

MORPHOMETRY AS A TOOL FOR TAXONOMY AND IDENTIFICATION OF M. RUME FROM EPE LAGOON

Oluayo, Bello and Adebayo, O.

Department of Aquaculture and Fisheries Management, Lagos State University of Science and Technology,
Ikorodu, Lagos

Abstract: Morphometric and meristic characterization are essential tools in fish identification, ecology, and taxonomy. In this study, a morphometric and meristic characterization of *Mormyrus rume*, commonly known as Elephant trunk fish, was conducted from Epe axis of Lagos Lagoon. A total of 150 fish samples were collected and grouped based on their size; small, medium, and large. The metric and meristic characters were measured and variations were observed in all the groups except for dorsal fin rays, which were constant. The study demonstrated a gradual increase in body length and weight with corresponding dorsal and anal fin rays, showing isometric growth patterns of *M. rume* from Epe axis of Lagos Lagoon based on morphometry characterization and length-weight relationship. The outcome of the study can serve as useful information for the management of *M. rume* from Epe axis of Lagos Lagoon, including the identification and taxonomy of the species.

Keywords: Morphometry, meristic, Elephant trunk fish, Lagos Lagoon, taxonomy, fisheries resources.

Introduction:

Accurate species classification and description, also known as Ichthyology, is a crucial part of fish morphology. Morphology characterization provides information on fish identification and characterization necessary for the conservation and successful management of fisheries resources. Morphology, length-weight relationship, and condition factor are essential components in fisheries management and serve to differentiate taxonomic units and their relationships during developmental changes in fish species. In addition, meristic and morphometric characters of fish species are essential tools in fish species identification and fish population dynamics in fisheries management. They determine the level or extent of exploitation of a particular species of fish to make credible recommendations in managing aquatic resources.

This study aims to conduct morphometric and meristic characterization of *Mormyrus rume*, commonly known as Elephant trunk fish, from Epe axis of Lagos Lagoon to enhance the management of the species and its habitat. A total of 150 fish samples were collected and grouped into three based on their size for measurement and reference purposes. Biometric parameters such as total length, standard length, head length, dorsal fin rays, pectoral fin rays, ventral fin rays, and anal fin rays were measured and recorded. The meristic characterization of *M. rume* shows a reliable tool for fish identification. The study demonstrated a gradual

increase in body length and weight with corresponding dorsal and anal fin rays, showing isometric growth patterns of *M. rume* from Epe axis of Lagos Lagoon. The outcome of the study provides useful information for the management of *M. rume* from Epe axis of Lagos Lagoon, including the identification and taxonomy of the species.

Overall, this study highlights the importance of morphometric and meristic characterization in fish identification, ecology, and taxonomical categorization, and their essential role in the conservation and successful management of fisheries resources.

MATERIALS AND METHODS

Study area: Epe Lagoon is a freshwater brackish water body which lies between longitude 50 30' - 50 40'E and latitude 30 50 - 40 10N with surface area of about 225km² and a maximum depth of 6m and connected to Atlantic Ocean through the Lagos Lagoon/harbor (Sandra *et al.*, 2020).



Fig. 1: Map showing Epe Lagoon

(Source: Jimoh *et al.*, 2011)

Fish sampling and Chain of custody: The study was carried out from November 2019 to January 2020. The fish samples are randomly collected monthly from landing site located close to Epe lagoon. The fish samples are examined, sorted, coded and identified based on fish classification charts. Samples of *Mormyrus rume* was purchased from Fishermen at the landing site of Epe Jetty, which is also called “Chief Landing Site”. A total number of 150 Specimens of *Mormyrus rume* were collected from the Epe lagoon between November 2019 and January 2020. *M. rume* specimens (150) were obtained from artisanal fishermen using gill nets set daily at 18:00 hours and recovered at dawn (06:00 hours) from the Lagoon. The specimens were collected for over 12weeks. The cast net and the set net are the major fishing gears used in the collection. *M. rume* was available throughout the study periods and most of the species of the Family Mormyridae spawn more or less

throughout the year according to the report of Scott (1974) as cited by Fawole (2002) Collected fish samples was transported in ice-chest cooler to the laboratory, and preserved by deep freezing prior to examination.

