# LENGTH-WEIGHT RELATIONSHIP OF FRESHWATER MUSSEL (*Etheria elliptica*) FROM RIVER OGBESE, NIGERIA

***OYEWOLE O. O., ABODERIN, O. O., ALUKO, O. J. & J. O. ADEYEMO**

Federal College of Forestry, Jericho Hill, Ibadan, Oyo State.
*****Correspondence: bollietee@yahoo.co.uk, +2348065659538

**ABSTRACT**
*One hundred mussels (Etheria elliptica) were collected from River Ogbese in Ondo State, Nigeria to determine the Length Weight Relationships (LWR). Sample collections were done fortnightly for a period of three months between August and October 2010 (wet season) and between October and December 2011 (dry season).Each sample was weighed and mantle length measured and recorded. Analysis of the LWR of E. elliptica showed that there is a strong positive relationship between length and weight of samples collected in both seasons. A non-isometric growth was observed in the collected samples, thus indicating an allometric condition factor in E. elliptica*
**Keywords:** growth relationships, benthic bivalves, length/weight measurements

## INTRODUCTION

The production of bivalves in the wild has witnessed a decline in the past few years, with the value of production decreasing from a trend of 21.5% to 12.7% during the periods of 1995 to 2005 (Sudari, 2009). In the production of bivalves many countries had attained a level of development in the production compared to Nigeria. Examples of such countries include China, which is the largest producer of bivalve with a production rate of 9.5 million metric tonnes in 2005; which contributed 70% to the global harvest. Japan is the second largest producer of bivalve about 5.8% of world's harvest. Other countries producing bivalves are Canada, France, Italy, Spain, and Chile (Sudari, 2009).

Bivalves are very good sources of protein and other essential minerals. Besides serving as food for man, some species of bivalves have a special ability to produce pearls of high marketable value and their shells of colourful beauty has an immeasurable value to man (Ghiselin, 2009). Bivalves production has also been shown to influence the aquatic ecosystem by enriching the area with macroinvertebrates, phytoplankton and zooplankton which increases the aquatic population and improves fish productivity (Oliver *et al.,* 2008*).* Large-scale production of bivalves when properly harnessed will undoubtedly provide a source of food, income and employment in developing countries.

In selecting any species for aquaculture, there is a need to select species best suited to environmental conditions and economic circumstances (Pillay, 1990). It would probably be impossible to culture any organism without first assessing its aquaculture potentials. There are different species of bivalves found in Nigerian waters. The mussel *Etheria elliptica* is commonly found in streams and rivers in South-western Nigeria and could be a candidate for culture. Studies on various aspects of biology of this important species will be of major value to its domestication and commercial propagation.

Length and weight relationship are the most important components used in assessment and management in fisheries (Park and Oh, 2002). Other uses of weight length relationship include the estimation of weight from length for individuals and for length classes (Anderson & Gutreuter, 1983) and the conversion of growth in length equations to grow in weight, for prediction of weight at age and subsequent use in stock assessment models (Pauly, 1993). Additionally, weight length relationships allow life history and morphological comparisons between species or between populations of a species from different habitats and or region. The study objective therefore was to determine the length weight relationship of *Etheria elliptica* from River Ogbese.

## STUDY AREA

The study area, River Ogbese, flows from Ekiti State through Ogbese town, in Akure North Local Government Area, Ondo State. The River which falls between Latitudes $7^0$ 00' N - $7^0$ 30' N and Longitudes $5^0$ 00' E - $5^0$ 30' E has its source from Aye Ekiti, Ekiti State.

It is a major tributary of the River Osse. River Ogbese flows for approximately 22 km from its source (through the derived savanna zone) to meet River Osse (265 km long) which discharges into the Atlantic Ocean through an intricate series of creeks and lagoons (Fagbenro *et al.,* 1999).

## MATERIALS AND METHODS

### Collection of samples

One hundred specimens of *Etheria elliptica* were collected from different points on the rocky outcrop along the river course with the help of fishermen. Samples were collected in two seasons, between August and October 2010 (wet season), and between October and December 2011 (dry season). Collections were made fortnightly. Samples collected were put in an ice packed container. The samples were transported to Fisheries and Aquaculture Technology (FAT) laboratory of The Federal University of Technology, Akure.

### Length and weight analysis

The Mantle Length (ML) and Total Body Weight (TBW) of individual specimen were measured with a measuring board to the nearest 0.1 cm and a weighing balance (Metler Toledo PB 350) to the nearest 0.1 g respectively.

The parameters *a* and *b* are the functional relationship between Mantle Length and Weight, viz

$W = aL^b$ ……..(i)

were estimated by converting it into logarithmic linear function (Sparre *et al.,* 1989)

$\ln W = \ln a + b \ln L$ …… (ii)

The parameters *a* and *b* of LWR were estimated using the least-square regression method.

where L = ML = Mantle Length

W = Weight

*a* = coefficient related to body form

*b* = (slope) an exponent indicating isometric growth when equal to 3

with *a* and *b* estimated using ordinary least-squares regression. The regression coefficient of the logarithmic function *r* was also calculated.

