

MEASUREMENT OF BARBEL, HEAD LENGTH, STANDARD LENGTH AND WEIGHT OF CATFISH (*Clarias gariepinus*) FROM EKPAN RIVER, DELTA STATE

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Abstract

This study was carried out to determine the meristic characteristics of African catfish *Clarias gariepinus* in Ekpan River and also to examine the relationship between the length and weight of the fish. A total of eight (18) fishes were bought from fishermen, measurement was done using weighing scale and meter rule. The total length nasal barbel length, maxillary barbel length and standard weight were also measured using a meter rule and the body weight of *Clarias gariepinus* was measured using a weighing scale. The length weight relationship was calculated using $W = aL^b$ and the condition factor was calculated using. Simple percentage was used to get the result of the mean of each fish species. Result shows that the total length (TL) of *Clarias gariepinus* was 43.7 ± 3.42 , the body weight was 1862.5 ± 114.15 , the standard length (SL) was 40.9 ± 0.05 , head length was 8 ± 0.52 nasal barbel length was 6.2 ± 0.26 maxillary barbell length was 13.2 ± 0.24 also some other body parameters were also evaluated. There was a negative allometric growth for all the fishes, when the growth co-efficient was calculated for *Clarias gariepinus* (2.734). The condition factor (k) has a value of 0.10 which indicates that the fish are not totally in a good condition. This could be due to unfavourable weather, water quality or feeding rate. The intercept (a) has the value of 5.64 and the coefficient relationship (r) of length-weight is given as 0.52. Therefore, the results obtained from this study suggest that there are no significant similarities in the morphological composition and co-efficient relationship of the *Clarias gariepinus*. There is a need to determine some factors favourable for the growth and development in subsequent studies in Ekpan River. Also, examination of fish wellbeing or condition factor needs to be studied to increase its spawning rate.

keywords: *Clarias gariepinus*, barbell, condition factor, allometric growth.

Introduction

African catfish, *Clarias gariepinus* which is generally considered to be one of the most important tropical catfish species for aquaculture has an almost pan-African distribution ranging from the

Nile to West Africa and from Algeria to South Africa, they also occur in Asia minor (Israel, Syria and South Turkey) (Gitonga *et al.*, 2015) They possess a great economic importance because they attain a large body size with minimum cost (Elshebly, 2006). Fagbuno, (2015) reported that *Clarias gariepinus* has high growth rate at high stocking densities most especially under culture condition, high fecundity rate, resistance to diseases, and ability to tolerate wide range of environmental extremes. Catfish is an economically important food fish, in other natural water bodies (Babalola and Apata, 2006).

The African catfish has an external appendage which is known as 'barbel'. The barbels are accessory feeding structures that contain sensory organs and they play an essential role in fish activities (El-Gendy *et al.*, 2017). Barbels fluctuate in number and size. Textures of barbels are of various varieties; some may be tender, rigid, there are no cartilage in some, some with axial rod of striated muscle, and some are without taste buds (El-Gendy *et al.*, 2017). The feeding, prey detection, direction of swimming, and community behavior of the fish depend on the sense of olfaction especially chemical sensation (Boudriot and Reutter, 2001).

The length-weight relationship (LWR) is a useful tool in fishery assessment, which helps in predicting weight from length required in yield assessment and in the calculation of biomass (Keyombe *et al.*, 2015). The inter-conversion of some parameters of a particular species is made possible by the length-weight relationship. Also, morphometric comparisons can be made between species and population (Keyombe *et al.*, 2015). In addition, the LWR allows fish condition to be estimated. $W = aL^b$ is the formula used to calculate the relationship between the length (L) and weight (W) of the fish Where *a* is the intercept and *b* is the allometry coefficient. Values of the

exponent b provide information on fish growth. There is an isometric increase in weight, when $b=3$. Weight increase is allometric when the value of b is other than 3. (positive if $b > 3$, negative if $b < 3$). The structure and function of fish population is determined when we use these useful tools (Keyombe *et al.*, 2015).

