Some Aspects of the Biology of African Electric Fish *Mormyrus rume* Valenciennes, 1846 (Osteoglossiformes; Mormyridae) in Lower River Niger at Idah, Kogi State, Central Nigeria

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Abstract:
Aspects of the biology of Mormyrus rume (Valenciennes 1846) in Lower River Niger at Idah, Kogi State, central Nigeria were investigated. This included the length-weight relationship, condition factor and food and feeding habits of the fish species. The major fishing methods employed for collecting the 220 specimens were gillnetting and drag netting. Analysis of stomach content was by numerical, frequency of occurrence and point methods. The length weight relationship was determined using linear correlation and regression analysis. The weight of the fish ranged from14.0g (SL = 12.2cm) to 79.4g (SL = 21.0cm) with mean value of 42.9g (11.5cm S L). The b value is 3.3, 3.2 and 3.2 for male, female and combined sexes respectively. The fish exhibited positive allometric growth. The average condition factor value of 0.93, 0.86 and 0.89 are recorded for the male, female and combined sexes respectively. The low average condition factor recorded in this study is as a result of the fact that the samples studied were post juveniles. The length of the gut in relation to the length of the body was about one third of the body length (1:3).The species fed on animal materials (Chironomous larvae and adult insects). The major food items encountered in the stomachs were majorly zoobenthos of which Chironomous larvae was dominant (commonness field >50)

Keywords: Chironomous, length-weight relationship, body, allometric growth, condition factor

1. Introduction

Length-weight relationships are two basic components in biology of fish species at individual and population levels (Ekelemu and Zelibe, 2006). It gives a quick overview of any aspect of its life in the laboratory (Ugwumba, 2003). It is 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. It is also used to determine possible differences between separate unit stocks of the same species (King, 2007).

Mormyrus or elephant snout fishes are freshwater tropical fishes. They are curious looking fish, highly variable in the shape of their head and the extent of their unpaired fin. They are reported to be bottom dwellers feeding on insect larvae (Babatunde and Raji, 2004). Fawole, (2002) identified detritus and plant parts in the diet of *M. rume* in Lekki lagoon, Nigeria. Odedeyi *et al.* (2007) reported allometric growth value of 1.699, 2.134 and 1.990 for males, females and combine sexes of *M. rume* respectively from river Ose, southern Nigeria with varying condition factor decreasing with increasing sexes. The mean condition for males, females and combined sex were 0.787, 0.859 and 0.823, respectively. *M. rume* are readily available, tasty and relatively cheap. They account for a significant proportion of the total fish landing in most fresh fish landing sites in Nigeria (Reed *et al,* 1967). Mormyrids are increasingly becoming important in the world aquarium business, aquaculture and neurological studies (Gosse, 1984). The knowledge of some aspects of the biology of *Mormyrus rume* will provide a basis for comparative studies and also for the proper management of the species in culture for maximum yield.

