SHORT COMMUNICATION   **KISA ARAŞTIRMA**

Length-weight relationship and condition factor of *Leuciscus niloticus* (De Joahhis, 1853) from Epe Lagoon, Lagos State, Nigeria

Olaniyi Alaba Olopade[1*] • Iyabode Olusola Taiwo[2] • Ayodele Eniola Ogunbanwo[3]

[1] Department of Fisheries, University of Port Harcourt, Port Harcourt, Nigeria
[2] Federal University of Agriculture, Abeokuta, Nigeria
[3] Department of Animal Production, Olabisi Onabanjo University, Agoiwoye, Nigeria
* Corresponding Author: olaniyi.olopade@uniport.edu.ng

Abstract: *Leuciscus niloticus* samples were obtained from Epe lagoon, Lagos state, Nigeria. The fish samples were designated into pooled, male and female sex respectively. Length-weight relationship was carried out to investigate the correlation value, growth pattern and the condition factor (k) of pooled, male and female *Leuciscus niloticus*. In this study, the growth pattern of pooled, male and female *Leuciscus niloticus* from Epe lagoon shows that the "b" values were 2.56, 2.62 and 2.38 respectively, showing that all the fish sampled exhibited negative allometric growth pattern. The overall length weight regression equation for pooled was (Log W = -1.679 + 2.559 log TL), (r = 0.898), and also the length-weight equations of males and females (Log W = -1.759 + 2.618 log TL) (r=0.919), (Log W = -1.449 + 2.384 log TL) (r=0.870) respectively. The mean condition factor (k) of *Leuciscus niloticus* was 0.55 ± 0.08 for pooled, 0.54 ± 0.08 and 0.55 ± 0.09 for both male and female respectively indicate poor adaptation of the fish in the Epe lagoon.

Keywords: Length, weight, condition factor, *Leuciscus niloticus*, Epe lagoon

INTRODUCTION

Growth is a fundamental characteristic of all living organisms and growth pattern and growth rates are highly species specific. Various patterns of growth occur among organisms, for example in fishes both isometric and allometric growths occur in fishes. Isometric growth occurs when an organ grows at the same rate as the rest of the body while allometric growth occurs when an organ grows at a different rate from the rest of the body (Taylor et al, 2005). The growth pattern may be positive or negative. Positive growth occurs when anabolism exceeds catabolism and the fish becomes relatively stouter or deeper-bodied as it increases in length, whereas negative growth occurs when catabolism exceeds anabolism and fish becomes more slender as it increases in weight. The length-weight relationship provides means for finding out the condition factor which indicates the "Wellbeing of the fish". The condition factor in fish serves as an indicator of physiological state of the fish in relation to its welfare, when condition factor value is higher it means that the fish has attained a better condition.

The family Cyprinidae is the largest family of freshwater fishes which are commonly known as minnows or carps comprises of 210 genera and 2010 species (Liu and Chen, 2003). The family is recognised by their large scales, toothless mouths, protrusile upper jaw and specialised pharyngeal teeth called "carp bone" for chewing (Winfield and Nelson, 1991). In

Nigeria freshwater system this fish family has members belonging to two sub-families; the sub-family Barbinae (the barbins) which include such genera as Labeo, Barbus and Garra and sub-family Barilinae (also known as Dianionine) and the members are the dianios. A danio in Nigeria freshwater belongs to the genus Leuciscus (Barilius) and the following Leuciscus species have been identified in Nigeria which includes, *L. niloticus, L. senegalensis, L. loati, L. ogunensis. Leciscus niloticus* is morphometrically identified by having no vertical bars, all the fins are very clear and the body uniformly slivery in colour. A detailed knowledge of growth rates of different fish stocks is important for more specific fishery management. These body relationships are well known in commercial fishery and have been studied for some common species, but few relationships are known about species of freshwater fish that are distributed in less-studied areas and not commercially exploited (Hossain et al., 2009).

The Epe lagoon, Lagos State, Nigeria is one of the important landing centers for commercially important fishes including species of *Leuciscus niloticus*. *L. nioticus* is highly important fish food and is gradually replacing traditional economic important fish species in the lagoon. In spite of good landing; no convincing information is available on the growth performance and other related information on this fish. It is

against this background the present study examined the length-weight relationship and condition factors of *Leusicus niloticus* from Epe Lagoon, Lagos State.

MATERIAL AND METHOD

Epe lagoon (Fig. 1) lies between latitudes latitudes 6º 23'N and 6º 41'N and Longitudes 2º 42'E and 3º 42'E is fed by River Oshun, it has a surface area of more than 243km2 and a maximum depth of 6m though a large area of more than 243km2 shallow with a minimum depth of 1m, and the vegetation surrounding the lagoon is of the mangrove swampy type. Epe lagoon is sandwiched between two other lagoons, the Lekki lagoon (freshwater) in the east and the Lagos lagoon (brackish water) in the west. The lagoon opens into the Gulf of Guinea (Atlantic Ocean).

