in Kuala Tambangan village, especially regarding the potential for heavy metal pollution.

## RESEARCH METHODS

The method used in this study is a literature review by exploring data and information from articles collected from various sources. The sources of data and information are to gain an understanding of the Bioaccumulation of Heavy Metals Lead (Pb) and Cadmium (Cd) in the Organs of *Timpakul Periopthalmodon schlosseri* and *Boleopthalmus boddarti* in Kuala Tambangan Village.

## RESULTS AND DISCUSSION

The results of measurements of total body weight, length, height, and weight of tymphakul organs were processed to produce averages and calculate percentages. The measurement of the tympanum was done to facilitate the analysis of the tympanum organ. The results of total body weight measurements of *P. schlosseri* were divided into two groups based on body weight range, namely group A (34-59 grams) and group B (34-93 grams). This species has a dark brown body, with dark, pale brown lateral parts and a whitish or gray abdomen. A distinctive black stripe extends from the posterior eye at the opercular dorsal edge, continuing down the back, pectoral fins, and to the base of the tail (Polgar, 2008).

The total body weight measurements of *B. boddarti* were also divided into two groups, group A (29-39 grams) and group B (39-46 grams). *B. boddarti* has a shiny blue body and dorsal fin, sometimes blue-green in color. The body has a brownish-black stripe, with the head covered in bluish spots and black stripes. The lower part of the body is white (Muhtadi et al., 2016).

The total weight of *P. schlosseri* tymphakul used ranged from 34-93 grams, with an average of 54.6 grams, and the most dominant percentage of body weight was 34 grams with a percentage of 20%. Total length ranged from 15.4-22.9 cm, with an average of 3.6 cm, and the most dominant percentage of body length was 16 cm with a percentage of 10%. *P. schlosseri* is the largest of the Mudskipper species, reaching a body size of about

26 cm. *P. schlosseri* is also known as the giant mudskipper, being a large mudskipper that has the largest size among other species (Polgar, 2008).

The *B. boddarti* tympakul species used had a total weight ranging from 24-46 grams, with an average of 35.7 grams, and the most dominant percentage of body weight was 39 grams with a percentage of 30%. Total length ranged from 14-17.2 cm, with an average of 7.6 cm, and the most dominant percentage of body length was 16 cm with a percentage of 20% (Ramadhani et al., 2014).

### CONCLUSIONS

Based on the research findings, it can be concluded that organs such as gills, skin, liver, kidneys, and meat of tympakul fish *P. schlosseri* and *B. boddarti* in Kuala Tambangan village contain heavy metals lead (Pb) and cadmium (Cd), with the highest content found in the kidneys. The content of heavy metal lead (Pb) in the estuarine water of Kuala Tambangan village at high tide exceeded the quality standard of 0.07 mg/l, while cadmium (Cd) was not detected. The Pb and Cd metal tests in sediments were still below the quality standard, and mangrove crabs did not accumulate heavy metals.

The first test results showed that the highest Pb metal content was 12.49 mg/kg and Cd 5.30 mg/kg in the kidneys of *P. schlosseri*. Analysis of the kidneys of *B. boddarti* species revealed the highest Pb content of 7.56 mg/kg and Cd 3.94 mg/kg. In the second test, the content of heavy metals Pb and Cd in tympanic organs was not detected, which was <0.24 mg/kg for all organs measured. In the third test, most of the Pb and Cd metal contents were not detected, while some organs contained heavy metals but still below the quality standards, except for the Cd content in the liver of *P. schlosseri*, which was 0.364 mg/kg, which exceeded the normal threshold.

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