

The Length Weight Relationship and Condition Factor of Four Mormyrid Species, Namely; Petrocephalus Simus, Mormyrus Rume, Campylomormyrus Tamandua and Mormyrops Delicousus in Oguta Lake

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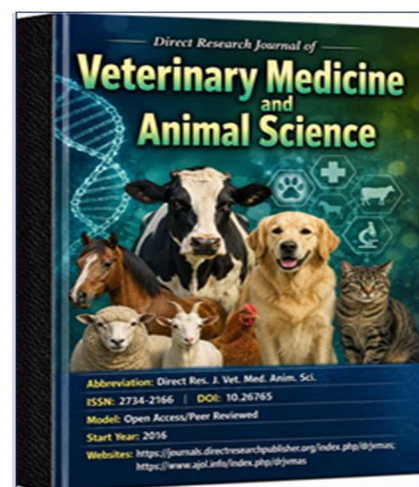
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ABSTRACT

The length-weight relationship and condition factor of four mormyrid species namely Petrocephalus simus, Mormyrus rume, Campylomormyrus tamandua and Mormyrops delicousus, in Oguta Lake were investigated from October 2023 to August 2024. Length-weight relationship showed that the exponent “b” were 2.09 for P. simus, 1.6 for M. rume, 2.12 for C. tamandua and 1.75 for M. delicousus respectively. The mormyrid species studied with exception of M. rume exhibited isometric growth and the correlation coefficients were positive and highly significant ($P < 0.05$). The condition factor (k) shows that all the specimen was greater than one, which implies that all the fishes were in good physiological state of well-being. There was no significant difference ($P > 0.05$) in the mean condition factor between the males and females in all the mormyrid species. The importance of condition factor in the breeding activities of the mormyrid species revealed that not much energy is diverted into gonad synthesis and maturation during the breeding cycle season. The study recommends other studies on other aspect of the biology of these species to provide the needed ecological information for the effective exploitation and conservation of the species in the water body. Length-weight relationship was calculated thus: $W = aL^b$. Since the body weight increased more rapidly than total length, the formula was logarithmically transformed for the purpose of data analysis. The condition factors of all fish species sampled fall outside the range recommended as suitable for matured fresh water fish species in the tropics.

Keywords: Mormyrids, Length-weight relationship, Condition factor



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INTRODUCTION

Fishes have long served humans as an important food source along Africa's inland waterways. Length-weight relationship (LWR) and condition factor (K) are important tools for describing fish growth, assessing relative physiological condition and supporting fisheries management. Recent studies in Nigerian freshwater systems have continued to demonstrate the value of these parameters across different species and water bodies (Olagbemide & Owolabi, 2023; Hassan *et al.*, 2024; Adeniyi & Agbugui, 2024; Julius *et al.*, 2025). Olagbemide and Owolabi (2023) assessed LWR and condition factor of *Oreochromis niloticus* in selected tropical reservoirs of Ekiti State, while Hassan *et al.* (2024) examined *Clarias gariepinus*, *Mormyrus rume* and *Synodontis budgetti* in Dadin Kowa Reservoir. These studies demonstrate that growth pattern and physiological condition can vary among species and among aquatic environments, making location-specific studies necessary. (Abowei, 2010; Adaka *et al.*, 2015; Anibeze, 2000; Ahouansou Montcho *et al.*, 2009; Alfred-Ockiya, 2000; Alfred-Ockiya & Njoku, 1995; Ahmed & Saha, 1996; Hart & Abowei, 2007; Kumolu-Johnson & Ndimele, 2010; Ude *et al.*, 2011) (Abowei & Davies, 2009; Adaka *et al.*, 2010; Adeyemi *et al.*, 2009; Arawomo, 1982; Bagenal & Tesch, 1978; Bakare, 1970; Bake *et al.*, 2004; Diri, 2002; Ezenwaji, 2004)

