Rev. Biol. Trop. 50(2): 689-694, 2002
www.ucr.ac.cr www.ots.ac.cr www.ots.duke.edu

Morphometry and diet of *Mormyrus rume* in the Lekki lagoon, Nigeria

O.O. Fawole
Fisheries Unit, Department of Pure and Applied Biology, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Oyo State, Nigeria. e-mail: fawole@esscon.skannet.com

Received 08-VIII-2001. Corrected 12-XII-2001. Accepted 30-V-2002.

Abstract: Aspects of the biology of *Mormyrus rume* (Cuvier and Valenciennes) in Lekki lagoon were investigated. This included the length-weight relationship, condition factor, food and feeding habits and the fecundity of the fish species. The major fishing methods employed for collecting the 225 specimens were castnetting and setnetting. The total lengths ranged from 15.0 to 24.9 cm while the standard lengths ranged from 13.0 to 23.0 cm. The body weights also ranged from 26.2 to 99.3g. The fish exhibited isometric growth in the lagoon. The mean condition factor obtained was 1.20. The condition factor generally decreased with increase in individual sizes. The major food items were detritus and plant parts. The population of males was significantly higher than the females. The gonadosomatic index showed that *M. rume* in the Lekki Lagoon uses an average of 7.89% of its body weight in egg production. Fecundity ranged from 741 to 6000 eggs with an average of 2991 eggs per female.

Key words: Length-weight relationship, condition factor, fecundity, *Mormyrus rume*, Lekki Lagoon, Nigeria.

Mormyrids or elephant snout fishes are curious looking fish, highly variable in shapes of their head and the extent of their unpaired fins. *Mormyrus rume* belong to the family Mormyridae and are found in freshwaters of tropical Africa (Meek 1916, Greenwood *et al.* 1966).

In Nigeria there is paucity of knowledge on the biology of Mormyrid species. Members of the family have rudimentary electric organs situated on each side of the terminal portion of the tail and they possess extraordinarily large brains (Holden and Reed 1972).

In order to obtain a maximum fish yield from a body of water using the minimum effort and without depleting adversely the available stock, a knowledge of the general biology of resident fishes is essential.

The present study is aimed at making a study of some aspects of the biology of *M. rume*, from the Lekki lagoon Nigeria with particular reference to the length – weight relationship, condition factor, food and feeding habits and fecundity. This will contribute to the limited available information on this fish species which is a commercial fish species, being sold fresh or smoked in the markets of Lagos, Nigeria.

MATERIALS AND METHODS

The study area: The study was carried out in the Lekki lagoon, a large expanse of shallow freshwater located in the Lagos and Ogun states of Nigeria. It covers an area of nearly 247 km^2 (Fig. 1). A greater part of the lagoon is shallow and less than 3.0 m deep, while there are areas of up to 6.4 km in depth (Kusemiju 1973). It lies between longitudes 4º 00' E and 4º 12' E and latitude 6º 25' N and 6º 37' N. The lagoon is fed by river Oni in the north eastern part, while rivers Oshun and Saga flow into the north western part. William

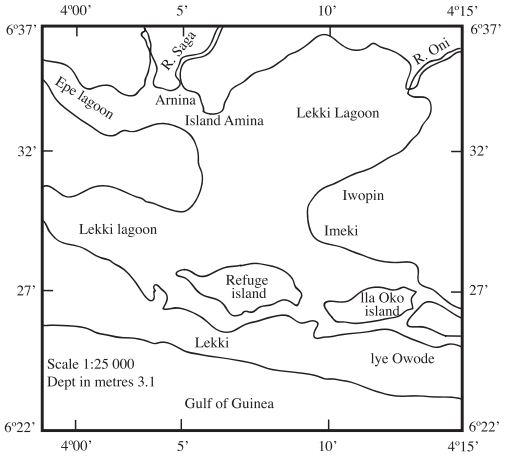

Fig. 1. Map of Lekki Lagoon. (Kusemiju, 1976).

