International Journal of Fisheries and Aquatic Research
www.fishjournals.com
ISSN: 2456-7248
Received: 27-11-2023, Accepted: 12-12-2023, Published: 28-12-2023
Volume 8, Issue 2, 2023, Page No. 13-16

Length - weight models and condition factor of elephant snout fish *Mormyrus rume* in Sokoto River, Nigeria

Yem I Y[1], Ewutanure S J[2*], Ogunfowora O O[1], Haruna M K[1], Adamu I[1]
[1] National Institute for Freshwater Fisheries Research, New Bussa, Niger State, Nigeria
[2] Department of Fisheries and Aquaculture, Faculty of Environmental Management, Maritime University, Okerenkoko, Delta State, Nigeria

Abstract
Length - weight models and condition factor of *Mormyrus rume* in Sokoto River, Nigeria was studied from January 2022 - December 2022. Mean standard length of male Female and combined sexes were 25.50 cm, 23.90 cm and 24.77 cm respectively. Mean total length of male, female and combined sexes were 28.90cm, 27.00 cm and 28.03 respectively. Mean weight of male, female and combined sexes were 227.70g, 205.11 g and 217.14g. The b - values (slope) of male (1.02), female (1.49) and combined sexes (1.08) depicted negative allometric growth pattern. Length - weight regression equation showed significant correlation in male (0.85), female (0.90) and combined sexes (0.87). Condition factors (K) for male (1.79), female (1.91) and combined sexes (1.93) showed that the fish was in good condition. Similar study need to be done for the remaining month to show seasonal trend in the growth, this study should be used as baseline information to formulate management strategies of this fish in the river, other aspects of the biology need to studied and water quality of the river need to be assessed.

Keywords: Length- weight, condition factors, *Mormyrus rume*, Sokoto River, Nigeria

Introduction

Inland water bodies such as rivers, lakes, reservoirs harbours diverse fish species that is intensively exploited and constitute a key component of the artisanal fisheries. *Mormyrus rume*, which belongs to the family Mormyridae and endemic sub - Saharan Africa is among the commercial fish exploited. It is highly appreciated for consumption, shows good growth rate in the natural environment and could be a good potential for aquaculture. In Nigeria, this species of fish is present in many water systems. However, according to IUCN (2019) the fish has a high vulnerability of about 63% and therefore the need for sustainable management.

For any management and conservation practice to be achieved there is need to have knowledge of growth trends of the fisheries, such as size distribution, length - weight models and condition factor amongst others. Data from such trends are quite useful for a number of purposes, which include population dynamics, biology and stock evaluation. However, a major constraint to science - based fisheries assessment is lack of reliable data on the target fish or stock (Andersen and Beyer, 2015) [2]. This according to Abobi and Wolf (2019) [1] is common for inland water fisheries in Africa. Although, this species is common in rivers, lakes, reservoirs, floodplains, etc, studies on length - weight models and condition factor for Sokoto River is lacking. Such data will give insight on the productivity level and quality of the environment for successful fisheries management (Ayandiran and Fawole, 2014 [3]; Bolarinwa, 2016) [4].

This study, therefore tends to document length - weight pattern and condition factor of *Mormyrus rume* in River Sokoto for rationale exploitation and proper management of the species.

Materials and method

Study Area

The source of Sokoto river is Dukku River, which is a tributary of the River Niger located on Latitude 10º 04' N and Longitude 3º - 8º 14' E and flows northwest through Gusau in Zamfara State forming Gusau Reservoir supplying the city with water. It enters Sokoto State further downstream and eventually join by the Rima River, turning south and flowing through Birnin Kebbi. The river reaches its confluence with Niger River at about 120 kilometers south of Birnin Kebbi. The plains around the river are widely cultivated through irrigation using the water.

Fish identification and Sample collection

Mormyrus rume used for the study where identified at landing site (Kwalkwalawa) using morphometric and meristic (counts) characteristics according to guides of Paugy *et al*. (2003) and Olaosebikan and Raji, (2021) [10]. Descriptive features such as shape of mouth, barbels, colour, fins number, spine numbers and lateral line scales were used.

One hundred and fifty (150) fresh samples of various sizes of *Mormyrus rume* were collected and used for the study. This was done for a period of six months between January 2022 and December 2022.

