

DETERMINATION OF GROWTH PATTERN AND SPAWNING SEASON OF ELEPHANT SNOOT FISH, *Mormyrus rume* (Valenciennes, 1846) IN RIVER NIGER, KEBBI STATE, NIGERIA

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ABSTRACT

The research was carried out to determine the growth pattern and spawning season of Elephant Snout Fish (*Mormyrus rume*) in River Niger at Gafara Ngaski, Kebbi State, Nigeria. A total of one hundred and six (106) samples were collected for the research, which covered a total of twelve months (January – December, 2020). Fifty-four (54) out of the total fishes used for the study were females while fifty-two (52) were males. The fishes were purchased from fishermen and placed into sterile plastic containers using containing ice block and transported to the laboratory in the Department of Forestry and Fisheries, Kebbi State University of Science and Technology, Aliero, for analysis. Morphometric measurements of the fish were taken using standard methods and the fish were dissected to take data on gonadosomatic index (GSI). The 'b' values for females and males were 1.545 and 1.578, with correlation coefficients (r^2) of 0.944 and 0.919, respectively. The GSI was highest in December ($5.22 \pm 1.66\%$), indicating the peak spawning period. The study revealed that the fish exhibit negative allometric growth pattern.

Key words: Growth pattern, Spawning season, *Mormyrus rume*, Gafara River.

INTRODUCTION

Nigeria as a nation is endowed with vast indigenous fish species in inland waters which can enhance aquaculture development to a greater extent, however, the reverse is the case because, the current demand for fish is about four times the level of local production. The number of species is on the decline especially due to impoundments and other anthropogenic activities. The establishments of industries, chemical plants, and thermal- and hydropower plants near the water resources as their discharge affect the ecology of water body resulting in loss of biodiversity (Tewari and Bisht, 2021). Increased farming activities, climate change, water pollution, housing and breakwater construction might have influenced the condition and reproductive capacity of the fishes in the River Niger negatively (Lae *et al.*, 2021). Some of the most important factors necessary in the successful culturing of a fish species are obtaining a basic understanding of its key biological processes, including its growth pattern, reproductive biology as well as food and feeding habits. *Mormyrus rume* constitute a prominent proportion of the total fish landing in freshwater fish landing sites in Nigeria (Reeds, 1967), and are increasingly becoming important in the world aquarium business and are good candidates for aquaculture. The purpose of this study was to establish the Length-weight relationships and spawning season of *M. rume* population of the River Niger at Gafara, Ngaski, in the North-Western Nigeria which might be used as a first step towards culture and improved management of the species.

MATERIALS AND METHODS

Study Area

The study was conducted on River Niger at Gafara landing site, Ngaski Local Government Area, Kebbi State. Gafara is a fishing village along the River Niger, located at the Western part of Ngaski town between Latitude $10^{\circ} 23' 34.7''$ N and Longitude $4^{\circ} 37' 15.7''$ E.

Samples Collection

A total of one hundred and six (54 females and 52 males) samples of *M. rume* were purchased over 12 months study period from the fishermen at Gafara Fish Landing Site.

Species Identification

The species were identified according to fish identification manual (Olaosebikan and Raji, 2013).

Sex Determination

The sexes of *Mormyrus species* were identified after dissection and the gonads inspected.

Data Analyses

3.6.1 Length-weight Relationship Determination

The relationship between length and weight was determined using the equation:

$$W = a L^b \text{ (Le Cren, 1961)}$$

Where,

W = fish weight; L = fish standard length; a = constant; b = slope.

Estimation of the Length weight parameters was done using the Microsoft Excel using Regression analysis as statistical tool favorable for the analysis. The data was log transformed and scatter plots used to depict the correlation between the length and weight.

3.6.2 Determination of Condition Factor

Fulton's condition factor was determined from the expression:

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

Where, K = condition factor; W = fish body weight (g); L = standard length (cm).

3.6.3 Determination of Spawning Period

The gonads were removed by opening up the abdomen. The spawning periodicity of the fish was determined by monthly evaluating the Gonadosomatic Index (GSI) using the formula:

$$GSI = \frac{\text{Gonad weight (g)}}{\text{Body weight (g)}} \times 100$$

RESULTS

Length-Weight Relationship of *Mormyrus rume* in River Niger at Gafara, Ngaski, Kebbi State

The Length-weight relationships of female and male *M. rume* are presented in Fig. 4.1 and 4.2, respectively. The Standard length (SL) and Body weight (BW) of the fish samples examined varied between 4.20 and 44.15 (Mean = 12.85±16.98cm) and 17.6 and 249.6 (Mean = 111.83 ± 231.56g), for females, respectively, while for the males, the SL and BW varied from 12.1 to 42.65 (Mean = 18.32±16.16 cm) and 65.00 to 432.67 (Mean = 171.45 ± 196.67 g), respectively, over the 12 months' study period. After log transforming the data, the graph (Fig. 1) of $W = \ln a + b (\ln SL)$ gave a Y – axis intercept of 0.103 and a slope of 1.545 (female) while for the males (Fig. 2) a Y – axis intercept of 0.141 and a slope of 1.578 was obtained. The exponential form of the Length-weight relationships for female *M. rume* is $W = 1.108491L^{1.545}$ while for males, $W = 1.1514L^{1.578}$. The 'b' values for females and males were 1.545 and 1.578, with correlation coefficients (r^2) of 0.944 and 0.919, respectively.

