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Length - Weight Relationship and Condition Factor of Clarias gariepinus from Igbokoda, Ondo State, Nigeria

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ABSTRACT

The length-weight relationship and condition factor of Clarias gariepinus sampled from Alape River, Igbokoda, Ondo State, Nigeria were determined. A total of 120 C. gariepinus catfish were procured from local fish farmers for this research work. This consisted of 90 males and 30 females. The length-weight regression analysis showed that the 'b' values of 2.625 and 2.764, exhibited negative allometric growth in males and females respectively. The significant linear relationships 'r' of 0.945 and 0.919 were recorded in both males and females. The condition (K) factor ranged between 0.567 and 0.644 in the two sexes. The 'K' values recorded which were lesser than 1 in this work showed that the male and female C. gariepinus from Alape River were not in a stable condition. The factors responsible for the condition of the river may be largely due to means of transportation on the water and other human activities.

Keywords: *Length, Weight, Condition Factor, Allometric Growth, Clarias gariepinus*

INTRODUCTION

Fish are excellent sources of protein when compared with other sources of protein due to the amino acid composition and protein digestibility (Louka, 2004). Fish provides more than 1.5 billion people with almost 20 percent of their average per capita intake of animal protein, and 3.0 billion people with at least 15 percent of such proteins. They also serve as a favourite foodstuff for large number of people across the globe due to their several health benefits (FAO, 2012; Ali and Kumar, 2010).

Clarias gariepinus, a dominant freshwater fish are found throughout Africa and the Middle East, and lives in freshwater lakes, rivers, and swamps, as well as human-made habitats, such as oxidation ponds or even urban sewage systems. The species is of major economic importance and also an important aquaculture species thus it was introduced all over the world for farming purposes in the early 1980s and is found in countries far outside its natural habitat, such as Brazil, Vietnam, Indonesia, and India (Froese and Pauly, 2017)

Length- weight relationship is a useful tool in fish growth pattern, age determination or fishery assessment (Pepple and Ofor, 2011). Beyer (1987) reported that, length-weight relationship of fishes are important in fisheries biology because it allows the estimation of the average weight of a given length group by establishing a mathematical relation between the two. The values of LWR are used for the comparison of the isometric growth among different regions. It was reported that fish grow at isometric rate when the b-value equals to 3 but, when the b value is less than 3, the fish has a negative allometric growth, when it is greater than 3, it exhibits a positive allometric growth according to Khairenizam and Norma-Rashid (2002) .

In fish length-weight relationship studies, fish body weight has an exponential relationship with its length. The power function; $W= aL^b$ is used to represent the length-weight relationship (When, W= total weight of fish; L=total length; a=constant of proportionality; b= allometry coefficient which most often fluctuates between 2 and 4). The fishes of the tropical and sub-tropical region water systems are characterized with growth fluctuations due to many factors such as environmental changes, changes in food availability and the chemical properties of the aquatic medium. Their status of fishes is greatly

influenced by the condition factor of their environment. The condition factor is expressed as the relative degree of robustness or well-being of fish and reflects the degree of nourishment and state of sexual maturity. It is influenced by sex, age, gonad maturity stage, type of fish species, food availability, physical factors, physiology of fish and season of samplings (Oso and Iwalaye, 2016, Anyanwu *et al.*, 2007). Condition factor (K) provides information about the physiological state of the fish in relation to its welfare and based on the hypothesis that heavier fish of a given length are in a better condition (Bagenal and Tesch, 1978). Some condition factors reported for fish species include; *Clarotes lateceps* from the fresh water reaches of the lower Num river (Abowei and Davies, 2009), *Liza falcipinus* from Badagry creek (Lawson *et al.*, 2010), *Synodontis robbianus* at Idah area of River Niger (Adeyemi, 2011). The condition factors of the fishes in Alape river have never been examined before now. This study was therefore designed to examine the length-weight relationship and the condition factor of *C.gariepinus* collected from Alape river, Igbokoda, Ondo State, Nigeria.

