



## Bioecological aspect of lamasi (*Barbonymus gonionotus*) in mailil rever labuhanbatu district, indonesia



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### ABSTRACT

The existence of gold mining activities in mailil river can disrupt the stability of the ecosystem, fishing by using toxins, which may result in a decrease in fish populations in the river mailil. This study aims to obtain information related to biological and ecological aspects (*Barbonymus gonionotus*) in river Mailil, Village. This study was conducted from November 2020 to January 2021. The locations for sampling were determined based on information from the local community in Bandar Kumbul Village. Samples were caught using nets, traps, and nets. Sampling was conducted from 09:00 am to 03:00 pm. The biological aspect being measured was the length-weight relationship of the fish using the linear allometric model (LAM). Meanwhile, the ecological aspect being measured was the condition factor using Fulton's K equation and relative weight ( $W_r$ ) equation. In this study, 54 silver barb (*B. gonionotus*) were successfully caught as samples. The results of the length-weight relationship analysis indicated a negative allometric relationship with the value of  $b = 0.52$  ( $b < 3$ ). Furthermore, the value of Fulton's K condition factor was 27.75, while the value of relative weight ( $W_r$ ) condition factor was 100.07. These results indicated that river Mailil as an ecosystem and habitat of silver barb is in the balance condition.

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### INTRODUCTION

*Barbonymus gonionotus* is a type of freshwater fish native to Kalimantan, Sumatra, and Java (Kottelat & Whitten, 1993). *Barbonymus gonionotus*, has another name *Puntius gonionotus*, *Barbus javanicus*, *Barbodes gonionotus*, *Puntius gonionotus*. *Barbus koilometopon* *Pentius jolamarki*, *barbodes jolamarki* according to (Smith, 1934) *puntius viehoveveri* and *Barbus*



koimometon, *puntius javanicus*. The *Barbonymus gonionotus* fish is better known as the Tawes fish (Sumatra, India, Philippines, United States), the Javanese Bale/Putih/Putih (Javanese) paitan fish (Batak toba) Lamasi fish (Labuhanbatu) Lamase (North Padang Lawas). Meanwhile, in Malaysia, this fish is known as Bale Jawa, Javanese barb, and Lalawak fish (Fisbase, 2021)

The characteristics of the *Barbonymus gonionotus* fish are long and flat with an elevated back and in part, Silver barbs (*Barbonymus gonionotus*) are fish that have a small mouth. At the tip of the jaw, these fish also have short barbel. Below the rib line, there are 5½ scales. Meanwhile, between the rib line and the pelvic fin, it can be found 3 - 3½ scales. *Barbonymus gonionotus* is a herbivorous species that feeds on aquatic plants, moss, soft grass, and plankton (Proese & Pauly, 2018). Therefore the existence of *Barbonymus gonionotus* in the water is very closely related to the abundance of plankton as a source of food. This gold mining activity causes the level of turbidity in the mailil river to increase this can hinder the consideration of plankton and ultimately led to a decrease in the population of *Barbonymus gonionotus* fish in aek mailil.

These fish are widespread in Southeast Asia and several locations in Australia. These can be found living in large rivers in Sumatra, Sulawesi, Java, Malaysia, Kalimantan, the Philippines, Cambodia, Myanmar, Laos, Vietnam, Thailand, and northern Australia (Proese & Pauly, 2018). They are freshwater fish and found to live in rivers with weak and swift currents with an optimum temperature of 25 – 33°C.

Several studies related to these fish have been carried out. Ayyubi, Budiharjo & Sugiarto (2018) studied the morphological characteristics of the fish from several different locations in Central Java, Indonesia. Qomah, Bayu & Syamsunarno (2019) conducted a study concerning the feminization of silver barbs (*Barbonymus gonionotus*) using the hormone Estradiol-17B. Besides, Zulkarnain, Hastuti, & Sarjito (2017) had made an experiment by adding vitamin C to the feed of *Barbonymus gonionotus* as an immunostimulant for blood performance, survival, and growth. Furthermore, Buwono, Arfiati, Muhammad & Arifin (2019) analyzed the stomach of *Barbonymus gonionotus* caught from the downstream part of the Bengawan Solo river. However, the specific study concerning the bioecology of *Barbonymus gonionotus* in Aek Mailil has never been reported gold mining activity upstream causes water turbidity to disrupt the ecosystem aek mailil and fishing using toxins that can result in a decrease in the population of that fish in aek mailil. Because of that, the purpose of this study was to examine the biological aspects related to the length-weight relationship of *Barbonymus gonionotus* and the ecological aspects related to the condition of Mailil waters.

