LENGTH-WEIGHT RELATIONSHIPS OF SOME NIGERIAN FRESH WATER FISHES FROM IBA-OKU STREAM, A TRIBUTARY OF IKPA RIVER, NIGERIA

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ABSTRACT: A comparative study of the morphometric features of some fishes caught in Iba Oku stream, a tributary of Ikpa River was carried out. Length-weight relationships of *Malapterurus electricus, Channa obscura, Barbus callipterus, Erpetoichthys calabaricus*, *Isichthys henryi* and *Epiplatys sexfaciatus* were studied. The value of the slope (b) showed negative allometric growth (b < 3.0) for all the species studied. The values of correlation coefficient (r) in the standard length – body weight relationships ranged from 0.691 for *Barbus callipterus* to 0.984 for *Channa obscura* (p < 0.001) showing that they are significantly correlated. The minimum condition factor (K) was seen in *Erpetoichthys calabaricus* (0.19) while the maximum was seen in *Epiplatys sexfasciatus* (3.08). The mean condition factor was 3.61. This showed that the fishes in this study area were in relatively "good" condition.

INTRODUCTION

Morphometric features are those morphological features found in fish which can be measured. Measurement of such features is important because, in fish, size is generally more biologically relevant than age, mainly because several ecological and physiological factors are more size dependent than age-dependent (Kalayci *et al.*, 2007). Consequently, variability in size has important implications for diverse aspect of fisheries science and population dynamics (Ali and McNoon, 2010). Knowledge of fish biology and species composition of different water bodies as well as their morphometric features is necessary to enhance the management of water resources (Mekkawy and Mohammad, 2011). When initiating any fisheries development therefore, fundamental knowledge about the morphometric features of the fish in question, their phenology, habitats and methods of processing them as well as their abundance and many other biological facts about them is vital (Kumolu-Johnson and Ndimele., 2011). Morphometric characteristics are used primarily to study relationships among individuals within stocks and among stocks. One of such relationships is the relationships between the body length and weight of fishes (Abdallah, 2002). Length-weight regressions have been used frequently to estimate weight from length because direct weight measurements can be time consuming in the field (Sinovcic *et al*., 2004). Calculation of condition factor is also made possible by length-weight relationship data (Abowei, 2009). Conversion of growth-in-length equation for prediction of growth-at-age and use in stock assessment model is also achieved through these data (Koca, 2002). Additionally, life history and population from different regions could be compared using length and weight data (Morey *et al.*, 2003). According to Mendes *et al* (2004), one of the most used analyses of fisheries data is length-weight relationship.

Ikpa River is the mainstay of five Local Government Areas in the traditional agricultural belt in Akwa Ibom State, Nigeria. Some important commercial and economic fish species for the various communities in the state and its environs which are exploited both at the artisanal and subsistence levels of fisheries are found here. Dredging, cassava fermentation, timber

transportation, etc. are other uses of this river. These, if properly managed and sustained can subsidize the high protein demand of the ever- increasing population and also boost her economy (Onuoha, *et al* 2010). Although some of its tributaries have been studied and very detailed information is available with respect to single species or family studies (King, 1992, 1996; Udoidiong, 1991, 1998; Udoidiong and King, 2000). There is dearth of information on a study of the morphometrics of the piscine species composition of Iba-Oku stream, Ikpa River which could serve as a baseline data. There is therefore the need to have a comprehensive update and baseline documentation of the length-weight relationships of the fishes of this important river. This paper therefore seeks to investigate the length-weight relationships and the condition indices of fishes in Iba Oku stream, a tributary of Ikpa River, Nigeria.