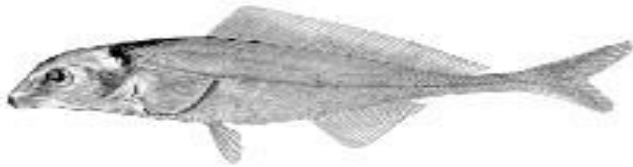


Fig. 2: *Mormyrus rume*.

Source: Fishbase, (2020)

Structure and Laboratory Specimen Assessment Survey: A total number of 150 Specimens of *Mormyrus rume* were collected from the Epe lagoon and grouped into 3 batches (Small, Medium and Large sizes) The length of each sample was measured in centimeters using a measuring board and the weight in grams using sensitive weighing balance (Model EK5055 of electronic kitchen scale). All the fish samples were measured to the nearest 0.1 cm and weighed to the nearest 0.1 g respectively.

The biometric was carried out between December 2019 and February 2020 by measuring length, weight, morphometric and meristic counts (total length, standard length, head length, dorsal fin rays, pectoral fin rays, ventral fin rays, anal fin rays)

Fish identification and Biometric features: The fish samples were sorted after the species name had been identified by using appropriate field guide, information on Fishbase (2020) publications and personal communication with Ichthyologist. Biometric features such as the type of mouth, position of the mouth, shape and length of the tail fin, fin count, spine count, kind of teeth, were examined on the fish species for purpose of taxonomy, in case new species or strains are among the catch. Excess water droplets were removed from fish immediately after thawing. All the measurement was recorded to the nearest 0.01g and 0.01mm respectively. The parameter taken for biometric data analyses of 50 *M. rume* fish samples are as follows: TL = Total length, FL = Forked length, SL = Standard length (distance from the tip of the snout to the mid base of the caudal fin), HL = Head length, BD = Body depth, CPL = Caudal peduncle length, AFL = Anal fin length, DFS = Dorsal fin spine,

DFR= Dorsal fin rays, AFR= Anal fin ray as described by Yoboue *et al.*, (2019)

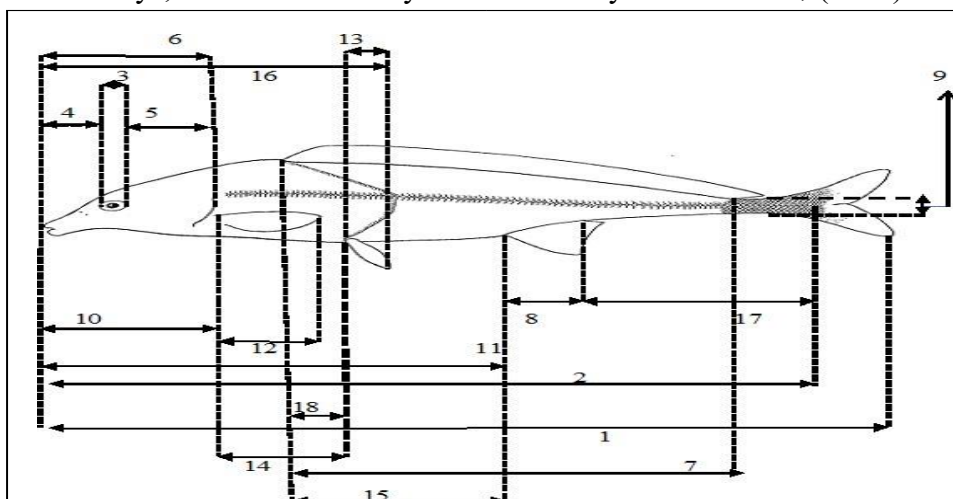


Fig. 3: Morphometric Measurements method of *M. rume*. (Source: Yoboue *et al.*, 2019) **1-** Total length (TL), **2-** Standard length (SL), **3-** orbital diameter (OD), **4-** pre-orbital distance (pOD), **5-** postorbital distance (ptOD), **6-** Head length (HL), **7-** dorsal fin base length (LDF), **8-** anal fin base length (AL), **9-** caudal peduncle height (CPH), **10-** prepectoral distance (pPD), **11-** pre-anal distance (pAD), **12-** pectoral fin length (LPP), **13-** pelvic fin length (LPeF), **14-** pectoral-pelvic distance (pPeD), **15-** dorsal-anal distance (DAD), **16-** Prepelvic distance (pPeD), **17-** caudal-anal distance (ACD) and **18-** height of the body (HB).