Body Measurements

Standard length (distance from the tip of the snout to the caudal peduncle), total length (distance from the tip of the snout to the longer portion of the caudal fin) and weight of each fish sample was measured and taking respectively. The lengths and weights were measured and taken using measuring board in centimeters (cm) and top loading balance (Camry emperors model) in grams (g) respectively.

Determination of Sexes
The sexes of *Mormyrus rume* were determined based on visual examination of the external genital papilla and other external features. Where otherwise, samples were carefully dissected from the anal region to the head region to expose the gonads, which can easily be used to differentiate males from females.

Size Distribution
The length frequency method was used to categorize *Mormyrus rume* samples collected in order to determine their distribution based on sizes in the population.

Determination of Growth Pattern
This was determined through length - weight relationship using the following formula according to $W = aL^b$, which was transformed into log as follows
Log W = Log a + b Log L
Where:
a = Intercept
b = Regression value (describe the growth)
W = Weight of fish (g)
L = Length of fish (cm)

Determination of Condition Factor (K)
The well - being of *Mormyrus rume* based on size and sexes will be determined using the formula according to Pauly 1984 [12] *cited in* Yem *et al*. (2019) [13] as follows:

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

Where;
K = Condition Factor
W = Weight of fish (g)
L = Length of fish (cm)

Statistical Analysis
Descriptive statistics was used to compute for minimum and maximum values, means and standard deviation. Data were analyzed using Special Package for Social Sciences (SPSS) version 13 and Microsoft Excel 2013.

Results
Table 1 showed the various body measurements of *Mormyrus rume* in Sokoto River, Nigeria. Males had standard length ranged from 10.00 cm - 45,00 cm of mean of 25.50 and total lengths of 14.00 cm - 50.00 cm of mean of 28.90. Females had 12.00 cm - 45.00 cm of mean of 23.90 as standard length and 18.00 cm - 48.00 cm of mean 27.00 as total length. Males had weight range of 100.00 g - 450.00 g of mean 227.7 while females had range of 100 g - 390.00 g and mean of 205.11. Combined sexes had 10.00 cm - 45.00 cm of mean 24.77 as standard length, 14.00 cm - 50.00 cm of mean 28.03 as mean and 100.00 g - 450.00 g of mean 217.14 as weight.

Table 1: Body measurements of *Mormyrus rume* in Sokoto River, Nigeria

Parameter	Male	Female	Combined sexes
No	80	70	150
Standard Length (cm)	10.00 - 45.00	12.00 - 45.00	10.00 - 45.00
Mean ± SD	25.50 ± 7.80	23.90 ± 7.57	24.77±7.69
Total Length (cm)	14.00 - 50.00	18.00 - 48.00	14.00 - 50.00
Mean ± SD	28.90 ± 8.22	27.00 ± 7.56	28.03±7.95
Weight (g)	100.00 - 450.00	100.00 - 390.00	100.00 - 450.00
Mean ± SD	227.70 ± 82.60	205.11 ± 78.75	217.14±81.35

Table 2 showed the length distribution of *Mormyrus rume* in Sokoto River, Nigeria. Class interval of 20.00 - 29.00 was highest for males followed by 30.00 - 39.00 while the lowest was 40.00 - 49.00. Female had 10.00 - 19.00 as highest class interval followed by 20.00 - 29.00 while 40.00 - 49.00 was the lowest. Combined sexes had class interval of 20.00-29.00 as highest followed by 10.00 - 19.00 then 40.00 - 49.00 as lowest.

Table 2: Size (length) distribution of *Mormyrus rume* in Sokoto River, Nigeria

Class interval (cm)	Male	Female	Combined sexes
10.00 - 19.00	22	28	50
20.00 - 29.00	29	25	54
30.00 - 39.00	26	13	39
40.00 - 49.00	3	4	7
Total	80	70	150

The length - weight relationship of male *Mormyrus rume* in Sokoto River, Nigeria were shown on figure 1 and table 3. The values of a, b and r were 0.9124, 1.0211 and 0.8525 respectively.