An index reflecting interactions between biotic and abiotic factors in the physiological condition of the fish is the condition factor, during the various stages of the life cycle, it shows the population welfare of the fishes (Blackwell *et al.*, 2000). The management of fish populations is made possible through the analysis of the fish condition and this has become a standard practice world-wide, as a measure of both individual and cohort (e.g., age or size group), fitness or well-being. The generic well-being or the robustness of an individual fish is known as the condition factor (Blackwell *et al.*, 2000) and this can be typically been estimated by comparing the weight of the individual fish and given length to a standard weight. Measurements of condition factors are generally intended to act as indicators of tissue energy reserves, with expectation that a fish in relatively good condition should demonstrate higher growth rate, greater reproductive potential and higher survival than a lower conditioned counterpart, given comparable environmental conditions (Keyombe *et al.*, 2015).

Numerous studies have been done on barbell, length-weight relationship and condition factors. Edema *et al.* (2009), carried a study on the sensory barbell of five catfish species from the Osse River. This was undertaken to ascertain the differences between the five types of barbells. The five species showed their maxillary to have the highest proportion of standard length (SL). The differential ranking of the maxillary were *Heterobranchus bidorsales* (eoffoeoy saint Hailaire,

41.58%), *H. lonifilis* (Valenciennes 36.05%), *synddontis nigrita* (valenciennes 22.24%), *Malapterus electricus* (amelen 23.60%) and *chrysichthys furcatum* (Gunter 20.30%). There was a significant head-SL relation value in all five species whereas the maxillary – SL relationship was significant in *S. Furatus*, *H. Bidorsales* and *M. electricus*.

Oyebola *et al.* (2022) carried out a study on the growth pattern (length-weight relationship-LWT) and condition factor (k) of some *clarias gariepinus* from Oueme valley, Benin. From the above study, results shows that the relationship between the length and weight of each *clarias gariepinus* species may be influenced by their stages in life, and its habitat which includes feed abundance, species composition and competition as well as water quality. It was therefore recommended that government needs to strictly enforce laws and set up managements or agencies to organize further environmental pollution with can slow down the growth improvement of catfish. Little or no documented report has been carried out on Ekpan river, which has led this research.

The aim of this study is to measure the Barbel, Head length, total length, weight and standard length of catfish (*Clarias gariepinus*) and to provide information on the length-weight relationship and condition factor of *Clarias gariepinus* in Ekpan River, Warri, Delta State Nigeria.

Materials and Methods

Study area

Ekpan River is a slow flowing river by the western part of Niger Delta. It is located in Delta state of Nigeria. It took its source from Utagba-Uno in Ndokwa Local Government Area and flows to Agbarhe in Warri through Ekpan where it flows through the rainforest forades and finally

discharge into the Atlantic ocean. The entire length of the river lies between latitude 5°30'N of the equator and longitude 5°44'E. Seventy-five percent of the river is fringed with mangrove trees consisting of mainly the black mangrove (*Avicennia germinans*) which blossom during the raining season. The river is characteristically turbid due to the various anthropogenic activities such as farming. It serves as major drainage channel for the areas receiving domestic and treated industrial waste from Warri refinery and petrochemical companies as well as other industries around the Warri Metropolis such as Chevron limited in Nigeria.

