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Length- Weight Relationship and Condition Factor of Two Species of Tilapia and One Species of Mormyrops from a Tropical Dam in a Southwestern State, Nigeria

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ABSTRACT

The length-weight relationship and condition factor of Tilapia zillii, Oreochromis niloticus and Mormyrops anguilloides from Itapaji dam, Ekiti State Nigeria were examined in this study. A total of 150 fish made up of 113 T. zillii (65 females and 48 males), 24 O. niloticus (11 females and 13 males) and 13 M. anguilloides (11 females and 2 males) procured directly from the fishermen were examined. The parameters 'a' and 'b' were determined from the linear regression of the logarithm of length and weight of the fish when transformed into the growth equation, $W= aL^b$. The values of 'b' for the fish species ranged from -1.16 to 10.12 and the result showed that the Cichlidae had negative allometric growth while Mormyrops showed positive allometric growth. The condition factor 'K' value for female and male O. niloticus were closer to the recommended range of 2.9 to 4.8 while the 'K' value of other two species were greater than 1 except in the female M. anguilloides. The difference in the 'K' values may be caused by the variation in weight of individual fish species sampled as well as environmental factors to which they are exposed in the dam.

Keywords: *Tilapia zillii, Oreochromis niloticus, Mormyrops anguilloides, Length-Weight relationship, Condition Factor* .

INTRODUCTION

Fish are aquatic organisms which consist of gill bearing cranium but lack limbs with digits and are cold-blooded animals. They are of great importance for the Nigerian aquaculture industry and their production is gradually increasing. Fishing, like other hunting activities has been a major source of food for human race and has put an end to the outbreak of anaemia, kwashiorkor and so on. The cichlids include *Oreochromis*, *Sarotherodon* and *Tilapia*. Cichlidae add values to the life of fish farmers and commercial fishery of inland waters of most countries of the world. They are tolerant to a variety of habitats and omnivorous in nature. (Omoniyi and Agbon, 2008). *Mormyrops species* are well distributed in swamps, lakes and rivers of most Nigerian fresh water bodies. Mormyridae include *Hyperopisus*, *Mormyrus*, *Petrocephalus*, *Mormyrops*, *Marcusenius and Gnathonemus*. The family Mormyridae is highly variable in their head shape. Their common characteristics include upward pointing of pectoral fin, narrow gill openings and their eyes are small and weak and covered by a thin layer of skin. This species has always been consumed for its oily and tasty flesh (Achionye-Nzeh, 1996, Nzeh and Lawal, 2012)

FAO (2003) reported that Nigeria is one of the largest importers of fish in the developing world, importing about 600,000 metric tonnes annually. To solve this short-fall in fish supply, Nigeria must be fully involved in proper aquacultural management. Scientifically good management of fish resources relies on the basic knowledge of the biology of the species. This includes information on population structure which influences the development of management strategies and conservation of biodiversity (Turan *et al.*, 2005). Morphological characters such as morphometrics and meristics have been commonly used to identify different fish stocks (Teugels, 1982 and Turan 2004). To our best knowledge, nothing is known about the

population structure of Cichlidae and Mormyridae species from Itapaji dam in Ekiti State, Nigeria. It is important to obtain detailed knowledge on the population structure of these commercially exploited species in order to apply this information to their management in the dam. This research work was therefore designed to compare the length-weight relationship and condition factor of *Oreochromis niloticus, Tilapia zillii* and *Mormyrops anguilloides* collected from Itapaji Dam in Ekiti State, Nigeria.

MATERIALS AND METHODS

The Study Area

A total number of one hundred and fifty (150) fish species consisting of 113 of *Tilapia zillii* (65 females and 48 males), 24 *Oreochromis niloticus* (11 females and 13 males) and 13 *Mormyrops anguiloides* (11 females and 2 males) were collected for this work.The samples were collected from Itapaji dam. The dam was constructed in 1975 for the supply of water for domestic use and production of fish for Ikole Local Government Area of Ekiti State and the environs. It is entirely within the tropics. It is located between latitude 7^0 53^IN and longitude $5^0.5^I30^{11}$ E of the Equator. The dam has the capacity of 5,175m3/day. The surface area is 115.2Km. It's length is 400m and the height is 24m. Its neighbours are Kwara State to the North, Kogi State to the North East, Ekiti East to the East, Gboyin Local Government in the South and Oye Local Government in the West.

