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Population Characteristics of *Schilbe mystus* (Linne, 1758), from two Different Habitats: Asejire and Oyan Lakes Southwestern Nigeria

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ABSTRACT

The population variability of *Schilbe mystus* in Asejire and Oyan Lakes located in Osun and Ogun states respectively is studied for the first time and it would serve as a reference for future sustainable fisheries management in various environments. Specimens of African butter catfish *Schilbe mystus* were caught from Asejire and Oyan lakes and ten morphometric and six meristic features were investigated and used to evaluate the degree of variation among the populations. The morphological characters of fresh specimens of *Schilbe mystus* collected from Oyan and Asejire Lakes showed differences in the meristic and morphometric characteristics of the two populations but these were not statistically significant ($p > 0.05$; t-test) except right gill raker count. The mean values for all body measurement ratio were higher for specimens from the Oyan Lake than Asejire Lake, except for pectoral fin length/standard length and anal fin length/standard length ratios, however, they were not significantly different ($p < 0.05$). The two populations are not racially distinct due to close similarities between meristic and morphometric characters. Differences observed in the right gill raker counts may be attributed to environmentally induced changes rather than by genetic properties.

Key words: Taxonomic features, Asejire and Oyan lakes, *Schilbe mystus*, meristic features, morphometric features

INTRODUCTION

S. mystus is the commonest of the four species of family Schilbeidae found in Nigerian waters (Reed *et al.*, 1967; Holden and Reed, 1978). Virtually all species which occur over a large geographical range exhibit measurable variations in various characteristics in the different habitats. This variation has a genetic and or environmental component which is a measure of the population differentiation within a species. This variation especially in the morphometric and meristic characters could indicate the existence of differences in various characteristics such as rate of growth, survival, food conversion and dressing percentage (i.e., the amount of flesh available after the wastes have been removed in fish processing) (Ezenwa, 1978). And if some of these characteristics are inheritable, it could be possible to develop improved strains for commercial production through breeding and selection.

Anyanwu and Ugwumba (2002), Britto and Castro (2002), Evans and Jerry (2006), Buitrago-Suarez and Burr (2007), Suneetha Gunawickrama (2007) Devaere *et al.* (2007), Gharibkhani *et al.* (2009), Kavan *et al.* (2009), Khalili and Amirkolaie (2010), Wiecezek and Krzykowski (2010) and Wiecezek *et al.* (2010) have used meristic and morphometrics characteristics as well as electrophoretic/genetic studies to determine cohort variations or to separate populations among widely distributed species. Electrophoresis provides an additional estimate of background

variability within a species. There is presently no report on population variability of *S.mystus* within and outside Nigeria. Information on the variability of meristic and morphometric characters in populations of different origin could serve as a reference for future sustainable fisheries management in various environments. Also the equation derived for morphometric relationships of the fish can be utilized to find out one character from the other.

This study therefore, has studied the morphometric and meristic features of two populations of *S. mystus* from Asejire Lake in Osun State and Oyan Lake in Ogun State.

MATERIALS AND METHODS

Study areas: Lake Asejire is a man-made lake constructed on River Oshun in 1972. River Oshun is one of the series of West African rivers which do not drain into the Niger system but discharge directly into coastal lagoons and creeks bordering the Atlantic Ocean. The lake is Y-shaped with two unequal arm length of the Y. The location of Asejire and Oyan lakes is shown in Fig. 1.

The catchment area above the dam is 7,800 km² and the impounded area is 2,342 ha. The dam has a normal pool elevation (water level) of 150 m and maximum flood elevation of 152.4 m. The lake has an approximate gross storage of 7,403 mL (From the data supplied by the Oyo State Water Corporation)

Oyan lake is also an artificially constructed lake on Oyan river and it started to fill with the closing of the gates of the dam on the 30th of October 1984 and took 2½ months to fill. The average

