LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF THE ELEPHANT FISH, *Mormyrus rume* (Valenciennes, 1846) IN RIVER OSE, SOUTHWESTERN NIGERIA

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ABSTRACT

A total of 791 elephant fish, Mormyrus rume specimens of various sizes were sampled from River Ose, southwestern Nigeria. Length-weight relationship and condition factor of the M. rume specimens were studied. Their standard lengths ranged from 15.0 to 45.0 cm. Mean standard length for males, females and combined sex were 27.86 cm, 30.08 cm and 28.97 cm, respectively. The body weight ranged from 75.5 to 610.0 g. Mean body weight for males, females and combined sex were 167.57 g, 237.38 g and 202.48 g, respectively. Length-weight relationship for males, females and combined sex were 1.699, 2.134 and 1.990, respectively. The fish exhibited allometric growth in the river. The predictive equation was log W = -0.636 + 1.99 log L. The mean condition factor varied between seasons. The mean condition for males, females and combined sex were 0.787, 0.859 and 0.823, respectively. The condition factor decreased with increase in individual sizes.

Key words: Length-weight relationship, Condition factor, *Mormyrus rume*, River Ose, Nigeria

INTRODUCTION

Mormyrus rume Valenciennes, 1846 (Pisces: Mormyridae) are found in fresh waters of tropical Africa (Meek, 1916; Greenwood *et al*., 1966; Fawole, 2002). They occur in fast moving waters with demersal habits. Members of the family have rudimentary electric organs situated on each side of the terminal portion of the tail and they possess large brains (Holden and Reed, 1972).

Length-weight relationships of fishes are important in fisheries biology because they allow the estimation of the average weight of the fish of a given length group by establishing a mathematical relation between the two (Beyer, 1987). Like any other morphometric characters, the Length-weight relationship can be used as a character for the differentiation of taxonomic units and the relationship changes with various developmental events in life such as metamorphosis, growth and the onset of maturity (Thomas *et al*., 2003). Besides this, the length-weight relationship can also be used in setting yield equations for estimating the number of fish landed and comparing the population in space and time (Beverton and Holt, 1957). Furthermore, the empirical relationship between the length and weight of the fish, enhances the knowledge of the natural history of commercially important fish species, thus making the conservation possible.

The condition factor (K) (Le Cren, 1951) is a quantitative parameter of the well-being state of the fish and reflects recent feeding conditions. This factor varies according to influences of physiologic factors, fluctuating according to different stages of the development. Anderson and Neumann (1996) refer to length-weight data of population as basic parameters for monitoring study of fisheries, since it provides important information concerning the structure and function of the populations.

The objective of this study was to determine the length-weight relationship and condition factor among seasons, sexes and sizes of *M. rume* populations in river Ose, southwestern Nigeria.

MATERIALS AND METHODS

Study Area: River Ose is a major perennial river in the southwestern part of Nigeria. The river took its source from Apata hills and flows through the Savanna, the rainforest down to the mangrove forest and discharges into the Atlantic Ocean through a series of creeks and lagoons. The river lies between longitudes 5°20'E to 6°10'E and latitude 6°20'N to 8°00'N. It flows approximately 300 km from its source before breaking into series of creeks and lagoons (Figure 1). Traditional fishing has been known in this river and has been sustaining a thriving fishery in that part of the country (Fagbenro *et al*., 1991). The fish fauna is very rich and varied. Fishes of commercial importance found in the river are *Oreochromis niloticus, Sarotherodon galilaeus, Tilapia zillii, Parachanna obscura, Heterobranchus longifilis, Clarias gariepinus, C. anguilaris, Labeo coubie, Hepsetus odoe, Malapterurus electricus, Mormyrus rume, M. hesselquisti, M. macrophthalmus* and *Mormyrops* spp. The fishermen operate from non-powered dug-out canoes and use a variety of gears which include gill nets of various mesh sizes, long lines (with baited and unbaited hooks), traps (trigger type and non-return valve type) and cast nets.

Fish landing reaches the peak twice in November - January (during the dry season when river level is low) and in May - July (when river level rises due to frequency in rainfall). In August - October, landing is minimal because of flood.