## RESEARCH METHODS

### Research Design

This study applied the exploration method. In this method, the observation was carried out by visual and physical contacts on surface/subsurface conditions, in which all fish caught were taken as samples. Fishing of Lamasi (*Barbonymus gonionotus*) was conducted in one location, namely the mailil river. By dividing 3 zones or coordinate points that are upstream, the middle, and downstream, from the designated coordinate point is taken with 50 m Upstream, and 50 m downstream.

### Population and Samples

This study was conducted from November 2020 to January 2021 in Aek Mailil, Bandar Kumbul Village, Labuhanbatu Regency, North Sumatra, Indonesia. The locations for taking the samples of *Barbonymus gonionotus* were Station 1 at coordinates 2°5'27" N 99°47'31" E, Station 2 at coordinates 2°4'54" N 99°47'17" E, and Station 3 at coordinates 2°3'39.71" N 99°46'56.22 E. Sampling location can be seen in Figure 1.



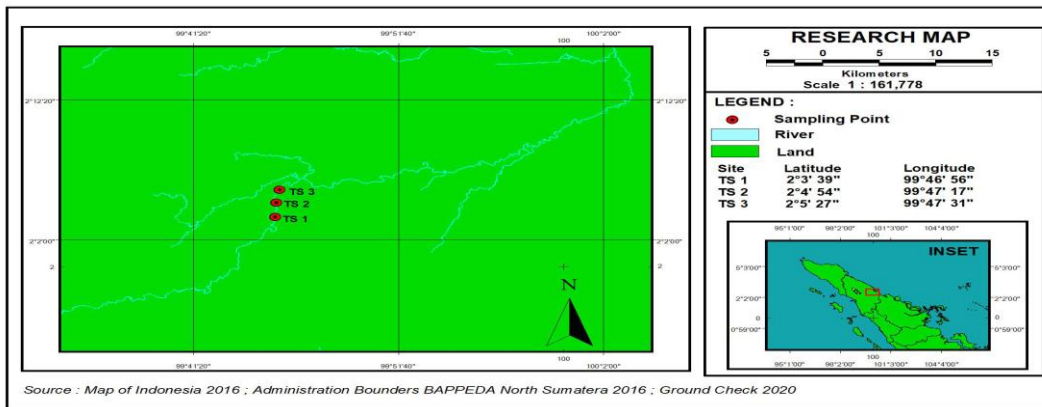


Figure 1. Picture of a map of the research location in Aek mailil bandar kumbul village.

The analysis of the length-weight relationship of the fish was carried out in the Ecology Laboratory of the Faculty of the Education University of Labuhanbatu. The locations for conducting sampling were determined based on information from the local community about where these fish were usually found. Sampling was conducted once a month from 09.00 AM to 03.00 PM for three months.

### Instruments

Fish were caught using fishing traps, hand nets, and cast nets. The weight (g) of the caught fish was measured using a digital scale, while the length (cm) was measured using a ruler. Fish are caught using tools such as mesh, fish trap, and nets. And the purifier used. Then the sample used was *Barbonymus gonionotus* fish. All the tools can be seen in Figure 2.

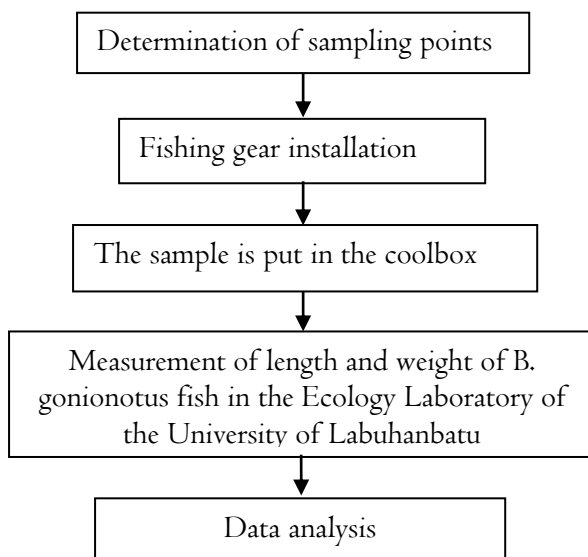


Figures 2. Picture of Instruments of the research; (a). digital scale; (b) Ruler; (c) Fish Trap; (d) casting net; (e) gill net.