Sample Collections and Identification

Tilapia species (Oreochromis niloticus and *Tilapia zillii)* and *Mormyrops species. (Mormyrops anguilloides*) were collected directly from the local fish farmers. The fish were collected by set and catch net usually set overnight. The samples collected were transported to the laboratory immediately for the experiment. The *O. niloticus, T. zillii* and *M. anguilloides* were identified using the standard keys by Olaosebikan and Raji (1998).

Experimental Procedure

The fish samples bought directly from the fishermen were transported immediately to the Post-graduate Laboratory of Zoology and Environmental Biology Department, Ekiti State University, Ado- Ekiti. The fish samples were sorted into different samples and sexes and labeled properly.

DATA COLLECTION

The data on growth pattern of the species were collected through length – weight relationship by using the equation below,

$W = aL^b$

Where

W= Weight of fish in grammes (g)

a = Intercept of the regression

L = Total length of fish in centimeters (cm)

b = Regression coefficient (Slope) (Pauly, 1983)

The "a" and "b" values were obtained from the linear regression of the logarithm of length and weight of fish. When b is equal to three (3), isometric pattern of growth occurs but when b is not equal to 3, allometric pattern of growth which may be positive if greater than 3 or negative if less than 3 occurs. The correlation coefficient (r) that shows the degree of association between the length and the weight was computed from linear regression analysis.

The mean weight and length of the experimental fish were used to estimate condition factor using equation below:

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

Where

K-The Condition Factor

W= Weight in grammes (g)

L= Total length of fish in centimeters (cm)

RESULTS AND DISCUSSIONS

Table 1 shows the ranges and mean values of the total length and body weight of both sexes of the three species of fish collected from the study area. In all the species, the male fish had the higher mean total length of 16.59 cm, 16.68 cm and 30.05 cm in *Tilapia zillii, Oreochromis niloticus* and *Mormyrops anguilloides* respectively compared to the female fish with 16.54 cm, 16.64 cm and 27.48 cm in Tilapia zillii, *Oreochromis niloticus* and *Mormyrops anguilloides* respectively. For the body weight, female *Tilapia zillii* and *Oreochromis niloticus* were larger than the male fish. On the other hand, female *Mormyrops anguilloides* were smaller in weight than their males. However, *Mormyrops anguilloides* showed the highest mean total length and body weight among the three species.

Table1. *The ranges and mean values of the total length and body weight of the three fish species collected from Itapaji Dam, Ekiti State, Nigeria*

Fish species	Sex	Total Length		Body Weight	
		Range	Mean	Range	Mean
Tilapia zillii	Female	14.1-19.3	16.54	39.5-108.0	77.81
	Male	14.0-19.1	16.59	43.4- 97.2	67.47
Oreochromis niloticus	Female	15.5-18.1	16.64	61.9-98.5	85.11
	Male	14.0-17.8	16.68	66.6-105.0	84.70
Mormyrops anguiloides	Female	24.4-39.5	27.48	97.7-182.3	145.12
	Male	28.0-32.1	30.05	151.9-193.4	172.00

Table2. *Length-Weight relationship and condition factor of the three species collected from Itapaji Dam, Ekiti State, Nigeria.*

Fish species	Sex	No sampled	K-factor	Regression equation		Regression Coefficient	
				a	b	r^2	r
Tilapia zillii	Female	65	1.75	80.10	0.09	0.016	0.13
	Male	48	1.63	37.36	1.81	0.016	0.13
Oreochromis niloticus	Female	11	2.25	60.68	1.46	0.021	0.15
	Male	13	2.19	104.07	-1.16	0.007	0.09
Mormyrops anguiloides	Female	11	0.75	-80.24	8.20	0.408	0.64
	Male	02	1.27	-131.51	10.12	1.000	1.000