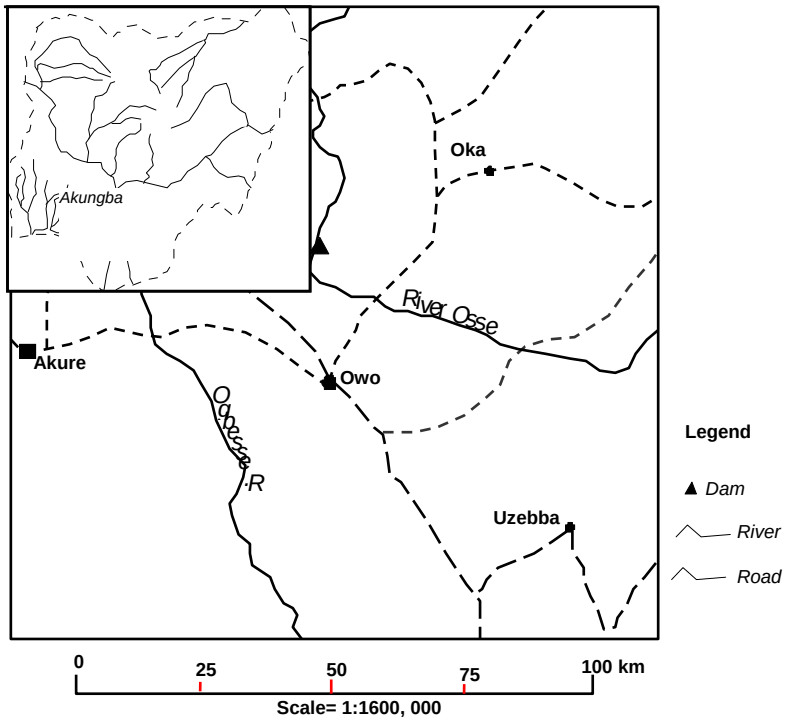

Figure 1: Map of Ose River Basin showing Nigeria Inset

Fish Sampling: *M. rume* specimens were collected once weekly, directly from fresh landings of fishermen from river Ose over 24 months. The specimens, totaling 791, were selected randomly to include various size ranges. The specimens were sorted into three size groups namely, small (<20.00 cm), medium (20.01-34.99 cm) and large (>35.00 cm). Records of total length (cm), standard length (cm) and body weight (g) measurements of individual fish were made in the field before preserving them in ice. The specimens were dissected, sexes were noted, gonads and digestive systems were removed and kept in cross-reference plastic bottles for laboratory investigations.

Data Analysis: Length-weight relationship was calculated using Le Cren (1951) equation $W = aL^b$. The data were transformed into logarithms to determine the growth pattern thus: Log W = Log a x b Log L, where W = body weight of fish (g), L = standard length of fish (cm), a = constant, b = exponent. The condition of the fish was expressed by Fulton's condition factor (K), calculated using the formula: $K = 100W/ L^3$.

RESULTS

Length-weight Relationship: The total lengths of 791 specimens of *M. rume* examined in this study ranged from 17.0 to 50.0 cm while the standard lengths ranged from 15.0 to 45.0 cm. The weights ranged from 74.50 to 610.0 g. Figure 2 illustrate the length-weight relationship of the species. Table 1 presents the length-weight regression analysis of the species. Relationship between standard length and body weight of all the specimens were estimated as: Log W = -0.636 + 1.99 Log L, r = 0.865. The b values for males, females and both sexes were shown in Table 1. The females had better b values of 2.134 indicating the possibility of better growth patterns than males (1.699) and combined sex (1.990).

Condition Factor (K): The condition factor (K) value was calculated for *M. rume* and examined in relation to sex, size and season; and ranged from 0.41 to 1.21, 0.44 to 2.21 and 0.41 to 2.21 for males, females and combined sexes, respectively. Mean K values were 0.784, 0.849 and 0.817 for males, females and combined sexes, respectively. Figure 3 illustrates the mean condition factor for the three size groups of combined sexes while Table 2 presents the mean seasonal condition factor (K) for the combined sexes.

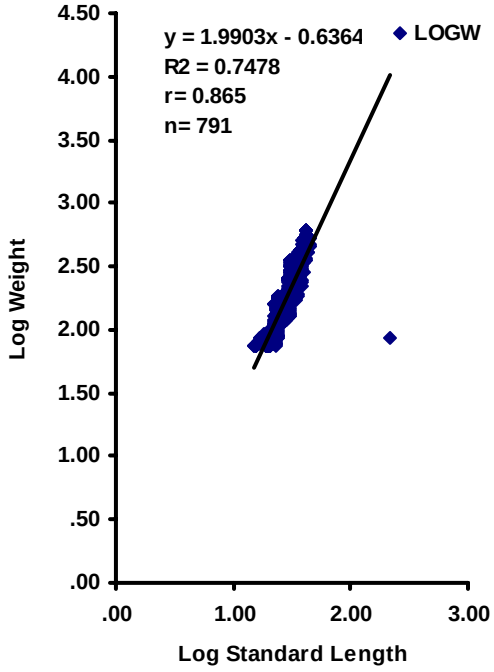

Figure 2: Length-weight relationship of *M. rume* from River Ose (October 2004 - September 2006).