### Procedures

This study was started by determining the locations for conducting sampling based on information from the local community which is located in Bandar Kumbul village, western blade sub-district, Labuhanbatu Regency, North Sumatra Province. Samples were caught using fishing traps, hand nets, and cast nets, which were installed around the sampling points from 09.00 AM to

03.00 PM. They were checked every hour. The caught fish were put into a cool box and then taken to the Ecology Laboratory of the Labuhanbatu University for measuring their length and weight. The research procedure can be seen in [Figure 3](#).



**Figure 3.** Flow chart of the research procedures.

## Data Analysis

### The length-weight relationship

The length-weight relationship was analyzed using the linear allometric model (LAM) by calculating constants  $a$  and  $b$  (Le cren, 1951).  $W = aL^b$  Where:  $W$  is the total weight (g) of the fish;  $L$  is the total length (cm) of the fish;  $a$  and  $b$  are the constants. After carrying out linearization through logarithmic transformation, the obtained equation is as follows.  $\text{Log } W = \text{Log } a + b \text{ Log } L$ .

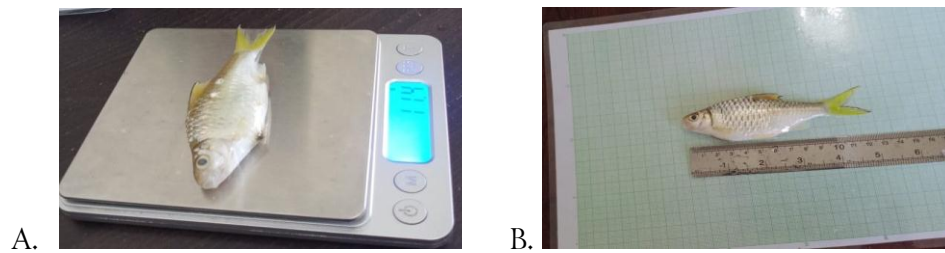
### Condition factor

In this study, the relative weight ( $W_r$ ) was calculated to predict the condition factor for each sample. For calculating the relative weight ( $W_r$ ), the researcher used the formula proposed by Rypel & Richter (2008).  $W_r = W / W_s \times 100$  Where:  $W_r$  is relative weight;  $W$  is the weight of each sample;  $W_s$  is the prediction of the standard weight of the same sample as it is calculated from the combined length-weight regression over the range between species.  $W_s = a L^b$

The factor coefficient for Fulton's condition is calculated using the equation proposed by Okgerman (2005).  $K = WL^{-3} \times 100$ , Where:  $K$  is the condition factor;  $W$  is the weight (g);  $L$  is length (cm);  $-3$  is the length coefficient to test whether the  $K$  value tends to be close to 1. According to Morton & Routledge (2006), the fish population is in a good condition if the  $K$  value is more than 1. The situation is not as good as if  $K$  is below 1.

## RESULTS

Based on the results of this study, the length (TL) of fish caught is rotated 7.2 - 15.9 cm. Besides, the weight ( $W$ ) was in the range of 24.8 - 45.1 grams. Weight prediction ( $W_s$ ) was in the range of 24.57 - 37.11. The value of the relative weight ( $W_r$ ) condition factor was 80.12 - 106.36. The coefficient of determination was 0.8573. Furthermore, the value of the  $b$  coefficient for Aek Mailil was 0.52 for more details can be seen in [Figure 4](#) and [Table 1](#).

