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Length-Weight relationship and condition factor of *Macrobrachium vollenhovenii* in Asejire Lake

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ABSTRACT
African river prawns, Macrobranchium vollenhovenii, the largest Macrobranchium species found in West Africa, have contributed immensely to fin fish availability for human consumption. This prawn is being exploited in Asejire Lake in substantial quantity for the past two decades, yet there is no documented report on its growth performance in the area. This study fills the missing information and also provides the baseline data for further studies on M.vollenhovenii in Asejire Lake, Oyo state. Samples of M.vollenhovenii were collected on a biweekly basis from fishermen catches, for a period of three months. The prawn samples were identified based on keys provided by Holthius (1980) and Powell (1985) and, sexed using morphometric features. Morphometric measurements such as Total Length (TL), Carapace Length (CL) and Weigth were taken using standard procedure. Pool of data collected was subjected to statistical analysis using FAO Fish Stock Assessment Tool (FISAT) to establish the length-weight relationship. A total of Two hundred and twelve samples were collected with 37.7% and 62.3% male and female respectively. The total length of male ranged 9.0 – 15.4 cm with mean value of 10.89±0.17cm and weight ranged 14.5g -121.0g of 34.49±2.35g mean value. The linear regression analysis of length – weight relationship gave a positive value of (b) for male (3.52), female (3.29), and combined population (3.36). The condition factor k for male was 0.72±0.02; female was 1.17±0.02 while that of the combined population was 1.13±0.03. The weight growth in male, female and mixed population was found to be positively allometric, indicating that this species get plumber as it grows larger. The value obtained from K factors implies that Asejire lake is a suitable environment for the species, thus, for sustainable management of these stocks the environmental status should be maintained.

Key words: Morphometric features, Length-Weight, Condition factor, Sustainable Management and *Macrobranchium vollenhovenii*.

INTRODUCTION

Freshwater prawns of the genus *Macrobrachium* are decapod crustaceans belonging to the family Palaemonidae. The palaemonids and penaeids have been globally identified as foremost in terms of economic importance and possibility of recruitment into aquaculture. *Macrobrachium* species are found in most inland freshwater areas including ponds, lakes, rivers and irrigation

ditches, as well as in estuarine areas (New, 2002). Hitherto, prawns' fishing in Nigeria is facing challenges of overfishing and pollution caused by industries like Oil and Gas, Bottling Industries, and Nigerian Breweries. It becomes necessary to diversify management efforts to assess the productivity of water bodies and measure the growth and development performance of shrimps to ensure sustainable exploitation. It has been observed that there is a significant reduction of the natural stock of prawns in Nigeria water bodies (Nwosu, 2007). Despite its economic importance and future potentials, very little documented works are available on this prawn in West Africa. Some fish scientists have worked on freshwater prawns and its culturability. Aspects of the biology of *M. vollenhovenii* occurrence in Nigeria have been documented by Marioghae (1982) on the ecology and distribution in Lagos Lagoon, Powell (1982) on their occurrence in the Niger Delta area, Anetekhai (1989 and 1990) on the salinity tolerance and sexual dimorphism in Asejire Lake, Bello-Olusoji *et al.* (1995) on the food of the larvae, Jimoh*et al* (2009) on the food and feeding habits in Epe Lagoon, Abohweyere (2008) on the recruitment pattern in the Lagos-Lekki Lagoon system. Willführ-Nast *et al.* (1993) has recommended this species for aquaculture cultivation, as an African equivalent of the now widely cultured *M. rosenbergii* (FAO, 2000). However, less work have been done on the state of their general wellbeing in relation to growth performance and culturability in their natural ecosystem in Nigeria. This study therefore focuses on the growth pattern and condition factor of *Macrobranchiumvollenhovenii* in Asejire lake.

In fisheries research, length-weight relationship is important for the estimation of weights where only length data are available and as an index of the condition factor of the fish (Pauly, 1993; Petrakis and Stregiou, 1995; Goncalves *et al.*, 1967; Haimovici and Velasco, 2000). The mathematical parameters of the relationship between the length and weight of fish furnish further information on the weight variation of individuals in relation to their length (condition factor K). This factor estimates the general well-being of the individual, sex, season, maturity stages etc. Fish specimens of a given length, exhibiting higher weight are said to be in better condition (Anyanwu *et al.*, 2007).

Most recent works on the length-weight relationship and condition factor of *Macrobrachium species* includes Lagos lagoon (Abohweyere and Wilhams, 2008; Abohweyere, 2008b), Cross River estuary, Nigeria (Enin, 1994), Bello-Olusoji (2005) on species from Rivers, Osun, Ogun and Osse. Yakub and Ansa (2007) used Length-Weight relationship as a tool to assess the general wellbeing of the pink shrimps- *Penaeus notialis* and giant tiger shrimps- *P. monodon* of Buguma creek in the Niger Delta. The observed condition factor suggested the ecological suitability of the brackish water of Buguma creek to be suitable for co-habitation of indigenous pink shrimp and exotic giant shrimp.

African river prawn – *M. vollenhoveni*is exploited in Asejire Lake in substantial quantity, yet, for more than two decades now, there is no detailed and updated report on the growth performance of this prawn in the area. Latest work done by Omoike (2004), on sustainable management of fisheries in Asejire reservoir, did not provide any information on this prawn as it's not part of the fishes examined. This study fills the missing information about the growth performance of *M. vollenhovenii* and also provides an input for further studies on this prawn in Asejire Lake in Oyo state. A study on the Length-weight

relationship of *M. vollenhovenii* in Asejire Lake provides base line data for management decision on the species in the area and similar water bodies. The information on growth- length-weight relationship forms the basis for estimating mortality, recruitment and other parameters of populations.

MATERIALS AND METHODS

Study Area

This study was carried out in Asejire Lake in Oyo State in the Southwest of Nigeria on River Osun, about 30 kilometers east of Ibadan. It is located on the coordinate's 7°21'45"N 4°08'00"E (figure 1). The reservoir was built in the late 1960s. Farming is totally banned in the catchment area, and trees have been planted on the banks, so erosion and silting are not issues. With lot of water supply, the reservoir remains full throughout the year (ADB, 2010). The reservoir provides raw water to the Asejire and Osegere water treatment plants in Ibadan (NL EVD International, 2009). The water supply project was completed in 1972, and has a capacity of about 80 million liters per day, of which 80% is used for domestic purposes (CBN, 1999). Oyan and Asejire lakes have horizontal distance of about 100 km between them.

