



Studies on Morphological Variation of Localized Wild Populations of Black Tiger Shrimp (*Penaeus Monodon*) and Giant Freshwater Prawn (*Macrobrachium Rosenbergii*)

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Abstract— This research was done to identify morphometric variations in localized wild populations of the giant tiger shrimp (*Penaeus monodon*) and the giant freshwater prawn (*Macrobrachium rosenbergii*). The number of each sex of the two species is 500. The prawns were collected from Thanlwin river near Hpa-an township and the shrimps from Indian Ocean shoreline near Thantwe township. Six morphometric parameters consisting total length (TL), standard length (SL), orbital length (OL), abdominal length (AL), carapace length (CL), second pereopod (sp) length in prawn and third pereopod length (tp) in shrimp were measured in live and wet specimens after weighing. The measurements were subjected to statistical methods of variance, ANOVA and linear regression by SPSS version 14.0 software to find out the most variable as well as stable characteristics in relation to body weight classes in the two species. The abdominal length (AL) was less variable in adult *M.rosenbergii* compared to adult *P.monodon* in both sexes among body weight classes. AL had larger significant difference ($P \leq 0.01$) in *P.monodon* relative to *M.rosenbergii* in both sexes. Linear regression revealed that jump growths occur in both sexes of *M.rosenbergii*, but only in females of *P.monodon*. Overall, regarding all six morphometric parameters, variation was lower, AL increment was slower and growth had jumps in both sexes of the wild adult *M.rosenbergii*, compared to the wild adult *P.monodon*. The data of this research could form the basis for development of high quality broodstocks and could be useful for improvement of growth in pond cultures of shrimps and prawns.

Keywords— Black tiger shrimp, giant freshwater prawn, morphological variation, wild populations.

1. INTRODUCTION

Myanmar has fairly large fishery resources and shrimps occupy a significant commercial position in the coastal fisheries. It is important to gain further knowledge about penaeids and palaemonids to understand their fisheries and effects of commercial exploitation [1], [2].

M. rosenbergii (the largest palaemonid prawn) and *P.monodon* (the largest penaeid shrimp) are of commercial importance not only in Myanmar but also in other Southeast Asian countries. They are needed to be cultured for export market because of their bigger size, good taste, faster growth, high price, high protein content and high demand in market [1], [2].

In Myanmar, regarding the systematic study on the freshwater prawn collected from Yangon markets, Tin Tin Soe (1970) described nine species of freshwater prawn [10]. Similarly, Khin Nwe Mu (1980) reported 10 species of freshwater prawn found in the mouth of Nga Wun River, Patheingyi Township [6]. Htay Aung (1982) recorded twenty eight species of penaeid shrimp occurring in Mon state and Tanintharyi Division coastal water [5]. Also, Myint Thein (1984) described thirteen species of freshwater prawn under the genus *Macrobrachium* found in Ayeyarwaddy Delta Regions [8]. Win Win Myint (1988) classified and described sixteen species of freshwater prawns from estuarine

water of Mon state [11]. Sann Aung and Hla Htay (1987), presented a field guide to identification of commercially important marine prawns of Myanmar [9].

However, study on morphological character variations and their relationships in the wild species of shrimp and prawns has not yet been done in Myanmar. Hence, it is necessary to study the quality and morphological variations in the natural wild populations of the shrimps and prawns so that the data could be applied to more effective genetic and quality control of the cultured shrimps and prawns to meet the export quality standards, and to develop genetically superior broodstocks for commercial applications.

2. MATERIALS AND METHODS

2.1 Study areas and study period

M.rosenbergii adults were studied from Thanlwin River near Hpa-an township in Kayah State during 2005, and *P.monodon* adults were studied from near shore catches around Thantwe township in Rakhine state during 2006-2007.

2.2 Sampling

Five hundred specimens each of adult males and females of both species were collected from local wholesale dealers in the respective study areas.

2.3 Identification of specimens

Identification, classification and sexing of both species were done using keys and methods [3], [4], [7] and [9].

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2.4 Morphometric study

After collection, identification and sexing, each specimen of the prawns and shrimps were weighed for wet body weight in grams (gm) and various respective body and appendage lengths (i.e. total length, standard length, orbital length, abdominal length, carapace length, 2nd pereopod length in prawn and 3rd pereopod length in shrimp) were measured in centimeter (cm). All data were recorded on data sheets and specimens were photographed were ever necessary.

2.5 Preservation of specimens

Specimens collected fresh from the natural wild catches were preserved in a solution of 5% formalin or 5% alcohol in labelled glass bottles with caps for future reference.