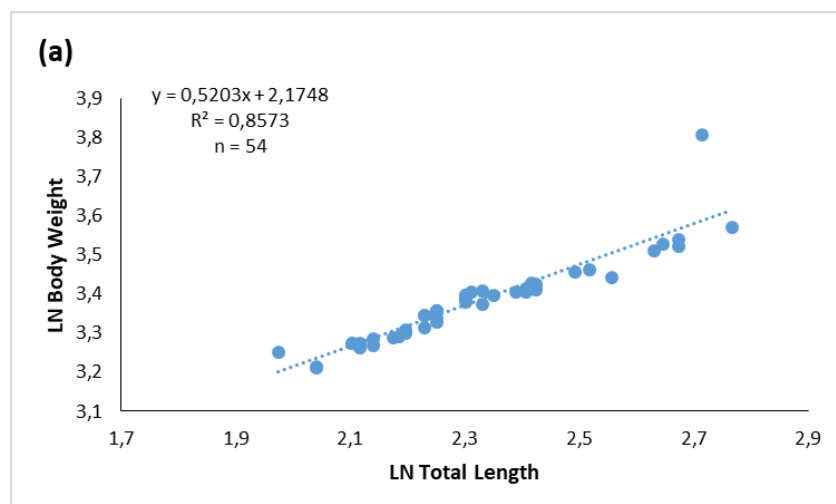


**Figures 4.** A. Measurement of the weight of *Barbonymus gonionotus* fish using digital scales; B. measurement of the total length of *Barbonymus gonionotus* fish using a ruler and millimeter paper.

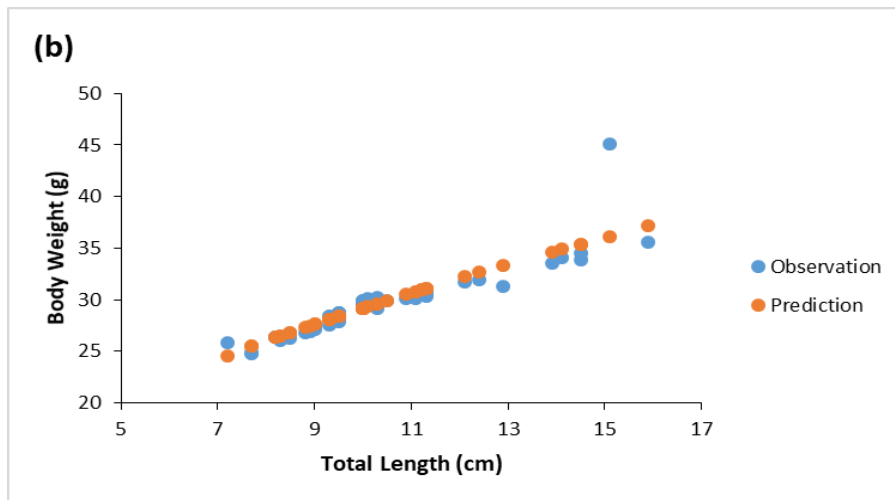
**Table I.** The observation results Parameters observed in *Barbonymus gonionotus* fish in river mailil Bandar Kumbul Village

No	Parameter	score	average
1.	Total lenght (TL)	7.2-15.9	10.35
2.	Body Weight, W (g)	24.8-45.1	29.59
3.	Predicted Body Weight, $W_s$ (g)	24.57-37.11	29.57
4.	Relative Body weight, ( $W_r$ )	80.12-106.36	100.45
5.	Fultons condition factor, (K)	0.88-6.91	3.03
6.	Coefficient determination, ( $r^2$ )	0.8573	-
7.	Score b	0.52	-

The total of *Barbonymus gonionotus* caught throughout this study was 54 fish. The average weight was 10.35 grams and the average length was 29.59 cm. The analysis of the length-weight relationship showed a negative allometric relationship with the value of  $b = 0.52$  ( $b < 3$ ). This indicates that the growth of length is faster than the growth of weight, it is then described in Figure 5a and Figure 5b. The value of Fulton's condition factor (K) was 27.75, and the value of the relative weight ( $W_r$ ) condition factor was 100.07. (can be seen in Figure 5a and Figure 5b) In graphic images a and b there are observations of the long relationship of the weight of fish *Barbonymus gonionotus*.



**Figure 5a:** The length-weight relationship of silver barbs (*Barbonymus gonionotus*) in Mailil river, Bandar Kumbul Village;



**Figure 5b:** The comparison of the length-weight relationship between the results of observations and predictions on silver barb (*Barbonymus gonionotus*) in Mailil river, Bandar Kumbul Village.