Data analysis: The data on morphometric measurements and meristic counts were recorded in Microsoft Excel software spreadsheet (Windows 2019) and mean values, ranges and standard deviations of each feature were computed.

RESULTS

The results on metric and meristic characters of *M. rume* are grouped into three (3) according to the size; the small, medium and the large group. The metric and meristic characters are measured, weighed and counted using appropriate units of measurement and weighing as presented below.

Length of fishes in small group ranged from 15.0cm – 20.0cm with mean value of 17.38cm while body weight in (g) ranged from 41.0g – 106.0g with mean value of 40.21g. The body length of those in medium group ranged from 20.0cm - 27.5cm with mean value of 26.93cm while body weight in (g) ranged from 106g – 136g with mean value of 119.3g. The body length of large group fishes ranged from 27.5cm - 49.5cm with mean value of 29.5cm while the body weight in (g) ranged from 108g – 223g with mean value of 172.0g.

Moreover, the other metric characters that are measured in the small size group are; The Total Length range is 16.0cm - 17.0cm with the mean value of 17.37cm. Fork length ranged from

1.50cm -1.70cm with mean value of 1.62cm. Standard length ranged between 14.0cm and 15.0cm and the mean value is 15.74cm. Head length mean value is 4.333 cm and ranged from 4.0cm -4.8cm. The Body depth measured ranged between 4.0cm - 5.0cm with the mean value of 4.1933cm. The Caudal peduncle length and anal fin length have their ranged values of 3.9cm - 4.0cm and 15.0cm- 16cm with their mean values of 4.09cm and 16.38cm respectively.

In addition, the biometric parameters of the medium size group recorded are as follows; Total length range (25cm – 26cm) and the mean value (26.92cm). The Fork length range (2.30cm – 2.40cm) and the mean value is 2.5cm. The Standard length measured is in the range of 22cm – 24cm with the mean value of 23.96cm. Head length and Body depth parameters have the same range of 4cm - 5cm with mean values of 5.26cm and 5.33cm respectively. The Caudal peduncle length and anal fin length respective mean values are 10.13cm and 26.50cm while their ranges are 10cm – 11cm and 25cm – 26cm correspondingly.

Also, the last grouping which is Large group have their metric characterization in the following order; Total length (Range = 28.5cm -30cm. Mean = 29.12cm). Fork length (Range =2.9cm -3.0 cm. Mean =2.9 cm). Standard length (Range = 27.5cm – 28cm. Mean = 28.19 cm). Head length (Range =5.5cm - 6.5cm. Mean = 6.3cm). Body depth (Range = 5.0cm - 6.0cm. Mean = 6.4 cm). Caudal peduncle length (Range =13.4cm -15.0 cm. Mean = 14.5cm). Anal fin length (Range = 12.0cm - 13.5cm. Mean = 13.28cm).

However, meristic characters of *Mormyrus rume* are recorded in numbers. Mean dorsal fin rays in small group had 55, in medium and large group are 65 and 70 respectively. The numbers of mean pelvic rays counted in small, medium and large group are 6.5, 7.0 and 9.0 respectively while mean pectoral fin rays counted are in following sequence, Small =7.5, medium=9.0 and large = 10.5. Anal fin rays in small group had 15 rays. Medium group had 22 rays while large group had 20 rays.

The analysis of variance showed that out of the 30 variables (10 in each group), 10 characters, including 8 metrics and 2 meristics varied significantly ($p \leq 0.05$). Also; no single meristic character gave coefficients of

variation greater than 70. Furthermore, there is positive correlation between body length and body weight and varied significantly ($p \leq 0.05$) on all the parameters taken on metric characterization of *M. rume* from Epe Lagoon

DISCUSSION

Mormyrus rume (mormyrids) is a species of bony fish which have long served humans as an important food source and highly priced and preferred fish commodity in Nigeria (Odedeyi *et al.*, 2008). This short communication is centered on metric and meristic count of *M. rume* due to dearth of information on this aspect of *M. rume* from Epe axis of Lagos lagoon unlike other lagoons from this part of the world and to determine the impact of different environment to the species variability. The morphological variability investigation of 150 *Mormyrus rume* samples from Epe lagoon showed the subsistence of morphological variations between the fish samples and size/weight from this water body.