LWR studies published between 2024 and 2026 further show substantial variation in growth patterns among freshwater fish populations. Adeniyi and Agbugui (2024) investigated dominant fish species in the lower River Niger; Yahaya and Suleiman (2025) reported a mean b-value of 1.896 for *Tilapia zillii* in Kanye Dam; Dauda *et al.* (2025) reported negative allometric growth for *Clarias gariepinus* in Tiga Dam and River Wudil; and Idris *et al.* (2025) found negative allometric growth for *C. gariepinus* in Kalgwai Reservoir. Auta *et al.* (2025) similarly reported negative allometric growth in *C. gariepinus* and *Oreochromis niloticus* in Sabke Reservoir. Recent work on *Coptodon zillii* in four Kano water bodies (Usman *et al.*, 2025), fish communities in three Nigerian lakes (Julius *et al.*, 2025), economically and ecologically important fishes in Ilaje, Ondo State (Ojo *et al.*, 2025), and five fish species in Ureje Reservoir (Balogun *et al.*, 2026) further confirms the importance of examining LWR and condition factor in relation to particular species and environments. However, species-specific information on the four mormyrid species investigated in Oguta Lake remains limited. This study therefore provides additional information on the length-weight relationship and condition factor of *Petrocephalus simus*, *Mormyrus rume*, *Campylomormyrus tamandua* and *Mormyrops deliciousus* in Oguta Lake, Imo State, Nigeria, to support fisheries management and conservation.

MATERIALS AND METHODS

Field and Laboratory Techniques Fish samples were obtained fortnightly between October 2023 and August 2024 from artisanal fishers at their landing site for the study.

The fishers were provided with hook and line of size 13, gill nets and other fishing gears which included bag nets, cast nets and traps of diverse mesh sizes ranging from 50 mm to 100 mm. Thereafter, the specimens were taken to the Wet and Dry Laboratory of the Department of Fisheries and Aquaculture of Federal University of Technology Owerri for identification using standard taxonomic descriptions. Specimens were stored in coolers containing ice and transported to the laboratory for further analysis. Each fish was weighed to the nearest 0.1 g, while total and standard length were determined to the nearest 1 mm.

Data Collection of Fish samples and Statistical Analysis

The Total Length (TL) of the fish was measured from the tip of the anterior part of the mouth to the caudal fin using a meter rule calibrated in centimeters. Fish were measured to the nearest centimeter. Fish weight was measured after blot drying with a piece of clean hand towel. Weighing was done with a tabletop weighing balance to the nearest gram. The length measurements were converted into length frequencies with constant class intervals of 2 cm. The mean lengths and weights of the classes were used for data analysis. The relationship between length (L) and weight (W) of fish was expressed as $W = aL^b$, consistent with recent LWR studies in Nigerian freshwater systems (Olagbemide & Owolabi, 2023; Hassan *et al.*, 2024). Where W = weight of fish (g), L = total length (cm), a = constant (intercept), and b = length exponent (slope). The a and b values were obtained from linear regression of the length and weight of fish. The correlation (r^2), representing the degree of association between length and weight, was computed from the regression analysis. The condition factor (K) of the experimental fish was estimated from $K = 100W/L^3$.

RESULTS AND DISCUSSION

Figure 1 Multiple pie charts showing the percentage composition of some Mormyridae fishes of Oguta Lake with *Petrocephalus simus* 35.5%, *Mormyrus rume* has 17.4%, *Campylomormyrus tamandua* has 20.7% and *Mormyrops deliciousus* 20.7%.

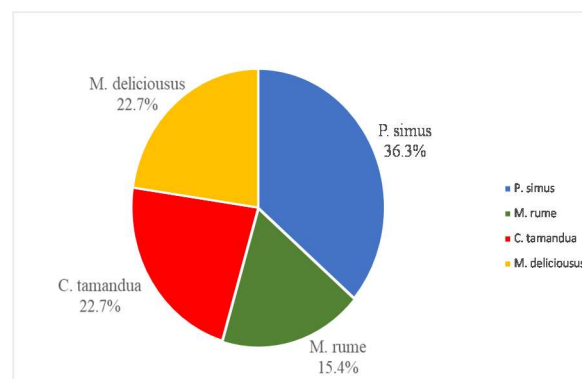


Figure 1: Showing the percentage composition of the four species in Oguta lake

Relative composition of some Mormyrid fishes in Oguta lake

Table 1 shows the mean and range of length-weight relationship of mormyrid fishes in Oguta lake. *Petrocephalus simus* has a total number of 15 fishes and its total length ranges from 14cm-28cm, while the weight ranges from 50g-200g.

