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Length-Weight Relationship of Five Clariid Species from Akpoha River, Nigeria

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Abstract

This study describes the length-weight relationships (LWR) of five Clariid fish species from Akpoha River, Ebonyi, Nigeria. A total of Two hundred and fifty-two (252) fishes belonging to 12 families: 18 general and 32 species were collected using local fishing gears from January to December 2007 and identified using taxonomic keys. The degree of association ($LWR = aL^b$) between the length and weight was computed from the linear regression analysis, using FAO/ICLARM FISAT 11 Analysis tool. The 'b' values of all the species showed positive allometry; 13.6, 8.6, 7.5, 27.4 and 5.7 for *Clarias buthupogon, Clarias anguilaris, Clarias macromystax, Clarias submarginatus* and *Heterobranchus longifilis* respectively and differed significantly ($p < 0.01$) from 3. It was concluded that these populations stand the risk of over-exploitation if urgent measures are not taken to protect the fishery. Adequate monitoring of the fisheryand regulation of operations within the system was recommended.

Keywords: Length-Weight Relationship, Inland Fisheries, Nigeria

1.0 Introduction

The importance of the various types of aquatic ecosystem as sources of food fish varies greatly and is difficult to evaluate.Unfortunately, many countries still encounter great difficulties in managing and funding the collection of inland capture statistics. For example, despite the fact that African lakes and rivers provide food to a large number of inhabitants and also revenues from fish exported outside Africa, it was necessary for FAO to estimate the 2004 inland total catch for half of the African countries where inland fishing is known to take place (FAO, 2006). This implies that Fish catch statistics of African inland waters for example, are not usually reported according to ecosystems.

FAO, (1991) reported that fish contributes about half of the animal protein intake in Africa and Inland Fisheries provide almost 40% of this. The share of fish proteins in total world animal protein supplies grew from 14.9 per cent in 1992 to a peak of 16.0 percent in 1996, declining to about 15.5 per cent in 2003. Unfortunately, many countries still encounter great difficulties in managing and funding the collection of inland capture statistics. For example, despite the fact that African lakes and rivers provide food to a large number of inhabitants and also revenues from fish exported outside Africa, it was necessary for FAO to estimate the 2004 inland total catch for half of the African countries where inland fishing is known to take place (FAO, 2006).

Ude (2011) reported that Catfishes command high value in most tropical African countries because of their good taste, size and availability within the rivers that transverse many communities whose inhabitants depend on the aquatic living resources for sustaining their livelihoods. Fish therefore plays an important role in the development of a nation.

The length-weight relationship of fish is an important fishery management tool whose importance is pronounced in estimating the average weight at a given length group (Beyer, 1987) and in assessing the relative well being of a fish population (Bolger and Connoly, 1989; Le Cren, 1951 and Angelescu, 1958).

Several studies have been conducted on the LWR of different fish species within and outside Nigeria. Shenouda *et al.* (1994) worked on *Chrysichthys* spp. from the southernmost part of the River Nile (Egypt), Alfred-Ockiya and Njoku (1995) on mullets in New Calabar River, Ahmed and Saha (1996) on Carps in Lake Kapital, Bangladash, King

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(1996) onMudskipper in Cross River estuary Nigeria, Hart (1997) on*Mugil cephalus* in Bonny Estuary; Diri (2002) on *Tilapia guineensis* in Elechi creek, Nwani *et al.* (2006) on Mormyrids of Anambra River, Abowei *et al*. (2009) for five fish species from Nkoro River, Niger Delta, Nigeria, Ude *et al*. (2011) for fish species of Ebonyi River, Nigeria. At the moment, there is paucity of information on the length-weight relationship of Clariid species of Akpoha River despite the importance of the river which constitute an important aspect of the commercial fishery of Ebonyi State, Nigeria. This study aims at filling the existing gap and generates information which will be useful in the management of the fishery and policy formulations.

2.0 Materials and Methods

Akpoha River is in Ebonyi State-Nigeria and is located between latitudes 5° 58' and 30° N and longitudes 7° 69' and 8° 10' E and lies within a tropical rainforest zone that has an average annual rainfall of 222mm, and discharges into the Cross River and subsequently the Atlantic Ocean in the Gulf of Guinea.

Fish samples were obtained three times monthly at 10 days interval from September 2006 to February 2008, from fishers using hook and line of size 13-18, gill nets and other fishing gears such as cast nets, bag nets and traps of diverse mesh sizes ranging from 50mm to 100mm, to catch the fish. The collected species were taken to the laboratory, sorted and identified to families, genera and species levels, using reference identification texts of Reed *etal.* (1967), Olaosebikan and Raji (2004) and Adesulu and Sydenham (2007). The Total Length (TL) of the fish was measured from the tip of the snout to the tip of the caudal fin using meter rule calibrated in centimeters. Fish were measured to the nearest centimeter. Fish weight was measured using electronic weighing balance, to the nearest gram. The relationship between the length (L) and weight (W) of fish was expressed by equation $W = aL^b$ (Pauly, 1983);

where W is weight of fish in (g); L is the total length (TL) of fish in (cm); a is the constant (intercept); b is the growth exponent (slope).