Table 2 shows the length-weight relationship and condition factor of the three species of fish sampled from Itapaji dam. *T. zillii* had the greatest number of fish (65 females, 48 males) sampled while *M. anguilloides* had the least number (11 females, 2 males). The intercept 'a' varied from -131.51 in male *M. anguilloides* to 104.07 in male *O. niloticus*. The length- weight relationship of the female and male fish shows that the 'b' value ranged from -1.16 in the males of *O. niloticus* to 10.12 in the males of *M. anguilloides*. The coefficient of determination, r^2 and correlation coefficient "r" also varied from 0.007 in male *O. niloticus* to 1.000 in *male M. anguilloides* and from 0.09 in the males of *O.* niloticus to 1.000 in the males of *M. anguilloides* respectively. The mean condition factor ranged from 0.75 in the female *M. anguilloides* to 2.25 in the females of *O. niloticus.*

The sample number of *Mormyrops* species collected for this study was very low, in contrast to the result of Offem *et al*. (2009) in which it was one of the dominant species collected from the flood plain river of Calabar, Nigeria. Also, among the three species of fish sampled in this study, *Mormyrops anguilloides* had the least sample size. The possible reason for the low number of the species may be due to over exploitation by the local fish farmers thereby making the species a threatened one in this area. This is in agreement with the report of Tweddle *et al*. (2018) as it has been enlisted among the IUCN red list (Least Concern) of threatened species. The results further showed that *Tilapia zillii* was a dominant species in the dam which was followed by *O. niloticus* during the collection period.

The result of length- weight regression analysis in this work showed that both the males and females exhibited allometric growth. The values of 'b' showed that both males and females of *T. zillii* and *O.niloticus* exhibited negative allometric growth while the female and male *M. anguilloides* showed positive allometric growth pattern. This means that *T. zillii* and *O. niloticus* became thinner or slender with increase in their length as reported by King (1996) and Riedel *et al.* (2007) while *M. anguilloides* was more robust as its length increased.

The results obtained in this work were similar to Sangu et al. (2007) and Offem et al. (2009) on fishes of some Nigerian inland waterbodies. Dan-Kishiya (2013) reported that all the five fish species collected from a water reservoir in Abuja, Nigeria had negative allometric growth while Oso and Iwalaye (2016) reported that three out of their four collections from Ero Dam in Ekiti State, Nigeria had negative allometric growth.

The b values reported for males and females of *T. zillii* and *O. niloticus* in this study were similar to 1.4 and 2.3 reported by Imam *et al.* (2010) but in variance with the range of 4.73 to 15.59 recorded for *T. zillii, Sarotherodon melanotheron, T. guineensis, T. mariae* and *O. niloticus* (Akintade et al., 2016). The reasons for

differences in the fish growth patterns may be due to availability of food, the season of collection, poor environmental conditions, competition along the food chains.

The relationship of length -weight can be used in the estimation of condition factor (K) of fish species. The condition factor obtained in this study was different from the reported 0.99455 to 4.3457 on four fish species obtained from Ero dam, Ekiti State (Oso and Iwalaye, 2016). However, Ajani (2013) reported the range of 0.45 to 2.25 on five tropical fish from a coastal lake while Nwadiaro and Okorie (1995) reported the condition factor ranging from 0.49 to 1.48 in another lake. Kumolu-Johnson and Ndimele (2010) reported K value (0.91 to 8.46) on 21 fish species from Ologe lagoon, Lagos while Abowei and Hart (2009) reported K value of 1.10 for *Cyloglossus senegalensis* in Nikoro. The variation in values of condition factors may be attributed to variations in weight and stage of maturity. Other factors which might have contributed to the variations may include stress, season, availability of feeds, mutagens from human interference, and other water quality parameters. Since results also showed that the population of *M. anguilloides* is threatened, there may be need for proper examination of the water quality parameters and other factors affecting the Itapaji dam to establish the suitability of the reservoir for fish breeding.

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