Morphology and weight-length relationship of tinfoil barb (Barbonymus schwanenfeldii) at Tasik River, South Labuhanbatu Regency, Sumatera Utara

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Abstract. Tinfoil barb is one of the fish caught in the Tasik river. The purpose of this study was to determine the morphology and weight-length relationship of tinfoil barb. This research was conducted in July-August 2020 in the Tasik river using a net with a mesh size of 1.25 inches. The number of fish caught was 96 fish with a total weight (TW) of 2-47 g and a total length (TL) of 60-125 mm. Meristic characteristics of tinfoil barb consecutively are as follows: 31-33 Linnea Literalis (LL), 24-26 Body Circular Scales (BCS), 12-14 Dorsal Front Scales (DFS), 12-14 Tail Scales (TS) a total of 12 pieces, the dorsal fin formula (DF) is DI. 8-9, the ventral fin formula (VF) is V8-10, the pectoral fin formula (PF) is P12-14, the anal fin formula (AF) is AI. 5-6 and the caudal fin formula is (CF) C14. The results of the length-weight relationship indicate that the growth pattern of fish is negative allometric (b = 3.221) where the weight gain is faster than the length gain.

1. Introduction

Tinfoil barb is another name for Lampam fish with Latin names namely Barbonymus schwanenfeldi, Barbus pentazona schwanefeldi, Barbonymus schwanenefeldi, Barbus schwanefeldi, Systomus schwanenfeldii, Puntius schwanefeldii, Barbonymus schwanefeldii. The common name of lampam fish is tinfoil barb and its local names and also the called lampam, lempam, lempem, kepiat, sala, tenadak merah and kapiek [1]. Tinfoil barb is a fish native was found in Indonesian freshwater islands of Sumatra, Java and Kalimantan. This fish is known as a high economic value consumption fish [2].

B. schwanenfeldii has features such as a flattened, widened body shape with a silver and golden yellow body, red dorsal fin with black patches on the tips, pectoral, pelvic and anal fins red, tail fin orange or red with a border line black and white along the caudal fin lobe [3]. According to [4] the average size is between 10 cm and 25 cm and weighs around 200-600 g. This fish can reach a maximum size of 30 cm in length and weighs more than 1 kg.

Tinfoil barb is a species of fish produced from the Tasik river and is used as consumption fish at a relatively high price. As a result of the high price of tinfoil barb, fishing activity is high along the Tasik River.

The Tasik River is inseparable from human activities around the river, where with the overfishing and the less well-preserved aquatic ecosystem of this fish habitat due to the discharge of domestic and
agricultural waste into the river, it has resulted in a decrease in the population of tinfoil barb in this river. This greatly affects the survival and growth of fish. Therefore, it is necessary to research the morphology and weight-length relationship of tinfoil barb in this river. Because this research is an important main step in the effort to manage fishery resources in the waters and as a basis for information for sustainable fisheries resource management.

2. Materials and methods

2.1. Research location
This research was conducted in July-August 2020 in the Tasik River, Torgamba District, South Labuhanbatu Regency, North Sumatra Province. The location of fish sampling can be presented in figure 1.

![Figure 1. Research sites (station 1: 01°51'55.0''LU 100°06'49.3''E, station 2: 01°51'03.6''LU 100°06'42.0''E and station 3 : 01°50'58.5''LU 100°06'44.2''E).](image)

2.2. Procedures
The tools used in this research are GPS (Global Positioning System), digital caliper, coolbox, ruler, net, millimeter block paper, stationery and digital camera. The materials used in this study were 96% alcohol solution, tinfoil barb. Taking fish samples using a net with a mesh size of 1.25 inch. Fish were collected for 2 months at 3 different station locations. All tinfoil barb caught are put into the coolbox to observe their morphometric and meristic characters.

The relationship between fish weight length is seen using the formula according to [5]:

\[ W = aL^b \]  

Where:
- \( W \) = Fish body weight (g)
- \( L \) = Fish length (mm)
- \( a, b \) = constant
- \( b = 3 \), the length-weight relationship is isometric
b > 3, the length-weight relationship is positive allometric
b < 3, the length-weight relationship is negative allometric

3. Results and discussion

3.1. Morphometry and meristic tinfoil barb
The morphology of tinfoil barb in the Tasik River can be seen in figure 2, where the body is flattened and spread out with a silver-yellow-golden body. According to [3] *B. schwanenfeldii* has features such as a flattened body shape with a body of silver and golden yellow, red dorsal fin with black spots on the tips, pectoral fins, pelvic and anal fins red, tail fin orange or red with a black and white border along the caudal fin lobe.

![Tinfoil barb](image)

*Figure 2. Tinfoil barb (Barbodes schwanenfeldii).*
(Source: personal documentation).