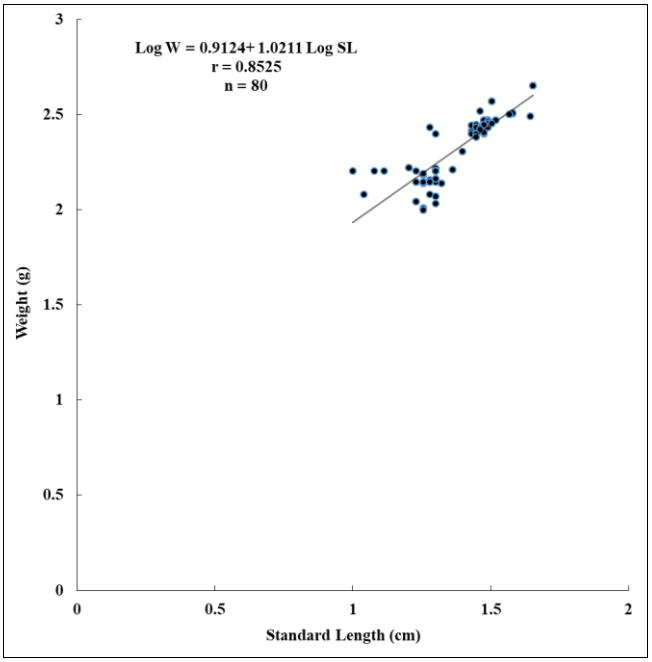

Fig 1: Log length - weight relationship of male *Mormyrus rume* in Sokoto River, Nigeria

The length - weight relationship of female *Mormyrus rume* in Sokoto River, Nigeria were shown on figure 2 and table 3. The values of a, b and r were 0.2936, 1.4969 and 0.9033 respectively.

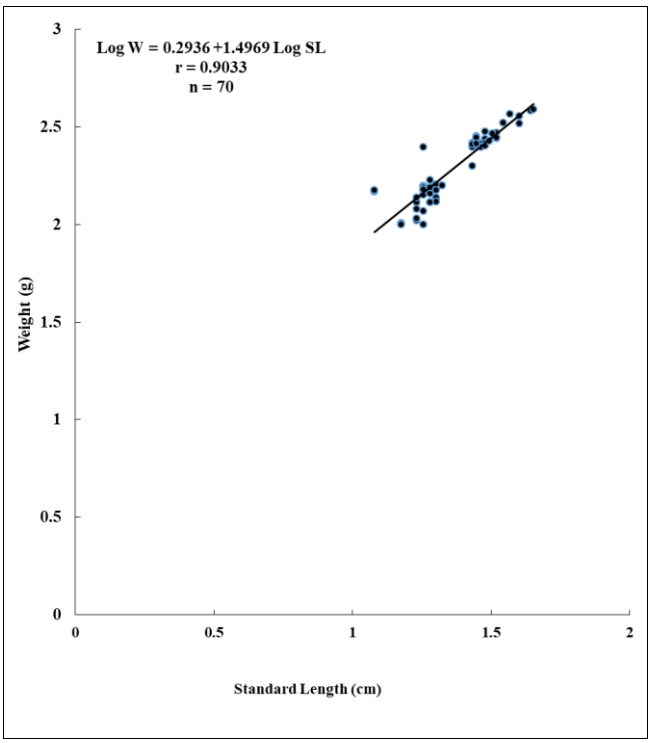

Fig 2: Log length - weight relationship of female *Mormyrus rume* in Sokoto River, Nigeria

The log length: log weight relationship of combined sexes of *Mormyrus rume* in Sokoto River, Nigeria were shown on figure 3 and table 3. The values of a, b and r were 0.8225, 1.08 and 0.8754 respectively.