The Morphometric characterization of *Mormyrus rume* shows that the length and weight in the three groups of fish samples increases with the increase in body length and weight and numbers of meristic counts. This shows that the morphometric parameters considered in this context could be seen as one of the best tools in the scientific identification and classification of *M. rume* from Epe lagoon as reported by Faiz *et al.*, (2015) and reiterated by Ajagbe and Ojo-Fakuade (2020) on *Hypophthalmichthys molitrix* from Tanda Dam and *M. rume* from Ikere-Gorge respectively The corresponding increase in length, weight and meristic counts in all the fish samples is in agreement with the publication of Tengjaroenkul *et al.*, (2000) on the morphometry study on *Oreochromis niloticus*.

The result shows that there are different meristic counts of dorsal and anal fin ray among different fishes with different length and weight, therefore, the meristic count is independent of body size. This perhaps might be due to environmental factors, food and feeding habit of *M. rume* from Epe lagoon (Konan, 2009)

The statistical significant of meristic counts of *M. rume* revealed that there is no single character that gives coefficients of variation more than 70. The mean of the different meristic variables appears so similar among the fish samples. These shows that the meristic characters is a reliable tools for fish identification as described by Konan, (2015) who stated that descriptive meristic characters are separate and permanent at the last stage of fish development.

High level of variance in morphometric indexes observed in the data collected on *M. rume* from Epe lagoon could be associated with fish condition factor which are influenced by environmental fluctuations/condition such as temperatures and food abundance. This corroborates the work of Ridanovic *et al.*, (2015) on fish condition factor from Sava River in Bosnia and Herzegovina.

In conclusion, fish species identification and classification is a reliable step in scientific classification of fish species and add to the knowledge on fish Ichthyology. Metric and meristic studies are one of the important tools used to understand the taxonomy but also necessary to know the relationship between various species and their habits. It is therefore recommended that Metric and meristic studies are important to understand the taxonomy of Elephant trunk fish (*Mormyrus rume*) by fish biology/Ichthyologist researchers, and more importantly to understand the effect of environmental factor on fish wellbeing.

References

Adedeji RA, Araoye PA. (2006) Study and characterization in the growth of body parts of *Synodontis schall* (Pisces: Mochokidae) from Asa Dam, Ilorin Nigeria. *Nigeria Journal of Fisheries.*; 2:290-298.

- Alhassan, Elliot. Abobi, Seth. Mensah, Stephen and Boti, Franklin. (2014). The spawning pattern, length-weight relationship and condition factor of elephant fish, *Mormyrus rume* from the Bontanga reservoir, Ghana. *International Journal of Fisheries and Aquatic Studies*. 109-114.
- Ajagbe, Stephen O. and Ojo-Fakuade, Folashade. F (2020). Population Dynamics of *Mormyrus rume* (Valenciennes, 1847; Osteoglossiformes; Mormyridae) Of Ikere-Gorge, Iseyin, Oyo State, Nigeria. *Global Journal of Agricultural Sciences* Vol. 19: 51-57
- Chacha John Mwita(2015). Morphometric Relationships among the Clariid Fishes of the Lake Victoria Basin, Tanzania. *Open Journal of Marine Science*, 5, 26-32
- Ekelemu, K.J. & Zelibe, S.A.A. (2006). Aspects of hydrobiology of Lake Ona in Southern Nigeria 1: Fish fauna. *Journal of Environmental Hydrology*. 14. 1-9.
- Faiz Ur Rehman, Hameed Ur Rehman, Saadia Aman, Satara Aziz, Hassan Shabir, Abdul Majid, Aman Ullah, Aziz Ur Rehman Safi and Fazal Subhan (2015). Morphometric and Meristic Analysis of Silver Carp (*Hypophthalmichthys molitrix*) from Tanda Dam, District Kohat, Pakistan. *Global Veterinaria* 15 (1): 82-92
- Fawole O.O (2002) Morphometry and diet of *Mormyrus rume* in the Lekki lagoon, Nigeria. *Rev. biol. trop* vol.50 n.2
- Fishbase(2020). <https://www.fishbase.se/summary/Mormyrus-rume>. Retrieved 15th March 2021
- Fletcher, L R. and J.D. Cräwford. (2001). Acoustic detection by sound-Producing lishes (Momyridae): The role of gas filled tympanic bladders. *j. Exp. biol.* 204: 175-183.
- Fricke and Eschmeyer. (2012). Catalog of fishes.<http://research.calacademy.org/redirect>. Retrieved 14 March 2021
- Jimoh, Abayomi, Clarke, Edwin, Whenu, Olusegun and Adeoye, H.B. (2011). Concentration of heavy metals in *Macrobrachium vollenhovenii* (Herklots, 1857) from Epe lagoon lagos Nigeria. *Res. J. Environ. Earth Sci.* 3. 197-202
- King, Michael. (2013). Fisheries Biology, Assessment and Management, Second Edition. 10.1002/9781118688038.ch6.
- Konan KM. Diversité morphologique et génétique des crevettes des genres *Atya* Leach 1816 et *Macrobrachium* Bate, 1868 de Côte d'Ivoire (2009). Thèse pour l'obtention du grade de Docteur de Sciences et Gestion de l'Environnement de l'Université d'Abobo-Adjamé, pg190
- Konan KT. Systématique des poissons de la famille des mugilidae du lac fahé et des hydrosystèmeslagunaires de côted'ivoire (2015). Thèse de Doctorat, UFR des Sciences et Gestion de l'Environnement, UniversitéNangui-Abroguia (Abidjan, Côte d'Ivoire), pg150.