2.6 Statistical analysis of morphometric parameters

Specimens from natural wild catches were studied and measured for key characters. The results recorded were compared to that of standard parameters for the key characters of the male and female in each species.

Data for the key measurements of the morphological characteristics were subjected to suitable statistical methods by using SPSS version 14.0 to identify the most variable characters as well as stable traits within each weight class of males and females of both species.

3. RESULTS

Seven body measurement parameters consisting body weight, total length (TL), standard length (SL), orbital length (OL), abdominal length (AL), carapace length (CL), pereopod length (sp or tp) were measured and subjected to statistical analysis, and the following results were obtained.

3.1 Variance

In male *M.rosenbergii*, the abdominal length, which is important for marketing, had very low total variance (1.842).

In female *M.rosenbergii*, the abdominal length had low total variance of 1.217.

In male *P.monodon*, AL had low variance in most weight classes with total variance of 4.662.

In female *P.monodon*, AL had total variance of 7.432.

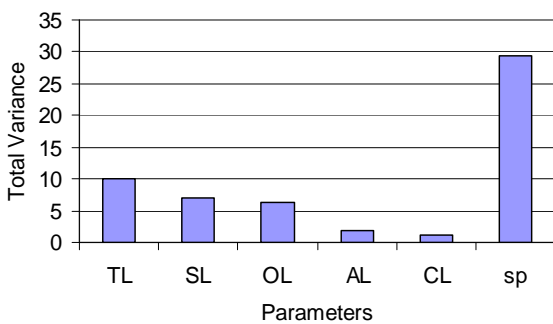


Fig.1. Total variance of six morphometric parameters based on body weight classes in adult male *M.rosenbergii*

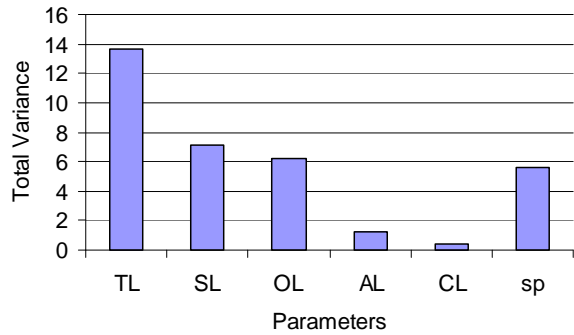


Fig.2. Total variance of six morphometric parameters based on body weight Classes in adult female *M.rosenbergii*

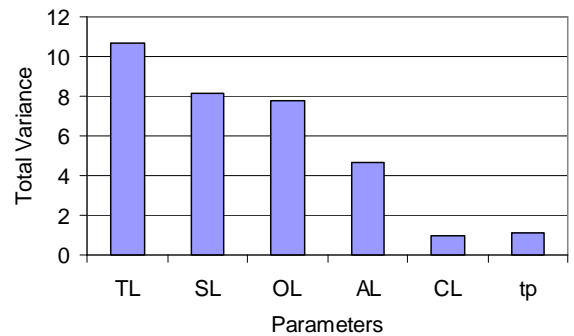


Fig.3. Total variance of six morphometric parameters based on body weight classes in adult male *P.monodon*

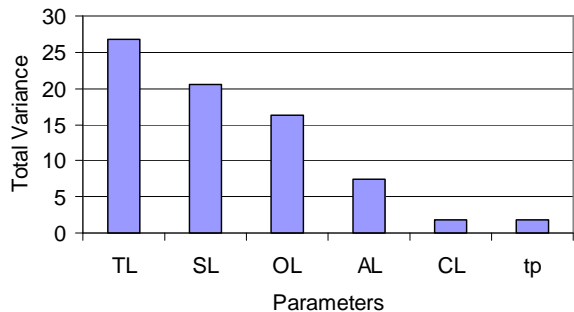


Fig.4. Total variance of six morphometric parameters based on body weight classes in adult female *P.monodon*

3.2 Analysis of variance (ANOVA)

M.rosenbergii females had larger significant difference than males for AL between weight classes (i.e. F = 175.56 and F = 44.79; P ≤ 0.01).

Regarding *P.monodon*, females had larger significant difference in AL between weight classes compared to males (i.e. f = 785.47 and f = 347.25; P ≤ 0.01).

3.3 Linear Regression

In *M.rosenbergii*, female had stronger relationship in AL to body weight compared to male. Females have greater AL increments than males (i.e. 0.0247 cm/gm versus 0.0127 cm/gm).