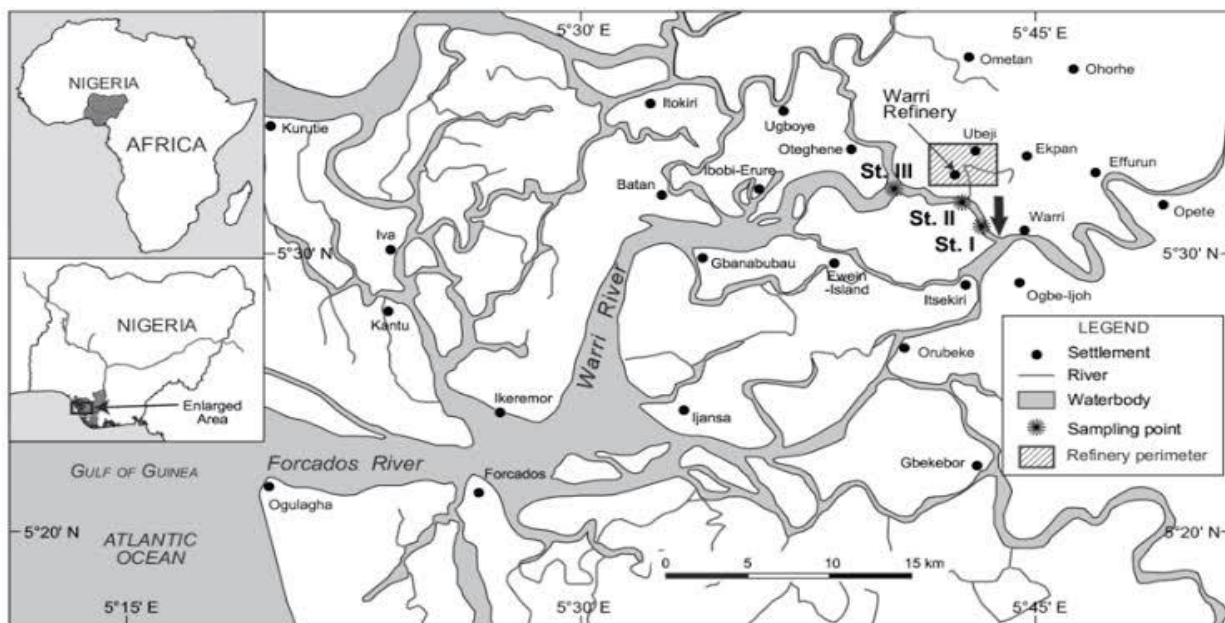


Fig.1 Map of Ekpan River

Source: Foghi *et al.*, 2022

Sample Collection and Analysis

A total of eighteen (18) catfish (*clarias gariepinus*) were bought from fisher men in Ekpan river in Warri South area in Delta State. Thirteen morphometric measurements were carried out on each

fish specimen. The traits of the body measured were body weight (B.W) (taken by using a top loading balance (Adam AfP4100L). To the nearest 0.01), total length (TL) measured from the maxilla to the end of the caudal tail). Standard length (SL), Head Length (HL), head depth (HD), Nasal Barbel length (NBL), Maxillary barbel length (MBL), Doral fin rays (DFR) Anal fin rays (AFR), pectoral fin Rays (PER), Pelvic Fin Rays (PEFR), caudal fin Rays (FR) and Head width (HW).

The length-weight relation was calculated using equation

$W = aL^b$ Where W = Body weight of fish (g) L = Standard length of fish (cm) a = constant (regression constant) b = an exponent transformed to logarithmic form as:

$$\text{Log } W = \text{Log } a + b \log l$$

The condition factor or poderal index (k) values were calculated using Fulton's condition factors formula. $K = 100W/SL$ Where K = condition factor W = Weight (g) SL = Standard length of fish (cm).

Results

Meristic characteristics of *Clarias gariepinus*

Table 1 shows the summary statistics for the morphometric characteristics measured in *Clarias gariepinus*. The Total Length (TL) of *Clarias gariepinus* ranged from 33.6 – 46.3cm with mean value of 43.7 ± 3.42 cm while the body weight ranged from 1.7 – 1.9g with a mean value of 1862.5 ± 114.15 g. The standard length (SL) ranged from 39.4 – 42.3 cm, with a mean value of 40.9 ± 0.05 . The Head depth ranged from 3 – 4.8 with a mean value of 3.98 ± 0.54 .

The head width ranged from 7 – 8.9 with a mean value of 8 ± 0.52 . The Nasal barbel length (NBL) ranged from 5.3 – 6.8, with a mean value of 6.2 ± 0.26 . The Maxillary Barbel Length (NBL) ranged from 12.8 – 13.6 with a mean value of 13.2 ± 0.24 . The Dorsal fin ray ranged from 2.4 – 2.6 with a mean value of 3.1 ± 0.38 . The Pectoral Fin Ray (PFR) ranged from 4.5 – 5.5 with a mean value of 5.8 ± 0.81 . The Caudal Fin Ray (CFR) ranged from 5 – 5.7 with a mean value of 5.2 ± 0.59 . Pelvic Fin Ray (PFR) ranged from 3.2 – 4.5 with a mean value of 3.8 ± 0.25 . The Anal Fin Ray (AFR) ranged from 1.6 – 2.8 with a mean value of 2.1 ± 0.43 . The value of the total length, body weight and standard length were significantly different from each other.

