

# The Length-Weight Relationship of *Metapenaeopsis mogiensis* in North Aceh Waters, Indonesia

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**Abstract.** Shrimp as one of potential commodity which has a high protein and savory flavor of meat is highly favored by the people in the country and abroad. The catch activity of the *Metapenaeopsis mogiensis* shrimp by the fisherman in Pusong Lama, Lhoksemawe has long been a livelihood. However, if the shrimp catching activity was carried out continuously without any restrictions, it can threaten the sustainability of the shrimp. The purpose of this study was to determine the length-weight relationship of shrimp caught in the waters of Aceh Utara, Indonesia. This research was expected to provide additional information on the existence of *Metapenaeus mogiensis* shrimp and future sustainable resource management for farmers. The research method used was a simple random withdrawal method by taking shrimp samples randomly from a basket of fishermen's catch in one sail. A total of 10% shrimp samples of the total catch of fishermen was taken, then length was measured and weighed. Sampling was carried out in July 2019 at TPI Pusong lama, Lhoksemawe. The length of carapace of male shrimp ranges from 14.8 mm to 22.2 mm and females 13.9 mm to 22.1 mm. The weight of male shrimp ranges from 2.17 grams to 6.73 grams and the weight of female shrimp ranges from 2.01 grams to 5.83 grams. Growth patterns found in both males and females showed allometric negatives and the ratio of sex was 1.5: 1 (male:female).

Keywords: shrimp, length-weight, Aceh.

## 1 Introduction

Indonesia has many edible fish and crustaceans [1, 2,16] and Aceh is one province located at the western tip of Indonesia. Aceh area was surrounded by the sea (Indian Ocean and Malacca Strait) which makes Aceh as One of Indonesia Potential Areas in Fisheries.

Aceh has a coastline about 1,865 km and a sea area of 591,089 km<sup>2</sup> with 663 islands. Along the East Coast of Aceh Province has a variety of diversity in the marine crustaceans sector. One of them is *Metapenaeopsis mogiensis* shrimp. *Metapenaeopsis mogiensis* shrimp is one of the shrimp that has important economic value in the waters of North Aceh, Lhokseumawe. Excessive use of fishery resources can threaten the sustainability of these *Metapenaeopsis mogiensis* shrimp resources.

Shrimp are known as important commodities from the fisheries sector, because they have high nutritional value [1,3]. There are many studies on fish and shrimp including nutrition, shrimp immunity, and diversity [2, 4, 5, 6, 7, 8, 9, 10, 11,15]. Shrimp fishing as a target encourages increased sustainable fishing efforts. This is caused by increased market demand for shrimp. Therefore, the purpose of this study was to determine the length-weight relationship of sea shrimp in the waters of Lhokseumawe District. This research is expected to provide additional information about the existence of

*Metapenaeopsis mogiensis* shrimp and sustainable management of crustacean fisheries resources for farmers.

## 2. Materials and Methods

### 2.1 Sampling

Sampling of *Metapenaeopsis mogiensis* shrimp was conducted in July 2019 at TPI Pusong Lama, Lhoksemawe City. The sampling method uses a simple random sampling method, namely by taking random samples of shrimp from a basket of fishermen's catch in one sail. Shrimp samples was taken 10% of the total catch of fishermen then the length was measured and weighed.

### 2.2. Research parameter

The length-weight relationship are calculated using a formula [12].

$W = a L^b$

Where:

W = total weight (gr);

L = shrimp carapace length (cm);

a = intercept

b = Constant

Values *a* and *b* are constants obtained from the results of long and heavy regression analysis. To find out

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that the value of b is significantly different or not with 3, the t-test is used according to the equation [13].

### 2.3 Sex ratio

According to Zar [14], the sex ratio of males and females can be performed using the Chi-square test ( $X^2$ ) with a confidence level of 95%.

