Biometrics and Dietary Studies of *Citharinus citharus* In the Lower River Niger in Kogi State, Nigeria

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Abstract
Biometrics and dietary habits of Citharinus citharus in the lower River Niger area of Kogi state were studied between October and December, 2018. A total of 120 fish samples were used for the study. The total length, standard length and weight were taken for each fish sample for the estimations of length-weight relationship using the formula $W = aL^b$ and transformed to Log W = Log a + b Log L. Stomach contents were analyzed by the frequency of occurrence method. The standard length of males, females and combined sexes ranged between 6.8 - 16.5, 7.3 – 14.3 cm, 6.8 – 74.2 (cm) respectively, with b – values of 3.0963, 3.174 and 3.1382. The condition factor ranged from between 2.04 – 2.80, 1.88 – 2.86 and 1.88 – 2.86 respectively. The food and feeding habits shows that the fish feeds mainly on sand grain (25.83%), mud (24.16%), plant part (12.50%), insect part (2.50%), algae (12.50%) and unidentified items (5.00%).Hence, C. citharus in the lower Niger area of Kogi state could be termed as an omnivore. Thus, River Niger could be suitable for growth and survival of the fish species C. citharus.
Keywords: Length-weight, sexes, stomach content, feeding habits, plant materials.

INTRODUCTION

Fish as food is an important resources worldwide. It is a most important single source of high quality protein, providing up to 75% of the total protein intake (FAO, 2002). Fish consumption contributes about 60% to human food and also contributes to the overall economic wellbeing of many African countries by means of export commodity, tourism and recreational activities. It is also known to be the most nutritious and highly valued food with a balanced amino-acids, vitamin B12, low cholesterol and high polyunsaturated fats (Gupta and Gupta, 2008). Fish is the critical food supply for the poor in the world, providing one (1) billion people sustenance for their daily lives and 150 billion people with employment, in which, 90% are in the artisan sector mostly in Africa. Worldwide per capital fish supply in 1997 stood at 16kg/year (World Fish Center, 2005).

The study of the biology of fishes could give important information necessary for fishery scientists in its management and sustenance. Several studies has been carried out on some aspects of the biology of some freshwater fish species across Nigeria (Malami *et al.,* 2007; Oniye *et al.,* 2006; Adeyemi *et al.,* 2009; Adeyemi, 2010), in order to generate useful information in positioning of the fishes in a food web in their environment and in formulation and management strategy options. This study is aimed at providing information on the length-weight relationship, condition factor and food and feeding habits of *Citharinus citharus* at lower Niger area of River Niger in order to combat the above described demands.

MATERIALS AND METHODS
Study Area

The study area (Fig 1) is River Niger trough in Kogi State. The area is located at the latitude of 7 06⁰N and longitude 6 43⁰E of the Greenwich meridian in the Guinea Savannah vegetation zone of Nigeria. The study area experiences two weather conditions, dry season