The results of the calculation of the morphometric and meristic characteristics of tinfoil barb with a total sample of 96 fish originating from the Tasik River can be seen in table 1 and table 2.

| Parameter | Morphometric characteristics of tinfoil barb | Research result |
|-----------|---------------------------------------------|-----------------|
| TW (g)    |                                             | 2 – 47          |
| TL (mm)   |                                             | 60 – 125        |
| SL        |                                             | 45 – 111        |
| HL        |                                             | 12 – 28         |
| ML        |                                             | 3 – 8           |
| DFH       |                                             | 11 – 31         |
| DFL       |                                             | 9 – 21          |
| ED        |                                             | 5 – 11          |
| SH        |                                             | 5 – 17          |
| TSH       |                                             | 18 – 53         |
| PFL       |                                             | 10 – 26         |
| VFL       |                                             | 10 – 25         |
Where:

| TW | Total Weight |
|----|--------------|
| TL | Total Length |
| SL | Standard Length |
| HL | Head Length |
| ML | Muzzle Length |
| SH | Stem Height |
| DFH | Dorsal Fin Height |
| TSH | Tail Stem Height |
| DFL | Dorsal Fin Length |
| PFL | Pectoral Fin Length |
| ED | Eye Diameter |
| VFL | Ventral Fin Length |

**Figure 3.** Fish morphometric section: a. total length, b. standard length, c. head length, d. tail length, e. muzzle length, f. dorsal fin height, g. dorsal fin length h. eye diameter i. tail stem height, j. height, k. pectoral fin length, l. ventral fin length [6].

**Table 2.** Meristic characteristics of tinfoil barb in Tasik river.

| Parameter | Meristic characteristics of tinfoil barb |
|-----------|----------------------------------------|
| LL        | Research result                        |
| BCS       | 31-33                                  |
| SFDF      | 24-26                                  |
| SAT       | 12-14                                  |
| DF        | 12                                     |
| V8        | DF: Dorsal Fin                         |
| VF        | DL8-9                                  |
| PF        | V10                                    |
| P12-14    |                                        |
| AF        | P15-6                                  |
| CF        | C14                                    |

**Where:**

LL : *Linnaea Literalis*

BCS : Body Circular Scales

SFDF : Scales Front Dorsal Fin

SAT : Scales Around the Tail

DF : Dorsal Fin

VF : Ventral Fin

PF : Pectoral Fin

AF : Anal Fin

CF : Caudal Fin

3.2. Distribution of long frequency of tinfoil barb

The number of fish caught during the study was 96 fish. The highest number of fish caught at station I was 43 fish, at station II 25 fish caught and 26 fish at station III (figure 4).
The difference in catch at each station is due to differences in water conditions in the Tasik River and differences in characteristics at each station, this is in accordance with [6] stating that the occurrence of fluctuations in water conditions and the presence of migration, mortality or spawning causes fluctuations in fish populations, other things that are suspected affect the difference in frequency is the availability of sufficient food.

Station 1 is an area that is preferred by tinfoil barb due to the large number of nutrients and food sources at this station compared to other stations. [4] stated that *B. schwanenfeldii* is a freshwater fish found in lakes and rivers in the pH range between 6.5 and 7, in the tropics at temperatures of 20-33°C.

![Figure 4](image_url)  
*Figure 4. The number of fish caught at the research location.*

Meanwhile, based on the class interval, the fish caught were found in the length class interval 87-95 mm with a total of 36 fish. The minimum number of fish caught at a size class hose at 123-131 mm is 1 fish (figure 5).

![Figure 5](image_url)  
*Figure 5. Distribution of length frequency of tinfoil barb.*

### 3.3. Length-weight relationship of tinfoil barb

The analysis of the length-weight relationship of fish was carried out on the fish obtained during the study with the amount expected to provide an overview of the growth patterns of tinfoil barb in the Tasik River. From the results of the analysis of the length-weight relationship of tinfoil barb, it
produces a growth model and a weight-length relationship curve (figure 6) with the value of determination ($R^2$) 0.924.

![Figure 6. Length-weight relationship of tinfoil barb.](image)

From the results of the long relationship analysis of the overall weight of tinfoil barb in the Tasik River, the growth equation for tinfoil barb is as follows: $W = 4E^{-06}L^{3.221}$ with a value of $b = 3.221$. This shows that the growth pattern of tinfoil barb is positive allometric where the value of $b > 3$, which means that the weight of tinfoil barb increases faster than the length gain (figure 6).

Similar to the research conducted by [1] in the Musi River, South Sumatra, the growth pattern of lampam fish (*B. Schwanefeldii*) is positive allometric. This means that fish weight growth is more dominant than fish body length gain and is different from research conducted by [7] at Sungai Belumai, the growth pattern of tinfoil barb is negative allometric. The difference in growth patterns that occur from one species of fish that live in different habitats according to [8] depends on the environmental conditions of the living organism, as well as the availability of food that can be used to support the survival and growth of the fish organism. Food is a more important factor than water temperature for the growth of fish in the tropics.

4. Conclusions
The number of fish was caught of 96 fish with a total weight (TW) of 2-47 g and a total length (TL) of 60-125 mm. The results of weight and length relationship indicate with the growth pattern of fish was found positive allometric ($b=3.221$) where the weight gain was faster than the length gain.

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