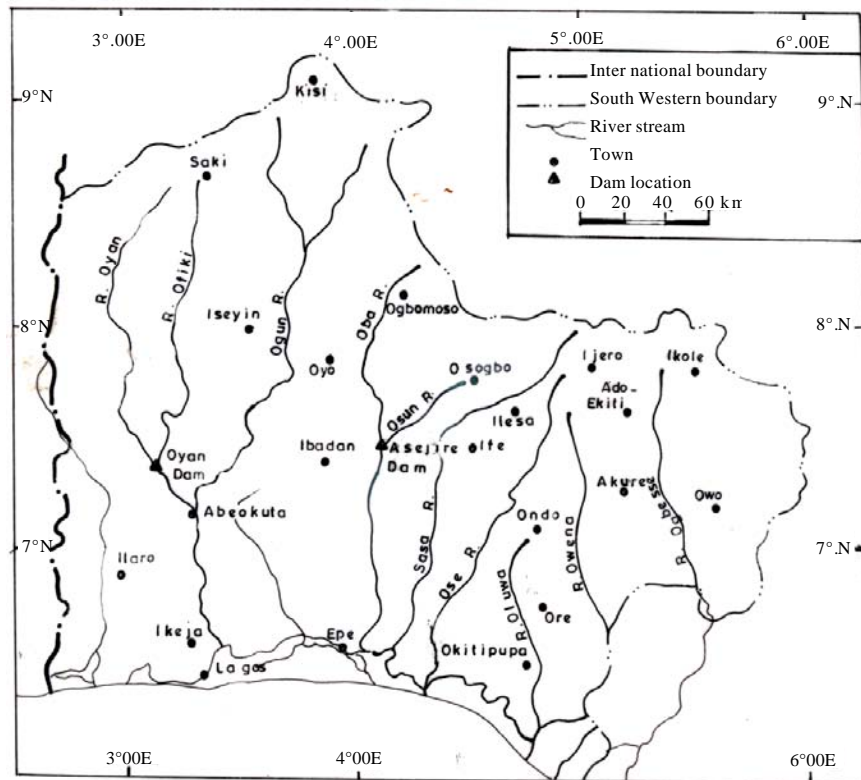


Fig. 1: Map of South-Western Nigeria showing drainage systems and location of Asejire and Oyan Lakes

annual flow at the dam site is estimated at 1,770 million m³ and the dam provides a normal level reservoir capacity of 270 million m³.

The climate of the Oyan lake is influenced by the NE-SW movement of a zone of surface discontinuity between maritime (Atlantic) air masses and dry continental (Sahara) air masses.

One hundred specimens of *S.mystus* with size range 10-18cm standard length each were selected for morphological studies from both lakes in July 2004. This size range was used because specimens with this standard length were more frequently encountered and also larger specimens were not examined, since only fish of similar size may be logically compared with each other when investigating differences in morphometrics which are otherwise influenced by size (Friedrich, 1972). The specimens were collected from artisanal fishermen that used cast nets and gill nets of mesh sizes 50-55 mm for catching the fish. Body measurements and meristic counts were undertaken in the laboratory and divider and vernier caliper were used for measuring morphometric features.

The morphometric data were measured as described by Fischer *et al.* (1998) and shown in Fig. 2. List are Total Length (TL), Standard Length (SL), Pre-Orbital Length (POL), Eye Diameter (ED), Post-Orbital Length (POL₂), Body Depth (BD), Length of Pectoral Fin (PFL), Length of Anal Fin Base (AFBL), Caudal Peduncle Length (CPL) and Head Length (HL). The meristic variables were counted using the method of Hubbs and Lagler (1964) and list are counts of dorsal, pectoral anal rays, left and right gill rakers and vertebrae. Morphometric and meristic characteristics were determined from the measurements and counts made from the left side of the fish except for the gill rakers which were counted on both sides. The gill rakers on the first gill arch (right and left) were washed in tap water, allowed to dry and counted thereafter. For vertebrae counts, the fish were dried in an oven at 60°C for 12 h and this allowed the easy removal of the flesh on either side without damage to the vertebral column. The counts included atlas and urostyle.

