Length-Weight Relationship and Condition Factor of Reared *Clarias Gariepinus* in Ilaro, Ogun State, Nigeria

Shittu, A.I.* and Oguntoye, V
Federal Polytechnic Ilaro, Ogun State
*Correspondence Author**

Abstract: **Growth of fish is dependent on a wide range of positive or negative impacting factors. This study aimed at determining the length-weight relationship of the reared *Clarias gariepinus* and assess the physicochemical parameters of the pond water samples collected at the fish farms. Length-weight relationship of *C. gariepinus* among the two ponds was not significantly different. The value of "a" was estimated to be 0.03 and exponent "b" was 1.63 (R^2=0.5873) for pond 1 and the value of "a" was-1.67 and exponent "b" was 2.74 (R^2=0.851) for pond 2. The exponent "b" was significantly different ($p<0.05$) for fish samples in pond 2. The fish samples in both ponds showed negative allometric growth pattern respectively, with positive relationships. The relative condition factor showed that samples of *C. gariepinus* were greater than 1, with mean values of 1.12 for pond 1 and 2.17 for pond 2. There were slight differences in the physico-chemical parameters measured in the two ponds used for the study; mean temperature were (24.0 and 22.3^{0}C), mean pH (7.5 and 7.9), mean transparency (65cm and 52.5cm), mean conductivity (124.1µS/cm and 219.5µS/cm), mean DO (6.8mg/l and 8.5mg/l) and the mean TDS (118.3mg/l and 135.2mg/l) for ponds 1 and 2 respectively. The physico-chemical parameters of pond water samples were all within acceptable limits compared to WHO limits. The results showed that the fish samples for both ponds were in good conditions, the fish samples showed negative allometric growth pattern and this may attributed to many factors such as poor feeding or unsuitable habitat. There should be awareness among local farmers on the importance of using good water quality for fish-farming as this enhances the growth of the fishes.**

Keywords; **(*Clarias, gariepinus*, condition factor, growth pattern, pondwater, length-weight relationship)**

I. INTRODUCTION

Fish is a high-quality food, rich in protein and vitamins with variable amount of fat and calcium. The production of catfish is an economic resource undertaken by a large number of people especially the small-scale farmers in Nigeria [1]. A comprehensive understanding of the conditions of fish species in a water body is an important management tool for a sustainable exploitation of the fishes. Regular biological surveys of fish species are thus very important in the management of fisheries [2]. Water bodies such as rivers, lakes and dams are valuable resources that serve many human needs and thus enhance our lives by providing many opportunities.

The condition factor shows the degree of the well-being of the fish in their habitat [3]. Growth of fish is dependent on a wide range of positive or negative impacting factors. Studies show that growth of fish in aquaculture mainly depends on feed consumption and quality, stocking density, biotic factors such as sex and age, genetic variance and abiotic factors such as water chemistry, temperature, photoperiod, and oxygen level [4], [5]. Therefore, successful management of fish ponds requires an understanding of the water quality parameters, which is determined by abiotic factors such as temperature, dissolved oxygen (DO), transparency, turbidity, water color, carbon dioxide, pH, alkalinity, hardness, unionized ammonia, nitrite, nitrate, primary productivity, biological oxygen demand (BOD), plankton population among others [6]. The study is aimed at determining the length-weight measurement and condition factor of reared *Clarias gariepinus* in Ilaro, Ogun State. Although, many studies have been conducted on some aspects of the ecology of catfish in Nigeria, but there is not enough information which provides a challenge to fishery managers in assessing the impacts of management actions and anthropogenic influence on the resource they manage, thus the need for the study.

II. MATERIALS AND METHODS

A. Study area

The study was conducted in the Research Laboratory of Science Laboratory Technology Department, Federal Polytechnic Ilaro, Ogun State, Nigeria.

B. Sample Collection

A total of 20 *Clarias gariepinus* fish samples were used for the study. The samples were obtained from two different fish farms in Ilaro using fishing nets, samples were then removed from the nets, and were kept in a cooler with ice block to preserve the fish samples to the laboratory for immediate analyses.