MATERIALS AND METHODS

Study Area

The *C. gariepinus* samples were collected from Alape River at Igbokoda in Ilaje local government area of Ondo State, Nigeria. The upstream of Igbokoda River is known to be the Alape river which is one of the major and important rivers in Ondo State, Nigeria. The river lies on latitude 4°40'-5°00' N and 6°00'-6°2'E. The Alape River is a natural habitat of freshwater fishes. The river serves as means of transportation to other states like Lagos, Ogun and Delta States among others.

Sample Collections

C. gariepinus used in this study were bought randomly from local farmers as they landed at the river shore. The fish were collected with cast nets, set nets, lift net and hook and line. A total of 120 specimens were collected and examined. The fish samples collected were transported to the laboratory of Department of Zoology and Environmental Biology, Ekiti State University, Ado-Ekiti for the analysis. The fish were allowed to acclimatize for 24 hours before the commencement of the practical.

Laboratory Procedure

The total length (L) of the fish was measured to the nearest 0.1 cm from the tip of the snout to the extended tip of the caudal fin. Body weight (BW) of individual fish was measured to the nearest 0.1 g with Electronic sensitive weighing balance after removing adhered water from the body. Length-weight relationship (LWR) was calculated from the equation; $W=aL^b$ (Pauly, 1984) and the equation was logarithmically transformed into log W= log a + blogL. (W= weight of fish in grammes, L= total length of fish in centimeters, a= constant, and b = Exponent of values). The correlation coefficient (r^2) which shows the degree of association between the length and the weight was calculated from the linear regression analysis.

The mean weight and length of the sampled fish were used to estimate the condition factor using the equation

$$K = \frac{100W}{L^3}$$

Where K is the Condition factor, W is the weight of the sampled fish in grammes and L is the total length in centimeter (Froese 2006)

RESULTS

One hundred and twenty fish species were collected from Alape River of which 90 were males and 30 were females. The length –weight regression analysis of *Clarias gariepinus* under study is shown in Table 1. The total length ranged from 12.90-28.50 cm and 14.50-24.70 cm while the weight ranged from 10.70-125.50 g and 23.60-103.70 g for males and females respectively. The 'b' values of males and females were 2.625 and 2.764 respectively. The result showed that both male and female *Clarias gariepinus* exhibited negative allometric growth. The length-weight relationship of males and females showed a significant linear relationship ($p<0.05$) of 0.947 and 0.919.

Table1. *Ranges and mean values of total length and body weight and length-weight relationship of male and female C. gariepinus collected from the study area.*

Sex			Total Length		Body Weight			
	Range	Mean	Range	Mean	a	b	r^2	r
Male	12.90-28.50	21.79±3.61	10.70-125.50	61.49±26.50	-1.7253	2.625	0.897	0.947
Female	14.50-24.70	19.98±2.56	23.60-103.70	53.20±20.46	-1.9890	2.764	0.844	0.919

The condition factor, K ranged from 0.319 to 0.869 and 0.480 to 0.806 while the mean values were 0.567 ± 0.093 and 0.644 ± 0.096 for male and female *C. gariepinus* respectively as shown in Table 2.

Table2. *Condition factors (K) of male and female C. gariepinus collected from the study area.*

Sex	Exponential equation	Range of K	Mean of K
Male	$-1.725(TL)^{2.625}$	0.319 -0.869	0.567 ±0.093
Female	$-1.989(TL)^{2.764}$	0.480 - 0.806	0.644± 0.096

DISCUSSION

The sustainability of fishery resources requires effective management of all the processes involved in breeding. It also requires the detailed knowledge of the population parameters such as length-weight relationship. This important length –weight relationship allows the estimation of the mean weight of the fish from a given length group and, it reveals the well-being of individual fish and determines the possible differences between separate unit stocks of the same species (King, 2007; Beyer, 1987). The length –weight relationship provides valuable information on the habitat where the fish are reared and in the modeling of the ecosystem. (Kulbicki et al., 2005, Pauly, 1993).