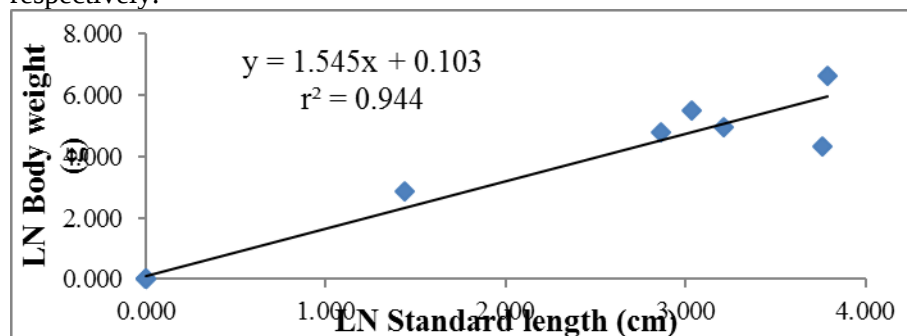


Fig. 1: Length-weight relationship of female *Mormyrus rume* in River Niger at Gafara

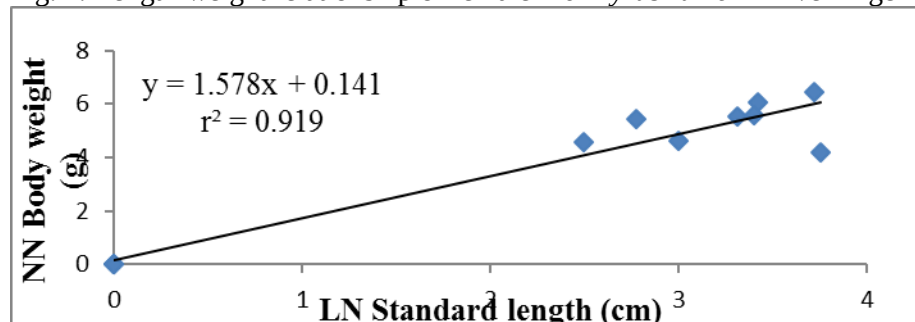


Fig. 2: Length-weight relationship of male *Mormyrus rume* in River Niger at Gafara

Spawning Season of *M. rume* in River Niger at Gafara

The Gonado somatic Index (GSI) of *M. rume* during the year 2020 was estimated monthly and the values expressed in percentages. The GSI began to rise in February but decreased in March, indicating pre-spawning period (Figure 3). The GSI was highest in December ($5.22 \pm 1.66\%$), indicating peak spawning period.

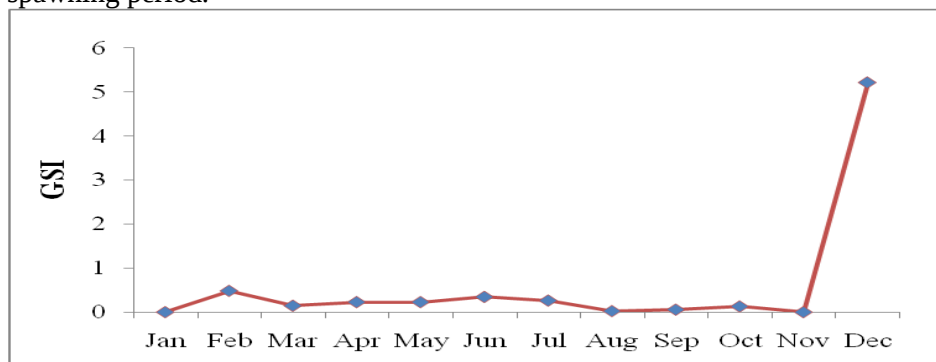


Figure 3: Gonadosomatic index of *Mormyrus rume* during the year 2020 in River Niger at Gafara

DISCUSSION

Length – Weight Relationship

Estimation of the Length –weight relationship of *M. rume* in River Niger at Gafara showed the growth pattern of female and male as negative allometric ($b < 3$), which means that the weight of both sexes does not increase with corresponding increase in length. Negative allometry was also found in *Trachinotus marginatus* (Lemos *et al.*, 2011). Positive allometric growth was found in *Sardinella maderensis* and *Cynoglossus senegalensis*, with $b = 6$ and 3.5 , respectively (Abowei *et al.*, 2009). These are contrary to the findings from this study. Differences of b value of *M. rume* in River Niger from other species of different water bodies could be due to differences of food abundance, season, sex and environmental degradation (Bangenal, 1978). High coefficient of determination (r^2) observed between log length and log weight showed the existence of good relationship between length and weight for both sexes.

Gonadosomatic Index (GSI) of *M. rume*

The GSI of a fish increases with maturation of the fish which is highest during the peak period of maturity and drops abruptly after spawning. The GSI of the Elephant Snout fish (*M. rume*) was averagely low from January to September but tremendously increased in December, thus, reaching its peak in December. This is in agreement with the GSI recorded for *Pomadasys commersonnii* which ranged from $0.4 - 5.5\%$ for both sexes (Amtyaz *et al.*, 2013). Higher GSI ($18.34, 7.87\%$) were recorded for *M. rume* from Lekki lagoon and Epe lagoon Nigeria, respectively (Igejongbo *et al.*, 2018), which are in contrast to the findings of this study. The difference could be attributed to presence of more food items and better condition for the fish in the lagoon than in the river due the relative stability of the lagoons. The peak GSI recorded in December during this study is an indication that *M. rume* spawns once in a year. Peak value of GSI was observed only once for *Channa marulius* and *Barbus luetus* (Nazir *et al.* 1978; Tiwari *et al.*, 2014), indicating one spawning period for the fishes, which is similar to the findings of the present study.

CONCLUSION

The study revealed that the fish exhibit negative allometric growth pattern which means that the weight of both sexes does not increase with corresponding increase in length.

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