It was transformed using the equation $Log\ Y = a + b\ Log\ X$

The "a" and "b" values were obtained from a linear regression of the length and weight of fish. The correlation (r^2), which is the degree of association between the length and weight, was computed from the linear regression analysis of the function: $Y = a + b\ X$. These were obtained using Food and Agricultural Organization/ICLARM fisheries statistical analysis software (FISAT II, 2001).

3.0 Results and Discussion

The regression graphs of the LWR of *Clarias buthupogon, Clarias anguilaris, Clarias macromystax, Clarias submarginatus* and *Heterobranchus longifilis* respectively are presented in Figures 1 to 5, all showing algometric relationships. The regression parameters generated from the function, $Y = a + b\ X$ is also presented in Table 1 depicting positive correlation coefficients for all the species studied. The relative slopes of the LWR of all the species showed positive allometry (13.6, 8.6, 7.5, 27.4 and 5.7 for *Clarias buthupogon, Clarias anguilaris, Clarias macromystax, Clarias submarginatus* and *Heterobranchus longifilis* respectively) and are presented in Figure 6. This is an alarming sign and requires urgent attention to salvage the Clariids of the Fishery and avert imminent ecological catastrophe.

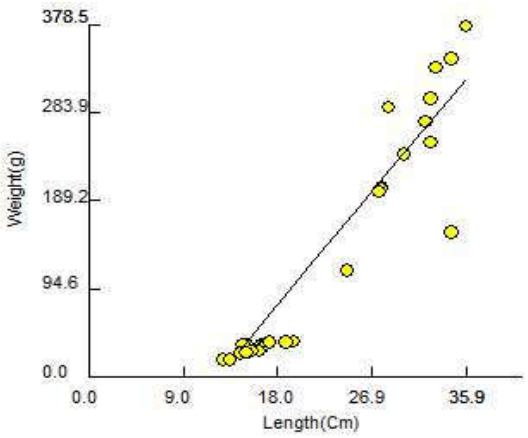

Figure 1: Length–weight relationship of *Clarias buthupogon*

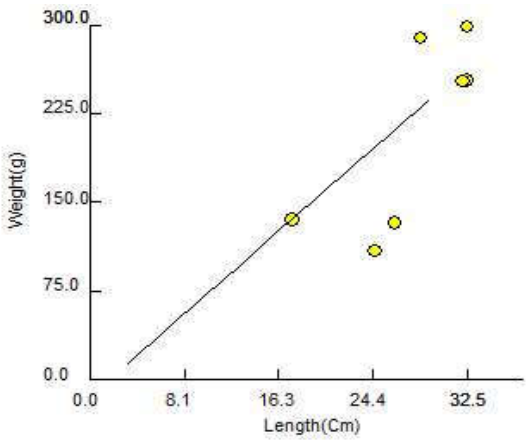

Figure 2: Length-weight relationship *Clarias anguilaris*

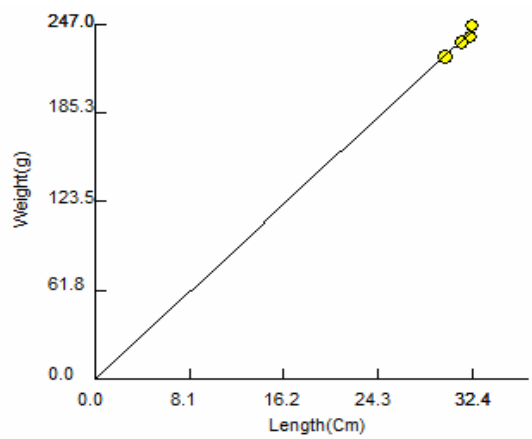

Figure 3: Length-weight relationship *Clarias macromystax*

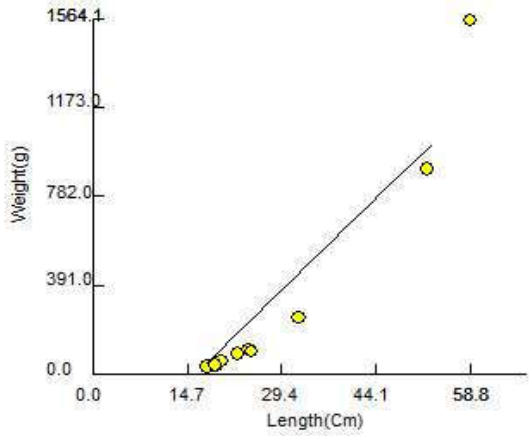

Figure 4: Length-weight relationship *Clarias submaginatus*

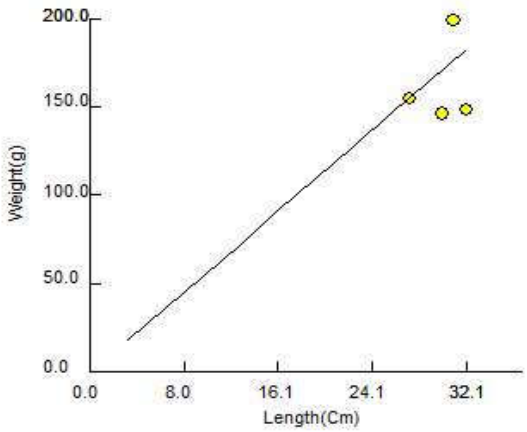

Figure 5: Length-weight relationship *Heterobranchus longifilis.*

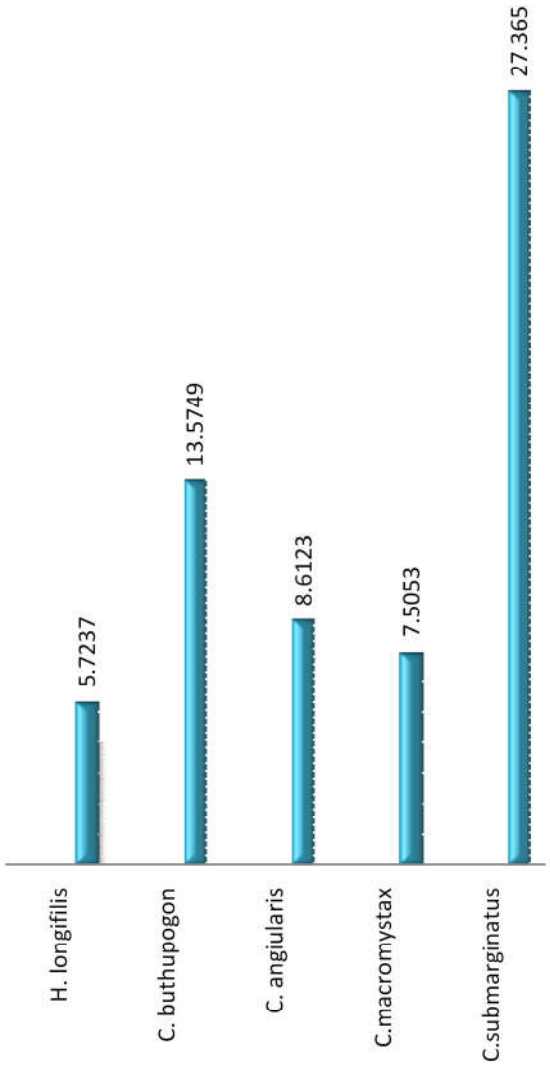

Figure 6: Comparative slopes of the Length-Weight relationship of Five Clariid species.