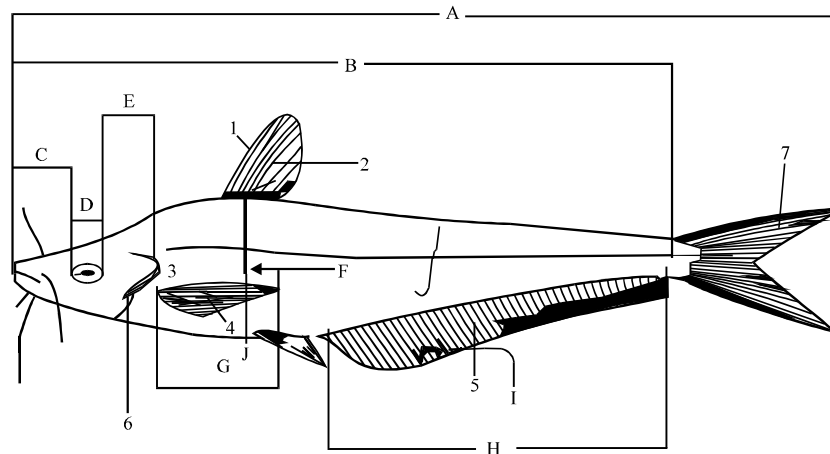


Fig. 2: Meristic and morphometric features taken on *Schilbe mystus*. Meristic count : 1; Number of dorsal spine, 2; Number of dorsal fin rays 3; Number of pectoral spine 4; Number of pectoral fin rays, 5; Number of anal rays 6; Number of gill rakers on first gill arch 7; Number of vertebrae (internal). Morphometric measurement: A; Total length B; standard length C; Preorbital length D; Eye diameter E; Post orbital length F; Body depth G; Length of pectoral fin H; Length of anal fin base I; Caudal peduncle length J; Head length

Ayoade *et al.* (2006) determined and reported the physico-chemical characteristics (surface water temperature, transparency, dissolved oxygen content and pH) of the two study areas, as well as environmental conditions (relative humidity, rainfall and atmospheric temperatures).

Statistical analyses: Simple statistics were employed presenting means, standard deviation, t-test, while also regression and correlation coefficients were computed.

RESULTS

Meristic features: The counts and computations of the meristic characters of *S. mystus* from the two study locations are shown in Table 1. The average number of each character was similar for the two study sites, although there were some slight differences which were not statistically significant ($p>0.05$) except for right gill raker count ($t = 3.92, p>0.05$).

Morphometric characters: The standard lengths of *S. mystus* from Oyan lake ranged from 10-18.7 cm (Mean = 13.49 ± 4.01), while those of Asejire lake ranged from 10.8-18 cm (Mean = 13.58 ± 3.22 cm). The mean values of the Preorbital Length (PL), Body Depth (BD) and Caudal Peduncle Length (CPL) were the same for the two study locations, while the other morphometric features, ED, HL, PFL, AFBL, POL showed differences which were not statistically significant ($p>0.05$) (Table 1). The body proportions of *S. mystus* are presented in Table 2. The mean values for all the body measurement ratios were higher for specimens from Oyan lake than Asejire lake except PFL/SL with value of 17.1 ± 1.23 for specimens from Oyan lake and 17.5 ± 1.63 for specimens from Asejire lake. Also, the AFBL/SL for specimens from Oyan lake was 51.2 ± 2.03 , while that of Asejire lake was 55.8 ± 4.25 . However, the differences were not statistically significant ($p>0.05$). Also from Table 2, it can be observed that AFBL is long in this species forming more than 50% of the SL in the species in both lakes. The average ratio of body depth in SL (27.2 ± 3.53 and 26.2 ± 3.19) in Oyan and Asejire lake respectively revealed that it is slightly greater than HL in SL (22.8 ± 2.13 and 21.5 ± 1.93) in Oyan and Asejire lakes, respectively.