River Osun is one of the series of West African rivers which do not drain into Niger system but discharge into coastal lagoons and creeks bordering the Atlantic Ocean. The lake is Y-shaped with two unequal arms of the Y. The catchment area above the dam is 7,800 km^2 and the impounded area is 2,342 hectares. The dam has a normal pool elevation (water level) of 150 m and maximum flood elevation of 152.4 m. The lake has an approximate gross storage of 7,403 million liters.

Artisanal fishing activities are known to be pronounced in Asejire Lake throughout the year. Catch composition of fishermen varies from one season to another due to the seasonality of some fish species including freshwater shrimps. The fish catch composition in the area include *Chrysichthys auratus*, *C. nigrodigitatus*, *Hydrocynus forskalii*, *Clarias gariepinus*, *Heterobranchus bidorsalis*, *H. longifilis*, *Pellonula leonensis*, *Malapterurus electricus*, *Gymnarchus niloticus*, *Synodontis nigri*, *Hepsetus odoe*, *Hernichromis fasciatus*, *Tilapia zilli*, *T. guineensis*, *Sarotherodon melanotheron* and *Eleotris senegalensis* and shellfish including *Macrobrachium vollenhovenii* and crabs.

Table 1. Features of Asejire Lake, Oyo State, Nigeria

PARAMETER	ASEJIRE LAKE
Location	30 km East of Ibadan, Oyo state
Latitude	7°21'N
Longitude	4°08'E
Elevation	137 m
Geology	Precambrian metamorphic rocks
Climate	Dry season: November to April Rainy season: May to October
Mean temperature	27.3°C
Mean rainfall	14.7 mm
Mean humidity	79%

Source: Adapted from Ayoade *et al.* (2006).

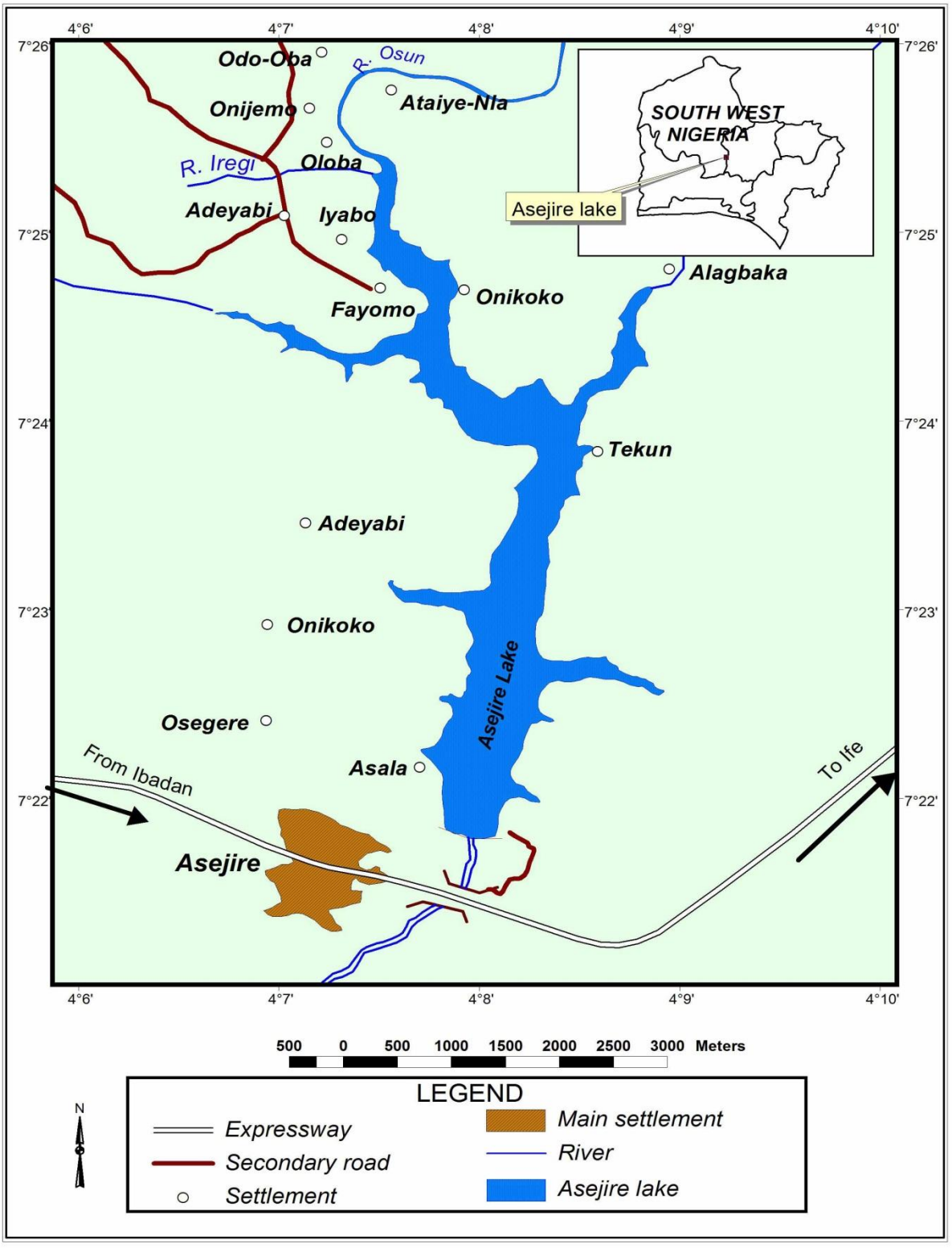

Figure 1: Map of Asejire Lake
Source: Geography Department, University of Ibadan

Collection of Samples

This study was carried out from July to September, 2012 in Asejire Lake/Reservoir. Biweekly samples of *M. vollenhovenii* were collected in the Lake from fishermen catches. The fishing was done with cone-shaped bamboo basket traps described by Solarin *et al.* (2003) and Jimoh *et al.* (2009). The basket trap, locally called *Ajera or Kara*, has a two non-return valve mechanism at the centre of the trap. It has a total length and opening aperture of about 1.0m and 0.3m respectively. Cassava tuber, fresh palm oil fruits, fish, meat were used as baits overnight for 2-3 days. Selection of prawns was done at random as they are harvested from the basket traps. The prawn samples were worked on alive so as to limit errors due to handling/ some morphometric changes as a result of rigor mortis caused by muscle contraction when dead. Samples were conditioned inside a well aerated container while they are being transported to the laboratory prior to analysis. It was observed that some of the life samples collected lost some parts of their appendages to aggression.