In *P.monodon* male had stronger relationships between AL and body weight compared to female. Males have

greater AL increments than females (i.e. 0.0908 cm/gm versus 0.0777 cm/gm).

M. rosenbergii wild adult males have jump or “leapfrog” growth between 250gm and 300gm body weight classes; but wild females have a spurt of “divergent” growth between 50gm and 75gm weight classes after which the growth levels off more linearly.

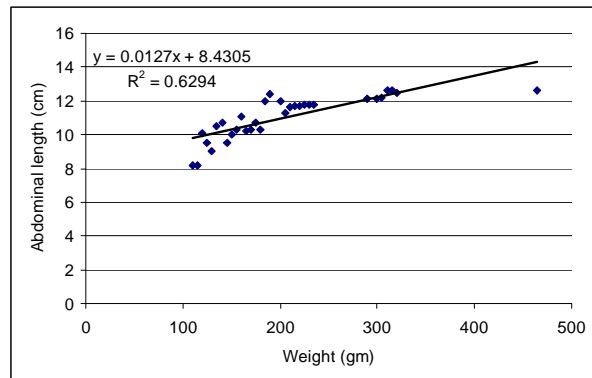


Fig .5.Relationship between body weight and abdominal length of adult male *M. rosenbergii*

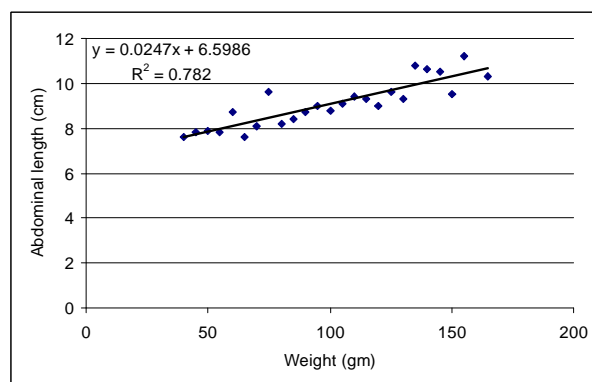


Fig .6.Relationship between body weight and abdominal length of adult female *M. rosenbergii*

P.monodon wild adult males have a more or less continuous and linear growth pattern, but females have a “jump” growth between 60gm and 80gm body weight classes for 5 parameters of TL, SL, OL, AL and CL but was slight for tp growth.

4. CONCLUSION

This research was carried out to study morphometric variations of the localized wild populations of *P.monodon* and *M.rosenbergii*, with the aim to assess the stability or variation of the morphometric characteristics of genetic and economic importance.

Abdominal length (AL), which is important for headless export, is less variable in wild adult *M.rosenbergii* compared to wild adult *P.monodon* among both sexes and body weight classes. The study through variance method showed that AL variance is the lowest in 110gm and 310gm weight classes and the highest in 185gm and 230gm body weight classes in males; but the lowest in 55gm and 150gm weight classes and the highest in 130gm and 165gm weight classes in females for *M.rosenbergii*. For *P.monodon*, variance method

showed that AL variance is the lowest in 70gm and 80gm body weight classes and the highest in 50gm and 100gm weight classes in males; but the lowest in 95gm weight classes and the highest in 60gm and 100gm weight classes in wild adult female.

Females have larger significant difference ($P \leq 0.01$) than males in AL between body weight classes in both wild species.

In wild adult *M.rosenbergii* females have greater AL increments than males, whereas adult *P.monodon* wild females have slower AL increment than males.

According to linear regression analysis, males have jump or “leapfrog” growth; but females have a spurt of “divergent” growth in *M.rosenbergii*. In *P.monodon*, males have a more or less continuous and linear growth pattern, but females have a “jump” growth for 5 parameters of TL, SL, OL, AL and CL but was slight for tp growth.

RECOMMENDATIONS

Specimens with good AL increment and low variance could be selected from among the body weight classes, and cross to obtain progeny with stable and improved AL increment for grow-out farming leading to higher quality headless category export.

Moreover, individual with shorter second or third walking leg could be selected and bred for progeny with less leg weight contribution to total body weight, improving net meat weight yield.

Furthermore, through selective breeding improved broodstocks with good qualities such as stable and faster growing TL and AL with low variance, small walking legs could be developed for genetic upgrading in shrimp and prawn hatcheries. The data generated, in this research work, could form the basis for development of high quality broodstocks and for improvement of growth in pond cultures of shrimps and prawns.

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