2. Materials and Methods

2.1. Description of study area

The study area is lower river Niger at Idah. It is located between latitudes $7^0 04^1$ and $7^0 06^1$ and longitude $6^0 45^1$N and $6^0 45^1$E. The river extends from Lokoja via Ajaokuta and Itobe to Idah. The temperature of the water ranges from 22^0C to 31^0C. It is characterised by tropical savannah climate vegetation with two clearly marked seasons of wet (between April and October) and dry (between November and April), Areola *et al.*, 2007. The dry cold wind is experienced between November and January when the hot season starts and last until the rain begins. The highest water level are between August and September and the lowest between March and April. The river forms a boundary between Kogi and Edo states. Figure 1 shows the map of lower river Niger at Idah (popularly known as river Ega by the native settlers).
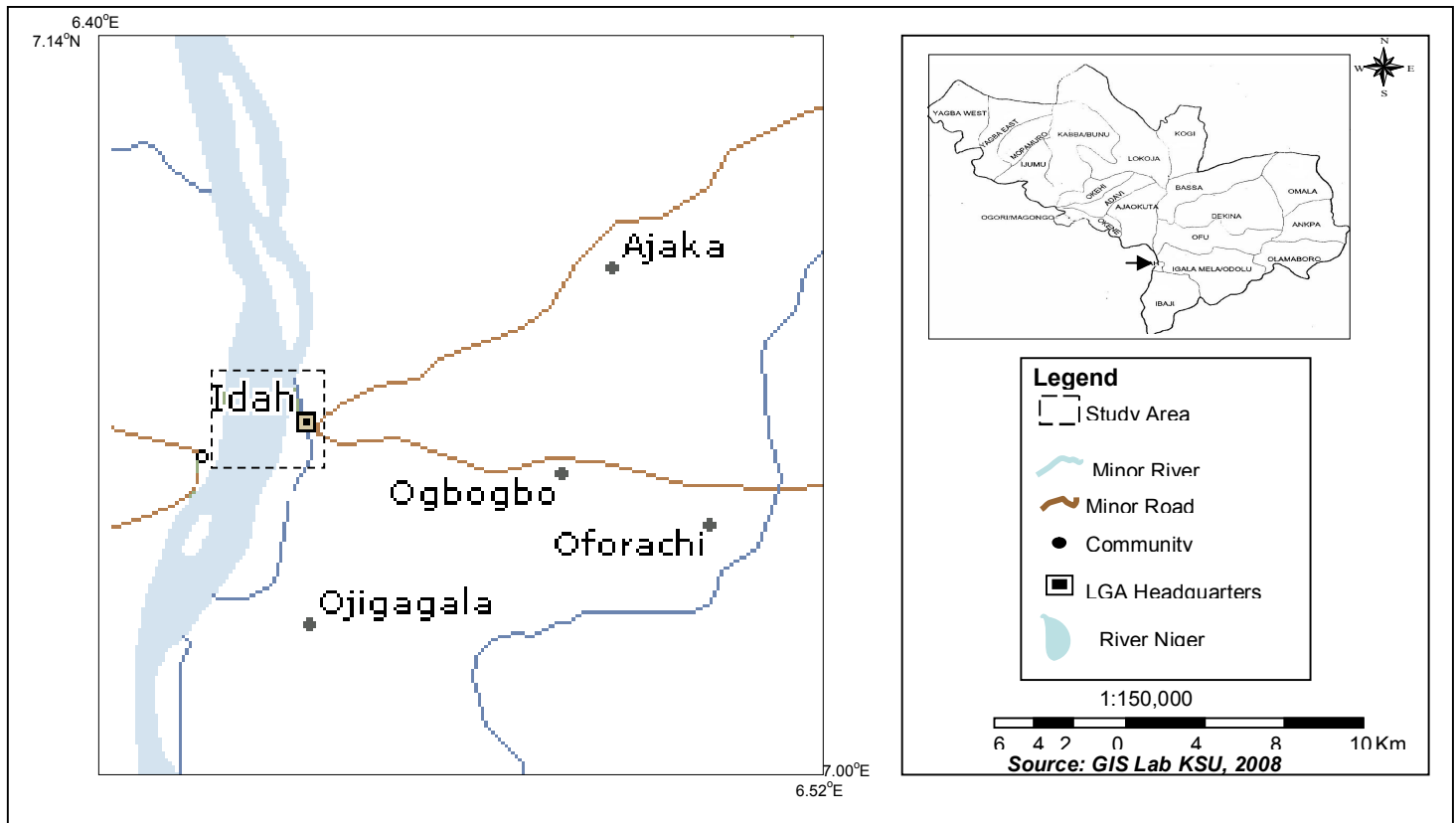

Figure 1: map of lower river Niger at Idah

2.2. Collection of Samples

A total of two hundred and thirty (220) fish samples were obtained from Ega landing site at Idah, Kogi State of Nigeria. Sampling was done bimonthly from the period of September, 2010 to December, 2010.They were identified immediately using the identification keys and catalogue provided by Olaosebikan and Raji (2004). The samples were transported to the laboratory in an ice box. Analysis was done on the fish samples immediately, and any leftover samples were refrigerated to avoid post-mortem for further analysis.

2.3. Method of Collection of Samples

Fish samples for the study were obtained from one source, at the commercial fish landing site at Ega, Idah. The fishing gears used are gill net and dragnet; collection was made between the hours of 10: 00am and 11: 00am in the morning.

2.4. Sex Identification and Measurement

Identification of sex was based on visual examination of the papilla. The samples were sorted by sex into two categories, the male and female. Each fish was given a serial number and weighed using a top load weighing balance in gram. The Standard length of each specimen was taken from the beginning of the snout to the most extreme caudal fin using a meter rule.

2.5. Stomach Content Analysis

Each fish was placed on the table and dissected using a dissecting kit. Dissection was from the anus (vent) to the jaw. The gut was weighed and length of the gut was also taken to the nearest 0.1cm. The contents of each stomach were emptied into the petri dish. 10% saline solution was added to the content to disperse the food items. The food items were sorted out into categories and identified to

species level were possible. Analysis of the stomach content was done using numerical, point and frequency of occurrence methods provided by Hyslop (1980) and Coastal *et al.* (1992).

2.6. Length-Weight Data Analysis
The length-weight data was determined by using linear regression and correlation. The relation between length and weight is given by the equation
$W = a L^b$ (Le, Cren, 1961) or $W = a + b L$ .Where
W –weight of the fish (g),
L – Standard length of fish (cm),
a – Constant and
b – The growth factor.