Sample Analysis

The prawns were identified using morphological characters as reported by Holthius (1980) and Powell (1985). Sex was determined using morphometric features, such as presence of an appendix masculina on the second pleopods and an appendix interna in the male while only the appendix interna was present in the female. There is also a lump on the ventral view of the first segment of the male abdominal region which could be felt by the tip of finger while it was absent in the female (Anetekhai 1990;Abohweyere, 2008a).

Morphometric Measurement

The Total Length (TL) was measured to the nearest 0.1 cm from the orbital notch to the tip of the telson using a Vernier caliper (Holthius, 1980; FAO, 1981), Carapace Length (CL) from the orbital notch to the posterior edge of the carapace. The Total Length in this study is the Ocular length of prawn. The weight of each shrimp is taken to the nearest 0.1g using "OHAUS" digital Top loading weighing balance, model 71160415.

Data Analysis

The entire three months samples data taken biweekly were put together. The mean, total length and weight as well as the standard deviations were calculated. Using the pooled data, the length-weight data was plotted. FAO Fish Stock Assessment Tool (FISAT) data Analysis programme was deployed to identify and delete obvious outliers (Gayanilo *et al.*, 1996).

The relationship between the length (L) and weight (W) of fish was calculated using Le Cren (1951) equation:

$W = aL^b$ ……. (xix)

Where:

W = body weight of prawn (g)
L = total length of prawn (cm)
a = constant (intercept)
b = exponent or growth co- efficient

The linear transformation was made using natural logarithm as proposed by Zar (1984)

Log W = a + b*LogTL …… (xx)

Where

Log W = natural log of body weight of the prawn (g)

Log TL = natural log of total length of prawn prawn (cm)

a= constant
b= slope or growth co-efficient

The condition factor was calculated using Pauly (1984) formula:

$C.F = W.100/L^3$…….. (xxi)

Where

W = weight (g)
L = total length (cm)

RESULTS AND DISCUSSION

Two hundred and twelve specimens made up of eighty (37.7%) males and one hundred and thirty two (62.3%) females *M.vollenhovenii* were examined during this study period. The Total length of male *M. vollenhovenii* ranged from 9.0cm to 15.4cm with mean value of 10.89 ± 0.17cm and its weight ranged from 14.5g to 121.5g of 34.49 ± 2.35g mean value. While from that of the female *M. vollenhovenii*, Total Length ranges 8.5cm from to 14.8cm of 11.56 ± 1.47cm mean and the weight is from 13.5g to 87.5g of 39.00 ± 1.39g mean.

Growth pattern

The length frequency distribution and condition factor of *M.vollenhovenii* is shown in Tables 2 and 3. The prawn's population was classified into 0.4 class interval for reasonable representation of the entire stock. The total length of larger specimen of male *M. vollenhovenii* ranged from 9.0cm – 9.4cm and that of the lower specimens were 14.5cm – 14.9cm and 13.5cm - 13.9cm, while the total length of larger female *M. vollenhovenii* ranged from 12.5cm – 12.9cm and the lower specimen was 14.5cm – 14.9cm. The larger specimen of combined population had total length ranging from 10.0cm – 10.4cm respectively as shown in Tables 2.

M. vollenhovenii from Asejire Lake ranged in total Length of 8.7cm to 15.2cm and the total weight ranged from 14.35g to 117.00g respectively of the combined population.

Among the 212 specimens of *M. vollenhovenii* used to compute the length-weight relationship, a mean weight of 37.30±18.14g and a mean total length of 11.31±1.52cm were obtained. The condition factor 'K' as shown in Tables 2 and 3 ranged from 0.56 to 0.87 with a mean of 0.72±0.02 (male), 1.07 to 1.27 with a mean of 1.17±0.02 (female) and 0.90 to 1.26 with a mean of 1.13±0.03 (combined population). It was observed that there was no marked variation in the condition factor between the sexes but K-values increased with increasing size of prawns except for few cases.

The length-weight relationship and growth pattern are shown in Table 4. Linear regression analysis of length-weight relationship is shown in Figures 2 and 3. The length-weight relationship of *M. vollenhovenii* gave a positive value of 'b' for male (3.52), female (3.29), and combined population (3.36), which showed that *M. vollenhovenii* growth is positively allometric as the t-test is a departure from 3. Hile (1936) and Martin (1949) observed that the value of the regression coefficient 'b' usually lies between 2.5 and 4.0 and for ideal fish maintain the shape b=3. The values of regression coefficient for male (3.52), female (3.29) and combined sexes (3.36) in the present analysis are very much within range and therefore, *Macrobrachium vollenhovenii* does follow the Cube law. There is a linear relationship between the length and weight of as indicated by the high "r" value of 0.94 (male), 0.98 (female) and 0.96 (combined population).

Table 2. Length frequency distribution and Condition factor (K) by sex of *M. Vollenhovenii*

	MALE				FEMALE			
TL (range) (cm)	**Frequency 'n'**	**TL (cm)**	**Wt (g)**	**K**	**Frequency 'n'**	**TL (cm)**	**Wt (g)**	**K**
8.0-8.4	-	-	-	-	-	-	-	-
8.5-8.9	-	-	-	-	2	8.7	14.35	1.16
9.0-9.4	17	9.2	17.74	0.72	7	9.2	18.01	1.22
9.5-9.9	7	9.7	19.93	0.67	10	9.7	19.14	1.09
10.0-10.4	11	10.2	26.14	0.73	19	10.2	24.55	1.18
10.5-10.9	13	10.7	27.14	0.64	15	10.7	27.93	1.14
11.0-11.4	8	11.2	32.40	0.65	13	11.2	33.97	1.20
11.5-11.9	3	11.7	50.00	0.87	8	11.7	41.36	1.27
12.0-12.4	8	12.2	48.16	0.72	14	12.2	45.89	1.22
12.5-12.9	5	12.7	57.20	0.74	20	12.7	50.65	1.18
13.0-13.4	4	13.2	49.13	0.56	10	13.2	56.58	1.16
13.5-13.9	1	13.7	82.00	0.81	7	13.7	64.14	1.17
14.0-14.4	-	-	-	-	6	14.2	66.58	1.08
14.5-14.9	1	14.7	90.50	0.70	1	14.7	74.00	1.07
15.0-15.4	2	15.2	117.00	0.81	-	-	-	-
Mean		**10.89**	**34.49**	**0.72**		**11.56**	**39.00**	**1.17**
S. Error		**0.17**	**2.35**	**0.02**		**1.46**	**1.39**	**0.02**
S.D		**1.53**	**2.10**	**0.09**		**1.47**	**15.99**	**0.06**