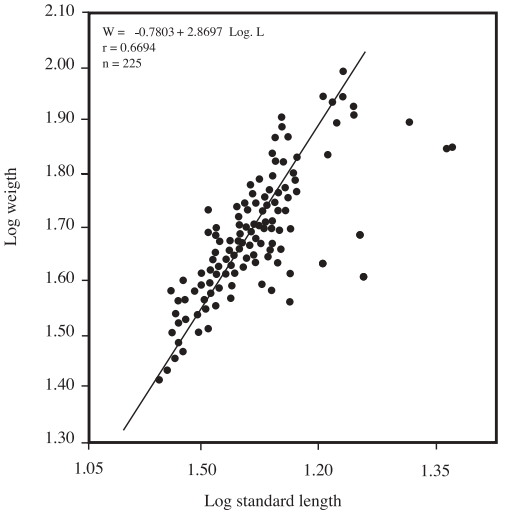

Fig. 2. Log length-Log weigth relationship (combined sexes) of *M. rume.*

(1961, cited by Trewavas 1983) described Lekki lagoon as fresh. Vanden Bossche and Bernacsek (1990) recorded a salinity range of 0.0 – 0.5% for this lagoon.

Specimens of *Mormyrus rume* were collected monthly from the Lekki lagoon between December 1999 and November 2000. The cast net and the set net were the major gears used in the collection. All specimens were measured and weighed to the nearest 0.1 cm and 0.1 g respectively. Each specimen was then dissected in order to identify the stomach and the gonads. The stomach was transferred into a petri dish for analysis of the food organisms. The numerical and frequency of occurrence methods were used to analyze that stomach contents of the specimens. The sex of the fish was identified and the reproductive stage recorded. The condition factor was determined by using the formula:

$$K = \frac{100W}{L^3} \qquad \text{(Bannister 1976)}$$

Where K = condition factor
W = weight in g
L = Length in cm

Matured ovaries were preserved in Gilson's fluid prior to fecundity studies. The surrounding ovarian tissues were removed and the estimate of the number of eggs in each pair of ovaries were determined using the gravimetric method.

RESULTS

A total of 225 specimens of *M. rume* were examined in this study.

Length - weight relationship: The total lengths ranged from 15. 0 to 24.9 cm while the standard lengths ranged from 13.0 to 23.0 cm. The weights ranged from 26.2 to 99.3 g. Fig. 2 illustrates the length – weight relationship of the species.

Condition factor (K): The condition factor was calculated for *M. rume* and examined in relation to size and sex. The K value ranged from 0.33 - 1.40, 1.16 - 1.48 and 0.33 - 1. 48 for males, females and combined sexes respectively.

The mean K – values were 1.16, 1.25 and 1.20 for males, females and combined sexes respectively (Table 1).

Food and feeding habits: Out of the specimens collected, 4.8% had empty stomachs, 22.2% had $^1/_4$ full stomachs, 28. 9% had

TABLE 1
Condition factor (K) values for M. rume

	Male				Female				Combined sexes			
Size range S.L.	F	SL	W	K	F	SL	W	K	F	SL	W	K
13.0-13.9	12	13.45	33.80	1.4	8	13.48	32.53	1.33	20	13.50	33.2	1.37
14.0-14.9	32	14.53	40.40	1.36	23	14.44	41.30	1.37	55	14.5	40.9	1.37
15.0-15.9	52	15.48	50.38	1.32	27	15.40	49.38	1.34	79	15.4	50.0	1.33
16.0-16.9	36	16.40	56.55	1.32	14	16.28	65.20	1.48	50	16.3	60.9	1.4
17.0-17.9	3	17.00	63.50	1.39	2	17.90	66.35	1.16	5	17.5	64.9	1.28
18.0-18.9	3	18.05	68.50	1.17	5	18.40	8 9.25	1.41	8	18.2	78.9	1.29
19.0-19.9	3	19.15	65.63	0.92	1	19.00	85.30	1.24	4	19.1	75.5	1.08
20.0-20.9	-	-	-	-	-	-	-	-	-	-	-	-
21.0-21.9	1	21.20	79.60	0.84	-	-	-	-	1	21.2	79.6	0.84
22.0-22.9	2	22.85	71.20	0.60	-	-	-	-	2	22.9	71.2	0.6
23.0-23.9	1	23.00	71.70	0.33	-	-	-	-	1	23.0	71.7	0.33