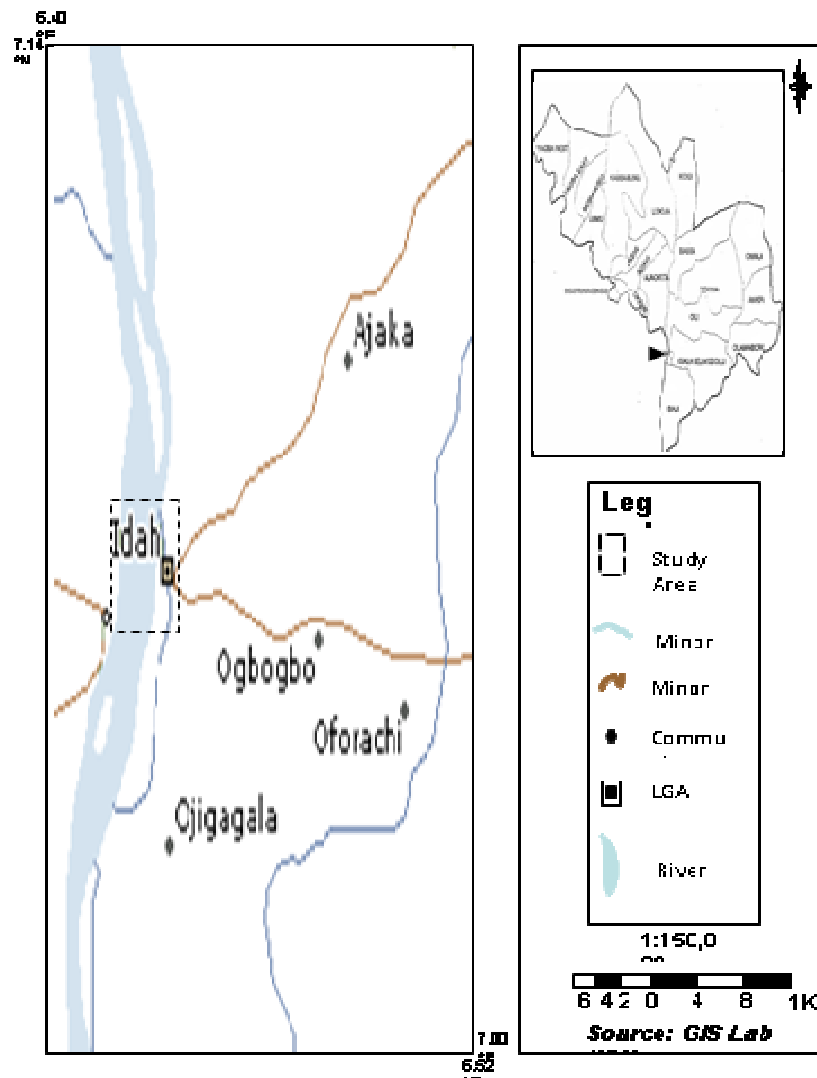which starts from November to April and wet season which starts from April to October (Areola *et al*., 1992).

Fig.1: Map showing the study area

Sampling

A total of one hundred and twenty (120) samples of *Citharinus citharus* were purchased from fishermen at Idah area of river Niger between October and November, 2010. The fish samples were transported in plastic buckets to the Biological Sciences Laboratory, Kogi State University, Anyigba for analysis while those that could not be treated were preserved in a freezer until the next day. They were sorted and identified up to species level using the guides of Teugels *et al.,* (1992), Olaosebikan and Raji, (1998), Idodo-Umeh, (2003) and Paugy *et al.,* (2004).

Laboratory Analysis

The total length of the sampled fish were measured with an aid of measuring board from the anterior end of the fish snout (mouth closed) to the posterior extremity of the caudal fin, with the aid of a measuring board to the nearest 0.1 cm. The standard length was measured from the anterior tip of the snout to the end of the caudal peduncle for every fish in centimeters (cm). The body weight of each fish was also measured to the nearest 0.1g using top loading weighing balance in grams (g) respectively.

The sex of each fish was determined externally by the presence of a genital papilla (a corn-like projections of the genital aperture of the males which are absent in females). Each stomach was dissected and split open and the contents were emptied into petri-dishes containing 10% saline solution and observed under a compound microscope. The food items were counted and the stomachs were scored 0,25,50,70 and 100% according to its fullness as described by Bagenal and Tesch, (1978).

Data Analysis

For each fish sample, parameters such as length (L) in centimeters (cm) and weight (W) in grams (g) were used to estimate Length-Weight Relationship (LWR) formula, i.e. $W = aL^b$ and transformed to Log W = Log a + b Log L through base 10 logarithm transformation. Allometric growth of the fish was recorded when the regression co-efficient 'b' was less than 3.0 or greater than 3.0 (Ama-Abasi, 2004).

The stomach contents were analyzed by frequency of occurrence as described by Hynes, (1950) and Bagenal and Tesch, (1978). The occurrence of each food item was expressed as a percentage of all stomach with food. That is, P = (b/a) x 100 where a = Total number of fish examined with the food in the stomach; b = number of fish containing a particular food; P = percentage of occurrence of each food item.

RESULTS

A total of one hundred and twenty specimens were used out of which 50 were males and 70 were females. The length-weight relationship of male *Citharinus citharus* from Idah area of river Niger, Kogi state, conformed to the curvilinear plot was represented by the formula W = aL^b. The values of a, b and r are 0.0196, 3.0963 and 0.9951 respectively (n = 50) (Fig. 2a). This relationship is transformed to logarithmic value in the plot represented in Fig 2b with the formula Log W = log 3.0963 + 1.7067 Log L (Fig 2b). The length-weight relationship of female *C. citharus* indicated that the values a, b and r were 0.0165, 3.174 and 0.9919 respectively (n = 70) (Fig. 3a). The log transformed relationship also gave the linear plot (Fig. 3b) represented by the formula Log W = Log 3.174 + 1.7819 Log L.