Table 3. Length frequency distribution and Condition factor (K) of the combined sexes of *M. vollenhovenii* from Asejire Lake

TL (Range) (cm)	Frequency 'n'	Midpoint TL (cm)	Weight (g)	K
8.0-8.4	-	-	-	-
8.5-8.9	2	8.7	14.35	1.00
9.0-9.4	24	9.2	17.88	1.04
9.5-9.9	17	9.7	19.54	0.95
10.0-10.4	30	10.2	25.35	1.04
10.5-10.9	28	10.7	27.54	0.96
11.0-11.4	21	11.2	33.19	1.00
11.5-11.9	11	11.7	45.68	1.18
12.0-12.4	22	12.2	47.03	1.06
12.5-12.9	25	12.7	53.93	1.06
13.0-13.4	14	13.2	52.86	0.91
13.5-13.9	8	13.7	73.07	1.11
14.0-14.4	6	14.2	66.58	0.90
14.5-14.9	2	14.7	82.25	0.99
15.0-15.4	2	15.2	117.00	1.26
Mean		**11.31**	**37.30**	**1.13**
S. Error		**0.11**	**1.25**	**0.03**
S.D		**1.52**	**18.14**	**0.10**

Table 4: Length-weight relationship parameters of *M. vollenhovenii*

Sex	N	a	b	r	Growth pattern
Male	80	-2.16	3.52	0.94	+
Female	132	-1.93	3.29	0.98	+
Combined sexes	212	-2.00	3.36	0.96	+

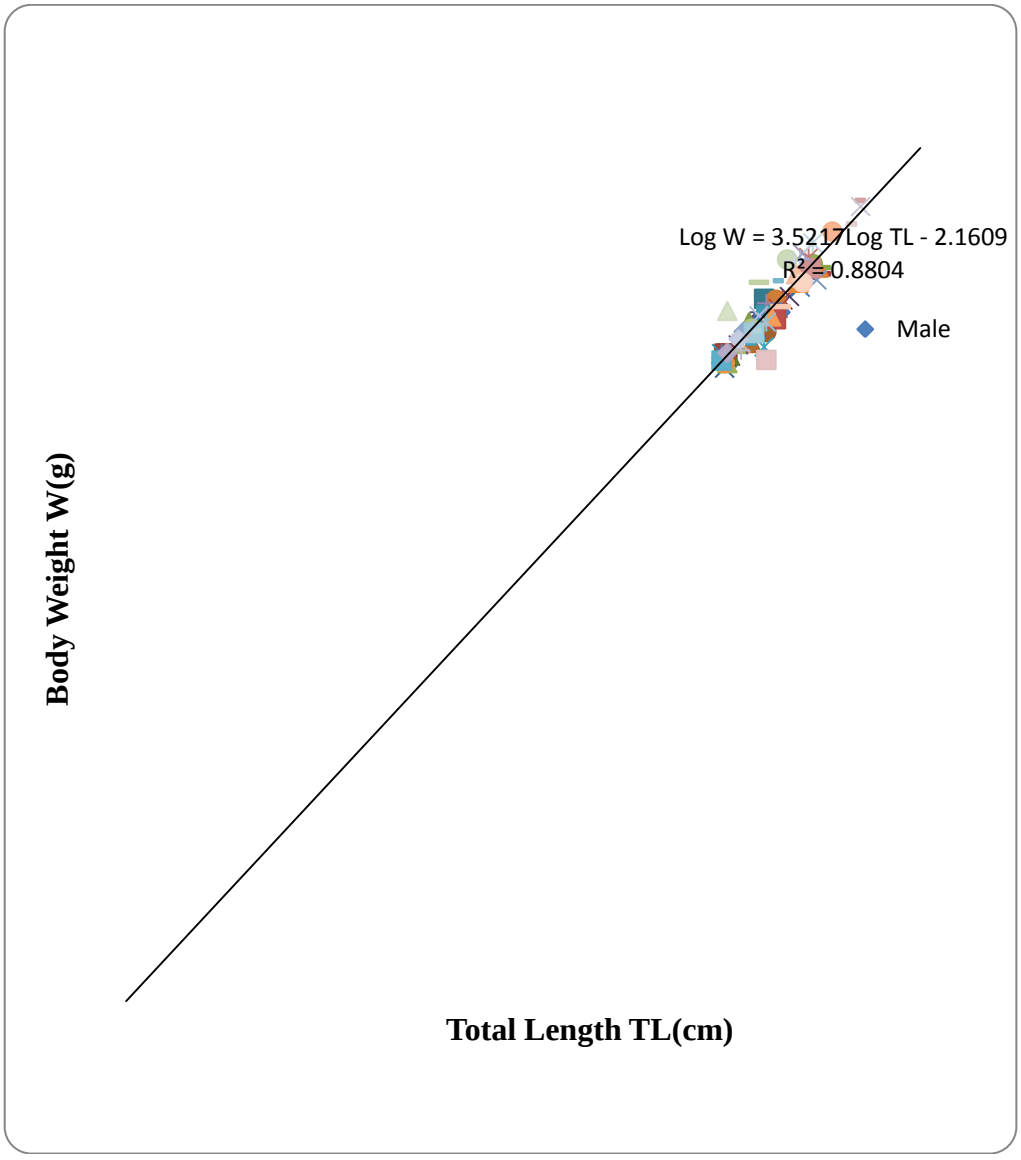

Figure 2: Scatter diagram graph showing the linear regression analysis of length-weight relationship of male *M. vollenhovenii*.