## 3. Results and Discussion

### 3.1. Length-weight relationship

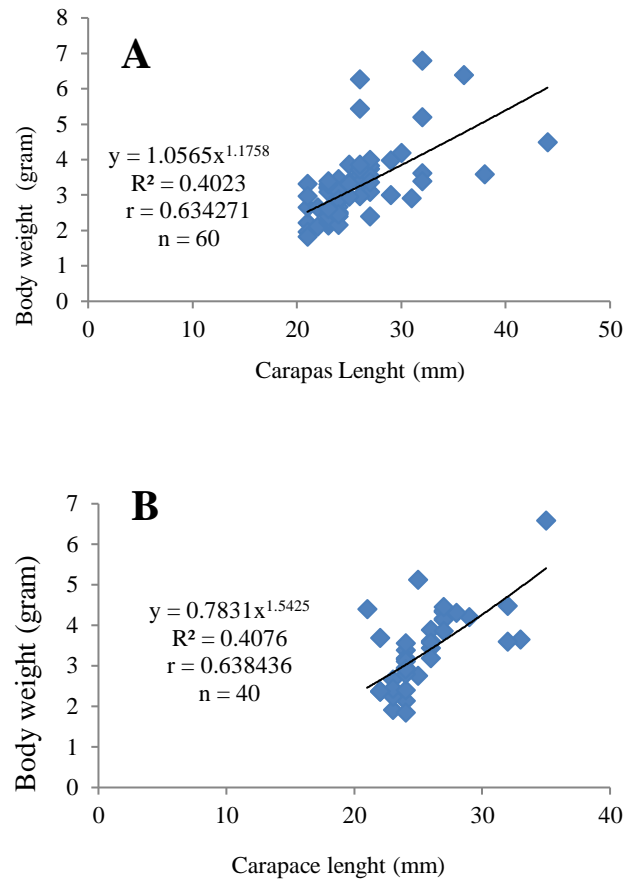
The numbers of *Metapenaeopsis mogiensis* caught during the study were 100, 60 male shrimp and 40 female shrimp. The results of the analysis of the shrimp *Metapenaeopsis mogiensis* relationship between length and weight could be seen in Table 1.

**Table 1.** The relationship of length-weight of *Metapenaeopsis mogiensis*

No	Parameter	Male	Female
1	Carapace length range (mm)	21-44	22- 35
2	Body weight (g)	1.83- 6.8	1.85- 6.58
3	b value	1.17	1.54
4	Coefficient correlation (r)	0.63	0.63
5	Regression equation	$y = 1.0565x^{1.1758}$	$y = 0.7831x^{1.5425}$
6	Type of growth pattern	Allometric negative	Allometric negative
7	Number of samples (n)	60	40

The b value in Table 1 showed that the growth patterns for *Metapenaeus mogiensis* shrimp, both male and female, were allometrics negative which mean that the length increase was faster than the weight. Based on the results, it showed that shrimp were still in its infancy and efforts need to be made to limit the catching of shrimp using net. Young shrimp can still grow and develop.

The results also showed the correlation coefficient (r) of male and female *Metapenaeopsis mogiensis* shrimp 0.95 and 0.94 which showed that the relationship between weight gain of shrimp with length increase indicated a strong relationship (Figure 1). The determination coefficient ( $R^2$ ) of male and female were 0.60 and 0.60, respectively. This means that about 60 % of shrimp weight gain was due to increased shrimp length, while 40 % increase in shrimp weight is caused by other factors such as environmental and age. High and low values obtained in this study probably due to the shrimp length will increase with the increasing of shrimp weight.



**Figure 1.** Length-weight of shrimp (*Metapenaeopsis mogiensis*) caught at TPI Pusong Lama Lhoksemawe City. (A) male and (B) female.

### 3.2. Sex ratio

Sex ratio was calculated based on the comparison of male shrimp and female shrimp was presented in the Table 2.

**Table 2.** The sex ratio parameters of *Metapenaeopsis mogiensis* shrimp.

No	Sex ratio parameters	Male	Female
1	Percentage (%)	60	40
2	Sex ratio	1	0.66
3	Test chi square	4 > 3.84	

Table 2 showed the percentage of male and female sex of Shrimp *Metapenaeopsis mogiensis* were 60% and 40%, respectively. This result indicated that that shrimp caught in the waters of North Aceh, Lhoksemawe have fewer opportunities for spawning or mating. Based on the calculation of the sex ratio, the ratio of male and female shrimp is 1: 0.66, where the ratio of males is greater than females. Chi square test value with a confidence level of 95% obtained  $4 > 3.84$  results showed a comparison between male and female genital ratio unbalanced, where  $H_1$ : there is a real difference between male and female genital ratio.

## 4. Conclusion

The long-weight relationship of male and female shrimps showed growth negative allometric, where length growth is faster than weight gain. Correlation coefficient values indicate that the relationship between weight gain and length gain (male and female) shows a strong relationship. Comparison of male and female sex ratio was 1: 0.66 and chi square values obtained by males and females are not balanced.

