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Length weight relationship and condition factor of *Tilapia zilli* (Perciformes: Cichlidae) in Warri River, Southern Nigeria

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Abstract
The length-weight relationship and condition factor of *Tilapia zilli* were analyzed in Warri River, Southern Nigeria. A total of 240 species were recorded. The mean total length and weight were 11.27 cm and 26.57 g respectively. The highest (0.248134) and lowest (0.138083) "a" value was recorded in January and February respectively, while the "b" value ranged from 5.037534 January and 7.923723 in May, 2013. The mean condition factor ranged from 2.18 in January and 7.25 in May. The result obtained in this study showed general positive allometric growth.

Keywords: Length-weight, *Tilapia zilli,* Condition factor, Warri River

1. Introduction
Fish such as the much sought after cichlids, plays an important role in any nations economic and development [1]. The fish food is nutritive in protein and other essential nutrients needed for the body development [2]. Length-weight relationship is an important tool for adequate exploitation and management of the population of fish species [3]. The length and weight data are a useful and standard result of fish sampling programs [1]. However, these data are required in order to estimate growth rates, length and age structures, and other components of fish population dynamics [4]. In the study of Fisheries Science, the condition factor 'K' is used in order to compare the "Condition" fatness or wellbeing of fish. The 'K' is important in understanding the life cycle of fish species and contributes to adequate management of the species, hence, maintaining the equilibrium in the ecosystem [5]. It is based on the hypothesis that heavier fish of a certain length are in better condition [6]. Condition factor (K) is strongly influenced by both biotic and abiotic environmental conditions and can be used to assess the status of the aquatic ecosystem in which fish live [3]. Fish found in tropical and sub-tropical water system experience frequency growth fluctuations due to factors such as food composition changes, rate of spawning to mentioned but a few [7]. The study was therefore aimed for studying the length-weight relationship and condition factor of *Tilapia zilli* in Warri River at Agbarho, Southern Nigeria.

2. Materials and Methods
The Warri River at Agbarho is located Southeast of the Niger Delta between longitude 5º 24'- 6º 21'E and latitude 5º 21- 6º 0'N (Figure 1). The sampling site is forested by mangrove, the river is fed principally by ground seepage from an aquifer in the thick rainforest of Utagba-Uno in Ndokwa, Southern-Nigeria and flows southwest for about 74 km, through Akoku, Eziokpor, Amai and Umuebu, Abraka, Ughelli and Warri before it empty into the Atlantic Ocean through the Forcados estuary. Climate of the study area is defined by dry season and wet season. Fish samples were collected monthly from fishermen at the landing site from January-July 2013. Samples were preserved in 10% formalin prior to laboratory examination. In the laboratory, data obtained from each fish included; length and weight. Standard length (SL) and total length (TL) were measured to the nearest 0.1cm and weighed (wt.) to the nearest 0.1 g using S. Meter (0.01 – 500 g). Samples were identified using [8, 9]. Fulton's condition factor (CF) was determined using the expression: K = (W/L3)100, K= condition factor, W = total weight (g), L =total length (cm) and 3 = the cubic relationship between length and weight. Data collected were collated and analyzed using descriptive statistics (mean and standard error). The exponents (b) of L-W Relationship were tested for departure from isometry (b=3) using t–statistics. Figure 2 is a picture of *Tilapia zilli.*