Table 1: Length-weight regression analysis of *M. rume* in River Ose

Sex	No. of fish examined (n)	Log a	Log b	Correlation coefficient
Male	352	-.266	1.699	0.822
Female	439	-0.812	2.134	0.910
Combined sexes	791	-0.636	1.990	0.865

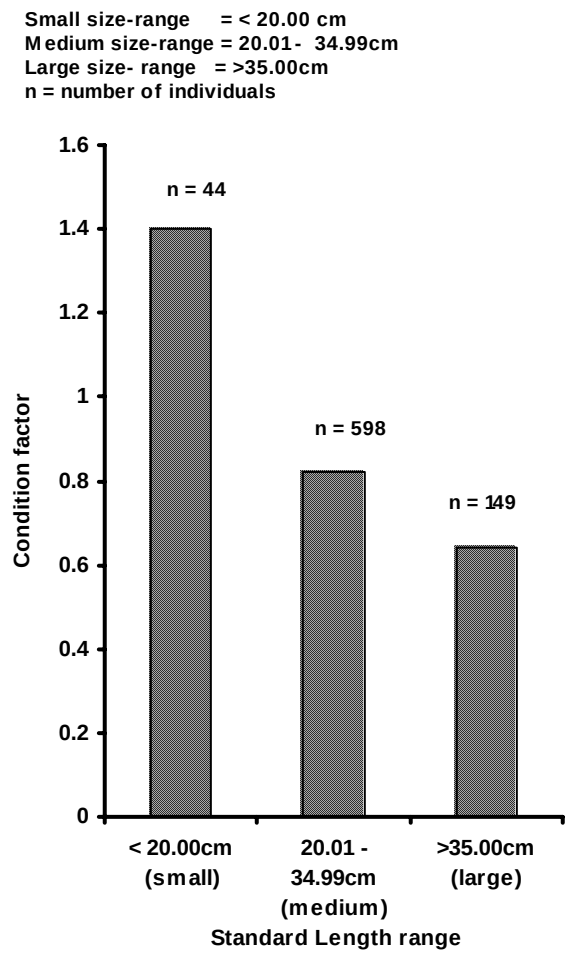

Figure 3: Means of condition factor for *M. rume* by size-range in River Ose (October 2004 - September 2006).

Table 2: Seasonal mean condition factor of *M. rume* from River Ose

Season	No. of specimens examined	Mean condition factor (K)
Dry (October 2004-March 2005)	190	0.793 ± 0.028
Wet (April-October 2005)	247	0.916 ± 0.097
Dry (November 2005-March 2006)	151	0.782 ± 0.040
Wet (April-September 2006)	203	0.908 ± 0.073

DISCUSSION

Fish weight is considered to be a function of length (Weatherley and Gill, 1987; Zafar *et al.,* 2003). For an ideal fish, which maintains dimensional equality, the isometric value of b would be 3.0. This has occasionally been observed (Allen, 1938; Thomas *et al*., 2003). A value significantly larger or smaller than 3.0 indicates allometric growth (Tesch, 1978). A value less than 3.0 shows that the fish becomes lighter (-ve allometric) or greater than 3.0 indicates that the fish become heavier (+ve allometric) for a particular length as it increases in size (Wootton, 1998; Zafar *et al*., 2003). From Figure 2, it was evident that the weight of *M. rume* increases as the length increases. The b values for males, females and combined sexes (Table 1) show a negative allometric growth with the general assumption that the specific gravity of the fish remained constant (Tesch, 1978). Le Cren (1951) and Fagbenro *et al*. (1991) stated that obedience to the cube law (isometric growth, b = 3) was rare in a majority of fishes and this was true for *M. rume* in this study in which there was a deviation from the cube law. This value was close to the values reported for some freshwater fish species (Thomas *et al*., 2003).

Correlation coefficients were very high and highly significant (Table 1) an indication that changes in standard length and weight of this Elephant fish species were proportional in one direction. Nikosky (1963) reported that the larger the condition factors the better the condition of the fish. In this study the female *M. rume* were in a better condition than the males. This agrees with the results of Oben *et al*. (1999) on *M. rume* in Lekki lagoon. There was a general decrease in condition factor with increasing length of the specimens (Figure 3). This means that increase in length did not bring about proportional increase in weight. Mgbenka and Eyo (1992) and Fawole (2002) attributed the differences in condition factor to the deposition of materials for gonad formation, which led to increase in weight and actual spawning which led to reduction in fish weight respectively.

Mean monthly indices of condition, K values (Table 2) shows that there was an improvement in fish condition between April and September (wet season). This observation agrees with the findings of Welcomme (1979) and Fagbenro *et al*. (1991) for many freshwater fishes in Africa. Lagler *et al*. (1977) attributed such differences in seasonal values of condition to availability and abundance of food supply, timing and duration of breeding cycle; physiological stress caused by changes in water quality properties within the habitat; sexual differences age; changes in seasons; and gonad maturity stages in fish. The seasonal variations in fish condition observed in this study may be attributed to the availability of natural food in the habitat consequent upon flooding during the rainy season which resulted in the inundation of previously dry ground thereby altering a number of water quality properties which ensured growth and production of natural food.

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