F = frequency
SL = mean standard length (cm)
W = mean weight (g)
K = mean condition factor

TABLE 2
Summary of stomach contents of M. rume *in the Lekki lagoon*

	NUMERICAL METHOD		FEREQUENCY METHOD	
FOOD ITEMS	Number	%	Number	%
Plant remains	49 980	71.09	214	100
Detritus	-	-	214	100
Fish eggs	8 560	12.18	134	62.66
Fish bones	7 120	10.13	172	80.37
Shrimp remains	1 926	2.73	106	49.53
Coscinodiscus	1 516	2.16	200	93.46
Terpsinoe musica	1 202	1.71	180	84.11
Mud	-	-	214	100

2/4 full stomachs, 20.4% had $^{3}/_{4}$ full stomachs and 28.4% had full stomachs. During the course of examination, it was observed that the fullness of the stomach was not in relation to length or weight.

A summary of food items that constituted the diet of *M. rume* specimens from the Lekki lagoon is given in Table 2. Detritus and plant remains constituted the most important food items, both occurring in all stomachs containing food (100% in occurrence) and the latter accounting for 71.09% of the number of food items. Mud was also found in all stomachs containing food. Including food items such as fish eggs (12.18% in number and 62.66% in occurrence); and fish bones (10.13% in number and

80.37% in occurrence) made up the next food group in order of importance .

The class crustacean was the next group, it comprised of remains of shrimp larva and made up 2.73% in number and 49.53% in occurrence. The phytoplankton, *Coscinodiscus spp* and *Terpsinoe musica* both diatoms came last accounting for 2.16% in number, 93.46% in occurrence, and 1.71% in number and 84.11% in occurrence respectively.

Sex ratio and gonad development: The result shows that, of the 225 specimens examined 145 (64.44%) were males and 80 (35.56%) were females giving a sex ratio of 1:0.55. The population of males were significantly higher than females in the Lagoon. A chi – square analysis of the result shows that there is a significant difference between the preponderance of the male *M. rume* and that of the female ($\chi^2 = 18.78$, $p = 0.05$).

Six stages of gonad development were observed in the specimens examined. The stages are

Stage I - Immature, inactive
Stage II - Immature, developing
Stage III - Maturing
Stage IV - Maturing (Ripe)
Stage V - Ripe running
Stage VI - Spent

The females show all the stages of gonad development as classified by Nikolsky (1963). However, the males show only stages I -IV

Gonado–somatic index (GSI): The gonad weight expressed as a percentage of the fish somatic weight (Sturm 1978) was used as the Gonado–somatic index (GSI). It gives an indication of the percentage of the fish's weight that is used in egg production at the mature stage (when the eggs are to be shed). The GSI ranged from 2.33 to 15.74%. The mean value obtained was 7.89%.

Fecundity: 50 mature females were used for fecundity studies. The standard lengths ranged from 13.5 to 19.0 cm while the body weights ranged from 32.0 to 99.3 g Fecundity ranged from 741 to 6 000 eggs. Average fecundity was 2 991. The fish specimen with the highest fecundity had a standard length of 16.5 cm and a weight of 89.0 g while that with the lowest fecundity had a standard length of 16.0 cm and a weight of 55.7 g. The relationships between fecundity and fish length; and fecundity and fish weight are shown in Figs. 3 and 4.