Table 1: Meristic characteristics of *Clarias gariepinus*

Parameters	Values
Total length, TL (g)	43.7 ± 3.42
Body weight (BW) (g)	1862.5 ± 114.15
Head length (HL), (cm)	8.8 ± 2.74
Head width (HW) (cm)	8.0 ± 0.52
Head Depth (HD), (cm)	3.98 ± 0.54
Nasal barbell length (NBL)	6.2 ± 0.26
Maxillary barbell length (MBL)	13.2 ± 0.24
Dosal fin ray (DFR), cm	3.1 ± 0.38
Rectoral fin ray (PEFR), cm	5.8 ± 0.81
Pelvic fin rays (PFR), cm	3.8 ± 0.25
Caudal fin ray (CFR), cm	5.2 ± 0.59
Standard length (cm)	40.9 ± 0.05
Anal fin ray (AFR)	2.1 ± 0.43

Length-weight relationship and condition factor

In table 2; the length-weight relationship showed that the result of (b) value seen for *Clarias gariepinus* in this study is 2.734 which is <3 and it signifies that the fish there is a negative allometric growth when the fish becomes less rotund as its length increases. The correlation co-efficient (r) of *Clarias gariepinus* in this study was calculated as 0.52 while the intercept (a) of *Clarias gariepinus* in this study, was calculated as 5.64.

Table 2: Length-weight relationship and condition factor of *Clarias gariepinus*

Sample	A	B	R	K	$W = aL^b$
<i>Clarias gariepinus</i>	5.6354	2.7337	0.5213	0.10	83,014.32

