Length weight relationships and condition factor of sweet river prawn, *Macrobrachium esculentum* (Thalwitss, 1891) in the downstream Rongkong watershed

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Abstract. Swett River Prawn, *Macrobrachium esculentum* (Thalwitzz,1891) is one of the freshwater prawns' species that have important economic value and is the least concern species in the IUCN red list. The purpose of this study was to determine the length-weight relationship and condition factor of *M. esculentum* in the downstream watershed Rongkong. Prawns’ sampling was conducted from September 2018 to February 2019 from the artisanal fishery in the downstream watershed Rongkong, using method simple of Random Sampling. *M. esculentum* obtained as many as 244 Prawns’ consisting of 147 male and 97 female. The results showed that the long weight relationship for males was $W = 0.712L^{0.2865}$ and females $W = 11.137 L^{3.0537}$. $b$ value for males is smaller than 3, growth is allometric negative while females are positive allometric ($b>3$). Average condition factor values for male and female shrimp are 275.28 and 1.88, respectively. The average relative weight (Wr) values for males and females are 100.2 and 101.9, respectively, which shows that the waters are still in good condition.

1. Introduction

Rongkong watershed is located in the area of Luwu Regency, and North Luwu in South Sulawesi Province, the potential for inland fisheries is quite high, especially in the downstream rivers. Several types of freshwater shrimp live in these waters and become a source of livelihood for the local community, one of which is the sweet river prawn (*Macrobrachium esculentum* (Thallwitz, 1891)), a freshwater shrimp species that is traded and is dominantly caught by local fishermen. The species life at Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls) and the lower reaches of rivers1.1 with sand/ mud substrate not far from the sea at the interface between fresh and brackish water [1].

Information on length-weight relationships is needed to determine growth patterns and age [2,3,4], it is very important for modeling stock assessments and evaluating the relative condition of fish among populations [5]. Growth is an important component of biological production, which affects overall production directly. and condition factors to be known as efforts to manage fisheries resources [2] Condition factors are used to predict physical and biological conditions which are interactions of food availability, disease infections and physiological conditions [6]. Studies on the biological aspects of *M. esculentum*, are
still lacking, status is least concern [3] and occurrences in Indonesia and Taiwan [7]. Research on the length-weight relationship and condition factors of *M. esculentum* in the downstream Rongkong watershed is the first to be carried out, the will go along way it can be a basic information for the management sustainable of these prawn resources.

2. Material and method

2.1. Study site

Prawns' sampling was conducted from September 2018 to February 2019 with one-quarter frequency, from the artisanal fishery in 3 sub das the downstream waters of Rongkong (Waelawi, Salu Jambu and Pombakka), Luwu Districs and North Luwu. South Sulawesi Province, respectively 3 capture stations Figure 1.

![Figure 1. Map showing the Sampling Site of downstream Rongkong Watershed, where *M. esculentum* was captured for the present study.](image)

**Figure 1.** Map showing the Sampling Site of downstream Rongkong Watershed, where *M. esculentum* was captured for the present study.

2.2. Sampling of prawns

The sampling method is random sampling using a traditional type of mini-trap tool called Kopa’, a tube-shaped trap, a length of 80 cm and a diameter of 25 cm. Samples that were caught were put in a coolbox and then taken to the Elementary Laboratory of the Faculty of Fisheries, Andi Djamena Palopo University. Samples were separated between male and female visually by looking celiped (second leg) if female and paired were male [8]. Total Length measurements using 0.01 mm caliper and weight with acis Ad 300i 0.01 gram digital scales. The ingredients are Sweet River Prawn (*Macrobrachium esculentum*) and 70% alcohol.
2.3. Analysis growth pattern (length and weight)

Analysis of length-weight data. The allometric linear model (LAM) is used to calculate parameters a and b through measurements of changes in weight and length. The correction of bias in the change in mean weight of the logarithmic unit is used to predict the weight of the length parameter according to the allometric equation [9]:

\[ W = a L^b \]  

(1)

2.4. Analysis condition factor (K)

The relative weight (Wr) and coefficient condition factors (K) are used to evaluate the condition factors of each individual. The relative weight (Wr) is determined based on equation [10].

\[ Wr = \left( \frac{W}{Ws} \right) \times 100 \]  

(2)

\( Wr \) is the relative weight, \( W \) is the weight of each fish, and \( Ws \) is the standard weight predicted from the same sample because it is calculated from the combined length-weight regression through the distance between species:

\[ Ws = a L^b \]  

(3)

The Fulton (K) condition coefficient is determined based on [14] with the following formula:

\[ K = WL^{-3} \times 100 \]  

(4)

Statistical analysis using Microsoft Excel and the significance of r² and b values between males and females was tested with a simple t test.

3. Result and discussion

3.1. Growth pattern (length-weight relationship).

Length and weight data are often analyzed in fisheries science to derive a parametric weight–length relationship for estimating biomass and to develop indices of condition for comparing the ‘wellness’ of different populations of fish [5]. The results showed growth patterns Table 1. Male sweet river prawn (\textit{M. esculentum}) has a negative allometric growth pattern, whereas females have a positive allometric growth pattern. The length-weight relationship graph is presented in Figure 2 and Figure 3.

| sex   | n  | Total Length (mm) | Weight (gr) | Regression Parameters |
|-------|----|-------------------|-------------|----------------------|
|       |    | Min.  | Max.  | Min.  | Max.   | a    | b    | r²  |
| Female| 97 | 34.70 | 82.20 | 0.69  | 11.24  | 11.137| 3.0537| 0.9275|
| Male  | 147| 3.70  | 160.29| 2.94  | 8.99   | 0.712 | 0.2865| 0.9324|

The growth pattern of \textit{M. esculentum} male prawns’ in downstream Rongkong watershed is negative allometric and female, allometric positive. Similar results were found in \textit{M. malcommsonii} prawns’ in the Indus River with positive allometric growth patterns for males and negative allometrics for females [2]. In general, the value of b depends on physiological and environmental conditions such as temperature, pH, salinity, geographical location and sampling techniques, and also biological conditions such as gonadal development and food availability [11].
The results showed the value of the correlation coefficient (r) male 0.9656 and female 0.9631. High correlation coefficient values indicate a close relationship between length-weight gain. The coefficient value is terminated (R²) male 0.9324 and female 0.9631, this means that 93% and 96% of the total variant weight gain of both males and females can be explained by the graph of length-weight relationships.

3.2. Condition factor
The result condition factors of the sweet river prawn (*M. esculentum*) could be seen in Table 2.
Tabel 2. The value Condition Factors of M. esculentum from the downstream Rongkong Watershed

| Sex     | Average L | Average W | Ws    | Wr    | Condition Factor |
|---------|-----------|-----------|-------|-------|------------------|
| Female  | 52.63     | 3.17      | 3.0676| 101.6 | 1.29             |
| male    | 33.28     | 5.22      | 5.2082| 100.2 | 7.28             |

Condition factors Sweet River Prawn (M. esculentum) in Table 2, males and females have a value 7.28 and 1.29 respectively. The calculation results show the observed weight value higher than the predicted weight indicates the condition of the waters is still good to support growth. The condition factor value also shows that the waters of the downstream Rongkong watershed are sufficient food and predator density low. In addition to the availability of feed or predators, biotic, abiotic factors and management fisheries also influence the condition factors [12, 13].

4. Conclusion
The Length-weight relationship of M. esculentum female is positive allometric growth pattern and male negative allometric growth pattern. The condition factor values indicate that the Rongkong watershead downstream waters are sufficient food and low predator density. The condition of the waters of the Rongkong watershed is still good.

5. References
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