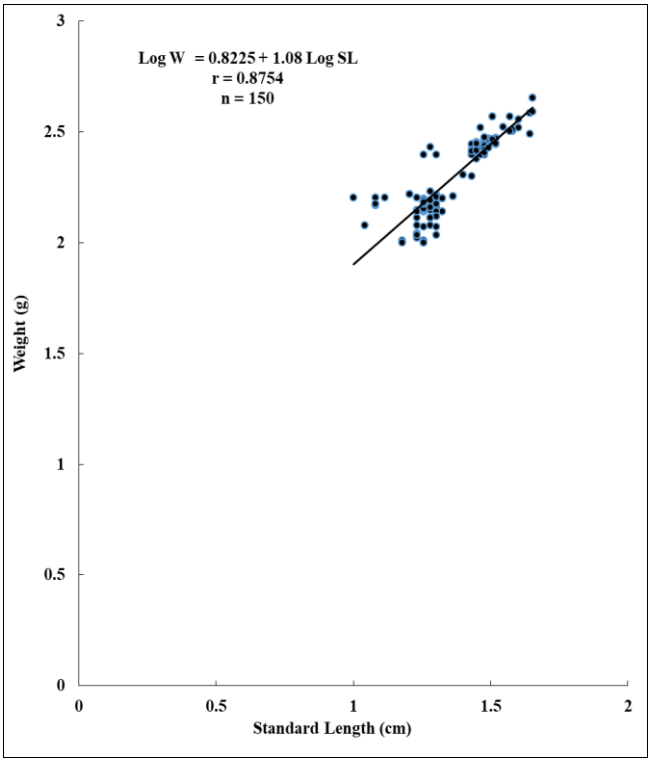

Fig 3: Log length - weight relationship of combined sexes of *Mormyrus rume* in Sokoto River, Nigeria

Table 3: length-weight relationship parameters of *Mormyrus rume* in Sokoto River, Nigeria

Parameter	Male	Female	Combined sexes
a	0.9124	0.2936	0.8225
b	1.0211	1.4969	1.08
r	0.8525	0.9033	0.8754

a = intercept
b = Regression value
r = Coefficient of regression

Table 4 showed the condition factor of *Mormyrus rume* in Sokoto River, Nigeria. Male had range of 0.36 - 2.47 of mean 1.79, female of 0.42 - 3.68 of mean 1.91 and combined sexes with 0.36 - 3.68 of mean 1.93.

Table 4: Mean condition factor (K) of *Mormyrus rume* in Sokoto River, Nigeria

Parameter	Minimum - Maximum	Mean ± SD
Male	0.36 - 2.47	1.79 ± 1.03
Female	0.42 - 3.68	1.91 ± 1.09
Combined sexes	0.36 - 3.68	1.93 ± 1.18

a = exponent describing the rate of change of weight with length (intercept), b = regression coefficient (slope), r = correlation coefficient

Discussion

The body measurements of *Mormyrus rume* varied during the period of study. This indicate the presence of different sizes of the fish in the river. This is a common observation in water bodies where a particular fish species differ in length and weight. Male had higher mean standard length than of female. Likewise means of total length and weight of being higher in male than female. This is an indication that male were bigger than female. This is contrary to the findings of Odedeyi *et al*. (2007) [9] where female were bigger than male in terms of length and weight. This could be due to differences in sampling period, location and level of maturity amongst others.

Size class or length - frequency distribution of *Mormyrus rume* showed different groups in the river. For the male, sizes within 20.00 - 29.00 cm dominated the population while female was within 10.00 - 19.00 cm. This is also reflected in combined sexes where 20.00 - 29.00 cm dominated. This implies that fish ranging from small to medium sizes were more in the population than older ones even though few large or mature numbers were recorded in 40.00 - 49.00 cm class for male, female and combined sexes. Odedeyi *et al*. (2007) [9] reported sizes of *M. rume* of less than 20.00 cm, 20.00-34.00 cm and greater than 35.00 cm as small, medium and large sizes, respectively. Converting these values to percentages, it implies that 69.3%, 76.0% and 64.0% of combined sexes, female and male populations during this study have not attain maturity. There was also decline in the number of fish in the population as the class size increases. This could be due to recruitment, period of sampling, adaptive behavior of fish and the type of gear used amongst others.

Growth is an important parameter of fish, which can be assessed by evaluation of weight in relation to length as well as body depth (Omoniyi *et al.*, 2010) [11]. The relationship between length and weight parameters is very vital in the assessment of growth pattern of fish in the aquatic environment. It also helps in knowing the productivity indices of fish (King, 1996) [7], providing information on

population structure and stock composition of fish in water bodies. More importantly to determine growth pattern of fish. This can be known by the slope of the graph (b - value) of these parameters. If the b - value from regression is equal to 3 the growth is isometric and less than 3 is allometric. The results of this study showed that male, female and combined sexes of *M. rume* exhibited allometric growth patterns and to be specific negative allometric growth. This indicates that the length of the fish regardless of sex are not growing at the same proportion with their weights. This implies that both male and female of Mormyrus rume were slender or thin. This is similar to the findings of Lawal and Bichi (2014) [78] and Imorou *et al*. (2019) [5]. This could be due to difference in sizes, water quality, spawning period and food availability amongst others.