### Statistical analysis

The minimum, maximum and mean values of both length and weight of *E. elliptica* specimens were determined. Regression analysis was used to determine the relationship between the length and weight of the collected specimen during wet and dry seasons using SPSS (version 16.0)

## RESULTS

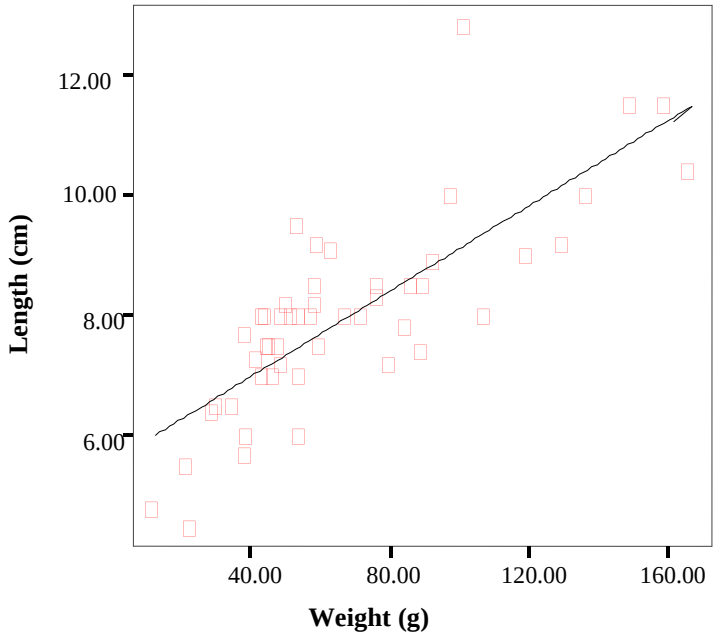
### Length weight relationship of *Etheria elliptica*

The result of the LWR Analysis of 50 specimens of *Etheria elliptica* collected in the wet season revealed that the organism has minimum and maximum length of 4.50 cm and 12.80 cm with their corresponding weight of 23.78 g and 102.34 g respectively. The minimum and maximum weight was 12.93 g and 166.60 g respectively with their corresponding length of 4.80 cm and 10.40 cm. The mean length was 7.99 g while the mean weight was 68.46 g as shown in Table 1. The LWR equation for the wet season: L = 5.56 + 0.04 * W.

During the dry season, minimum and maximum length of *E. elliptica* collected were4.50 cm and 12.00 cm with their corresponding weight of 23.70 g and 175.80 g respectively. The equation for the dry season: Length = 4.63 + 0.04 * w. The value of $R^2$ in Table 1 shows a strong positive correlation (high degree of correlation) between the length and weight of the organism. Figures 1 and 2 show the values of the length weight relationship of *E. elliptica* collected during wet and dry season. The estimated regression curve was plotted close to the data this shows a straight line relationship.

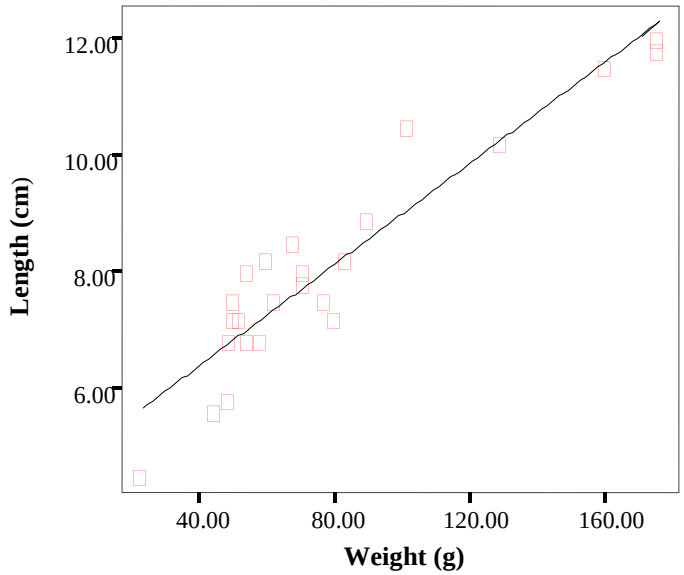
**Table 1: Summary of Length-Weight Relationship in *Etheria elliptica* specimens**

| Parameters | Wet Season | Dry Season |
|---|---|---|
| Number of specimens | 50 | 50 |
| R value | 0.79 | 0.936 |
| $R^2$ value | 0.62 | 0.875 |
| Range in length (cm) | 4.50 - 12.80 | 4.50 - 12.00 |
| Mean Length (cm) | 7.99 ± 0.3 | 8.08± 1.91 |
| Range in weight (g) | 23.78 - 102.34 | 23.70 - 175.80 |
| Mean weight (g) | 68.46 ± 0.99 | 79.36 |




Linear Regression = Length in centimeters = 5.56 + 0.04 * W
R-Square = 0.62, a = 0.04, b = 5.56. The *b* value estimates a positive allometric growth

**Fig. 1: Length weight relationship of *Etheria elliptica* collected during wet season**




Linear Regression= Length = 4.63 + 0.04 * w
R-Square = 0.88, a = 0.04, b = 4.63. The *b* value estimates a positive allometric growth