The result of the 'b' values which were less than three (3) recorded for male and female *C. gariepinus* during this research showed negative allometric growth. This means that the increase in length is not equal in proportion to the weight under constant specific gravity. This confirmed that fishes do not grow symmetrically as reported by Tesch (1968). King (1996) also reported that fish becomes slender with the increase in their length. The result recorded in this work is comparable with the findings of Oso and Iwalaye (2016), Dan- Kishiya (2013), Peter and Diyaware (2014), Abubakar (2006) and Haruna (1992) on some freshwater fishes of Nigeria. The results on length-weight relationship may be greatly influenced by both physical and biological factors. Some of these factors include the sex of the fish, age, season, habitat and geographical distribution (Olurin and Aderibigbe, 2006). Also, other factors such as increased intake of water or food, season of the year, and the time of the day of sampling of fish specimens have been reported to have great impact on the weight of the fish. Food regurgitation and spawning affect weight of fish thus affects 'b' values (Lagler, 1952).

Condition factor (K) is described as a morphometric index which provides information on the physiological state of fish in their different habitats in relation to its welfare. It is based on the principle that fish with better growth rate are in a better condition. The condition factor recorded in this work was similar to 0.65-0.70 documented on *C. gariepinus* by Anyanwu *et al.* (2007) but varied from 0.9455-4.3457, 0.77-5.37,1.02-1.52 and 1.06-2.02 reported by Oso and Iwalaye (2016), Akintade *et al.*(2016), Peter and Diyaware (2014) and Dan-Kishiya (2013) respectively on tropical fish species. The K values recorded n this work are less than the range of 2.9 and 4.8 recommended as suitable for mature freshwater fish by Bagenal and Tesch, (1978).This suggests that the condition of Alape River Igbokoda is not suitable for *C. gariepinus.*

The K- factor is always influenced by both biotic and abiotic factors. The Alape River condition may not be suitable due to factors such as; effluents from domestic sources, ships and canoes, urbanization of the area and other sources. In conclusion, the length and weight have a relationship which shows a negative allometric growth pattern in *C. gariepinus* from the river. The condition factor of the river is not suitable for the growth and development of the fish. Therefore, there may be need for the physico-chemical analysis of both the water and soil basement of Alape River, Igbokoda, Ondo State, Nigeria.

REFERENCES

[1] Abubakar, K.A.(2006): A study of Aspects of productivity and stock status of *Oreochromis niloticus* and *Clarias gariepinus* in Lake Geriyo Yola, Adamawa State, Nigeria. Unpublished Federal University of Technology, Yola, Nigeria 212Pp

[2] Abowei, J. F. N and Davies A. O. (2009). Some population parameters of *Clarotes laticeps* (Rupell, 1829) from the fresh water reaches of the lower river, Niger Delta, Nigerin .*Journal of Sciences Research 9:15-19*

[3] Adeyemi, S. O., (2011). Length – weight, length –length relationship and condition factor of *Synodontis robbianus* at idah area of river Niger, Kogi State, Nigeria. *Pakistan Journal of Nutrition, 10:505-508*

[4] Akintade A.O.Edwin, C.O.and Simon E.A. (2016): Length-weight relationship, condition factor and sex ratio of fish fauna in Badagry

creek, Lagos, Nigeria. *International Journal of Marine Science* 6(24):1-8

[5] Ali, A., and Kumars, P. (2010). Chemical and proximate composition properties of different fish species obtained from Iran. *World Journal of Fish Marine Science*, (2): 237239.