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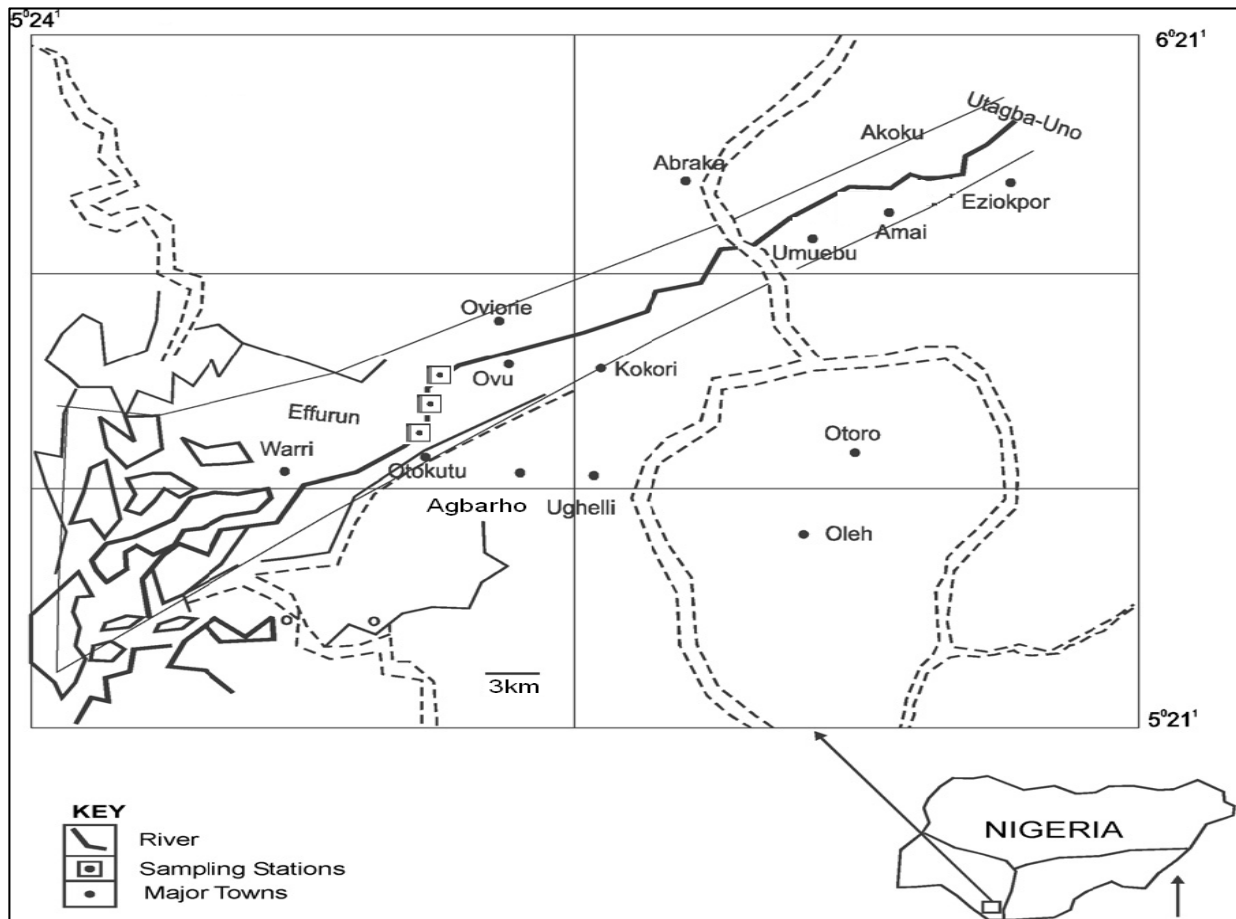
Fig 1: Map of the study area showing the sampling stations in Warri River at Agbarho.

Fig 2: Picture of *Tilapia zilli* by Azeroual. A.

3. Results

A total of two hundred and forty (240) species of *Tilapia zilli* were recorded. The monthly variation in length-weight relationship and condition factor (K) of *Tilapia zilli* is shown in Table 1. The mean total length (cm) and mean weight (g) ranged between 10.1 cm – 12.44 cm and, 21.45 g – 31.7 g respectively. The highest (0.248134) and lowest (0.138083) "a" value was recorded during the months of January and February respectively while the value of b ranged from 5.037534 recorded in the month of January and 7.923723 recorded in the month of May, 2013. The mean condition factor ranged between 2.18 in January and 7.25 in the month of May.

Table 1: The length-weight relationship and condition factor (K) of *Tilapia zillii*

Months	Mean length (cm)	Mean weight (g)	Intercept (a)	Slope (b)	Condition Factor / (k)
January	10.36	21.45	0.248134	5.037534	2.18
February	10.1	18.93	0.138083	7.486087	2.51
March	11.07	26.19	0.140219	7.397654	3.05
April	11.47	28.77	0.156696	6.961846	2.88
May	12.25	30.74	0.140738	7.923723	7.25
June	12.44	31.7	0.14886	7.721126	3.50

4. Discussion

Imam *et al.* [5] recorded 5.5-20 cm for annual length range for *T. zilli* from Wasai Reservoir in Kanoas against 10.1 - 12.44 cm recorded in this study. This could be as a result of the six months sampling period when compared to the one year sampling period of the study in Wasai reservoir in Kano.

The highest (0.248134) and lowest (0.138083) "a" value was recorded during the dry season in the months of January and February respectively Imam *et al.* [5] recorded "a" value of 1.5 during the dry season and 1.2 values during the wet season. The value of b ranged from 5.037534 recorded in the month of January and 7.923723 in May, 2013. This is comparatively

higher than the b values of (2.9 - 4.8) obtained from Haruna MA [10] and (2.91) from Bala U *et al* [11]. When "b" is not equal to 3, allometric pattern of growth occur, which could be positive if >3 or negative if <3 [5]. Imam TS *et al.* [5] reported maximum "b" values of 2.5 and 1.53 for wet and dry seasons respectively.

The (K) condition factor of 2.63 and 3.4 were reported during the dry and wet seasons respectively which showed higher value during the wet seasons [5]. Braga FMS [12] reported that values of the condition factor vary according to seasons and are influenced by environmental conditions. The mean condition factor ranged between 2.18 in January and 7.25 in May and the value comfortably fall within the ideal range set by Bagenal TB *et al* [6], but the result of January, February and April were out of the range set for ideal growth of freshwater fish. 6. Bagenal TB *et al*, Anene A, Imam TS *et al.* [6, 3, 5] reported k values of 2.9-4.8, 2.9-4.3 and 2.6-3.4 respectively.

5. Conclusions
An important contribution of this study is the provision of base line data on the length-weight relationships and condition factors of *Tilapia zilli* in Warri River at Agbarho, Nigeria. The result obtained in this study showed general positive allometric growth. The values for condition factor indicate that the fish are in good state. Fishermen in the area should be educated on sustainable management of this freshwater resource.

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