## References

1. Muchlisin ZA, Nurfadillah N, Arisa II, *et al.* : **Short Communication: Fish fauna of Lake Lauik Tawar and Lake Lauo, Simeulue Island, Indonesia.** *Biodiversitas.* 2017; 18(2): 752-757.
2. Rizwan T, Nasution TK, Dewiyanti I, *et al.* : **Fish diversity in the east coastal waters area of Aceh Besar District, Indonesia.** *AAFL Bioflux.* 2017; 10(5):1180-1185.
3. Pratiwi R: **Aspek Biologi Udang Ekonomis Penting.** *Oseana.* 2008; 33(2): 15-24.
4. Chen YY, Chen JC, Tayag CM, *et al.* : **Spirulina elicits the activation of innate immunity and increases resistance against *Vibrio alginolyticus* in shrimp.** *Fish. Shellfish Immunol.* 2016 ; 55: 690-698.
5. Chen YY, Chen JC, Lin YC, *et al.* : **Shrimp that have received carrageenan via immersion and diet exhibit immunocompetence in phagocytosis despite a post-plateau in immune parameters.** *Fish. Shellfish Immunol.* 2014; 36: 352-366
6. Kitikiew S, Chen JC, Putra DF, *et al.* : **Fuoidan effectively provokes the innate immunity of white shrimp *Litopenaeus vannamei* and its resistance against experimental *Vibrio alginolyticus* infection** *Fish. Shellfish Immunol.* 2013; 34: 280-290.
7. Lin YC, Chen JC, Morni WZW, *et al.* : **Vaccination enhances early immune responses in white shrimp *Litopenaeus vannamei* after secondary exposure to *Vibrio alginolyticus*.** *PLoS ONE.* 2013; 8: e69722.
8. Putra DF, Trisyahdar TN, Dewiyanti I , *et al.* : **Effect of enhanced *Artemia* with gamat emulsion on growth performance and survival rate of white shrimp *Litopenaeus vannamei* larvae.** *IOP Conf. Ser.: Earth Environ. Sci.* 2018; 216: 012005.
9. Muhammadar AA, Chaliluddin MA, Putra DF, *et al.* : **Study of probiotics of yeast and lactic acid bacteria in feeding on culture of larvae shrimp (*Penaeus monodon*).** *IOP Conf. Ser.: Earth Environ. Sci.* 2018; 216: 012031.
10. Baleta FN, Lin YC, Chen YY, *et al.* : **Efficacy of *Sargassum oligocystum* Extract on the Innate Immunity of White Shrimp *Litopenaeus vannamei* and Its Resistance Against *Vibrio alginolyticus*.** *J. Fish. Soc. Taiwan.* 2013; 40(4): 241-256.
11. Putra DF, Muhammadar AA, Muhammad N, *et al.* : **Length-weight relationship and condition factor of white shrimp, *Penaeus merguensis* in West Aceh waters, Indonesia** *IOP Conf. Ser.: Earth Environ. Sci.* 2018; 216: 012022.
12. Ricker WE: **Computation and interpretation of biological statistics of fish populations.** bulletin of fisheries research board of Canada 382pp. 1975
13. Pauly D: **A selection of a simple methods for the assessment of the tropical fish stock.** FAO Fish Circ. Firm/C. 729. 1984.
14. Zar JH : **Biostatistical analysis fourth edition** prentice.hall new jersey 663p (main text) + 212 pp (Apendices). 1999.
15. Hasanah A, Ernawati T, Suman A: **Some aspects of the biology of *Metapenaeus ensis dogol* shrimp in the waters of the land of the South Kalimantan Sea.** *Prosiding simposium nasional crustasea.* 2017.
16. Saputra SW, Solichin A, Rizkyana W: **Keragaman Jenis Dan Beberapa Aspek Biologi Udang *Metapenaeus* Di Perairan Cilacap, Jawa Tengah.** *Journal Of Management Of Aquatic Resources.* 2013; 2 (3): 37- 46.
17. Asbar: **The relationship between the level of exploitation and population structure and production of tiger *penaeus monodon* shrimp in Segara tillers.** Bogor. 1994
18. Walpole RE: **Introduction to statistics, 3rd edition.** PT Gramedia Main Library. Jakarta. 1995