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Length-Weight Relationships of *Auchenoglanis occidentalis* (Fam:Bagridae) in Kontagora Reservoir, Niger State, Nigeria

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Abstract: Length-weight Relationship (LWR) of 962 specimens of *Auchenoglanis occidentalis* inhabiting Kontagora reservoir were studied. The fish specimens were captured using experimental gill nets at three sampling sites on the reservoir between January-December, 2007. The parameters a and b of the length-weight relationship $W = aL^b$ and the condition factor (cf) = $100W/L^3$ were determined for the species. The mean cf value was 1.95. The b value was 3.292 which indicates a positive allometric growth with the variation in the body weight correlating with changes in the length.

Key words: Body length, body weight, fish population, variation, growth, Nigeria

INTRODUCTION

The importance of the knowledge of the relationship between body length and weight for fish species in a given geographical region has been emphasized by previous reearchers such as Haimovici and Velasco (2000), Araajo (2003), Gulland (1983) and Beyer (1987). Length-weight relationship of fish is important in fisheries biology because it allows the estimation of average weight of the fish of given length group (Beyer, 1987) and conversion of length-growth equations to the weight-growth equivalent (King, 1996). Bolger and Connoly (1999) reported that length-weight relationship help biologists in assessing the relative well being of fish population.

Length-weight relationships data for freshwater and brackish water fish resources of Nigeria are scanty, therefore the contribution of the present study cannot be over emphasized. Also, the fact that there is an increase in the demand of the fish species *Auchenoglanis occidentalis* in the country indicated that the Length-weight Relationship (LWR) would be of important for the assessment of their maturity, growth and production. Therefore, this study examines the length-weight relationship of *A. occidentalis* in Kontagora reservoir, Niger state, Nigeria.

MATERIALS AND METHODS

The Kontagora reservoir is situated in the Northern Guinea Savanna between latitude 3°20' and 7°40'East and longitude 8° and 11°3'North (Fig. 1). The reservoir is characterized by distinct dry season (November-April) and rainy season (May-October). Specimens of *Auchenoglanis occidentalis* were obtained between January-December, 2007 from Kontagora reservoir, Niger state, Nigeria using experimental graded gill net of various stretched mesh sizes (25.4, 38.1, 50.8, 63.5, 76.2, 88.9, 101.6, 127.0 and 177.8 mm).

The nets were used to sample the shore, surface and bottom waters at three sampling sites I-III on the reservoir (Fig. 1). The length-weight relationship was calculated using the formular described by Le Cren (1951):

$$W = aL^b \quad (1)$$

The data were transformed into logarithms before the calculations were made. The logarithm-transformed data will give the linear regression equation. Thus, Eq. 1 was transformed into:

$$\text{Log } W = \text{Log } a + b \text{ Log } L \quad (2)$$

Where:

W = Weight of fish (g)
L = Total length of fish (cm)
a = Constant
b = An exponent (Regression coefficient)

Fulton's condition factor (cf) was calculated for the species using the relationship described by Ikomi and Odum (1998) as follows:

$$cf = \frac{100W}{L^3} \quad (3)$$

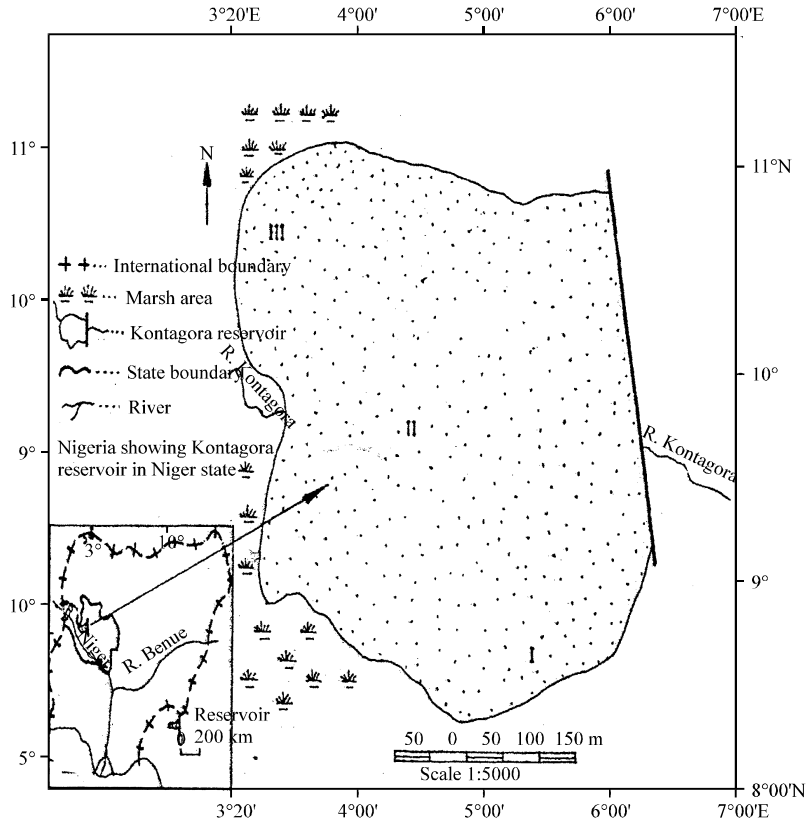

Fig. 1: Kontagora reservoir at Tunga Kawo (Niger Stateministry of Land and Survey Kontagora Area Office)

Where:

cf = Condition factor

W = Weight of the fish (g)

L = Total length of the fish (cm)

RESULTS

Table 1 shows the number, total length and weight of *Auchenoglanis occidentalis* caught in the three sampling sites I-III on Kontagora reservoir. The numbers of fish caught in the sampling sites were 562, 217 and 183 for the sampling sites I-III, respectively. The total length of fish caught from the sampling sites ranged from 13.60-23.0 cm with the largest length (23.0 cm) caught from sampling site III and the least length (13.60) caught from sampling site II. The weight of fish caught from the sampling sites ranged from 55-238.50 g with the largest weight recorded from sampling site I and the least weight recorded from sampling site II.

Table 2 shows the values of a regression intercept, b regression coefficient, r correlation coefficient and cf condition factor of *A. occidentalis* in the three sampling sites I-III on Kontagora reservoir. The mean values for the reservoir were a = 0.0032±1.32, b = 3.292±1.41, r = 0.9812±2.32 and cf = 1.95±2.12. Table 3 shows that the mean monthly condition factor ranged 0.98-2.16. The highest values were recorded in the months of October-December. There was a decrease in the months of April-July and a steady increase thereafter. Figure 2 shows the log weight-log length relationship of

Table 1: Size ranges of *Auchenoglanis occidentalis* (Fam:Bagridae) in Kontagora reservoir, Niger state, Nigeria (January-December, 2007)

Sampling site	No. of fish	Total length		Body weight	
		Max.	Min.	Max.	Min.
I	562	22	14.8	238.5	62
II	217	21	13.6	225.4	55
III	183	23	14.2	242.5	60

Table 2: Length-weight relationship parameters and condition factor of *Auchenoglanis occidentalis* (Fam:Bagridae) in Kontagora reservoir, Niger state, Nigeria (January-December, 2007)

Sampling site	a	B	r	cf
I	0.0032	3.288	0.9824	2.15
II	0.0031	3.268	0.9802	1.93
III	0.0033	3.321	0.9812	1.77
Mean	0.0032	3.292	0.9812	1.95
(±SD)	(1.320)	(1.410)	(2.320)	(2.12)

[a]Regression intercept; [b]Regression coefficient; [r]Correlation coefficient; SD: Standard Deviation; cf: Mean condition factor

Table 3: Mean monthly variation in condition factors of *Auchenoglanis occidentalis* (Fam:Bagridae) in Kontagora reservoir, Niger state, Nigeria (January-December, 2007)

Months	Sample size (N)	Condition factor (Mean±SD)
January	66	1.93 (0.03)
February	42	1.62 (0.04)
March	67	1.77 (0.02)
April	63	1.42 (0.02)
May	55	1.24 (0.05)
June	45	1.05 (0.03)
July	80	0.98 (0.02)
August	124	1.97 (0.02)
September	115	1.86 (0.04)
October	118	2.14 (0.03)
November	108	2.16 (0.05)
December	79	2.08 (0.05)