Fish samples of *Leuciscus niloticus*, were sample from the catches of local fishermen at chief market fish landing station located at Epe Lagoon. The collection was done from November, 2014 to January, 2014. Fish samples were sorted into male and female using the number of opening of their genital papillae, i.e male has only one opening, while the female has two opening of the genital papillae and also, a slight swollen abdomen which is protruded and a little bit extended in female more than in male. A total of 70 *Leuciscus niloticus* (40 males and 30 females) were investigated for this study. The samples were placed in ice chest from the landing point and transferred into deep freezer (temperature -20ºC). Excess moisture was removed from fish immediately after thawing, the biometric data such as body weight (BW), using an electronic weighing balance to the nearest 0.01g and Total Length (TL) were recorded using a measuring board, to the nearest 0.1cm for each specimen. The total length was taken as distance from the snout of the mouth closed to the tip of the caudal fin.

The length-weight relationships were expressed as: W=aLb and represented linearly by logarithms transformation:

LogW = Loga+b LogL

Parameters a and b were estimated by the least squares regression method, W and L were fish body weight and Total length respectively. The correlation (r2) that is the degree of association between the length and weight was computed from the linear regression analysis:

R = r2

When b is equal to three (3), isometric pattern of growth occurs but when b is not equal to 3, allometric pattern of growth occurs, which may be positive if >3 or negative if <3.

Condition factor of the fish was calculated using the formula: K = W X 100/ L3 Where K= condition factor, W= fish weight in grams, L= total length of fish in centimeter.

Data Analysis

Microsoft excel was used to calculate the mean condition factor (K), correlation and regression analysis (r2), which is used to establish the relationship between the body weight and total length. The length-weight relationship parameters, a, b, and r2 were computed using regression analysis of Excel data analysis programme. The programme allows for logarithmic transformation of W=a Lb (Thomas et al, 2003), while SPSS was used for linear representation of the graph, which shows the slope and the intercept.
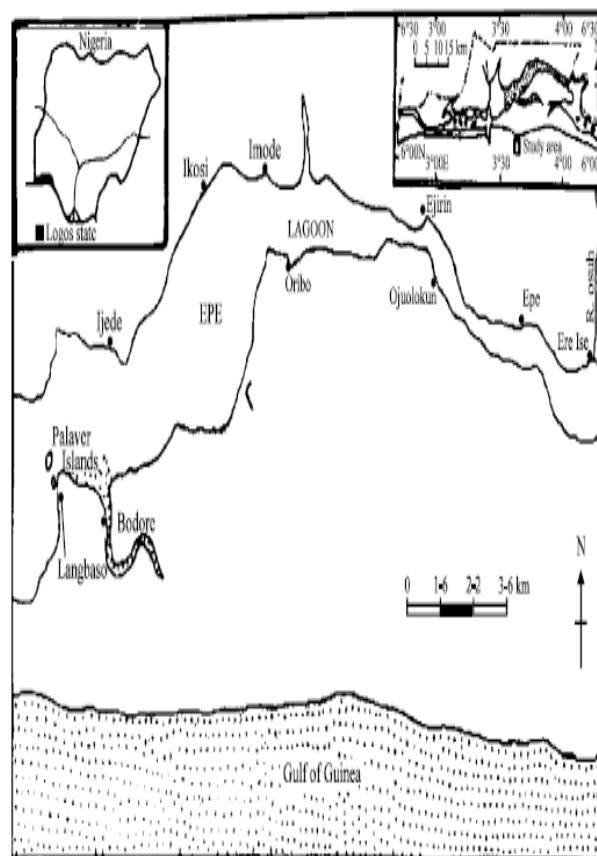

**Figure 1.** Map of Epe lagoon in Lagos State, Nigeria

RESULTS

Total length of males ranged from 13.6 to 27.6 cm with a mean value of 21.88 ± 0.56 cm and the regression equation for male was Log W= -1.759+2.618logTL. The females varied between 14.6 and 26.6 cm with a mean value of 21.43 ± 0.56 cm and the regression equation for female was Log W= -1.449+2.384logTL. The male weights ranged from 20 to140 g and ranged between 20 to 90 g for females. It was obvious that male has larger size than female (Table 1)

**Table 1.** Size range of *L. niloticus* from Epe Lagoon

Category	Length			Weight		
	Min. (cm)	Max. (cm)	Mean ± STD	Min. (g)	Max. (g)	Mean ± STD
Pooled	13.60	27.60	21.74 ± 3.36	20.00	140.00	58.86 ± 3.10
Female	14.60	26.60	21.43 ± 0.56	20.00	90.00	55.33 ± 3.64
Male	13.60	27.60	21.88 ± 0.56	20.00	140.00	60.25 ± 0.59

Analysis of length-weight relationships of both the males and females separately and combined showed that all the species exhibited negative allometric growth pattern. Their 'b' values were less than 3. In this study *L. niloticus* showed negative allometric growth, with value of 'b' of 2.56 for the pooled samples, 2.62 for males and 2.38 for the females. A logarithmic graph prepared, for male, female and pooled data, for the above data showed a straight line relationship (Fig. 2, 3 and 4).