Based on Figure 5a, it can be explained that there is a positive linear relationship between the length and weight of the fish. This means that there is an increase in  $R^2 = 0.8573$  means fish along with the increase in length. Figure 5b, shows that there is no difference in the pattern of length-weight relationship of fish between observation and prediction results

## DISCUSSION

The results of data analysis on 54 samples of *Barbonymus gonionotus* indicated that the length of the fish was in the range of 7.7 - 15.9 cm. Meanwhile, Aisyah, Bakti & Desrita (2017) reported that the length of *Barbodes schwanenfeldii* in the Belumai river, Deli Serdang Regency, North Sumatra ranges from 17.4 to 19.4 cm. Furthermore, Setiawan & Sulistiawan (2007) found that *Barbodes schwanenfeldii* in the Musi river, South Sumatra has a length ranging from 5 - 28 cm and a weight ranging from 1.25 - 3.36 grams. Apart from that, the results of the length-weight relationship analysis of *Barbonymus gonionotus* in Aek Maili showed that the growth pattern was negative-allometric, in which the value of  $b$  was 0.52 ( $b < 3$ ). Meanwhile, Aisyah et al., (2017) reported that the value of  $b$  of *Barbodes schwanenfeldii* in the Belumai river was 2.56 ( $b < 3$ ). A different result was reported by Setiawan & Sulistiawan (2007), in which they found that the value of  $b$  of *Barbodes schwanenfeldii* in the Musi river was 3.26 with a positive allometric growth pattern. Furthermore, Fuadi, Dewiyanti & Purnawan (2016) found that the growth patterns from two fish species (*Rasbora* sp. and *Puntius bre*) were negative allometric. Differences in growth patterns can be caused by the environmental conditions in which organisms live and the availability of food to support the survival and growth of the fish (Nikolsky & Magazanik, 2004).

Pellokilla (2009) stated that the success factors in obtaining food and the age of the fish when experiencing gonad maturity can also affect the growth of the fish. According to Rahardjo, Indra, Yudha, & Djokosetiyanto (2015), differences in the value of  $b$  are related to ontogenetic development, age differences, gonad maturity, sex, the fullness of the stomach, geographical location, parasite, and environmental conditions. Essentially, allometric growth is temporary because of changes related to gonad maturity, whereas isometric growth is a proportional continuous change (Effendi, 1997). (Roomiani, Sotudeh & Hakimi, 2014) stated that differences in the value of  $b$  do not only occur due to differences in species but can also occur in the same species because of differences in the level of stomach fullness on the same day.

The Fulton's (K) condition factor in Mailil river was 3.03. Meanwhile, (Aisyah et al., 2017) found that the condition factor of *Barbodes schwanenfeldii* in the Belumai river ranged from 1.15 - 1.37. According to (Morton & Routledge, 2006), the fish population is in a good condition if the K value is more than 1. The value of the condition factor is an efficient instrument and can show changes in fish conditions throughout the year (Rahardjo et al., 2015). Meanwhile, the value of the relative weight (Wr) condition factor in the waters of Mailil river was 100.07. On the other hand, if it is above 100, it indicates that the fish population in the waters is still in a good condition due to high food availability and low predator density. (Maizul, Setyawati & Wahyudewantoro, 2019) found that the result of the average condition factor value for *B. balleroides* in several rivers in Java island was 1.026586. This high value of the condition factor indicated that the environmental conditions and the availability of food in those locations were suitable for the growth of *B. Balleroides*. Meretsky, Wegner & Stevens (2000) stated that changes in fish weight can be caused by changes in feed and the habitat of the fish, in which these factors are related to the growth and reproduction of the fish. Therefore, these result in differences in fish weight even though having the same length. (Isa, Rawi, Rosla, Anuar, & Shah, 2010) studied *B. Bionotus* from the Karian river in Peninsular Malaysia. They obtained the b value of 4.106. Batubara, Muchlisin, Efizon, Elvyra & Irham (2019) explained that if the value of Wr is higher than 100, then the water condition is balanced.

From the results of the length-weight relationship analysis, it indicated that the growth pattern of *Barbonymus gonionotus* in Mailil river was negative allometric ( $b > 3$ ). The Fulton's condition factor and relative weight condition factor showed that the condition of Mailil river ecosystem is in a balanced condition. To the end of the word, it is information related to the biological and ecological aspects of *Barbonymus gonionotus* in the river Mailil.

## CONCLUSION

Based on the results of the study can be concluded that negative allometric growth patterns are characterized by a linear length weight relationship. Condition factor (K) analysis explains that the condition of the river Mailil is still in a balanced state and can support for *Barbonymus gonionotus* life.

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