[6] Anyanwu, P. E., Okoro, B. C., Anyanwu, A. O., Matanmi, M. A., and Ebonwu,B. I. (2007). Length-weight relationship, condition factor and sex ratio of African mud catfish (Clarias gariepinus) reared in indoor waters recirculation system tanks. *Research Journal of Biological Science, 2, 780-783.*

[7] Bagenal, T.B. and Tesch, F.W. (1978). Age and Growth. In: Methods for Assessing of fish Production in Freshwaters. Bagenal, T.B. (Ed.). 3rd Edtion. No. 3, *Blackwell Scientific Publication Ltd., pp: 101-136.*

[8] Beyer, J. E. (1987). Length- weight relationship part 1. Corresponding the mean weight of a given length class. *Fish byte 5: 11-13*

[9] Dan-Kishiya, A.S.(2013): Length-weight relationship and condition factor of five fish species from a tropical water supply Reservoir in Abuja, Nigeria. American Journal of *Research Communication* 1(9):175-187

[10] FAO (2012): *The State of the World Fisheries and Aquaculture.* Food and Agriculture Organization of the United Nations, Rome. Pp 3-41.

[11] Froese, R.and, Pauly D. (2017). Fish Base: World Wide Web electronic publication. Available at *:http://www.fishbase.org*

[12] Froese, R., (2006). Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. *Journal of applied ichthyology 22(4):241-251.*

[13] Haruna, A.B.(1992): Studies on aspects of water quality and biology of the fish of Jakara lake. Unpublished M.Sc. Thesis, Bayero University, Kano, 151Pp.

[14] Khairenizam, M. Z., and Norma-Rashid, Y. (2002). Length- weight relationship of mud skippers (Gobidae: Oxidercinae) in the Coastal areas of Sclangor, Malaysia. International Centre for living Aquatic Resources Management. *World Fish Centre Quarterly 25:20-22.*

[15] King, M. (2007). Fisheries Biology, assessment and management 2nd edition, Blackwell scientific publications, Oxford: Pp. 189-192.

[16] King, R. P., (1996). Length- weight relationship of Nigerian Coastal water fishes. *NAGA, ICLARM Quaterly* 19(3):49-52.

[17] Kulbicki, M., Guillemot, N., and Amand, M. (2005). A general approach to length-weight relationships for New Caledonian Lagoon fishes. *Cybium 29:235-252.*

[18] Lagler, K.E. (1952): *Freshwater Water Fishing Biology* (2nd Edition) IOWA W.M.C. Brown USA

[19] Lawson, E. O., Akintola, S. O., and Olatunde, O. A., (2010). Aspects of the Biology of sickle fin mullet, *Liza falcipinnis* (Valenciennes, 1836) from Badagry creek, Lagos, Nigeria.*National Sciences 8:168-182.*

[20] Louka, A. M. (2004). A novel colorimetric analysis used to compare different fish drying processes. *Food Control* 15: 327-334

[21] Lowe – McConnel, R. H., (1987). *Ecological studies in Tropical fish Communities*. 1st edition Cambridge University Press

[22] Olurin, K. B. and Aderibigbe, O. A. (2006): Length-Weight relationship and condition factor of Pond reared Juvenile *O. niloticus. World Journal of Zoology*1(2):82-85

[23] Oso, J.A and Iwalaye, A.O.(2016): Growth pattern and Condition factor(K) of four dominant fish species in ero dam in Ekiti State, Nigeria. *British Journal of Applied Research* 01(02):08-10

[24] Pauly, D. (1984): Fish population dynamics in tropical water: a manual for use with Programmable calculators. *ICLARM Studies and Reviews* 8:325

[25] Pauly, D., (1993). Editorial Fish byte. *NAGA, ICLARM Quaterly 16:20-26.*

[26] Pepple, P. C. G., and Ofor, C. O. (2011). Length – weight relationship of *Heterobranchus longifilis* reared in earthen Ponds. *Nigeria Journal of Fisheries 8(2): 315-321.*

[27] Peter, K. J and Diyaware, M.Y.(2014): The length-weight, condition factor and fecundity of *Clarias gariepinus* in Luhu Reservoir, Michika Local Government Area, Adamawa State-Nigeria. *Nigerian Journal of Fisheries and Aquaculture* 2:1-5

[28] Tesch, F.W. (1968): Age and growth. In *Methods for Assessment of fish production in* freshwater (Ricker, W.E.ed.) Blackwell Scientific Publication. Pg 93-123

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