

**NSAP****47th Annual
Conference
(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****LENGTH-WEIGHT RELATIONSHIP AND STOMACH CONTENT ANALYSIS OF AFRICAN CATFISH *CLARIAS GARIEPINUS* (BURCHELL, 1822) IN AJIWA RESERVOIR KATSINA, NIGERIA*****¹Umar, B. D., ²Hassan, Z. Y. and ³Auwalu J.****^{1,2&3}Department of Biology, Federal College of Education, Katsina, Nigeria*****Corresponding Author: E-mail: bashirumardayi0123@gmail.com. Tel: +2348168004506****ABSTRACT**

The Length-weight relationship and stomach content analysis of *Clarias gariepinus* from Ajiwa Reservoir were studied. *C. gariepinus* were obtained and physico-chemical parameters were measured monthly, from Ajiwa Reservoir from January to December, 2018. Morphometric parameters of 255 fishes were examined. Frequency of occurrence method was used for the stomach content analysis. The weight of *C. gariepinus* sampled range from 65.30-825 g, the largest male weight 666.0 g while the female was 825.0 g. The length-weight relationship of *C. gariepinus* in Ajiwa showed positive correlation ($r=0.95$) in both sexes. The regression exponent ($b>3$) for both sexes showed positive allometric growth pattern. The mean condition factor (0.72-1.18) varied during the different months and appeared to be associated with seasons, feeding and breeding activities. The stomach content analysis of *C. gariepinus* in Ajiwa showed high fish parts (65.88%), detritus content (60.39%), whole fish (31.76%), Plant parts (31.37%) and empty stomach (7.84%). In both sexes, mean condition factor increased with increase in length, which was attributed to the ability of the fish to obtain food and increase in size. Conclusively, *C. gariepinus* is in good condition in Ajiwa. Aquaculture of *C. gariepinus* should be encouraged in Ajiwa Reservoir for contribution towards securing animal agriculture in Nigeria amidst global challenges.

Keywords: length-weight relationship, Stomach content analysis, Condition factor, *Clarias gariepinus*, Ajiwa Reservoir

INTRODUCTION

Catfish are native to Africa; they are widely sought after as food by the population and constitute a very valuable source of protein.

The length-weight relationship of a fish is basically a measure of its growth pattern or age. Growth is an important component of biological production, which affects overall production directly. When the b -value is >3 it has positive allometric growth (Khaironizam and Norma-Rashid, 2002). Oniye *et al.*, (2010) reported that length-weight relationship of *Auchenoglanis occidentalis* showed positive correlation ($r=0.96$) in sexes, indicating an increase in weight as length increased, and the regression exponent ($b>3$) for both sexes showed allometric growth pattern.

The condition factor can be used in accessing the well-being of fish. Ikomi and Odum (1998) observed a monthly variation in the condition factor (K) of *Chysicthys auratus*, which was higher in the wet than the dry season, and that increase in the mean K -value of both male and female fish was attributable to conservation of stored energy, increasing size and weight of maturing gonads.

Availability of food is the important factor in the feeding habit of fishes as most fishes are highly adaptable (Lewis, 1978). Sambo (1999) reported from Dambo lake, Jigawa State, Nigeria that; *O. niloticus* and *S. galilaeus* were feeding on plant material while *C. gariepinus* feed on plant material, whole and fish part and detritus but *Bagrus bayad* was carnivorous.

MATERIALS AND METHODS

Clarias gariepinus were purchased monthly, from January 2018 to December 2018 from the landings of fishermen of Ajiwa Reservoir. The fish were transported in an insulated box containing ice to the Undergraduate laboratory of the Biology Department, Federal College of Education Katsina, the total length, standard length and weight of the fish were determined as described by ((Nwadiaro and Okorie,



1985). Fulton's condition factor, defined as weight percent divided by cube of the length of fish, (Ikomi and Odum, 1998) was calculated for each fish, using the relationship:

$$K = \frac{100W}{L^3}$$

Where K is the condition factor, L is total length in centimeters and W is weight in grams.

The length-weight relationship of the fish was described by the equation $W=aL^b$, Where W is the weight in grams, L the total length in centimeters a and b the regression constant. The logarithm-transformed data will give the linear regression equation: $\log W = \log a + b \log L$

Sex of fish was determined by visual and microscopic examination of the gonads (Ikomi and Odum, 1998). The unsexed small fish were regarded as immature.