C. Methods

Fish samples were weighed to the nearest grams (g) using electronic weighing balance and total length (distance from the tip of the snout to the tip end of the caudal fin) was measured using a measuring rule.

Length-weight Relationship: this was determined using the equation $W = aL^b$

where: W = weight of fish in (g), L = total length (TL) of fish in (cm), a = constant, b = the length exponent.

Condition Factor (K): This shows the degree of wellbeing of the fish in their habitat, and this was determined using [7].

$$K = \frac{100 \times W}{L^b}$$

Pond water quality determination

The determination of physicochemical parameters was carried out in two different fish ponds for a period of 6 weeks. The water samples were collected in polyethylene bottles. The temperature of the water sample was taken immediately at the sample sites. Other water quality parameters; pH, Transparency, Electrical conductivity, Dissolved oxygen and total dissolved solids were analyzed at the laboratory immediately after collection. The temperature was measured using a hand held thermometer, pH was measured using a pH meter, electrical conductivity was measured using a conductivity meter, and water transparency was measured using a secchi disk. The total dissolved solid was measured via gravimetric methods. The dissolved oxygen was measured via titrimetric method and all the analyses was done according to [8].

III. RESULTS AND DISCUSSION

Table 1: Mean Total Length and Weight of *C. gariepinus*

C. gariepinus	Length (cm)				Weight (g)			
	Min	max	Mean	SD	min	M ax	Mean	SD
Pond 1	36	60	41.6	±5.9245	320.10	625.10	447.49	±119.623
Pond 2	35.5	40.5	37.65	±1.5102	330.15	620.10	93.452	±76.940

Table 1 above shows a total of number of 20 *C. gariepinus* samples were selected from two different ponds. The mean total length (TL) of *C. gariepinus* taken from pond 1 was 41.6cm and weight (TW) of 475.6g while the mean total length (TL) from pond 2 ranged 16.7cm and a mean total weight (TW) of 93.5g.