MATERIALS AND METHOD

Study Area

Iba Oku stream is located at Uyo – the capital city of Akwa Ibom State, Nigeria. It runs from Mfangfang pond, through Obot Idim into Mfro Iba (Figure 1).
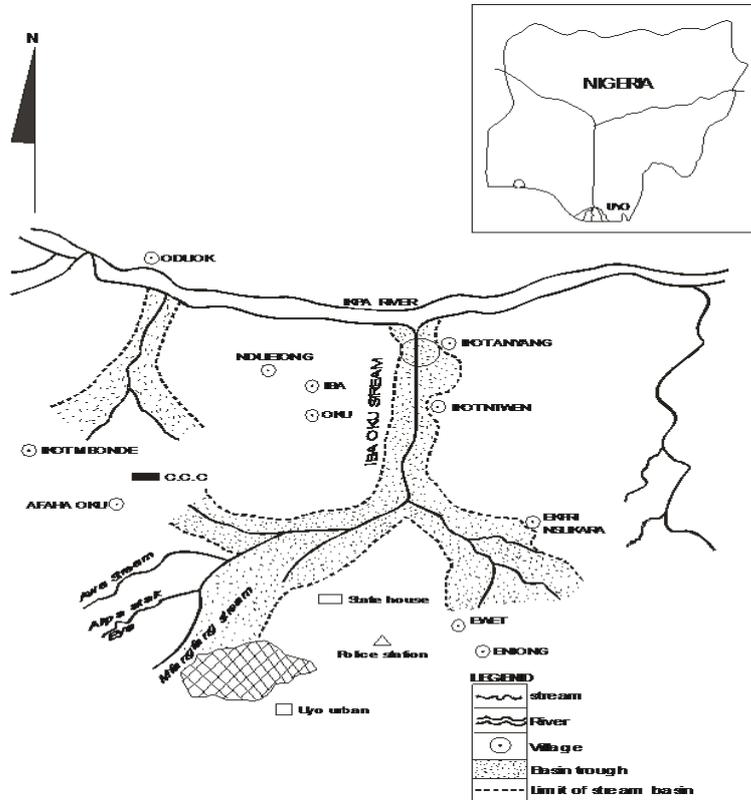

Fig. 1: Map of Iba – oku stream of the University of Uyo ravine, Uyo

The bottom of the stream is predominantly sandy and muddy while the edges are without mud. The topography of the catchment area is sloppy, so that water current is moderately fast. Some part of the water surface is covered floating leaves of *Azolla* and *Salvinia* species. The riparian zone is dominated by stands of *Raphia hookeri* and *Raphia vinifera.*

Sampling

A total of 312 specimens of fish (finfish, crabs and shrimps) were collected from the fishers' catch at different sites of Iba –Oku stream during March – July 2008. Most of the fish were caught with gill-nets of mesh ranging from 15-20 cm. A few were also collected by hooks and lines. These samples were taken on monthly basis to the laboratory using ice – packed coolers. The samples were then preserved in 10% formalin pending examination.

Fish Identification
The samples were first separated into species in the laboratory according to Holden and Reed, (1972); King (1992); Adesulu and Sydenham, (2007).

Fish Measurement
The samples were later removed, rinsed in clean water and measurement taken. The total length (TL) and standard length (SL) were measured according to Lagler (1978) to the nearest centimeter by means of a measuring board, and sometimes a ruler. Body weight (W) was measured using digital weighing balance (scout pro-400x0.01 g; model SPE 402; code number 80104013).

Calculations:: The length-weight (LWR) was calculated using the allometric formula;
$$W = al^b$$
Where, W = weight of fish (g), a = intercept on y-axis, l = length of fish (cm) while b = slope. The monthly condition factor (K) was calculated using the relationship for isometric growth from Gayanilo and Pauly (1997).
$$K = W/L^3*100$$
Where, K = Condition Factor, W = Wet weight (g), L = Total length (cm).
Monthly condition factor values >1 were considered as high while those <1 were considered as being low.

Statistical Analysis
All data were first log-transformed; then correlation and regression analyses were used to determine the type of relationship that exists between standard length and body weight. Data were analyzed using SPSS statistics, version 17.