Table 1: Comparison of meristic and morphometric features of *Schilbe mystus* from Asejire and Oyan Lake, Nigeria. Results of t-test comparing some parameters are also shown

Morphometric/meristic character	Oyan Lake		Asejire Lake		T
	Range	Mean±SD	Range	Mean±SD	
Spinous dorsal fin ray	1	1	1	1	-
Soft dorsal fin ray	5-6	5.2±0.4	5-6	5±0.37	-
Anal ray	51-65	59.7±2.49	55-68	60.2±2.2	1.56 ^a
Spinous pectoral fin ray	1	-	1	1	-
Soft pectoral fin ray	8-9	8.1±0.36	8	8	-
Right gill raker	10-15	12.5±0.86	10-15	12.1±0.89	3.2 ^b
Left gill raker	11-11	12.5±0.78	10-15	12.3±0.85	1.67 ^a
Vertebrae number	44-48	46±1.01	44-48	46±1.2	-
Preorbital length (cm)	1.2-2.5	1.7±0.25	1.3-2.2	1.7±0.18	-
Eye diameter (cm)	0.5-1.6	0.7±0.25	0.5-1.7	0.6±0.07	-4.07 ^a
Head length (cm)	2-4.8	3.1±0.17	2.3-4.6	2.9±0.36	-1.86 ^a
Body depth (cm)	1.5-6.3	3.6±0.97	2.5-6.6	3.6±0.67	-
Pectoral fin length (cm)	1.4-3.3	2.3±0.4	1.4-3.2	2.4±0.29	-
Anal fin base length (cm)	4.3-9.3	6.9±0.83	5-10.6	7.6±0.59	1.12 ^a

Value with different letter indicates non-significant and significant difference respectively ($p>0.05$), SD: Standard deviation

Table 2: Comparison of the ratios for several morphometric characteristics in *Schilbe mystus* studied in populations from Oyan and Asejire lakes

Body ratio	Oyan lake % Mean±SD	Asejire lake %Mean±SD
Preorbital length /SL	12.7±2.95	12.3±2.13
Eye diameter/SL	6.3±2.12	4.5±1.43
Head length/SL	22.8±2.13	21.5±1.93
Body depth/ SL	27.2±3.53	26.2±3.19
Pectoral fin length/SL	17.1±1.23	17.5±1.63
Anal fin base length/SL	51.2±2.03	55.8±4.25
Caudal peduncle length/SL	8.3±1.12	8.2±0.94
Post orbital length/SL	14.7±2.43	10.6±0.57

SL: Standard length; SD: Standard deviation

DISCUSSION

It is of primary importance in conservation of fishery resources to determine racial constitution of the stock of fish and it's also of fundamental importance to an understanding of species formation (Radcliffe, 1928). The nature and existence of racial differences varies greatly. Some are obvious, while others can only be found by careful statistical studies. In other cases, there are differences in growth rates and different age groups. Morphometric and meristic studies play a vital role in the identification of fish species and also use in racial studies.

This study showed that the numbers of vertebrae in *S. mystus* from the Oyan and Asejire lakes were not statistically different but showed identical range in both populations. This is supported by Barbour *et al.* (1982) working on *Ilisha africana* caught off the Nigerian coast and Ajado and Edokpayi (2003) who studied *Clarias gariepinus* from River Niger and Badagry Lagoon, reported identical numbers of vertebrae and pelvic fin rays. They reported that environmental factors did not appear to have considerable influence on vertebrae count of some fish.

The higher number of dorsal rays in Oyan Lake and fewer anal rays compared to Asejire Lake suggests an inverse relationship in both study areas. This apparently has also been observed in other species and agrees with Ikusemiju (1975) who also showed a similar inverse relationship in Nigerian lagoons in *Chrysichthys nigrodigitatus*.

The statistical difference in the right gill raker count of *S. mystus* agreed with earlier studies involving fish species from different water bodies.

The differences could be attributed to environmental factors such as temperature and water quality (different rainfall regimes) that showed some variations between the two locations as reported by Ayoade *et al.* (2006).

The minor differences observed in the morphometric measurements of *S. mystus* from the two studied localities that were statistically insignificant agreed with Ajado and Edokpayi (2003) who made similar observations on the morphometric characteristics of *C. gariepinus*. The minor differences observed in morphometric characters of different populations of *S. mystus* may be due to environmental or phenotypic influences within the species.

Although meristic and morphometric features are not significantly different, subtle differences were observed in measurements of anal rays, body depth, anal fin base length, post orbital length, and body measurement ratios and this may be due to differences in ecological conditions of the two lakes which have a great bearing on the growth and development of the body.

In conclusion, the two populations of *S. mystus* studied are not distinctly different judging from the close similarities obtained in meristic and morphometrics characters.

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