Table 1: Mean and Range of Length-weight relationship of some Mormyridae spp (*Petrocephalus simus*, *Mormyrus rume*, *Campylomormyrus tamandua* and *Mormyrops deliciousus*) in Oguta lake.

Species	N	Total Length (cm)		Weight(g)	
		Range	Mean	Range	Mean
<i>Petrocephalus simus</i>	15	14-28	21.00	50-200	125.2
<i>Mormyrus rume</i>	7	17-28	22.50	80-90	85.10
<i>Campylomormyrus tamandua</i>	10	17.5-19.5	18.50	60-200	130.0
<i>Mormyrops deliciousus</i>	10	13-27	20.00	90-200	145.0

Mormyrus rume has a total of 7 fishes and its total length ranges from 17cm-28cm, while the weight ranges from 80g-90g. *Campylomormyrus tamandua* has a total of 10 fishes and its total length is from 17.5cm-19.5cm, while the weight ranges from 60g-200g and *Mormyrops deliciousus* has a total of 10 fishes with a total length that ranges from 13cm-27cm, while the weight ranges from 90g-200g.

Table 2 shows the Log transformation and regression analysis of the fish species in Oguta lake. A represents constant while B represents the length-weight and it was gotten by this formula $\text{Log } W = \text{Log } a + n \text{ Log } L$. The estimated allometry coefficient value (a) of *Petrocephalus simus* ranged from 0.645 to coefficient value (b) 2.09, while that of *Mormyrus rume* ranged 0.127 in (a) and 1.623 in (b). *Campylomormyrus tamandua* ranged (a) 0.569 and (b) 2.12. *Mormyrops deliciousus* ranged 0.167 in (a) and 1.746 in (b).

Table 2: Log Transformation and regression analysis

Fish Species	A	B	Regression Equation
<i>Petrocephalus simus</i>	0.645	2.09	$\text{Log } W = 0.645 + 2.09 \text{ Log } L$
<i>Mormyrus rume</i>	0.127	1.623	$\text{Log } W = 0.127 + 1.623 \text{ Log } L$
<i>Campylomormyrus tamandua</i>	0.569	2.12	$\text{Log } W = 0.569 + 2.12 \text{ Log } L$
<i>Mormyrops deliciousus</i>	0.167	1.746	$\text{Log } W = 0.167 + 1.746 \text{ Log } L$

Table 3 shows the condition factor of the 4 species of mormyridae and length-weight relationship analysis.

Table 3: The Registration Statistics for the Length-weight relationship of the four species and their condition factors

Fish Species	A	B	Condition factor (K)
<i>Petrocephalus simus</i>	0.645	2.09	4.21
<i>Mormyrus rume</i>	0.127	1.623	3.41
<i>Campylomormyrus tamandua</i>	0.569	2.12	4.61
<i>Mormyrops deliciousus</i>	0.167	1.746	5.41

Based on the b-values presented in Table 2, all four species showed values below 3, indicating negative allometric growth in the sampled population. The values were 1.623 for *Mormyrus rume*, 1.746 for *Mormyrops deliciousus*, 2.09 for *Petrocephalus simus* and 2.12 for *Campylomormyrus tamandua*. This pattern is consistent with several recent studies of Nigerian freshwater fishes.