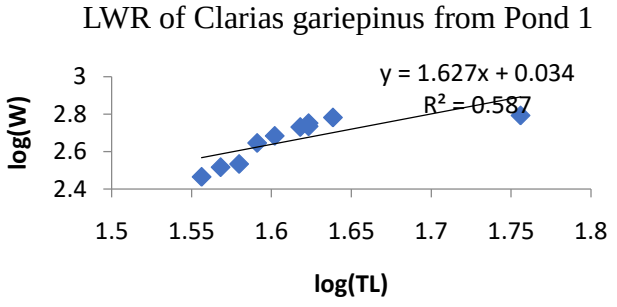

Figure 1: Length-weight relationship of *C. gariepinus* in Pond 1

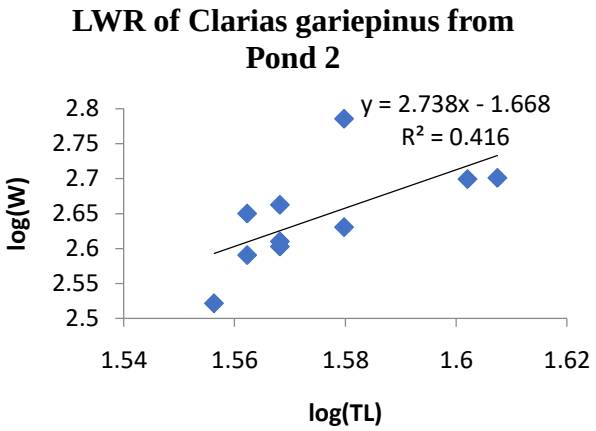

Figure 2: Length-weight relationship of *C. gariepinus* in Pond 2

Estimate of length-weight relationship in Figure1 above depicted a strong positive relationship between weight and total length of *C. gariepinus* in pond 1 (R^2 =0.5873) while that of Figure 2 above, also showed a positive relationship between weight and total length of *C. gariepinus* from pond 2 (R^2=0.851). The growth pattern of the fish species in both ponds under study were found to be negatively allometric. This also implies that the fish becomes slender in size as they grow in length. A similar study by [9], working on *C. gariepinus* in in Lake Baringo obtained a positive allometric growth, which disagrees with results of this study. This could be due to difference in type of aquatic environment, type of feed or spatial variation in both studies. Moreover, the differences in *b* values are often related to allocation of energy for the production of gametes, degree of stomach fullness, sex and preservation techniques [10]. The amount of energy allocation will also depend on intrinsic (genetic) and environmentally driven factors such as temperature and feeding

Table 2: Condition factor of *C. gariepinus*

C. gariepinus	Slope B	Intercept A	p-value	R	R^2	K
Pond 1	1.627406	0.034143	0.009727	0.7664	0.5873	1.1.2377
Pond 2	2.738315	-1.66887	0.04404	0.6450	0.416024	2.166914

Condition factor is an index reflecting the effect of interactions between biotic and abiotic factors on the physiological condition of fishes [11]. It indicates the wellbeing of fish. Table 2 above shows the mean condition factor for *Clarias gariepinus* obtained in both ponds in the study were recorded to be greater than 1 (k>1) with respective mean values of 1.102377 and 2.166914 for fishes in ponds 1 and 2. This implies that the fish species in both ponds are in good condition. High K values have been attributed to food availability, and feeding intensity of the fish, good environmental conditions or low or absence of predators.

Table 3: Physicochemical parameters of water samples

Parameters	Pond 1	Pond 2
Temperature (°C)	24.0 ± 0.09	22.3 ± 0.16
pH	7.5 ± 0.12	7.9 ± 0.19
Transparency (cm)	65.0 ± 2.05	52.5 ± 1.58
Conductivity (µS/cm)	124.11 ± 22.2	219.50 ± 33.2
DO (mg/l)	6.80 ± 0.60	8.47 ± 1.19
TDS (mg/l)	118.33 ± 20.21	135.19 ± 24.56

The mean temperature of 24^0C and 22.3^0C were recorded for ponds 1 and 2 respectively. pH is an important parameter which helps to determine the acid-base balance of water samples. The permissible level of pH in drinking water is 6.5 to 8.5. the pH value of water in both ponds they were within permissible limit. The result also showed that the transparency in pond 1 (65cm) was greater than pond 2 (52.5cm). It has been reported that water transparency is mainly affected by several factors such as rainfall, angle of incidence of rays, cloudiness, turbidity, visibility and plankton growth. Electrical conductivity has been found to be a good indicator of water quality [12]. Conductivity of Pond 1 (124.11 µS/cm) was lower than Pond 2 (218.50 µS/cm) which are still within permissible limits. The amount of oxygen dissolved in a reservoir is affected by temperature of water, salinity, altitude, water inflow and photosynthetic activity of algae and plants [13], [14]. DO level was found within optimum range of 6.80 mg/l in of Pond 1 and 8.47 mg/l in pond 2. Total dissolved solids (TDS) accounts for the various types of solids in dissolved form which may be organic or inorganic [15]. The study showed TDS was higher in pond 2 (135.19 mg/l) than in pond 1 (118.33 mg/l). The results gotten for the physicochemical parameters of the pond water samples in this study is similar to the study carried out by [16].

IV. CONCLUSION

The study found out that, catfish samples gotten from the fish farms in Ilaro, are generally in good conditions as the mean condition factor for *Clarias gariepinus* were recorded to be greater than one (k>1). The good condition of fish samples could be attributed to good water quality they were reared in. Fish samples from both ponds, showed negative allometric growth pattern that is, the fishes grow faster in weight than in length. The physico-chemical parameters of pond water samples varied throughout the study period and they were within the acceptable range for the fishes to thrive. I recommend that there should be awareness among local farmers on the importance of using good water quality for fish-farming as this enhances the growth of the fishes.

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