When *b* is equal to 3 or close to 3, growth in the fish is said to be isometric i.e. fish becomes more robust with increasing length. Similarly when b is far less or greater than 3, growth in the fish is allometric i.e. the fish become thinner with increasing length. This work is in agreement with King (1991) who reported allometric growth patterns for Tilapia species from Umuoseriche Lake. Ekang (1990) also reported isometric growth pattern for *Ethmalosa*

Table 1: Length-weight relationship parameters of Clariid fishes of Akpoha River

Family/Species	Intercept (a)	Growth Exponent (b)	Correlation coefficient (r)	Correlation coefficient (r^2)
Clarias buthupogon	-166.3200	13.5749	0.9374	0.8789
C. angiularis	-14.3121	8.6123	13.0561	0.8323
C. macromystax	-0.0527	7.5053	0.9997	0.9995
C. submarginatus	-434.5340	27.3650	0.1950	0.8189
Heterobranchus longifilis	-0.7629	5.7237	0.9746	0.9499

*fimbriata*from Cross River estuary in Cross River State and Abowei and Hart (2009) observed that all 10 finfish species studied in lower Nun River, Niger Delta, Nigeria exhibited positive allometric growth.

The implication is that these populations stand the risk of over-exploitation in Akpoha River if urgent measures are not taken to protect and enhance the fisheries. This underscores the fact that the biodiversity of inland aquatic ecosystems, and in some cases the very existence of the ecosystems, is increasingly threatened by factors which are related to humans. Ever increasing human population places a direct pressure on the limited resources through increasing demand to meet basic needs. Adequate monitoring of the fisheries operations within the system is therefore of urgent importance because of the apparent neglect of the ecological status of the River and unrestricted use of unselective fishing gears and other obnoxious practices by fishers, which tend to deplete the resources.

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