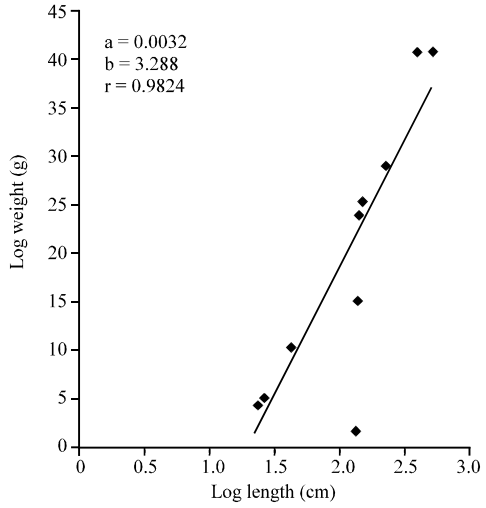

Fig. 2: Length-weight relationship of *Auchenoglanis occidentalis* (Fam:Bagridae) in Kontagora reservoir (January-December, 2007)

A. occidentalis in Kontagora reservoir, Niger state, Nigeria. This revealed that as the length of the fish increases, there was a correlating increase in weight.

DISCUSSION

In this study, efficient sampling was carried out to include the widest possible range of lengths which were generally obtained with large samples. The differences in fish sizes show that the fish population ranged from immature specimens to fully matured ones. This also suggests the variations in their growth (Frota *et al*., 2004). The maximum fish Total Length (TL) recorded for *Auchenoglanis occidentalis* in this study (23.0 cm) and maximum weight (242.50 g) are lower than the maximum length of 37.5 cm and maximum weight 800 g obtained for *A. occidentalis* in Zaria reservoir, Nigeria (Onimisi and Oniye, 2011) and 50 cm maximum length and 2 kg maximum weight of *A. occidentalis* reported from Lake Kainji (Lewis, 1974). The differences in the length and weight of the fishes may be due to the level of exploitation of the fish species in different aquatic environments and also the prevailing ecological advantages in the water bodies (Onimisi and Oniye, 2011). The least minimum fish Total Length (TL) recorded (14.80 cm) may be due to the selectivity of the mesh sizes of the nets used during the sampling.

The value of b = 3.292 recorded for *Auchenoglanis occidentalis* shows that the rate of increase in body length is proportional to the rate of increase in body weight. This is a positive allometric growth, i.e., the fish became heavier with increase in length. Similar b values results were obtained for *Chrysichthys walkeri* b = 3.114 (Ikusemiju, 1976), *Chrysichthys nigrodigitatus* b = 3.042 (Fagade and Adebisi, 1979) and *Ethmalosa fimbriata* (Bowdich) b = 3.210 (Torrey, 1991). Abdullah (2002) recorded b values of between 2.5-3.44 for the fish studied in different marine bodies.

According to Pauly and Gayanilo Jr. (1997), b values may range from 2.5-3.5 which suggest that the result of this study is valid. In a situation where b = 3, the growth in weight is term isometric and the weight is proceeding in the same direction as the cube of the length (Ricker, 1975). The Log weight-Log length relationship indicates the common general increase of weight with increasing length. The correlation coefficient value (r) was 0.9812 which indicates a high positive correlation.

The variations in weight for the fish samples may be due to individual condition factor (cf) as it relates to the well being and degree of fatness of the fish in a water body (Pauly, 1983). The calculated condition factor (cf) value for *Auchenoglanis occidentalis* in this study ranges from 1.77-2.15 with the highest condition factor value obtained in sampling site I and the least at sampling site III. The values are >1 in the three sampling sites on the reservoir. This suggests that the fish is above average condition in the reservoir (Wade, 1992).