RESULTS AND DISCUSSION

Length-weight Relationship
The Length-weight relationships (LWR) were presented on Table 1and plotted on scattered diagrams (Figs 2-7). The log-transformed length fitted over weight gave linear growth pattern indicating the three dimensional growth structure of most fish species (Lagler *et al*., 1977).

Table 1: Descriptive statistics' and estimated parameters of length-weight relationship of six fish species caught with gill net from Iba-Oku Stream, Ikpa River

Species	Length characteristics					Parameters of the relationship			
	n	Mean	SE	Min	Max	a	b	r^2	k
Malapterurue electricus	40	13.9	0.30	9.6	16.0	1.34	2.76	0.86	2.62
Channa obscura	22	12.3	0.83	3.8	21.8	1.81	2.89	0.97	1.53
Barbus callipterus	25	4.9	0.55	2.3	5.8	0.65	1.69	0.48	2.89
Erpetoichthys calabaricus	22	27.8	0.46	21.1	35.0	2.24	2.66	0.94	0.19
Isichthys henryi	37	8.5	0.74	4.7	17.2	1.04	1.91	0.78	1.03
Epiplatys sexfaciatus	22	4.6	0.56	2.1	6.4	0.77	1.84	0.63	3.08

The 99% Confidence Interval of b for all the six species ranged from 1.69 to 2.89. Of the Six species investigated, the slope (b) values for three species namely: *Malapterurus electricus, Channa obscura and Erpetoichthys calabaricus* were within the expected range of 2.5<b<3.5

(Calender, 1969) indicating that the cubic law could be applied within the indicated length range.

The regression coefficients were slightly less than 3.0 thus depicting negative allometric growth. This means that the length of body increases faster than the cube of their total length. Several authors have reported allometric growth for fish species from various water bodies. King and Akpan (2002) observed negative allometric growth in *Nanaethops unitaeniatus* caught in Mfangmfang pond downstream of Iba-Oku stream. King (1991) reported allometric growth patterns for Tilapia species from Umuoseriche Lake. In all cases, the lengths and weights were significantly correlated (r = 0.691-0.984; p = 0.001 in each case).
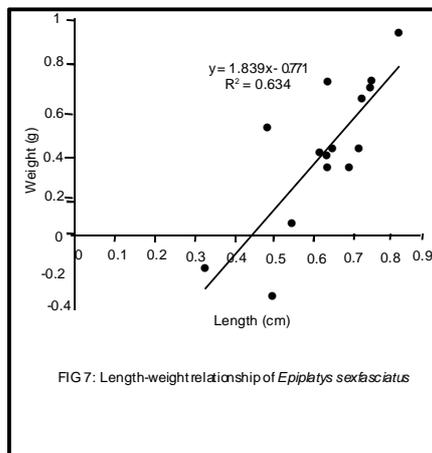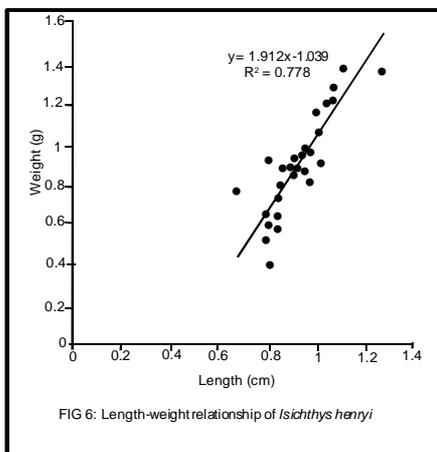
FIG 2: Length-weight relationship of *Malapterurus electricus*