DISCUSSION

The length weight relationship of *M. rume* reflected an increase in weight with a corresponding increase in length. The value of the

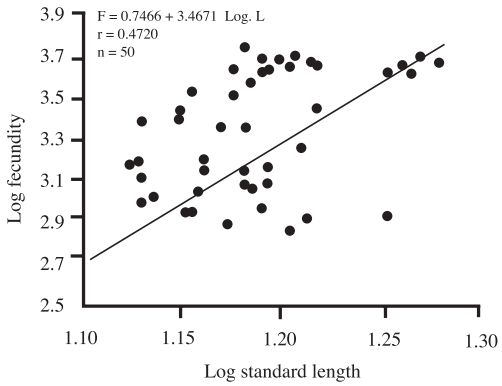

Fig. 3. Log fecundity-Log length relationship in *M. rume*.

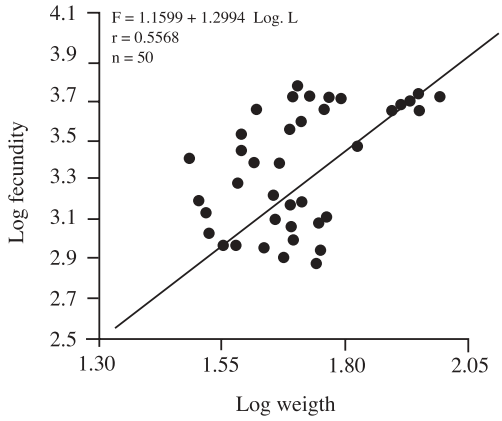

Fig. 4. Log fecundity-Log weigth relationship in *M. rume*.

regression coefficient (b) is approximately 3 which shows that the species exhibit isometric growth in Lekki lagoon (Bagenal and Tesch 1978).

The correlation coefficient (r) of 0.6694 showed a positive correlation between length and weight.

There was a general decrease in condition factor with increasing length of the specimens. This means that increase in length did not bring about proportional increase in weight. Mgbenka and Eyo (1992) attributed the decline in condition factor to the deposition of materials for gonad formation which lead to increase in weight and actual spawning which lead to reduction in fish weight respectively.

However the mean condition factor of 1.20 obtained for the population of *M. rume* in Lekki lagoon was an indication of the good condition of the fish (Bannister 1976).

The major food items of *M. rume* in Lekki lagoon were found to be detritus and plant parts and these were found in all stomachs containing food. There was also the presence of mud in all stomachs containing food, this was probably ingested along with food items during feeding. Other food items are fish eggs, fish bones, crustacean larval parts and some diatoms. The results showed that *M. rume* are bottom dwellers, corresponding with the findings of Omotosho (1993) who reported that *M. rume* fed on detritus, algae and macrophytes in Oyun mini–dam, Ilorin, Nigeria. The long tubular snouts are used to burrow in search of their food items (Holden and Reed 1972). The food items were encountered in the stomachs irrespective of size, sex or season.

Mature specimens (in stages III and IV) of both sexes were encountered throughout the months of the study period, this agreed with the findings of Scott (1974) that most of the species of the family Mormyridae spawn more or less, throughout the year.

The mean GSI value obtained showed that the fish species uses 7.89% of its body weight for egg production. The species was found to be highly fecund with an average of 3 371 eggs per mature female.

The correlation (r), between fecundity and weight (0.56) was higher than that between fecundity and length (0.47). Thus there is a closer relationship between fecundity and weight than what obtains between fecundity and length.

In the study, there were wide variations in fecundity of the species, Bagenal (1966, 1969), and Fawole and Adewoye (1999) attributed these wide fluctuations to differential feeding success within members of the fish population. It could also be due to the coexistence of a varied mixture of age classes since they reproduce year round.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Messrs A. O. Adebola and R. Bamisaiye both of the University of Lagos, Nigeria for their assistance in the collection of specimens.