This indicates that the fish species are doing well in Kontagora reservoir. These values are lesser than those values documented by Bagenal and Tesch (1978) for mature fresh water fish body weight. The mean condition factor (cf) showed variations during the different months of sampling in this study and appear to be related to the feeding and breeding activities of the fish (Ikomi and Odum, 1998; Onimisi and Oniye, 2011). Lower values of condition factors were recorded for May-July which might have coincided with the spawning period. The higher value of condition factor in the months of August-December may be due to increase in weight after spawning which is as a result of availability and usage of food items for growth.

CONCLUSION

In this study, the result of this study shows that *Auchenoglanis occidentalis* exhibited allometric growth pattern in Kontagora reservoir and that the reservoir had a suitable water environment for its growth and survival.

REFERENCES

Abdullah, M., 2002. Length-weight relationship of fishes caught by trawl off Alexandria, Egypt. Naga, 5: 19-20.

Araajo, F.G.C., 2003. Length-weight relationship and condition factor of *Micropogamia funieri* (*Perciformes sciaenidae*) in the Sepetiba bay, Rhode Jaweiro State, Brazil. NAGA ICLARM Q., 4: 209-213.

Bagenal, T.B. and F.W. Tesch, 1978. Methods for Assessment of Fish Production in Fresh Water. Blackwell Scientific Publication, Oxford, UK., pp: 101-136.

Beyer, J.E., 1987. On length-weight relationship. Part 1. Corresponding the mean weight of a given length class. Fishbytes, 5: 11-13.

Bolger, T. and P.L. Connoly, 1999. The selection of suitable indices for the measurement and analysis of fish condition. J. Fish Biol., 34: 171-182.

Fagade, S.O. and A.A. Adebisi, 1979. On the fecundity of *Chrysichthys nigrodigitatus* (L) of Asejire Dam, Oyo State, Nigeria. Nig. J. Nat. Sci., 1: 127-131.

Frota, L.O., P.A.S. Costa and A.C. Braga, 2004. Length-weight relationships of marine fishes from the central Brazilian coast. NAGA, World Fish Centre Q., 27: 20-26.

Gulland, J.A., 1983. Fish Stock Assessment. Vol. 1, FAO/Wiley Series, Food and Agriculture, UK., pp: 223.

Haimovici, M. and G. Velasco, 2000. Length-weight relationship of marine fishes from Southern Brazil. The ICLARM Q., 23: 14-16.

Ikomi, R.B. and O. Odum, 1998. Studies on aspects of the ecology of the catfish *Chrysichthys auratus* Geoffrey St. Hilaire (Osteichytes Bagridae) in the River Benin (Niger Delta) Nigeria. Fish. Res., 26: 187-198.

Ikusemiju, K., 1976. Distribution, reproduction and growth of the catfish, *Chrysichthys walkeri* Grunther in Lekki Lagoon, Nigeria, J. Fish. Biol., 8: 453-458.

King, R.P., 1996. Length-weight relationships of Nigerian fresh water fishes. NAGA., 19: 49-52.

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

Lewis, D.S.C., 1974. An illustrated key to the Fishes of Lake Kainji. O.D.A., London, pp: 106.

Onimisi, H.U. and S.J. Oniye, 2011. Length-weight relationship and condition factor of *Auchenoglanis occidentalis* in Zaria reservoir, Nigeria. Zoologist, 8: 52-56.

Pauly, D. and F.C. Gayanilo Jr., 1997. A bee: An alternative approach to estimating the parameters of a length-weight relationship from lengthfrequency samples and their bulk weights. NAGA ICLARM, Manila, Philippines.

Pauly, D., 1983. Some simple methods for the assessment of tropical fish stocks. FAO Fisheries Technical Paper 234, Food and Agriculture Organization of the United Nations, Rome, pp: 52. http://www.fao.org/docrep/ 003/X6845E/X6845E00.HTM.

Ricker, W.E., 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can., 191: 1-382.

Torrey, F., 1991. Tabular data on marine fishes from Southern Africa, part 1. Length-weight relationships. Fishbytes, 9: 50-53.

Wade, J.W., 1992. The relationship between temperature, food intake and growth of brown trout, *Salmo trutta* (L.); Fed. Natural and artificial pelted diet in earth pond. J. Aquat. Sci., 7: 59-71.