The length-weight relationship for the combined sexes of *C. citharus* from Idah area of River Niger, Kogi state had values for a, b and r as 0.0179, 3.1382 and 0.9937 respectively (n = 120) (Fig. 4a). The log transformed plot (Fig. 4b) is represented by the formula Log W = Log 3.1382 + 1.7463 Log L.

The values of condition factors for male, females and combined sexes ranged from 2.04 – 2.80, 1.88 – 2.86 and 1.88 – 2.86 respectively. The mean was 2.46 $\pm$ 0.18, 2.51$\pm$ 0.19 and 2.49$\pm$ 0.19 respectively (Table 1).

Six items were recorded in the stomachs of *Citharinus citharus* sampled. These include sand grain (25.83%), mud (24.16%), plant part (12.50%), insect part (2.50%), algae (12.50%) and unidentified items (5.00%) respectively (Table 2).

The stomach fullness classification of *Citharinus citharus* based on the degree of stomach fullness indicated that 31 (25.83%) had food in their stomach while 4 (3.33%) had no food in their stomach. There was food in 82 (68.33%) stomach of the females while 2 (1.67%) had no food. The males had 4 (3.33%) full stomach, 7 (5.8%) almost full, 15 (12.5%) half full, 5 (4.1%) almost empty and 3 (2.5%) empty appropriately (Table 3).

Table 1: Condition Factor for *Citharinus citharus* From Idah Area of River Niger.

Condition Factor	Total No	Range (cm)	Mean
Male	50	2.04 – 2.80	2.46 $\pm$ 0.18
Female	70	1.88 – 2.86	2.51$\pm$ 0.19
Combined sexes	120	1.88 – 2.86	2.49$\pm$ 0.19

Table 2: Stomach content of *Citharinus citharus* at Idah Area of River Niger

Items	Frequency of Occurrence (%)
Sand grain	25.83
Mud	24.16
Plant part	12.50
Insect part	2.50
Algae	12.50
Unidentified items	5.00

Table 3: Stomach content classification of *Citharinus citharus* based on the degree of fullness

Sex	Male n = 50	Female n = 70	Combined n = 120
% Stomach with food	31 (25.83)	82 (68.33)	113 (94.16)
% stomach without food	4(3.33)	2(1.67)	6(5.0)
% Degree of fullness			
Full (4/4)	4(3.33)	6(5.0)	10(8.33)
Almost full (3/4)	7(5.8)	5(4.1)	12(9.9)
Half full (1/2)	15(12.5)	9(7.5)	24(20.0)
Almost empty (1/4)	5(4.2)	10(8.3)	15(12.5)
Empty (0/4)	3(2.5.)	2(1.7)	5(4.2)

DISCUSSION

The b-values of 3.0963, 3.174 and 3.1382 observed for males, females and combined sexes of *Citharinus citharus* are quite similar to the b-value of 3.2134 obtained by Msheli *et al.,* (2008) for *Citharinus citharus* taken from the Lake Kainji, Nigeria. This conforms with the b-values of 3.40, 3.74 and 3.32 obtained by Narejo (2006) for the males, females and combined sexes of *Citharinus reba* from Manchar lake Pakistan.

The condition factor parameter of *C. citharus* reveals that the males females and combined sexes had mean condition factors ranging from 2.04 – 2.80, 1.88 – 2.86 and 1.88 – 2.86 respectively. These values are more than 1. This implies that the fish species were in good condition in the aquatic environment.

This study showed that the items found in the diet of this species include sand grain, mud, Plant part, insect part, algae and unidentified items making it an omnivore. This conforms to the study of Adeyemi *et al.,* (2009).

The growth in the species is allometric. The condition factor also indicated that the fish species was thriving well in river Niger. The findings of this study showed that 25.83% of items in the diet of *Citharinus citharus* were sand grain while mud, insect part, algae and unidentified items comprises 24.16%, 12.50%, 2.50%, 12.50% and 5.00% respectively.