FIG 3: Length-weight relationship of *Channa obscura*

FIG 4: Length-weight relationship of *Barbus callipterus*

FIG 5: Length-weight relationship of *Erpetoichthys calabaricus*

FIG 6: Length-weight relationship of *Isichthys henryi*

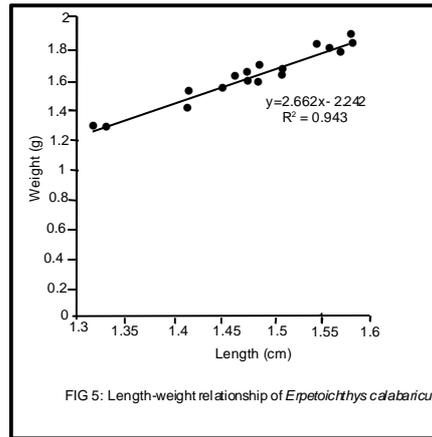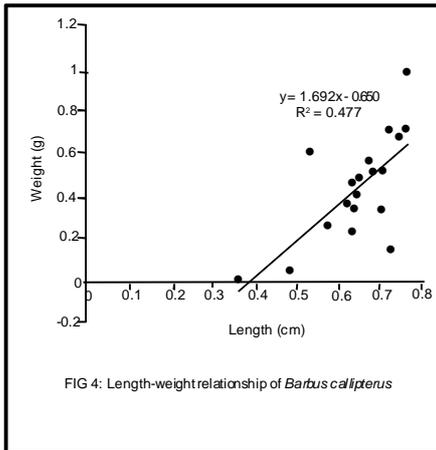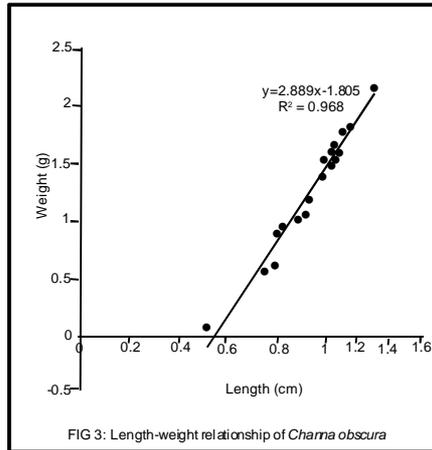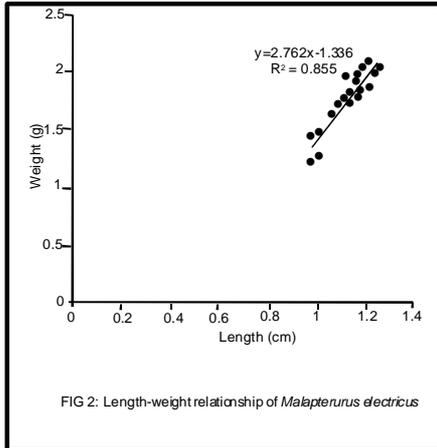FIG 7: Length-weight relationship of *Epiplatys sexfasciatus*

Table 1 also shows the condition factor (K) of the six fish species. The condition factor (K) of the six species ranged between 0.19 and 3.08. The minimum condition factor (0.19) was seen in *Erpetoichthys calabaricus* while the maximum (3.08) was seen in *Epiplatys sexfasciatus*.

All the species of fish investigated except *Erpetoichthys calabaricus* had low (K<1) condition factor. A closer examination of the condition factor reveal that 33% (2 out of 6 fish species) of the fish species had the K values within the range (2.9-4.8) recommended for matured fresh water fish by Bagenal and Tesch (1978). According to Vazzoler (1996), the lowest K values were obtained during the more developed gonadal stages and might mean resource transfer to the gonads during the reproductive period. Braga (1986) showed that values of K vary according to seasons and are influenced by environmental conditions. The same may be occurring in the environment under study. The length of the fish also has influence on K as it can be seen that the longest fish has the lowest K value. There is need for more studies to ascertain the length-weight relationships and K value of the ichthyofaunal assemblage of this community for proper management as this will contribute to the achievement of the 1st Millennium Development Goal – Eradication of Extreme Poverty and Hunger by 2015.

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