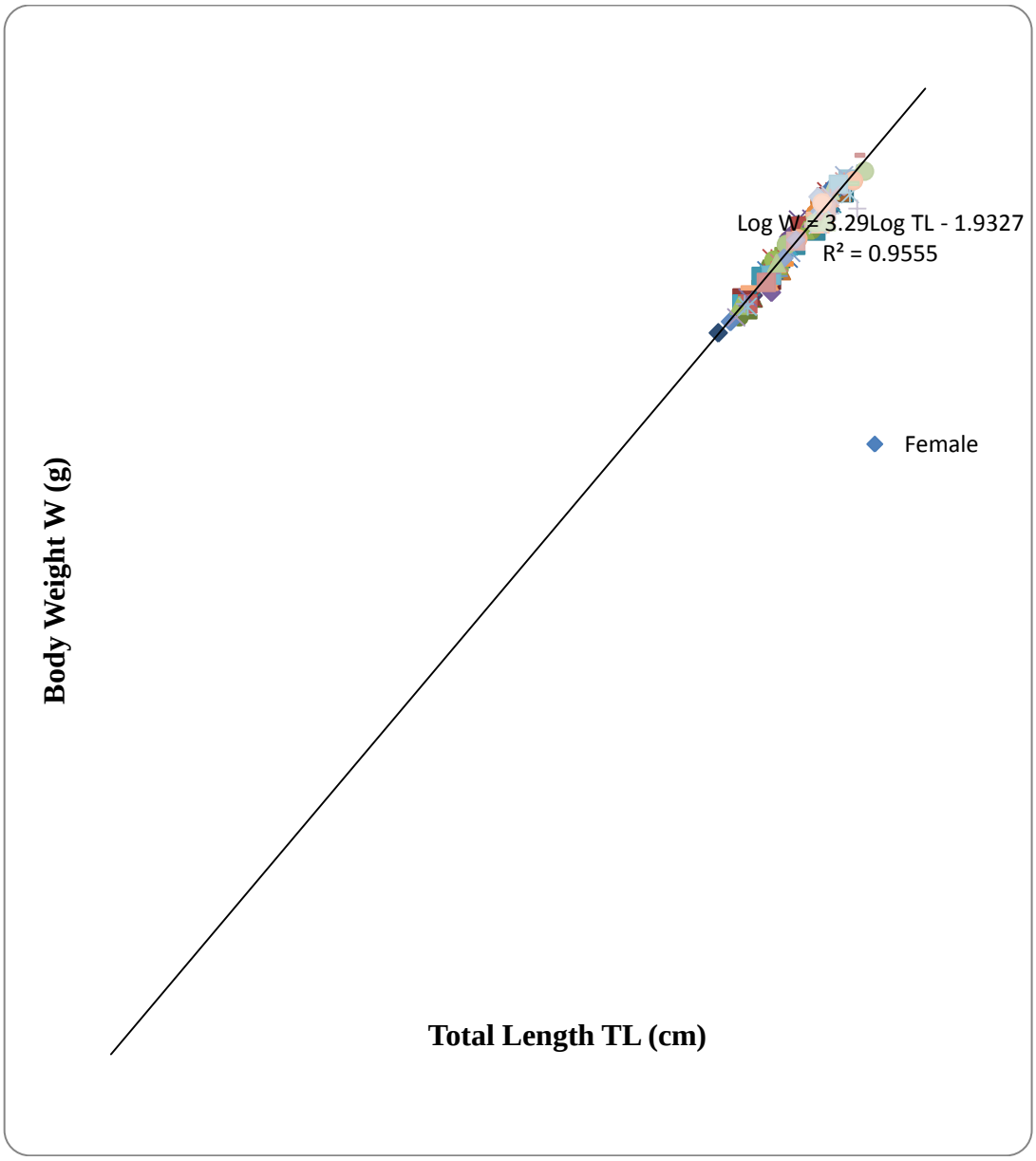

Figure 3: Scatter diagram graph showing the linear regression analysis of length-weight relationship of female *M. vollenhovenii*.

Discussion

Most of the prawn caught occured in the rainy season months July – September, 2012. This observation is in support with the results of Enin (1998) for Cross River estuary, where he observed heavy catches between June and December which could be described as the wet and the early dry seasons. *M. macrobrachion* was obtained throughout the year in Luubara creek. The all year round occurrence of *M. vollenhovenii* may be related to the high fecundity nature of the speciesand the availability of berried females that can spawn. This trend resulted to catching of shrimp throughout the year, but their relative abundance may vary as they are seasonal, according to the fishermen on Asejire Lake. Studies carried out on *Nematopalaemon hastatus* showed that there were also poor catches in the middle of the rainy season in the New

Calabar river estuaries (Marioghae, 1980, 1981).

The length frequency distribution of *M. vollenhovenii* as shown in Table 3 and Figure 3, showed that the number of females were more than that of males which is supported by the findings of other authors working with different species such as Afroz *et al*. (1991) in case of *Amblyphary godonmola*, Mortuza and Mokarrama (2000) in case of *Botialo hachata*. It was also reported by Deekae *et al.* (2010) that the catches of *M. macrobrachion* in Luubara creek was observed to be dominated by females which totaled 2005 individuals (62.05%) as against males (38.25%) in the sample population.

The regression coefficient 'b' values in the length-weight relationship of male, female and combined population of *M. vollenhovenii* exhibited positive allometric growth; while on the other hand departed from isometry as the t-test is significant. The implication of this finding is that the dynamics of *M. vollenhovenii* cannot be analyzed using the conventional fish population dynamics models, most of which assume isometry in fish and invertebrates (Pauly, 1984) and the results from such analyses must be used with caution bearing in mind that the assumption of isometry in the models is violated.

According to Thomas *et al.* (2003), regression coefficient of 3 of an ideal fish or aquatic fauna is indicative of maintenance of dimensional equality as the organism grows (isometric growth). Value of 'b' other than 3 indicates allometric growth (growth with changing body proportion). The characteristic of the length-weight relationship in fishes and invertebrate is that the value of the exponent 'b' is 3 when growth in weight is Isometric (without changing shape). If b value is different from 3, weight growth is said to be allometric (fish changes shape as it grows larger). Allometric growth may be negative (b less than 3) or positive (b greater than 3) The general lack of adequate theory to guide research and to formulate testable hypothesis on the LWR of fish and aquatic invertebrates, Pauly (1993) stated that "there is no theory that tells us in which case estimated b values can be expected to be below 3 (negative allometry) or above 3 (positive allometry). However, Wooton (1992) provided an idea on this situation indicating that allometric growth is negative (b less than 3) if the fish gets relatively thinner as it grows larger, and positive (b greater than 3) if it gets plumber as it grows larger.