2.7. Condition factor
The Condition Factor was computed using Fulton's condition factor (Ricker, 1975). It is given by the relation,
$$K = \frac{W \times 100}{L^b}$$
Where
K – Fulton's condition factor.
W – Weight of fish (g),
L – Standard length (cm)
b – Growth exponent

3. Statistical Analysis
The length and weight data were transformed into logarithm and keyed into the software, Statistical Package for Social Sciences (SPSS) version 15.0 for linear correlation and regression analysis.
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4. Results and Discussion
The weight of the fish ranged from14.0g (SL = 12.2cm) to 79.4g (SL = 21.0cm) with mean value of 42.9g (11.5cm S L). Standard lengths ranged from 12.2 to 21.0cm in male and 12.2 to 20.5cm in female. The maximum reported size by Olaosebikan and Raji, 2004 for adult *M. rume* is 100 cm. The maximum size of 21.0cm recorded in this study suggests that the samples used were post juveniles. Average k value for *M. rume* studied was 0.86 which is less than 1. This report is contrary to that of Fawole (2002) who reported average condition factor of 1.12 for the species in Lekki lagoon, Lagos state. According to Bolger and Connolly (1989), condition factor values of 1and above indicates that the fishes are healthy and fare well in the water and values of less than 1did not reflect good physiological and environmental conditions. The size range, mean condition factor and length-weight parameters of *M. rume* from lower River Niger at Idah are presented in table1.

Sex	N	SL (cm)	Weight (g)	Condition factor		a	b	r
		range	range	range	mean			
Male	86	12.2-21.0	15.9-71.0	0.48-1.53	0.93	0.74	3.3	0.9
Female	134	12.2-20.5	14.0-79.4	0.44-1.47	0.86	0.72	3.2	0.8
Combined	220	12.2-21.0	14.0-79.0	0.44-1.47	0.89	0.73	3.2	0.9
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Table1: Size range, mean condition factor and length-weight parameters of M. rume in lower River Niger at Idah
N – total number of samples, S L – standard length, a – intercept on y-axis, b – growth exponent and r – correlation coefficient.

The average condition factor value of 0.93, 0.86 and 0.89 are recorded for the male, female and combined sexes respectively. The value of less than 1 recorded for *Mormyrus rume* in this study is not surprising since condition factor increases with sexual maturity (Thomas *et al.*, 2002). The low values could be as a result of the fact that the samples studied were post juveniles with weight ranging from 14.0g to 79.4g. The correlation coefficients (r) for male, female and combined sexes are 0.9, 0.8 and 0.9 respectively. Weight correlated strongly with length (r > 0.5). The b value is 3.3, 3.2 and 3.2 for male, female and combined sexes respectively. This report is contrary to Odedeyi *et al,* 2007 who reported negative allometric growth in this species with the general assumption that the specific gravity of the fish remained constant. The fish exhibited positive allometric growth in lower River Niger at Idah with b value of 3.2 to 3.3(which is approximately 3). This result agrees with the cube law and is in confirmation with the report of Fawole, 2002 who reported the fish to exhibit isometric growth in Lekki lagoon, Nigeria.
The length of gut in relation to the length of the body was about one third of the body length (1:3) Fish vary tremendously in morphology and physiology of digestive gut and in feeding behaviour. Some fish have gut lengths less than one half of their body lengths especially carnivorous fishes and others have gut about six to eight times of their body length (Falayi, 2009).The length of the gut of *M. rume* is patterned after its feeding habit. The species fed on animal materials (*Chironomous* larvae and adult insects Two hundred and twenty samples were used for stomach content analysis of which 82.7% (N = 182) had food. Three main categories of

food were identified in the various stomachs namely zoobenthos, nekton and detritus. The food items in each category, the percentages in which they occur and their commonness field is presented in table 2.

Food items	Numerical method		Frequency method		Commonness field	Choice
	N	% N	N	% F		
Zoobenthos						
Insecta						
Chironomid larvae	4313	61.06	147	80.8	>50%	Dominant
Chaoborus species	1639	23.2	65	35.7	21-50%	Very common
Unidentified insect	367	5.2	32	17.6	6-20%	Common
Nymphs of unidentified insects	43	0.61	24	13.2	6-20%	Common
Cladocera						
Daphnias spp	501	7.09	57	31.3	21-50%	Very common
Nekton						
Finfish						
Fish fin	13	0.19	21	11.5	6-20%	Common
Fish eggs	187	2.65	15	8.2	6-20%	Common
Detritus						
Organic debris	-	-	162	89	>50%	Dominant
Total	7063	100	182	-	-	-

Table 2: Food items consumed by Mormyrus rume in lower River Niger at Idah Where N is number and F is frequency.

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