- Mojekwu, Tonna. (2015). Advanced Techniques for Morphometric Analysis in Fish. *Journal of Aquaculture Research & Development*. 06. 10.4172/2155-9546.1000354.
- Odedeyi, Dominic, Fagbenro, O., Oluayo, Bello and Adebayo, O. (2008). LengthWeight Relationship and Condition Factor of The Elephant Fish, *Mormyrus rume* (Valenciennes, 1846) In River Ose, Southwestern Nigeria. *Animal Research International*. 4. 10.4314/ari.v4i1.40803.
- Okomoda, Victor. (2015). Some Biometric Parameters of Four Selected Fish Species in Doma Dam, Nasarawa State, Nigeria. *International Journal of Aquaculture*. 10.5376/ija.2015.05.0031.
- 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.
- Ridanovic S.I Nedic Z. and Ridanovic L. (2015). First observation of fish condition from Sava river in Bosnia and Herzegovina. *Journal of Survey in Fisheries Sciences* 1(2)2732
- Sandra Chinwendu Akagha, Dike Ikegwu Nwankwo and Kedong Yin (2020): Dynamics of nutrient and phytoplankton in Epe Lagoon, Nigeria: possible causes and consequences of reoccurring cyanobacterial blooms. *Applied Water Science*. 10:109
- Scott, D.B.C (1974): The reproductive cycle of *Mormyrus kannume* (forsk) in Lake Victoria, Uganda. *J. Fish. Biol.*, 6, pp. 447-454
- Soyinka Olufemi Olukolajo and Ebigo Chikezie Hillary, (2012). Species Diversity and Growth Pattern of the Fish Fauna of Epe Lagoon, Nigeria. *Journal of Fisheries and Aquatic Science*, 7: 392-401.
- Tengjaroenkul B., Smith B.J., Caceci T. and Smith S.A. (2000). Distribution of intestinal enzyme activities along the intestinal tract of cultured Nile tilapia, *Oreochromis niloticus* L. *Aquaculture* 182: 317-327
- Thomas, J., Venu, S. And Kurup, B.M. (2003). Length-weight relationship of some deepsea fish inhabiting the continental slope beyond 250m depth along the west coast of India. *NAGA, ICLARM Quarterly*, 26(2): 17 - 21.
- Yoboue Ahou Nicole, Kouame Kouamé Martin, Boussou Koffi Charles, Konan Koffi Félix and Adepo-Gourene Abouo Béatrice (2019). Morphological characterization of *mormyrus rume* populations from sassandra, bandama and comoé rivers in côte d'ivoire. *International Journal of Fisheries and Aquatic Studies*. 7(5): 573-579