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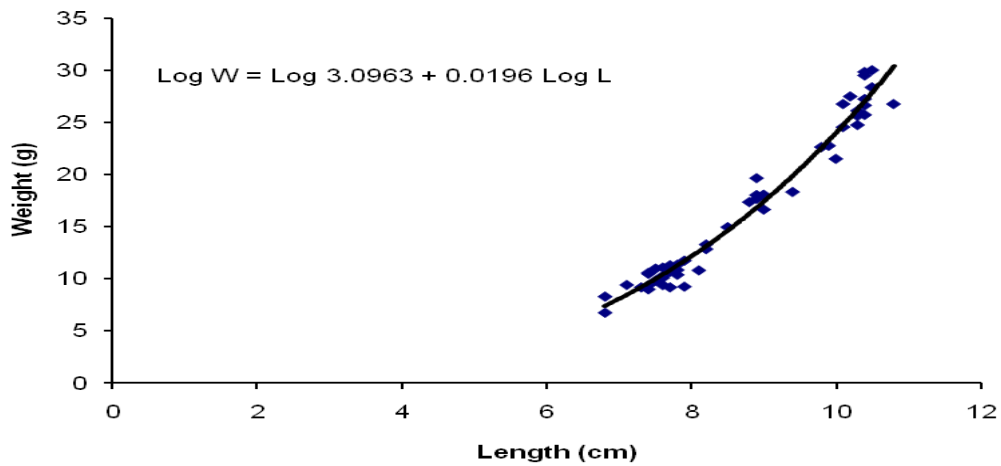pp 3 – 4.

Log W = Log 3.0963 + 0.0196 Log L

Fig 2a: Length - weight relationship of male *Citharinus*
citharus at Idah area of river Niger

Log W = Log 3.0963 + 1.7067 Log L

Log W = 3.0963 Log L - 1.70
r = 0.9951
n =50
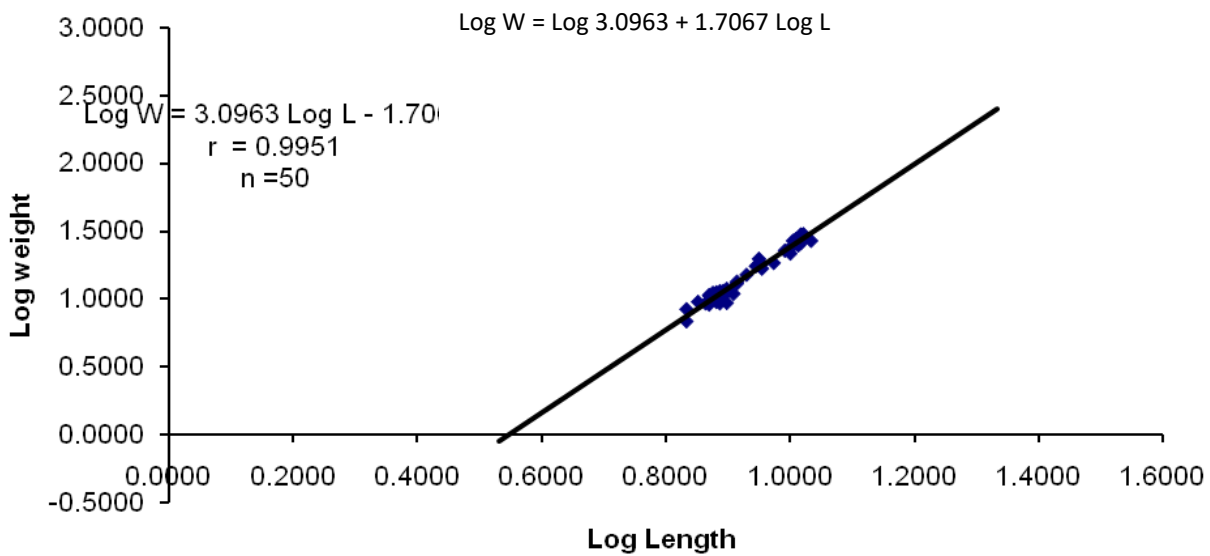
**Fig 2b: Log length, Log weight relationship of male *Citharinus citharus* at Idah
area of river Niger.**