Yahaya and Suleiman (2025) reported a mean b-value of 1.896 for *Tilapia zilli* in Kanye Dam, while Idris *et al.* (2025) obtained a combined b-value of 1.7843 for *Clarias gariepinus* in Kalgwai Reservoir. Auta *et al.* (2025) also reported b-values below 3 for *C. gariepinus* and *Oreochromis niloticus* in Sabke Reservoir, and Dauda *et al.* (2025) reported negative allometric growth for *C. gariepinus* in both Tiga Dam and River Wudil. These findings support the observation that negative allometric growth is common in several Nigerian freshwater fish populations, although the magnitude of the growth exponent differs among species and water bodies.

The condition factor values recorded in the present study were 4.21 for *Petrocephalus simus*, 3.41 for *Mormyrus rume*, 4.61 for *Campylomormyrus tamandua* and 5.41 for *Mormyrops deliciousus*. Recent studies have also reported substantial variation in condition factor among species and locations. Olagbemide and Owolabi (2023) reported condition factors within the range considered adequate for the *Oreochromis niloticus* populations studied in selected Ekiti reservoirs, whereas Hassan *et al.* (2024) recorded wide condition-factor ranges among the three species examined in Dadin Kowa Reservoir. Idris *et al.* (2025) reported mean K values of 0.73, 1.14 and 0.90 for male, female and combined *C. gariepinus*, respectively, and Auta *et al.* (2025) also observed differences in condition factor between sexes and species in Sabke Reservoir. Djidohokpin *et al.* (2026), working on freshwater *Chrysichthys* populations in Benin and Guinea, found geographic differences in condition and near-isometric growth for the examined populations. Together, these comparisons indicate that condition factor should be interpreted in relation to species, habitat and population characteristics rather than as a fixed value applicable to all freshwater fish.

Recent comparative studies also show that LWR and condition factor are strongly influenced by species and habitat. Hassan *et al.* (2024) reported substantial variation in the growth patterns of *Mormyrus rume*, *Clarias gariepinus* and *Synodontis budgetti* in Dadin Kowa Reservoir, including negative, isometric and positive growth patterns across the examined groups. Julius *et al.* (2025) similarly assessed fish populations across three Nigerian lakes, highlighting the usefulness of LWR and condition factor for comparing fish populations among lake environments. Usman *et al.* (2025) evaluated *Coptodon zillii* across four Kano water bodies, while Ojo *et al.* (2025) found allometric growth patterns in economically and ecologically important fishes from Ilaje, Ondo State. Balogun *et al.* (2026) extended this type of assessment to five fish species in Ureje Reservoir. These recent studies reinforce the importance of interpreting growth and condition within the specific ecological setting and species composition of each water body. (Beyer, 1987; Bolger & Connolly, 1989; Dodzie & Wangila, 1980; Fagade, 1978; Fagade, 1979; Fagade, 1983; Gayando & Pauly, 1987; Gosse, 1984; Hart, 1997; King, 1996; Kulbicki *et al.*, 2005; Le Cren, 1951; Loveque *et al.*, 1991; Odedeyi *et al.*, 2007; Olele & Obi, 2004; Oni *et al.*, 1983; Reed *et al.*, 1967;

Saliu, 2001; Shenouda *et al.*, 1994; Siddique, 1977; Sikoki & Otobotekere, 1999).

Paper Highlights

1. The study quantified length-weight relationships and condition factors for four mormyrid species in Oguta Lake, providing species-specific information for a fish assemblage that is less represented in recent Nigerian LWR literature.
2. The reported b-values were below 3 for all four species in Table 2, indicating negative allometric growth in the sampled population and adding comparative evidence to recent Nigerian studies that have reported different growth patterns across species and water bodies.
3. The condition-factor results provide a baseline for assessing the physiological status of the four mormyrid species in Oguta Lake and contribute information that can support future monitoring, fisheries management and conservation of the lake's fish resources.

Conclusion

This study revealed that the four Mormyridae species from Oguta Lake Southeastern Nigeria exhibited negative allometric growth pattern. The condition factor shows that all the fishes were in good physiological state of well-being in the Lake. The values for the condition factor revealed that *Mormyrops deliciousus*, *Campylomormyrus tamandua* and *Petrocephalus simus* were in a better condition factor than *Mormyrus rume*.

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