The Biology of the Tiger Shrimp (*Penaeus monodon*) from Lagos Lagoon, South-West Nigeria

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**Abstract:** Some aspect of the biology of Tiger Shrimp (*Penaeus monodon*) from Makoko fish market along the Lagos lagoon was analyzed. Randomly collected fresh samples were stored in a frozen iced chest boxes and transported to the laboratory for further analysis. The total length and weight were measured using standard methods. The mean lengths and weights of the samples were used for data analysis. The degree of association between the length and weight was computed from linear regression analysis. The respective exponential equation for the length weight relationship of the carapace length-total weight relationship are: Males (W= 0.494L^{2.954}); Females (W=1.490L^{2.044}) and Pooled sexes (W = 1.122L^{2.255}), and those for the total length-total weight relationship are: Males (W= 0.0027L^{3.354}); Females (W=0.0090L^{2.880}) and Pooled sexes (W = 0.0057L^{3.055}). Condition factors between both sexes were not significantly different at (p > 0.05). The diet of *Penaeus monodon* was also investigated as the frequency of occurrence of food items revealed primarily Planktons, Pisces, Crustaceans, partly digested food materials and less common items.

**Keywords:** Makoko, food and feeding habit, condition factor, Tiger shrimp.
1. Introduction

Globally, capture fisheries stocks are on the decline and aquaculture presently supplies more than one fourth of all fish (both fresh and marine species) that humans eat (FAO 2001). Aquaculture is a production system that cuts across several segments of human livelihood. It provides a lot of opportunities that significantly alleviate poverty, create employment and contribute to the conservation of natural resources and food security. Of the farmed aquaculture species, shrimps constitute a significant proportion. Shrimps are highly relished and among the leading priced seafood on the global menu (Zabbey 2007). With the steady increase in rates of shrimp consumption in the developed world, especially in the US, Europe and Japan, it is increasingly becoming obvious that per capita shrimp intake probably correlates positively with economic growth (Zabbey 2008).

Shrimp fishery is one of the most important components of world annual fishery production. Its value has accentuated over the years, due to high demand, especially in developed countries. Shrimps are regarded as the most consumed fishery products in most developed countries. The demand and high foreign exchange earnings have driven exploitation of most shrimp stocks to unhealthy levels.

The tiger shrimp, *Penaeus monodon* is one of the largest penaeid Shrimp in the world reaching 260 mm in body length or 250 g in weight, and is of commercial importance not only in Nigeria but also in other parts of the world. Although various studies have been carried out regarding tiger shrimp, *Penaeus monodon*, there is however a dearth of information on dynamics in biology of this shellfish from this part of the Country. It is on this basis that this study was carried out aiming at providing useful information on the dynamics in biology of *Penaeus monodon* caught in Lagos Lagoon, Nigeria.

2. Materials and Methods

2.1. Study Area

The field survey and collection of samples during the present study was conducted at Makoko fisheries market in Lagos state. Collection of samples was made both by commercial and research methods and hearsay evidence from fishermen on the seasonal occurrences of *P. Monodon*.

Makoko in Lagos state is located at latitude 6° 29’N and 3° 23’E of the equator which is about 1.53 miles away from the University of Lagos. The river serves as one of the major source of fishing ground for Lagos state. The market (Makoko market) is located beside the river which enables the populace of Yaba and its environs obtain fresh fish readily on a daily basis. Fig. 1 shows the map of Makoko and the sampling site.

Fresh samples of tiger shrimps (*Penaeus monodon*) were randomly collected from Makoko Jetty area of Lagos Lagoon. The specimens (*P. monodon*) were immediately preserved using a frozen...
iced chest and immediately transported to the laboratory of Marine Sciences, University of Lagos for further biological investigations.

Fig 1: Map of makoko along lagos lagoon showing sampling site (source: Encarta, 2009).

2.2. Growth Pattern (Length and Weight)

The carapace length (CL), total length (TL), rostral length (RL) and telson length (TL) of the *P. monodon* were measured in centimeters (cm) using the graduated measuring ruler, while the total weight (TW) and carapace weight (CW) were measured using a Sartorius top loading balance (Model 1100).

Total length measured to the nearest centimeter was obtained by stretching out the curved shrimp and taking lengths from the telson to the base of the eyestalk. The telson length was measured from the posterior end of the carapace to the base of the telson while the carapace length was obtained by cutting off the cephalothoraxes and taking measurements from the posterior end of the carapace to the base of the eyestalk.

The total weights of whole specimens were made using a top metic digital scale after excess water had been removed from the shrimp and the measurement was taken to the nearest gram. The length- weight relationship (LWR) was calculated using the equation bellow as given by Sparre and Venema (1992).

\[ W = aL^b \]

Where:

\( W \) = body weight of shrimp (g)
L = total body length of shrimp (cm)
a = proportionality constant or intercept
b = exponent

The corresponding log transformation values of length and weight gives the linear expression

\[ \log W = \log a + b \log L \]

via least square linear equation (Zar, 1984).

2.3. Condition Factor (K)

The condition factor (K) determines the effects of seasonal and habitat difference in the robustness and general wellbeing of the shrimp species and the condition factor (k) for the tiger shrimp was calculated using the equation below:

\[ CF = \frac{100W}{L^3} \]

Where:

W = weight of shrimp
L = Length of shrimp

2.4. Statistical Analysis

The experiment was designed and statistically analyzed using regression equation to observe any correlation in the morphometric parameters. Statistical significance of measured parameters was performed using the SPSS (Statistical Package Computer, Software 2004 version, Chicago Illinoise, USA). Measured variables were considered significant at \( p < 0.05 \).