**Fig. 2: Length weight relationship of *Etheria elliptica* collected during dry season**

## DISCUSSION

### Length-weight relationship

From the regression analysis, it was observed that the value of b was significantly different from 3 for *E. elliptica* in both seasons of collection. This indicated an allometric growth pattern, thus proving the indispensible use of the allometric condition factor which is a basic premise tool used in LWR analysis (Vazzoler, 1996). This observation agrees with the study carried out by Benedito-Cecelio *et al.* (1997) on the LWR of fishes caught in Itaipu Reservoir, Parana (Brazil). The authors observed that majority had values of *b* significantly different from 3. Another study carried out by Park and Oh (2002) estimated b value as 3.31 in *Scaphora broughtonil* from coastal waters of Korea. The study also agrees with the work carried out by Jamabo *et al*. (2009) where the research work showed a pattern of allometric growth which deduce that the weight increases faster than the length.

However, the result of this study was in contrast with the result obtained for some finfish for example, studies carried out by Marc (1997) on LWR, reported that the estimated value of *b* were close to 3 for most species caught from Seagrass Negros Oriental Phillipines indicating isometric growth. Similar result was obtained by Ruiz-ramirez *et al*, (1997) on the LWR of soft bottom demersal fishes from Jalisco and Colima States, Mexico.

The phenomenon that the positive allometric and isometric growth patterns are more noticeable in species of organisms that are typically sandy or sandy–mud bottom dwellers (Gasper *et al*, 2001) agrees with this study because freshwater mussels are bottom dwellers in the aquatic environment.

## CONCLUSION

The LWR analysis gave the knowledge on the evaluation of the average weight and furnishes further information on the weight variation of individuals in relation to their length (condition factor).

## ACKNOWLEDGEMENT

I express my profound gratitude to Prof. O. A. Bello- Olusoji, Department of Fisheries and Aquaculture, School of Agriculture and Agricultural Technology, Federal University of Technology, Akure, Ondo State, for his contributions and support during the period of this research work.

**REFERENCES**

Anderson, R. & Gutreuter, S. (1983). Length, Weight and Associated Structural Indices. *American Fisheries Society.* PP 283-300.

Benedito-Cecilio E., Agostinho A.A., Carnelos-Machado Vejho R. C. (1997). Length-weight relationships of fishes caught in the Itaipu Reservoir, Parana, Brazil. *NAGA 20(3&4):57-61*

Fagbenro, O., Adedire, E. O., Ayotunde, E. O., and Faminu, E. O. (1999). Haematological profile, food composition and digestive enzyme assay in the stomach of the African bony-tongue fish. *Heterotis (Clupisudis) niloticus* (Cuvier 1829) (Osteoglossidae). *Tropical Zoology* 13: 1-9.

Gasper, M. P., Santos, M. N., and Vasconcelos, P. (2001). Weight-length relationships of 25 bivalve species
(Mollusca:Bivalvia) from the Algarve coast (Southern Portugal). *J. Mar. Biol. Ass. Uk.* **81,** 805-807.

Ghiselin, M. T. (2009). "*Bivalve."* Microsoft® Encarta® 2009 [DVD]. Redmond, WA: Microsoft Corporation,
2008.

Jamabo, N. A., Chindah, A. C. and Alfred J. F. (2009). Length weight Relationship of a Mangrove Prosobranch *Tympanotonus fuscatus var fuscatus (*Linnaeus, 1758) from the Bonny Estuary, Niger Delta, Nigeria. *World Journal of Agricultural Sciences,* 5 (4): 384-388.

Marc K., (1997). Length-weight relationship of fishes from seagrass meadow in Negros Oriental, Philippines. *Naga, The ICLARM quarterly 20(3&4):64-65.*

Oliver D., Phillipe A., Christopher W., McKind S. and Robichad L. (2008). The influence of bivalve aquaculture on ecosystem productivity. *World Aquaculture.* 4:26-29.

Park, K.Y., and Oh C. W. (2002). Length weight relationships of bivalves from coastal waters of Korea Naga. The ICLARM Quarterly, 25(1):21-22.

Pauly, D. (1993). FishByte Editorial. *Naga, ICLARM Q. 16 (2/3):26*.

Pillay, P.V.R. (1990). *Aquaculture: principles and practices.* Gear Britain, Fishing New Books. 576pp

Ruiz-Ramirez, S., Lucano-Ramirez, G. and Mariscal-Romero J., (1997). Length-weight relationships of soft bottomdemersal fishes from Jalisco and Colima States, Mexico. *Naga, The ICLARM Quarterly 20(3&4):62-6.*

Sparre, P., Ursin, E. and Venema, S. C. (1989). Introduction to tropical fish stock assessment. Part I. Manual, FAO Fish. Tech. pap. 306, 337p.

Sudari P. (2009). Bivalves: Global production and trade trend (part 1) *INFOFISH 28,* www.infofish.org.

Vazzoler, A.E.A de M. (1996). Bilogia da reproducao de peixes teleosteos: teoria e practica. Maringa EDUEM Sao Paulo:SBI 169Pp.