The stomach contents were examined and analyzed after the removal of the stomachs which were opened up and examined using dissecting microscope in the Laboratory. The stomach contents were analyzed using frequency of occurrence method.

RESULTS

The weight of *Clarias gariepinus* sampled ranged from 65.30-825.0g. The largest male weighted 666.0 g, while the largest female was 825.0 g. The regression coefficients b for male and female fish was 3.29 and 3.32 respectively. Correlation coefficients r for male and female fish were 0.95 and 0.96 respectively (table 1).

Table 1: Length-weight relationship of male and female *Clarias gariepinus*.

Sex	Total length range (cm)	Weight range (g)	n	a	b	r
Combined	21.20-42.90	65.30-825	255	-5.13	3.30	0.95
Male	23.20-40.40	81.40-666	115	-5.17	3.29	0.95
Female	27.00-42.90	130.00-825	125	-5.23	3.32	0.96
Immature	21.20-22.50	65.30-79.2	15	-5.04	3.30	0.95

n = sample size, a = regression intercept, b = regression coefficient, r = correlation coefficient

Figure 1 show a scatter diagram of the length-weight relationship regardless of sex of *Clarias gariepinus* the relationship obtained reflect the common increase of weight with increase in length.

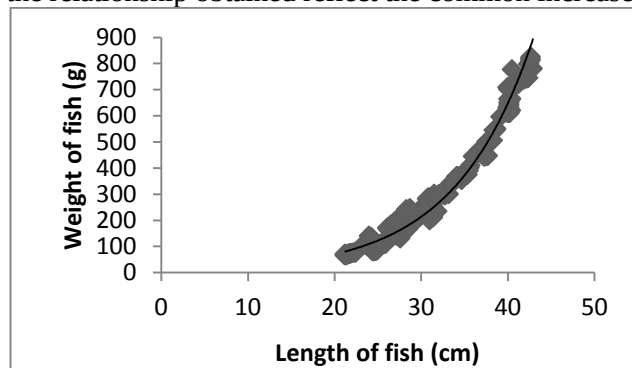


Figure 1: Length-Weight relationship of *Clarias gariepinus*.

The monthly values of the regression coefficient b were relatively higher in May, June, September and October with values of 4.00, 3.95, 3.85 and 3.75 respectively while the lower value (2.71) was obtained in January. In all cases, the value of b were greater than 3 (table 2).

Table 2: Monthly variation in length-weight relationship of *Clarias gariepinus*.

Month	n	a	b	r
January	13	-2.67	2.71	0.98
February	18	-7.74	3.65	0.98
March	20	-3.99	3.01	0.98
April	19	-5.01	3.37	0.96
May	23	-7.32	4.00	0.95



June	29	-7.01	3.95	0.97
July	20	-5.24	3.36	0.98
August	24	-4.75	3.25	0.90
September	25	-6.15	3.85	0.99
October	24	-6.42	3.75	0.99
November	23	-5.66	3.54	0.98
December	17	-4.23	3.12	0.98

n = sample size, a = regression intercept, b = regression coefficient, r = correlation coefficient

The overall mean monthly condition factors (K) ranged from 0.72-1.18 (Table 3).

Table 3: Mean monthly variation in condition factor of *C. gariepinus*.

Month	Range	Mean (+ SE)
January	0.64-1.15	0.99 (0.03)
February	0.86-1.13	0.98 (0.02)
March	0.84-1.10	0.94 (0.02)
April	0.39-1.07	0.72 (0.05)
May	0.52-1.17	0.84 (0.03)
June	0.48-1.01	0.80 (0.03)
July	0.70-1.08	0.87 (0.02)
August	0.63-1.18	0.95 (0.02)
September	0.70-1.48	1.18 (0.05)
October	0.71-1.26	1.05 (0.03)
November	0.44-1.52	0.99 (0.05)
December	0.82-1.30	1.11 (0.03)

The highest values were obtained in September, October and December. There was a decrease in April and a steady rise thereafter. Mean condition factor values increase with size of fish irrespective of sex (Table 4). Mean condition factor values increase with size of fish irrespective of sex. However, the overall (mean) K -values appeared to be marginally higher in the male (0.97) than in the female fish (0.96), but no significant difference ($p < 0.05$).