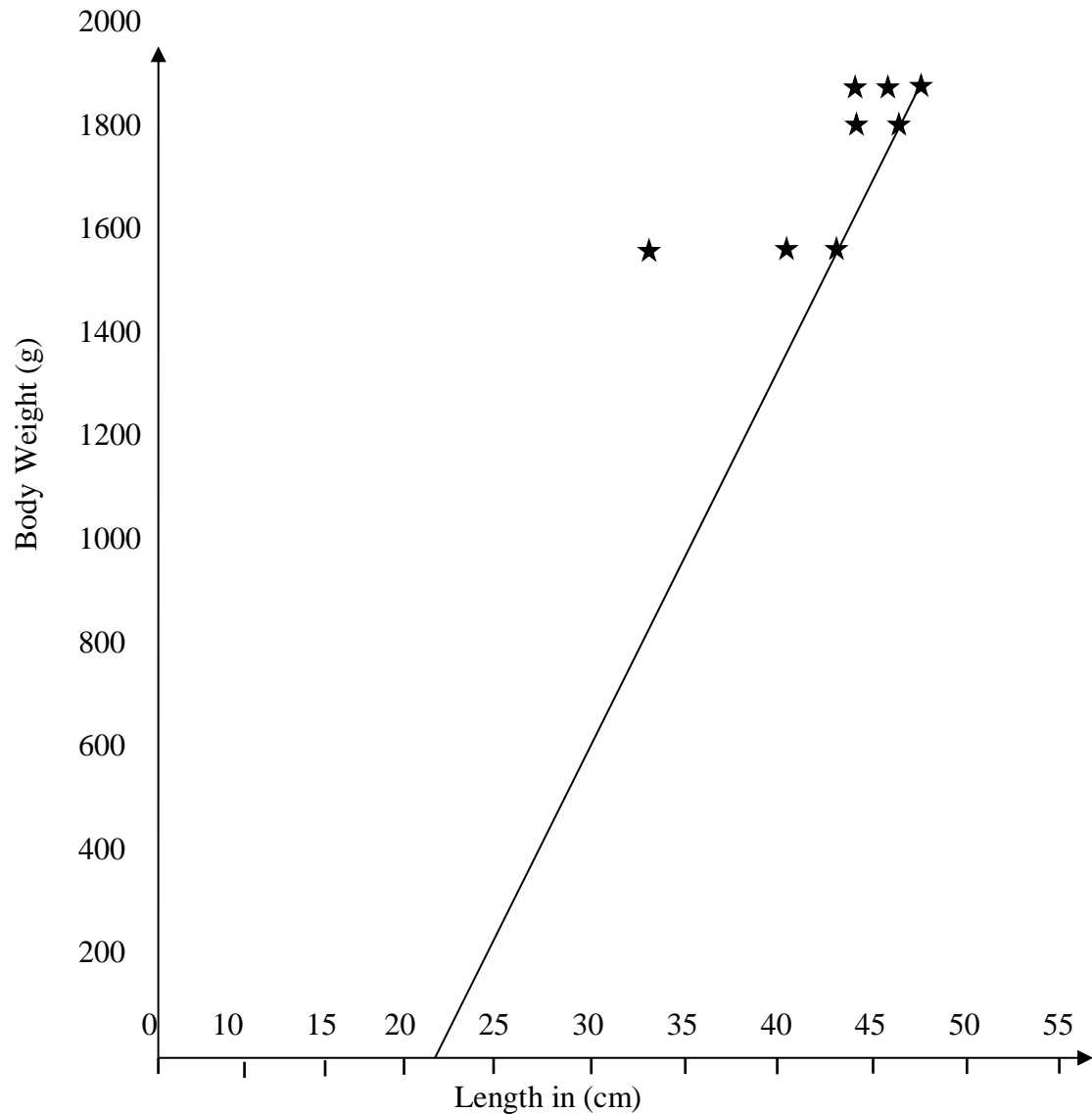


Fig 2: Graph shows length-weight relationship of fish species where y – axis = weight (g), and x-axis = length (cm)

Discussion

The African catfish in Ekpan river has four pairs of unbranched barbels, one on nasal, one maxillary (longest and most mobile) on the vomer and two mandibular (inner and outer) on the jaw. The morphometric characteristics of *Clarias gariepinus* as shown in table 1 shows that it is highly variable within a specific populations, this is because it can correlation with geographical and habitat variation or having a genetic component based on its common environment. The total length of *Clarias gariepinus* which ranged from 33.6 – 46.3 contradicts the findings of Abdullahi and Ahmed (2013) having a value ranging from 0.49 – 1.48 in Oguta lake in Imo State. This might be related to the abundance of food supply in Ekpan river compared to that of Oguta lake. The body weight from this study ranged from 1.7g – 9g which contradict that of Abdullahi and Ahmed (2013) which ranged from 0.25 – 1.75g. This difference is due to sufficient feeding and less pollution in Ekpan River which makes the fish profitable for business. The pectoral fin, pelvic fin and dorsal fin having the value of (5.8, 3.8 and 3.1 respectively) of this study is different from the findings of Lai *et al.*, (2020) having the values of (11.97, 4.95, and 4.51 respectively). These values of Lai *et al.*, (2020) is higher which implies that the fishes have inter-relationship of various body measurements with regard to length in *Clarias gariepinus*, reared in cemented ponds that those reared in a River. The maxillary barbel length which ranged from 12.8 – 13.6. This means the MBL is longer than the NBL and there is a difference in their mean value. This value indicated that catfish in Ekpan River grows larger due to proper care and dedicated observation from the fisher men reported by Alegbeleye *et al.*, 2012.

The condition factor (k) which gives information on the physiological condition of fish in relation to its welfare. The condition factor recorded during this study is 0.10 which contradicts the findings of Getso *et al.* (2017) having the value of 2.98. The k value of Getso *et al.* (2017) is within the range recommended. This could be caused due to environmental factor such as damming the river in Wudil River. It could also be the indicator of organic pollution, reflecting human interference to pollute the river. Riedel *et al.*, (2007), stated that if the allometric growth is positive, it indicates that the fish is becoming fatter (shouter) as it increases in length. An isometric length-weight relationship on the other hand simply implies that the weight of these fishes increases at approximately the same rate as the length increases (Oluwale, 2023).

The simple linear regression slope (b) of the fish species recorded during the period of the study was 2.734 which is almost similar to the report of Egbal *et al* (2011) whose study showed that the (b) value of the fish species from Atbara River and Khasun el-airba reservoirs in Sudan were within the range of 2.278 and 3.680. According to Oluwale (2023) it is stated that when $b = 3$, the fish grows isometrically, which results in ideal shape of fish. The value of (b) is less than 3.0, the fish has a negative allometric growth pattern (Oluwale, 2023).

The correlation coefficient (r) of this is 0.52 which is almost similar to that of Keyombe *et al.* (2015) having the value of 0.55 meaning that when r is positive. This meaning implies that as one of the variables increases the other also increases (direct relationship).

The intercept (a) of *Clarias gariepinus* has the value of 5.64 while the correlation co-efficient (r) of the fish sample is 0.52. It is therefore important to know that in fishery science the condition factor, correlation co-efficient and intercept is important to be examined during meristic analysis.

Conclusion and Recommendation.

The study reveals that the barbell of *Clarius gariepinus* species from Ekpan River Warri were not deformed but generally, the African catfish of Ekpan River were not in a total good condition, an indication of the unhealthy status of the population with less tissue energy reserves, depressed reproductive potential and low survival. This could be quality of feed, water quality, and environmental factors that has led to this state. The researchers recommend that there is need to determine some factors favourable for the growth and development of African catfish species in Ekpan River.

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