Thus, some indication of the condition of fish in a population can be obtained from the length-weight equation. In this study, results indicated that male and female population of *M. vollenhovenii* get plumber as it grows larger. Allometric growth has been observed in other *Macrobrachium species* as was reported for *M. macrobrachion* (3.28) from the Cross River estuary (Enin, 1994); *M. macrobrachion* 2.95 (male), and 2.82 (female) from Lagos Lagoon system (Abohweyere, 2008a); *M. vollenhovenii* 2.92 (male), 3.01 (female) from Lagos – Lekki, Lagoon system (Abohweyere, 2008b); 2.95 and 2.82 for male and female *M. macrobrachion* respectively, Abohweyere (2008); *M. felicinum* 1.79 (male), 2.05 (female) and 2.83 (combined population), *M. macrobrachion* 3.26 (male), 2.995 (female), 2.83 (combined population), *M. vollenhovenii* 3.79 (male), 3.34 (female), 3.49 (combined population), from Ovia River, Edo state (Ehigiator *et al.*, 2012).

Allometric growth has been observed in other *Macrobrachium species* such as: *M. macrobrachion* (3.28) from the Cross River Estuary (Enin, 1994); 2.88 (Bello-Olusoji, 2003); 2.95 and 2.82 for male and female respectively (Abohweyere, 2008). For *M. vollenhovenii* 2.46 (Bello-Olusoji, 2005); 2.92 and 3.01 for male

and female respectively (Abohweyere, 2008), and for *M. felicinum* b value reported was 2.84 (Bello-Olusoji, 2005). While other shrimp and crabs, 2.92 and 2.97 for *Penaeus notialis* and *P. monodon* respectively (Yakub and Ansa, 2007). And for male, female and mixed populations of *Callinestesarmatum* b values was 3.23, 2.05 and 2.42 respectively and 3.52, 2.52 and 3.01 for male, female and mixed populations respectively (Akin-Oriola *et al.,* 2005).

Isometric has also been observed by Enin, (1994) for Nemato*palaemon hastatus.* The observation of absolute Isometric growth (b=3) in nature is occasional (Bagenal, 1978); Bassey and Ricardo, 2003). Deviation from Isometric growth is often observed as most aquatic organisms change shape as they grow (Thomas *et al.,* 2003). The 'b' values obtained for both male and female *M. vollenhovenii* were close to each other, thus showing the indispensable use of the allometric condition factor in this case. Benedito-Cecilio *et al.,* (1997) stated that the allometric growth exhibited in 52 fish species analysed proved the indispensability of allometric condition in Itaipu Reservoir, Parana, Brazil.

The condition factor, which is an indication of the suitability of the environment for the resource, estimated as 0.56-0.87, and 1.07- 1.27 for male and female *M. vollenhovenii* respectively. The values were higher than what was obtained for *M. vollenhovenii* (1.46) by Abohweyere (2008b), *M. macrobrachion (*1.19) (Enin, 1994). In the Cross River estuary also values of 1.09 (male) and 0.98 (female) were recorded by Abohweyere and Williams(2008). The present result is also higher than values of 1.30, 1.22, and 1.56 reported for *M. vollenhovenii*, *M. macrobranchion* and *M. felicinum* respectively (Bello-Olusoji, 2005). Braga (1986) stated that in the case of such species with allometric growth, ''k' does not vary with fish length. There were noticeable differences in the condition factor among the sexes. However, their condition were good, an indication that the prawns are suitable for culture. *M. vollenhovenii* has the highest condition factor 0.87 and 1.27 for male and female respectively.

The results of the condition factor were sex and /or age dependent. There was a significant variation (≤0.5) between sexes. The difference between condition factors of male and female prawns may be attributed probably to the presence of ovigerous females. Branco and Masunari (2000) reported difference in condition factor of male and female *Callinectesdanae* from Conceicao Lagoon system, Santa Catarina, Brazil. They deduce that it may probably be due to higher weight of the female gonads of the crabs. However, in contrast, Lawal-Are and Kusemiju, (2000) reported higher condition factor in male than females crabs in Badagry Lagoon Nigeria. Emmanuel, (2008) also observed in his study at Lagos Lagoon and its adjacent creek higher condition factor in the males than the female crabs. He also observed that condition factor was lower in the smaller crabs. Warner (1977) reported that in true crabs, the males showed a higher condition factor than the females. Higher values of "k" in females of *Macrobrachium vollenhovenii* revealed that the length-weight relationships might be affected by the general condition of appetite and gonadal contents of the prawns.

The value of co-efficient of correlation (r) estimated for all the *M. vollenhovenii* (0.94 and 0.97 for male and female respectively) indicated that the relationship between the length and weight of the prawns were highly significant and this makes it suitable for commercial culture. Generally, the regression lines revealed a high correlation in all the sexes since the

correlation coefficient (r) values are very close to unity. This observation is indicative of a very positive correlation between carapace length and total weight in this species. This agreed with the report on the *Callinectes amicola* from Badagry, Lagos and Lekki Lagoons by Lawal-Are (2003) and the results on the species from Lagos lagoon and adjacent creeks by Emmanuel (2008). Similar trend was also observed on *Macrobrachium macrobrachium* (Enin, 1994) in the Cross River estuary of Niger Delta.

The high and significant correlation between Carapace Length and Total Length in *M. vollenhovenii* (0.96) indicated that either of the variables is suitable for establishing length weight relation for the species. The length-weight relationship parameters and condition factor revealed that *M. vollenhovenii* is suitable for aquaculture in Nigeria and West Africa.

CONCLUSION AND RECOMMENDATION

The Asejire Lake in Oyo state, south-west Nigeria support major artisanal fishery that have been sustained for several decades (FAO, 1969; Lawal-Are, 2003). Prawns of the genus *Macrobrachuim* are highly cherished by different ethnic groups in Nigeria especially people of the Niger Delta. However, with the significant reduction of the natural stock in our coastal and fresh water bodies (Nwosu, 2007), attributed to environmental degradation and overfishing, there is a need to engage in prawn production enhancement strategies such as improved aquaculture.