Table 4: Mean monthly condition factor (K) of male and female of *C. gariepinus*.

	Sample size (n)		(k) Range		Men condition factor	
	Male	Female	Male	Female	Male (+SE)	Female (+SE)
January	6	8	0.95-1.09	1.01-1.08	1.07(0.03)	1.04(0.03)
February	11	7	0.80-1.05	0.91-1.12	1.00(0.05)	0.97(0.05)
March	6	8	0.87-1.09	0.83-1.02	0.93(0.02)	0.95(0.02)
April	5	11	0.54-0.99	0.54-1.06	0.80(0.03)	0.78(0.05)
May	13	15	0.51-1.16	0.57-1.05	0.81(0.03)	0.85(0.02)
June	13	8	0.63-0.99	0.61-1.00	0.81(0.03)	0.81(0.03)
July	7	14	0.70-0.87	0.69-1.07	0.88(0.02)	0.82(0.03)
August	14	12	0.78-1.17	0.78-1.14	0.96(0.02)	0.88(0.02)
September	14	8	0.99-1.22	0.80-1.25	1.03(0.03)	1.07(0.03)
October	7	14	0.78-1.47	0.77-1.47	1.22(0.06)	1.18(0.05)
November	13	9	0.89-1.36	0.87-1.51	1.10(0.03)	1.03(0.03)
December	6	11	1.07-1.29	0.81-1.22	1.08(0.03)	1.14(0.03)
Total	115	125			0.97(0.05)	0.96(0.03)

In this study *C. gariepinus* feeds mostly on animal matter, also fed on detritus (60.39%) while some stomach examined contain plant materials (31.37%). A few stomachs (7.84%) were however empty (Table 5).



Table 5: % occurrence of the various food items found in the stomach of *C. gariepinus* in Ajiwa Reservoir

Food items		Fish stomach contents							
		Insects	Insect	Detritus	Whole	Fish	Plant	Algae	Empty
Number of stomach containing food items	255	80	00	154	81	168	80	00	20
% occurrence	100%	31.37	00.00	60.39	31.76	65.88	31.37	00.00	7.84

DISCUSSION

The length-weight relationship of *C. gariepinus* in Ajiwa showed positive correlation in Ajiwa showed positive correlation ($r=0.95$) in both sexes, indicating an increase in weight as the length increases. The regression exponent ($b>3$) for both sexes shows a positive allometric growth pattern. According to Pauly and Gayanilo (1997), b -values may range from 2.5 to 3.5.

The mean condition factor (K) in this study varied during the different months of study and, appear to be related to the feeding and breeding activities of the fish (Ikomi and Odum, 1998). Lower K -values were recorded from April to July, which probably coincide with the spawning period. The appreciation of the mean K -values in August, September and October, may be associated with weight increase after spawning period, which is a direct reflection of the availability and utilization of food items for growth then. In both sexes, mean K -values were found to increase with length, suggesting that the food foraging ability and utilization of food items for growth was reflected in the increasing length. The condition factor of other clariid such as *Clarias anguillaris* from Oguta Lake has a range of 0.77-1.80 (Nwadiaro and Okorie, 1985).

In Ajiwa Reservoir, Katsina State, Nigeria, this study *C. gariepinus* in addition to feeding on mostly animal matter, also fed on detritus (60.39%) while some stomach examined contain plant materials (31.37%). It could be concluded that *C. gariepinus* is omnivorous and an opportunistic feeder as observed by (Ikomi and Odum, 1998). A few stomachs (7.84%) were however empty and this could be attributed to the vomiting after capture as observed by (Ikomi, 1996).

CONCLUSION AND RECOMMENDATION

Conclusion: The length-weight relationship of *C. gariepinus* in Ajiwa showed positive correlation ($r=0.95$) in both sexes. The regression exponent ($b>3$) for both sexes showed positive allometric growth pattern. The mean condition factor (0.72-1.18) varied during the different months appears to be associated with the seasons, feeding and breeding activities of the fish, and in both sexes mean condition factor increased with increase in length and weight. Conclusively, *C. gariepinus* is omnivorous and an opportunistic feeder which is in good condition in Ajiwa.

RECOMMENDATION: It is recommended that aquaculture of *C. gariepinus* should be encouraged in Ajiwa Reservoir for contribution towards securing animal agriculture in Nigeria amidst global challenges.

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