There was a positive correlation between the length and the weight in the pooled, males and females sexes indicating a positive and strong correlation of 0.898, 0.919 and 0.870 respectively. The mean value of (K) for Leuciscus niloticus in both sexes were 0.548 ± 0.09 while the value for males was 0.545 ± 0.08. The maximum value of mean 'K' recorded for the female was 0.55 ± 0.10 (Table 2)
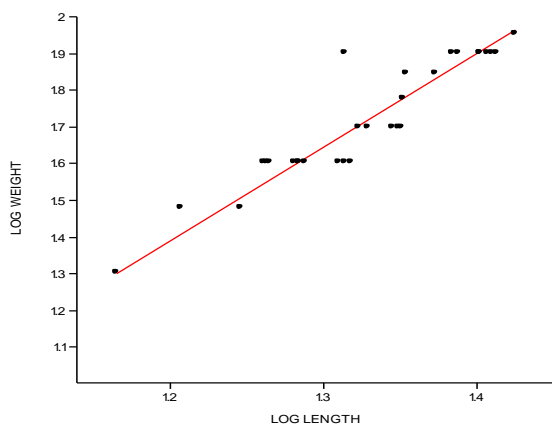
Figure 2. Length-weight relationship of male *L. niloticus* from Epe lagoon
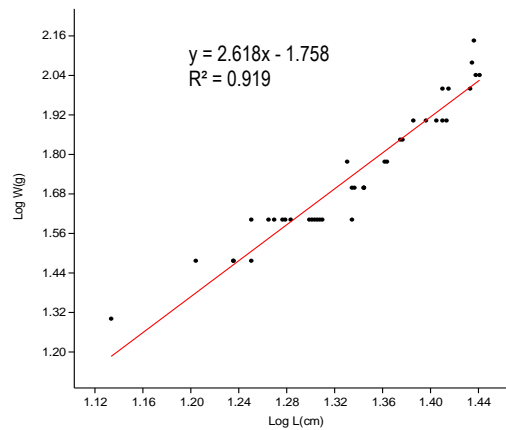
Figure 3. Length weight relationship of female *L. niloticus*
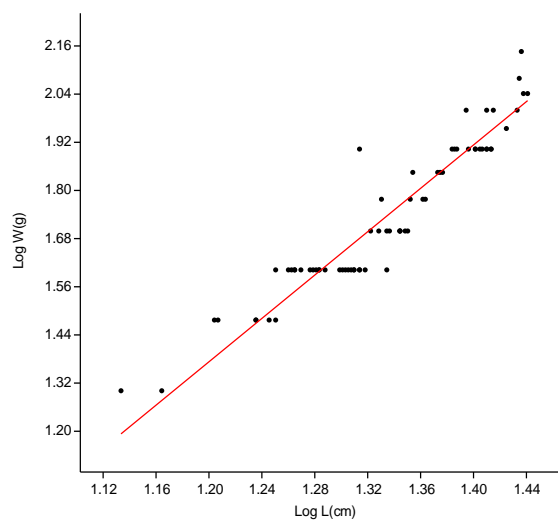
Figure 4. Length weight relationship of both male and female L. niloticus

Table 2. Length- weight relationship of females *L. niloticus* from Epe lagoon

Leusicus niloticus	N	b	R (r²)	Mean K ± STD
Leusicus niloticus (females)	30	2.38	0.87	0.548282 ± 0.091405
Leusicus niloticus (males)	40	2.61	0.92	0.544872 ± 0.083463
Leusicus niloticus (both)	70	2.55	0.89	0.550001 ± 0.083463

DISCUSSION

The result of length-weight relationship in the present study showed that the growth of the *L.niloticus* in the Epe lagoon was negative allometric growth, with value of 'b' of 2.56 for the pooled samples, 2.62 for males and 2.38 for the females. This indicates that the fish grows at different rate from the rest of the body. Ikusemiju et. al (1983) reported positive allometric growth with in Pellonula afzeliusi from Lagos lagoon. Differences in b-values were found in relation to sex of fish with b-values of males were higher than females, as males exhibited slightly more growth than females. Dashmona (1990) and Thapliyal (2002) have also reported significant differences in length-weight between different seasons and sexes of fishes studied by them.