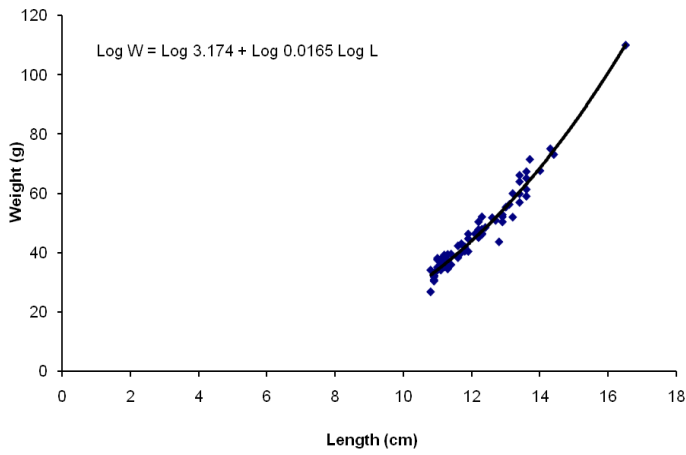FIG 3a: Length- Weight relationship of female *Citharinus citharus* at Idah area of river Niger
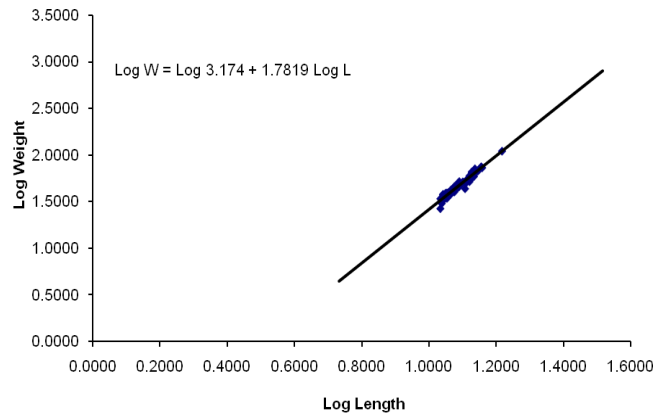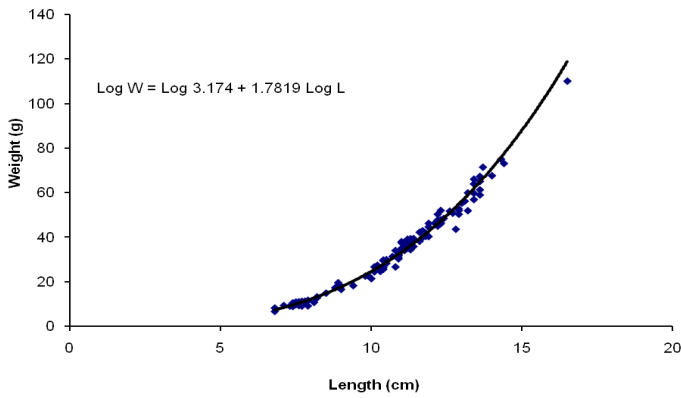
Log W = Log 3.174 + Log 0.0165 Log L

Fig 3b: Log Length-Log Weight of female *Citharinus citharus* at Idah area of river Niger

Log W = Log 3.174 + 1.7819 Log L

Fig 4a: Length-weight relationship of combined sexes of *Citharinus citharus* at Idah area of river Niger
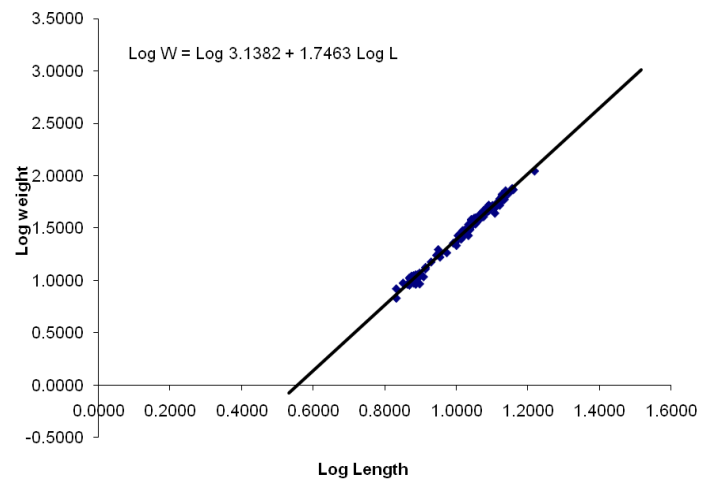
Log W = Log 3.174 + 1.7819 Log L

Fig . 4b Log-Length, Log- weight relationship of combined sexes *Citharinus citharus* at Idah area of river Niger.

Log W = Log 3.1382 + 1.7463 Log L