Lenght-weight relationship and condition factor of huluu fish 
(*Giuris margaritacea*) in Limboto Lake

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Abstract. *Giuris margaritacea* (Valenciennes), the snakehead gudgeon is a species of fish in the family Eleotridae, live in Limboto Lake. Decline in the quality of the lake water, sedimentation lakes and eutrophication give bad conditions resulting to Limboto Lake. Diversity resources fishing lake has degradation. Population the fish original and important has decline, one of that is huluu fish, increasingly difficult to found. The purpose of this study is to find out lenght- weight relationship and condition factor Huluu fish (*Giuris margaritacea*) in Limboto Lake. The research was done in april until june in Limboto Lake with 7 points of sampling in Limboto Lake. Sampling was carried out by purposive sampling. Data analysis used to this research is *Model Allometric Linear* (LAM) used to calculate parameter a and b through the measurement of changes in lenght-weight and condition factors. The result of this research known that fish huluu derived from Limboto Lake generally have model growth allometric positive (b>3) with the condition factors range between 0.12 - 1.91 whereby the meaning of the amount is fish categorized as flat fish.

1. Introduction

*Giuris margaritacea* (Valenciennes), the snakehead gudgeon is a species of fish in the family Eleotridae. In the world, distribution area spreading of the Giuris across Asia and Africa[1]. In Gorontalo, this fish are called Huluu and can be found in Limboto Lake. Limboto Lake is located in Limboto District, Gorontalo Regency, where has a strategic roles include the resources for fisheries (aquaculture and catch). Now the condition of Limboto Lake increasingly alarming and indicated sedimentation occur. In 1930, Limboto Lake depth was 30 meters with an area of 8000 Ha, then in 2007 the depth and area were decrease to 2.5 meters with an area of 3000 Ha[2].

Community activities that produce domestic waste and aquaculture activities carried out in the lake cause a decrease to water quality of lake, lake sedimentation and eutrophication. In addition, the native people also catches fish using poison (potas), fish bombs and large-scale fishing equipment causes a decrease in the genetic diversity of fish and water quality. Impact of the conditions that occur in Limboto Lake, the diversity of fisheries resources in the Lake has been degraded. The population of important native and economical fishes has decreased including Huluu (*Giuris margaritacea*)[3].

In 2016 the Fish Quarantine Center of Gorontalo Province issued a list of types of fish that were included in the protected species, barred and invasive (JADDI), and status of Huluu Fish was included in the JADDI fish list so it needed to be protected [4]. This statement is supported by The IUNC red List of Threatened Species in 2017 that the status of *Giuris margaritacea* is last concern [5]. Based on that knowledge was we need to do this research. Research objectives that is to know relations lenght-weight and condition factors of Huluu fish (*Giuris margaritacea*) in Limboto Lake. Lenght-weight relationship give information about growth pattern and condition factor give information about how the fish as related to its environment [6].
2. Research Method

Research was done in April until June in Limboto Lake with 7 points of sampling, that is Village Tabumela, Hutuo, Dembe, Lupoyo, Lekobalo, Kayu bulan and Hunggulawa. The points of sampling on map in Figure 1. Sampling was carried out by purposive sampling, which was based on fishing activities in Limboto Lake especially related to Hulu'u (Giuris margaritacea). In this study the process of fishing was carried out by using the type of trap fishing called "Bunggo". The time of fishing was carried out at 09.00-16.00 WITA. Furthermore, the fish caught was measured in length and weight.

Data analysis used to research is Model Allometric Linear (LAM) used to calculate parameter a and b through the measurement of changes in the weight and length

\[ W = aL^b \]  \hspace{1cm} (1)

Where; \( W \) is the weight of the fish (gram), \( L \) is the length of the fish (cm), \( a \) is the linear regression intercept, \( b \) is the regression coefficient. The value of \( b \) from this calculation can illustrate the pattern of fish growth. If the value of \( b = 3 \), then the growth pattern is isometric or weight gain equals to the length of the fish growth and if the value of \( b \neq 3 \), then the growth pattern is allometric. Allometric growth patterns are divided into two, namely allometric positive and allometric negative. If the \( b \) value below 3 is called allometric negative (the length increase is faster than the weight gain), and if the \( b \) value above 3 is called allometric positive (weight gain is faster than the length increase).

The condition factor is obtained through the formula:

\[ Kn = \frac{W}{aL^b} \]  \hspace{1cm} (2)

Where; \( Kn \) is the condition factor, \( W \) is the weight of the fish (gram), \( L \) is the length of the fish (cm), \( a \) is the linear regression intercept, \( b \) is the regression coefficient.

![Figure 1. Map station for collecting sample of Hulu fish in Limboto Lake](image)

3. Result and Discussions

Based on the results of research conducted in lake limboto on 7 point of sampling there are Tabumela village, Hutuo, Dembe, Lupoyo, Lekobalo, Kayu bulan and Hunggulawa. As for point the sample collection can be seen in Figure 1. Fish huluu who caught at the station I is 66 of fish, station II is 55 of fish, station III is 55 of fish, station IV is 35 of fish, station V is 46 of fish, station VI is 52 of...
fish and station VII is 54 of fish. The quantity of fish caught every month fluctuating. In April is the highest catches about 141 of huluu fish t, in May that is 110 of fish and June that is 112 of fish.

**Table 1.** Relationship between the length - heavy and factors condition of Huluu ( *Giuris margaritacea*) in Limboto Lake

| Station | a   | B   | R²  | L   | W   | Growth of pattern | Condition Factor |
|---------|-----|-----|-----|-----|-----|------------------|-----------------|
| I       | -5.70 | 3.35 | 0.93 | 14.58 | 37.7 | Alometric positive | 0.14            |
| II      | -5.48 | 3.23 | 0.82 | 15.2 | 39.7 | Alometric positive | 0.15            |
| III     | -5.27 | 3.13 | 0.96 | 15.3 | 41.5 | Alometric positive | 0.16            |
| IV      | -5.51 | 3.25 | 0.76 | 15.6 | 42.2 | Alometric positive | 0.15            |
| V       | -5.79 | 3.36 | 0.96 | 15.2 | 36.6 | Alometric positive | 0.12            |
| VI      | -5.58 | 3.25 | 0.79 | 15.6 | 38.4 | Alometric positive | 0.14            |
| VII     | 1.1  | 1.21 | 0.74 | 14.6 | 37.3 | Alometric negative | 1.91            |

Based on analysis of the was done with length and weight that show fish huluu who caught at the station I until VI having a pattern growth alometric positive which means growth the weight of the faster than the length of the body. Fish huluu who caught at the station VII having a pattern growth different namely alometric negative means the development the length of the body faster than the growth weight. Fish are not always have a similar growth, relations length and weigh is differently affected environmental water conditions s [7].

The results of the analysis condition factors were made Huluu fish discovered that the the range of condition factor between 0.12 - 1.91 whereby the meaning of the value a fish is categorized as fish flattened. Flattened of fish is result from the environment thick in the waters that is no longer support for fish to growth [8]. Factors that have brought about flattened of fish shaped in environmental factor thick in the waters, the availability of food and diseases [9].

4. Conclusion

The results of the study of the length and weight of Hulu'u fish (*Giuris margaritacea*) in Limboto Lake, showed that the Hullyu fish growth pattern at I-VI stations was positive alometric (b> 3) and at station VII Hulu'u fish growth pattern is a negative alometric (b <3) meaning that the increase in body length is faster than the growth of body weight. The condition factor analyzed for Huluu fish, it is known that the range of condition factors obtained is between 0.12 - 1.91 where the meaning of the value is the fish included in the category of flat fish.

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