The parameters of the length–weight relationship can vary significantly according to sex and season (e.g. Hossain et al., 2006), The correlation (r) revealed that the relation between length and weight in both males (0.959) and females (0.933) of *L.niloticus* was good. Cone (1989) indicated that the relationship between fish weight and length is frequently used to compare the effect of biotic and abiotic factors on the health or well-being of a fish population. The results of the present study are very similar to the above findings and almost in the same range as reported by Imam et al. (2010) and Ibrahim et al. (2012) on some species of family Cyprinidae.

The mean condition factor values of species sampled had their value less than 1 which was an indication that the fish samples were not doing well in the Epe lagoon. The result of condition factors of the species in the present study was within the ranges of 0.49 - 1.48 recorded by Nwadiaro and Okorie (1985) in Oguta Lake. Mahapatra and Datta (2004) attributed low mean condition factor values in Aristichthys nobilis to spawning strain, spent condition and low feeding rate. It has been reported that feeding intensity may also influence the condition factor (Wheatherly, 1972). This study has provided baseline information on length- weight relationship and condition for *L. niloticus*. Based on the results of this study it can be concluded that L. niloticus is not thriving very well in the Epe lagoon. Therefore, there is need to conserve *L.niloticus* in the Epe lagoon.

REFERENCES

Cone, R.S., 1989. The need to reconsider the use of condition indices in fishery science. Trans. Am. Fish.Soc. 118 (5), 510 – 514.

Dashmona, N., 1990.Fishery biology of Garra gotyla gotyla (Gray) from Garhwal Hill streams Srinagar,India: D.phill.Thesis, HNB Garhwal University

Hossain, M.Y., Ahmed, Z.F., Leunda, P.M., Islam, A.K.M.R., Jasmine, S., Oscoz, J., Miranda, R., Ohtomi, J., 2006. Length-weight and length-length relationships of some small indigenous fish species from the Mathabhanga River, southwestern Bangladesh. *Journal of Applied Ichthyology* 22: 301-303.

Hossain, M.Y., Jasmine, S., Ibrahim, A.H.M., Ahmed, Z.F., Rahman, M.M., Ohtomi, J., 2009. Length-weight and length-length relationships of 10 small fish species from the Ganges, Bangladesh. *Journal of Applied Ichthyology* 25(1): 117-119.

Ibrahim, B.U., Auta, J. Balogun, J.K., Bolorunduro, P.I., Dan-kishiya, A.S., 2012. Length-weight relationship and condition factor of Barilius niloticus (Family: Cyprinidae) in Kontagora Reservoir, Niger State, Nigeria. *Biological and Environmental Sciences Journal for the Tropics* 9 (2):155-158.

Ikusemiju, K., Oki, A.A., Graham-Douglas, M., 1983. On the biology of an estuarine population of clupeid, Pellonula afzelivsi (Johnels) in Lagos Lagoon, Nigeria. *Hydrobiological*, 102: 55-59.

Imam, T.S., Bala U., Balarabe, M.L., Oyey, T.I., 2010. Length-weight relationship and condition factor of four fish species from Wasai Reservoir in Kano, Nigeria. *African Journal of General Agriculture*.6:3: 125-130.

Liu H., Chen Y., 2003: Phylogeny of the East Asian cyprinids inferred from sequences of the mitochondrial DNA control region. *Can. J. Zool*. 81: 1938–1946.

Mahapatra, B. K., Datta, N. C., 2004. Relative condition factor (Kn) of the big head carp, Aristichthyes nobilis (Richardsoni). In: 47-53pp. Fishery Management (Avind Kumar eds.) Environmental Biology Research Unit S.K.M. University Dumka, A.P.H. Publishing Corporation, New Delhi –110 002.

Nwadiaro, C.S., Okorie, P.U., 1985. Biometric characteristics: length weight relationships and condition factors in Chrychthys filamentosus, Pisces, Bagridae from Oguta Lake Nigeria. *Biol. Afr.* 2: 48-56.

Thapliyal, A., 2002.Some aspects of fish biology Pseudoecheneis sulcatus (Mc. Clelland) from Grahwal Himalaya, Uttranchal, Srinagar India: D.phill.Thesis Gharwal Universiy ,Srinager

Taylor. D.J., Green, N.P.O., Stout G.W., Soper, R., 2005. Biological Science. Third edition, Cambridge University Press, London 389pp.

Thomas, J., Venus, S., Kurup B.M. 2,003. Length-weight relationship of some deep sea fishes inhabiting the continental slope beyond 250m depth along west coast of India. Naga. ICLARM. Q. (26): 17-21.

Wheatherly, A.H., 1972. Growth and ecology of fish populations. Academic Press, London, 293 pp.

Winfield, I.J., Nelson, J.S. (Eds.). 1991. Cyprinid fishes: systematics, biology and exploitation. Chapman and Hall, London