3. Results and Discussion

Results of total length-weight Relationships, condition factors and growth pattern of *P. monodon* obtained are shown in Table 1, 2 and 3).

**Table 1:** Regression constant “a”, Regression coefficient “b” and Ranges “r” of Carapace Length-Total Weight Relationship of *P. monodon*

<table>
<thead>
<tr>
<th>Sex</th>
<th>a</th>
<th>b</th>
<th>r</th>
<th>( r^2 )</th>
<th>W=aL^b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.49</td>
<td>2.95</td>
<td>0.83</td>
<td>0.689</td>
<td>0.494L^{2.954}</td>
</tr>
<tr>
<td>Female</td>
<td>1.49</td>
<td>2.04</td>
<td>0.95</td>
<td>0.901</td>
<td>1.490L^{2.044}</td>
</tr>
<tr>
<td>Pooled sexes</td>
<td>1.12</td>
<td>2.25</td>
<td>0.88</td>
<td>0.774</td>
<td>1.122L^{2.285}</td>
</tr>
</tbody>
</table>

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Table 2: Regression constant “a”, Regression coefficient “b” and Ranges “r” of Total Length-Total Weight Relationship of *P. monodon*

<table>
<thead>
<tr>
<th>Sex</th>
<th>a</th>
<th>b</th>
<th>r</th>
<th>r²</th>
<th>W=aLᵇ</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.0027</td>
<td>3.3541</td>
<td>0.9082</td>
<td>0.8248</td>
<td>0.0027L^{3.354}</td>
<td>0.669</td>
</tr>
<tr>
<td>Female</td>
<td>0.0090</td>
<td>2.8801</td>
<td>0.9530</td>
<td>0.9082</td>
<td>0.0090L^{2.880}</td>
<td>0.672</td>
</tr>
<tr>
<td>Pooled sexes</td>
<td>0.0057</td>
<td>3.0551</td>
<td>0.9336</td>
<td>0.8716</td>
<td>0.0057L^{3.055}</td>
<td>0.675</td>
</tr>
</tbody>
</table>

Table 3: Size Ranges of *P. monodon* from Makoko Fish Market

<table>
<thead>
<tr>
<th>Sex</th>
<th>Total Length (cm)</th>
<th>Carapace length (cm)</th>
<th>Total Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>Males</td>
<td>11.5</td>
<td>15.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Females</td>
<td>11.1</td>
<td>14.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Pooled</td>
<td>11.1</td>
<td>15.1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

During the present study, carapace length of *P. monodon* ranged from 2.7 cm to 3.6 cm in males and 2.5 cm to 3.5 cm in females, the length-weight relationship was determined as total length ranged from 11.1 cm to 15.1 cm for pooled sexes while total weight ranged from 8.58 g to 24.27 g as well. The slope or regression coefficient (b) obtained for carapace length-total weight relationship for males, females and pooled sexes were 2.95, 2.04 and 2.25 respectively. The intercept (a) for males, females and pooled sexes varied between 0.499, 1.49 and 1.12 respectively. The ‘b’ and ‘a’ values for carapace length–total weight relationship of *P. monodon* were highest in the females compared to those obtained for males.

The ‘b’ values were calculated to find out whether the *P. monodon* was growing allometrically or isometrically. Values for males, females and pooled sexes were lower than 3.0, thus, reflecting a negative allometric growth for *P. monodon*. The values obtained in this study are similar to the findings of Motoh, (1981) who worked on the fisheries biology of the giant tiger prawn, *Penaeus monodon* in the Philippines. The Rickter, (1973) equation was also adopted in the analysis of this result. Correlation analyses between carapace length-total weight relationships of *P. monodon* used in this research revealed an “r” value of 0.83 and 0.95 for males and females respectively. These values are closely similar to the findings of Motoh, (1981) with “r” values of 0.98 for males and 0.99 for
females. Likewise, the “r” value obtained for the total length-total weight relationship of *P. Monodon* for the males, females and pooled sexes are 0.908, 0.953 and 0.933 respectively. This result is similar to the findings of Francis, (2010).

The values of regression constant ‘a’, regression coefficient ‘b’ and ranges ‘r’ of length–weight relationship of *P. monodon* showed a negative allometric growth and these are not in agreement with the results of Yakubu and Ansa (2007) who reported that *P. monodon* showed positive allometric pattern of growth in Buguma Creek. Medina-Reyha, 2001 reported that variation in the values of ‘a’, ‘b’ and ‘r’ could be attributed to the fact that length - weight relationship of a species varies according to locality and season. Result for condition factor (K) in this study reveals that there were differences in the condition factors for the males and female shrimps however; these differences were not significantly different (p > 0.05). Food and feeding habits results for *P. monodon* in this study reveals a frequency of occurrence of food items to be mainly planktons, pisces, crustaceans, partly digested food materials and less common items.

4. Conclusion

In conclusion, the biology of *P. monodon* remains a major area for future research. More baseline information on the culture of this shrimp species will in no small measure improve the knowledge of culture and boost its cultivation in Nigeria.

References


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http://www.cehrd.org/files/EXPORTING_SHRIMP_FARMING_TO_NIGERIA.doc