The results of this study implies that Asejire Lake is a suitable environment for this species, thus for sustainable management of the stocks, the environmental status should be maintained. As the Lake is being exploited, it is recommended that assessment of its fish stock should be done continuously to ensure sustainable exploitation.

Prawns farming may be practiced in Asejire Lake with the use of cage culture system. This potential if exploited, will aid production and improve the livelihood of the fishermen.

Other species of Macrobranchium can also be introduced into the Lake to diversify prawns production, though further research may be needed to ascertain the new species performance. Ehigiator *et* al. (2012) report revealed that *M. vollenhovenii* and *M. macrobrachion* are prawns suitable for aquaculture and the two species can perform better together.

REFERENCES

Abohweyere, P. O. (2008). Length-based population dynamics of prawn *(Macrobrachium species)* as Management tool of Lagoslekki Lagoon system. PhD Thesis, University of Ibadan, Nigeria.

Abohweyere P. O. (2008a). Length frequency distribution and sex ratio of *Macrobrachium macrobrachion*in the Lagos-Lekki Lagoon system, *Nigeria Zoologist* 6: 16-20.

Abohweyere P.O. (2008b). Length-weight relationship and condition factor of *Macrobrachiumvollenhoveni*in the Lagos – Lekki Lagoon System, Nigeria. *Nigerian Journal of Fisheries.* 5(2): 98-106.

Abohweyere P. O. and Wilhams A. B. (2008). Length-weight relationship and condition factor of *Macrobrachiummacrobrachion*in the Lagos-Lekki Lagoon System, Nigeria. *Research.Journal of Biological Sciences* 3(11): 1333-1336.

ADB- African Development Bank (2010). Nigeria: Water and Sanitation for Oyo and Taraba states.

OWAS 1, Nigeria. P-NG-E00-004.Pp 2-5.

Afroz S, Hossain, M. A. and Parween, S. (1991). Notes on the size frequenceu distribution and length-weight relationship of freshwater fish. *Amblypharygodon mola* (Hamilton) (Cypriniformes : cyprinidae). *Univ. j. Zool. Rajshahi Univ*. 10&11: 103-104.

Akin-Oriola, G., Anetekhai, M.A. and Olowonirejuaro, K. (2005). Morphometric and Meristic studies in two crabs: *Cardiosoma armatum* and *Callinectes pallidus*. *Turkish Journal of Fisheries and Aquatic Sciences* (5),85-89.

Anyanwu P. E. B., Okoro C.,.Anyanwu A. O, Matanmi M. A., Ebonwu B. I., Ayaobu-Cookey I. K., Hamzat M. B., Ihimekpen F. and Afolabi S. E. (2007). Length-Weight Relationship, condition factor and sex ratio of African mud catfish (*Clariasgariepinus*) reared in indoor water recirculation system tanks. *Research Journal of Biological Sciences.*2(7): 780-783.

Ayoade A. A., Fagade S. O. and Adebisi A. A. (2006).Dynamics of limnological features of two man-made lakes in relation to fish production.*African Journal of Biotechnology* Vol. 5 (10), pp 1013-1021, 16 May 2006.

Bagenal T. B. (1978).Methods for assessment of fish production in freshwater.*Blackwell Scientific Publ*. Oxford, 75-89pp.

Bannister, J. V. (1976). The length-weight relationship, condition factor and gut contents of the dolphin fish, *Coryphaena hippunis* (L) in the Mediterranean. J. Fish Biol. 9: 335 – 338.

Bello-Olusoji O. A., Balogun A. M., Fagbenro O. A., Ugbaja N (1995). Food and feeding studies of the African river prawn *Macrobrachiumvollenhovenii*. (Herklots, 1857). In: Lavens P, Jasper E, Rowlantes I (Eds.): Larvi '95 Fish and shellfish symposium, Gent, Belgium, Sept. 3 – 7, 1995. *European Aquaculture Society Special Publication* No. 24: 425 – 427.

Bello-Olusoji A. O. (2005).Length-Weight Relationship and condition factors of Palaemonid Prawns from Different Habitats, *Nigerian Journal of Forestry*. 35(2) 149-152.

Benedito-Cecilio E., Agostinho and Carnelos-Machaado Velho, R.C. (1997). Length-weight relationship of fisheries caught in the Itaipu Reservoir, Parana, Brazil. Naga, *ICLARM* Q 20 (3&4): 57-61.

Braga F. M. D. S. (1986). Study between condition factor and length-weight relation for some marine fishes *RevistaBrasileira De Biol.,* 46:339-346.

CBN- Central Bank of Nigeria (1999).Urbanization and Related Socio-Economic Problems in Ibadan Area.*Research Department Occasional paper* No. 28.pp 21 . November 26, 1999

Deekae, S. N. and Abowei, J. F. N. (2010). *Macrobrachium macrobrachion* (Herklots, 1851) Length-Weight Relationship and Fulton's Condition Factor in Luubara creek, Ogoni Land, Niger Delta, Nigeria. *International Journal of Anim. And Veterinary Advances* 2(4): 155-162.

Deekae, S. N. and Idoniboye-Obu, T. I. E. (1995). Some aspects of commercially important molluscs and crabs of the Niger Delta, Nigeria. *Environmental Ecology*, 13(1): 136-142.

Ehigiator, Flora. A. R. and Agbogbo, Cassidy J. (2012).Comparative Study of the Length-Weight Relationship and Condition Factor of Three Macrobrachium Species in Ovia River, Edo State

Nigeria.*Publication of Owsdwafrica*.pp10:33.

Emmanuel, B. E. (2009). The artisanal fishing gears, crafts technology and their efficiency in the Lekki lagoon, Nigeria. Ph.D Thesis, University of Lagos. 268pp

Enin, U. I. (1994). Length-weight parameters and condition factor of 2 West African Prawns. *Rev. Hydrobiol. Trop.*, 27 (2): 121-127.

Enin, U. I. (1998). The macrobrachium Fishery of the Cross River Estuary, Nigeria. Arch. Fisheries Resour., 46(3): 26-272.

FAO (1969). Fisheries survey in the western and mid-western regions of Nigeria. FAO/SF74/NIR6.