The level of association (r) between growth parameters of fish is very important in fisheries. This helps to define the extent at which the length influence the weight. The r - values of *Mormyrus rume* indicates positive relationship between length and weight. Female r - value was higher than that of male. Converting these values to percentages, it shows that length and weight of *Mormyrus rume* correlate up to 90%, 87.5% and 85% for female, combined sexes and male respectively. Similar relationship was reported by Odedeyi *et al*. (2007) [9] and Imorou *et al*. (2019) [5]. This could be due to sizes difference and stages of development.

Condition factor (K) is also very important in fisheries management. It can be used to assess the well - being of fish in a given population. Once the value is 1(unity) and above the fish is in good condition, therefore the environment is favourable. The results of this study showed that the mean condition factor of male (1.79), female (1.91) and combined sexes (1.93) is above unity. This implies that the fish regardless of sex is in good condition in the river. This is contrary to the findings of Lawal and Bichi (2014) [8]. This could be attributed to availability of food, good water quality.

Conclusion

Male of *M. rume* were bigger than female in Sokoto River as shown by their body measurements.

Size class based on length - frequency distribution showed that majority of the fish regardless of sex have not attain maturity. Small, medium to few large sizes were recorded in the population.

The growth patterns of *M. rume* showed that male, female and combined sexes exhibited negative allometric growth; fish grows slimmer as the length increases.

There was positive relationship between length and weight of *M. rume* in the river.

Condition factor (K) of male, female and combined sexes are above unity hence the fish was in good condition.

Recommendations

- Similar study need to be done for the remaining month to show seasonal trend in the growth
- This study should be used as baseline information to formulate management strategies of this fish species in the river
- Other aspects of the biology need to studied
- Water quality of the river need to be analyzed

References

1. Abobi SM, Wolff M. West African reservoirs and their fisheries: An assessment of harvest potential. Ecohydrol Hydrobiol [Internet], 19: DOI: 10.1016/j.ecohyd.2019.11.004.
2. Andersen KH, Beyer JE. Size structure, not metabolic scaling rules, determines fisheries reference points. Fish Fish [Internet],2015:16(1):1–22. DOI: 10.1111/faf.12042.
3. Ayandiran TA, Fawole OO. Seasonal distribution and condition factor of Clarias gareipinus from polluted Oluwa River, Nigeria. IOSR J Pharm Biol Sci [Internet],2014:9(4):86–93.
4. Bolarinwa JB. Length-weight relationships and condition factors of Oreochromis niloticus and Chrysichthys nigrodigitatus in Mahin lagoon, Nigeria. Res J Agric Environ Manage [Internet],2016:5(3):75–80.
5. Imorou RS, Adite A, Sossoukpe E, Abou Y. Length-weight models and condition factors of fishes from Okpara Stream, Oueme River, Northern-Benin. Int J For Anim Fish Res [Internet],2019:3(3):65–80.
6. International Union for the Conservation of Nature. Red list of threatened species. International Union for the Conservation of Nature (IUCN) [Internet], Version 2014.3: Available from: www.iucnredlist.org.
7. King RP. Length-weight relationship of Nigeria freshwater fishes. Naga ICLARM Q [Internet],1996:19(3):49–52.
8. Lawal I, Bichi AH. Length-weight relationship and condition factor of 11 commercial fish species of Daberam Reservoir, Katsina State. Entomol Appl Sci Lett [Internet],2014:1(3):32–35, Available from: www.easletters.com.
9. Odedeyi DO, Fagbenro O, Bello-Olusoji O, Adebayo O. Length-weight relationship and condition factor of the elephant fish, Mormyrus rume (Valenciennes, 1846) in River Ose, Southwestern Nigeria. Anim Res Int [Internet],2007:4(1):617–20.
10. Olaosebikan BD, Raji A. Field Guide to Nigerian Freshwater Fishes. 4th ed. University of Ilorin Press, 2021, 231.
11. Omoniyi IT, Oyewumi JO, Ezeri GNO. Morphometric structuring of Nile tilapia Oreochromis niloticus from three man-made lakes in southwest, Nigeria. Niger J Fish [Internet],2010:7(1-2):39–48.
12. Pauly D, Leveque C, Teugels GG. The Freshwater and Brackish water Fishes of West Africa. Institute of Research and Development Editions. Collection Faune et Flore tropicales,2003:40(1):457.
13. Yem IY, Amos L, Bankole NO, Adamu I. Growth pattern and condition factor of three commercial fish species of Jebba Lake, Nigeria. Int J Appl Res Technol [Internet],2019:8(3):16–22.