RESUMEN

Se investigó varios aspectos de la biología de Mormyrus rume (Cuvier y Valenciennes) en la laguna Lekki, que Estos incluyeron la relación longitud-peso, el factor condición, alimento y hábitos alimenticios, y la fecundidad de esta especie de peces. Los métodos principales de pesca empleados para recolectar 225 especímenes fueron por medio de redes (castnetting & setnetting). La longitud total se distribuyó en un ámbito de 15.0 cm a 24.9 cm mientras que la longitud estándar se distribuyó entre 13.0 cm a 23.0 cm. Los pesos corporales se distribuyeron en un ámbito de 26.2 g a 99.3 g. Los peces exhibieron un crecimiento isométrico en la laguna. El factor condición promedio obtenido fue 1.20. El factor condición generalmente decrece con el incremento en el tamaño del individuo. Los principales alimentos fueron detritus y partes de plantas. La población de machos fue significativamente mayor que la de hembras. El índice gonadosomático mostrado por M. rume en la laguna Lekki presenta un promedio de 7,89% del peso corporal en producción de huevos. La fecundidad tiene un ámbito de 741 a 6 000 huevos con un promedio de 2 991 huevos por hembra.

REFERENCES

Bagenal, T.B. 1966. The ecological and geographical aspects of the fecundity of the place. J. Mar. Biol. Ass. U.K. 48: 161-168.

Bagenal, T.B. 1969 Relationship between egg size and fry survival in brown trout *Salmo trutta* (L) J. Fish Biol. L: 349- 353.

Bagenal, T.B. & Tesch F.W. 1978. Age and growth. pp 101–136. *In* T. Bagenal (ed.). Methods of Assessment of Fish production in freshwaters. Oxford, Blackwell Scientific publications.

Bannister, J.V.C. 1976. The length–weight relationship, condition factor gut contents in the dolphin fish *Coryphaena hippurus* (L) in the Mediterranean J. Fish Biol. 9: 335-338.

Fawole, O.O. & S.O. Adewoye. 1999. The length–weight relationship, condition factor and fecundity of *Sarotherodon galilaeus* (Artedi) in Oba reservoir Ogbomoso, Nigeria. Bioscience Res. Comm. 11(2): 113-119.

Greenwood, P.H., G.S. Myers, D.E Rosen & S.H. Weitzman. 1966. Phyletic studies of teleostan fishes with a provisional classification for living forms Bull. Am. Mus. Nat. Hist. 131: 339-456.

Holden, M. & W. Reed. 1972. West African Freshwater Fish. Longman Singapore. 68 p.

Kusemiju, K. 1973. A study of Catfishes of Lekki lagoon with particular reference to species of *Chrysichthys walkeri* (Bagridae) Ph.D. Thesis Univ. of Lagos, Nigeria.

Kusemiju, K. 1976. Distribution, reprod uction and growth of the catfish *Chrysichthys walkeri* (Gunther) in the Lekki lagoon, Nigeria. J. Fish. Biol. 8: 453-458.

Meek, A. 1916. The Migrations of Fish. Edward Arnold London. 427 p.

Mgbenka, B.O. & J.E. Eyo. 1992. Aspects of the Biology of *Clarias gariepinus* in Anambra River Basin 2. Maturation and condition factor J. Sci. Agric. Tech. 2(1): 52 –55.

Nikolsky, G.V. 1963. The Ecology of fishes. Academic Press, London and New York. 352 p.

Omotosho, J.S. 1993. Analysis of fish species composition of Oyun min-dam, University of Ilorin, Nigeria. J. W. Afr. Sci. Assoc. 36: 37–48.

Scott, D.B.C. 1974. The reproductive cycle of *Mormyrus kannume* (Forsk) in Lake Victoria, Uganda. J. Fish Biol. 5: 447–454.

Sturm, de L.M.G. 1978. Aspects of the Biology of *Scombemorus maculatus* (Mitchell) in Trinidad. J. Fish Biol. 13: 155-172.

Trewavas, E. 1983. Tilapine fishes of the Genera *Sarotherodon, Oreochromis* and *Danakilia*. London British Museum (Natural History). 583 p.

Vanden Bossche, J.P.V. & G.M. Bernacsek. 1990. Source Book for the inland fishery Resources of Africa CIFA technical paper 18/2. FAO Rome. 325 p.