FAO (1981). Species identification streets for fisheries purposes. East central Atlantic Fishing Area. 34 and part of 47. *Dept of Fish and Oceans*. Canada Vol. II: 1-8.

FAO (1999). Fisheries Statistics: Aquaculture Production. FAO Fisheries Series No. 58. FAO, Rome, 1988.

FAO (2000).Aquaculture production statistics 1989-1998.*FAO Fisheries Circular* 815 (rev. 12). FAO, Rome.

Gayanilo F. C., Sparre P., Pauly D. (1996). FAO-ICLARM Stock Assessment Tools. *User's manual FAO/UNDP*. ROME. 65-80pp

Goncalves, J. M. S., Bentes, L., Lino, P. G., Ribeiro, J., Canario, A. V. M. and Erzini, K. (1997). Weight-length relationships for selected fish species of the small-scale demersal fisheries of the south and Southwest coast of Portugal. *Fisheries Research* 30, 253-256.

Haimovici M. and Velasco G. (2000).Length-weight relationship of marine fishes from Southern Brazil. Naga, *International Centre for Living Aquatic Resources Management*. Quarterly 23: 19-23.

Holthius, L. B. (1980). Shrimps and prawns of the world: an annotated catalogue of species of interest tofisheries. FAO Fish. Synop., 125: 271

Jimoh A. A., Clarke E. O. O., Whenu O. O., and Adeoye H. B. (2009).Food and feeding habits of the African river prawn (*Macrobrachiumvollenhovenii*, Herklots, 1857) in Epe Lagoon, southwest Nigeria.*Interntional Journal Fish Aqua* 3: 10-15.

Lawal-Are, A. O. (2003). Aspects of the Biology of the Lagoon crab, *Callinectesamnicola*(DeRocheburne) . In: Badagry, Lagos and Lekki Lagoons, Nigeria. A.A. Eyo and E.A. Ajao, (Eds.).*Proceedings of the 16th Annual Conference of the Fisheries Society of Nigeria (FISON),* Maiduguri 4-9th November, 2001, pp: 215-220.

Lawal-Are, A. O. and Kusemiju, K. (2000). Size composition, growth pattern and feeding habits of the blue crab, *Callinectes amnicola* (De Rocheburne) in the Badagry Lagoon, Nigeria. J. Sci. Dev., 4: 117-126.

Le Cren, E. D. (1951). The length-weight relationship and seasonal cycle in gonadal weight and condition of perch (*Perca fluviatilis*). J. Anim.Ecol.,20(l):201-219.

Marioghae, I. E. (1980). The ecology and commercial fishery of *Palaemon* (Nematopalaemon) *hastatus* (Aurivillius, 1898) M.Sc. Thesis, University of Port Harcourt, Nigeria. 70pp.

Marioghae I. E. (1982). Notes on the Biology and Distribution of *Macrobrachiumvollenhoveni*iand *Macrobrachion macrobrachion* in the Lagos Lagoon.Rev. 2001.*African.* 96 (3): 493-508.

Marioghae, I. E. (1987). An appraisal of the cultivability of Nigerian Palaemonid prawns. ARAC/87/WP/4. Lagos. UNDP/FAO/NIOMR. 12P.

New, M. B. (2002). Farming freshwater prawns: A manual for the culture of the giant river prawn, (*Macrobrachium rosenbergii*). Food and Agricultural Organization, Fisheries *Technical Paper*, 428:212pp.

Nwosu F. M. (2007). The Problem of by Catch Associated with Industrial Shrimping: Implications for Inshore Demersal Fisheries in the Niger Delta. In: Zabbey (Ed.), *Small Scale Shrimp Fisheries in Nigeria. Centre for Environment, Human Rights and Rural Development (CEHRD)*, Eleme, Rivers State CEHRD/TECH/CONSERV/01/2007 , pp: 32-48.

Omoike A. (2004). Sustainable management of Fisheries of Asejire Reservoir and its environs in Southwestern Nigeria. *PhD Thesis.*Dept. of Wildlife and Fisheries Mgt., University of Ibadan, Nigeria.Pp 20-163.

Pauly D. (1984). Fish population dynamics in tropical waters: A manual for use with programmable calculators. *ICLARM, Studies and Rev*. pp. 8-325.

Pauly, D. (1993). Editon'al.Fishbyte, NAGA, The ICLARM Quarterly, 16(2-3), 26.

Petrakis G. and Stregiou K. I. (1995). Weight-Length relationships for 33 fish species in Greek waters. *Fish. Res*. 21:465-469.

Powell C. B. (1982). Fresh and brackishwater shrimps of economic importance in the Niger Delta. *Proceeding 2nd Annual Conferance Fisheries Society of Nigeria*.Calabar 25-27 January 1982, pp: 254-285.

Powell, C. B. (1985). The Decapods Crustaceans of the Niger Delta. In: Wilcox, H.B.R. and C.B. Powell, (Eds.), Publication Committee, University of Port Harcourt, pp: 226-238.

Thomas, J., Venu, S., Kurup, B. M. (2003). "Length-weight relationship of some deep-sea fish inhabiting the continental slope beyond 250m depth along the West Coast of India", *NAGA, ICLARM* 26(2), 17-20.

Umoh I. B. and Bassir O. (1977).Lesser known sources of protein in some Nigerian peasant diets. *Food Chem*., 2*:* 315-329.

Warner G. F. (1977).The Biology of Crabs.*Paul Elek Scientific Books Ltd*., London, pp: 202.

Willlifuhr-Nast J., Rosenthal H., Udo P. J. and Nast F. (1993).Laboratory cultivation and experimental studies of salinity effects on prawn Macrobrachiumvollenhovenii (Decapod, Palaemonidae), *Aquatic Living Resources* 6:115 – 137.

Wootton, R. J. (1992). Fish Ecology. Chapman and Hall, New York, 212pp.

Yakubu A. S. and Ansa E. J. (2007). Length-weight relationships of the pink shrimp *Penaeusnotalis* and giant tiger shrimp P. monodon of Buguma creek in the Niger Delta, Nigeria. *The zoologist* volume 5: 47 – 53.

Zar, J. H. (1984). *Biostatistical Analysis.* Prentice –Hall, Englewood Cliffs, New Jersey, USA. 718p.