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Morphometric and Meristic Analysis of *Gymnarchus niloticus* (Teleostei: Gymnarchidae) from Oyan Dam and Epe Creek in South West, Nigeria

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Abstract
A study of morphometric and meristic characteristics of *Gymnarchus niloticus* from Oyan dam in Ogun State and Epe creek, Lagos State used three meristic and ten morphometric measurements in relation to standard length and head length. The body measurements and proportions did not bring out definite demarcation in the morphology of *Gymnarchus niloticus* from the two locations, even though; slight differences were observed in all the parameters measured. Specimens from Oyan dam were longer (mean = 92.6 mm) than those from Epe creek (75.6 mm). Similarly meristic counts also showed slight differences in the two locations with dorsal fin ray count in Oyan dam specimens higher (165.7) than Epe Creek specimens (155). The t-Test revealed no significant differences exist in these character ratio data at 5% probability level of significance. These results have in dictated that minor difference observed in morphometric characters and meristic counts may be due to environmental influence on the species.

Key words: *Gymnarchus niloticus*, morphometric characters, meristic characters, Oyan dam, Epe creek

Introduction

The osteoglossid *Gymnarchus niloticus* Cuvier is the only member of its family (Holden and Reed, 1972; Gupta and Gupta 2006) and occurs in the inland waters of West Africa, from Senegambia to the Nile and Lake Turkana. It has no anal or caudal fins and the dorsal extends almost the entire length of the back while the long eel-like body attenuates gradually to a cylindrical rat-like tail. It can grow to a length of at least 1.5m and a weight of 15kg and is an excellent sporting fish (Holden and Reed, 1972). It is a commercially important species that supports small-scale subsistence fisheries in Nigeria (Arawomo, 2004). It is found frequently in lagoons where it is caught by fishermen and traded in the traditional markets. Its wide distribution, with no known major widespread threats, means that it is categorised by IUCN as Least Concern (Azeroual *et al.* 2010).

The morphology of *G. niloticus* may vary in riverine, lacustrine and estuarine habitats since the composition of communities combined with the spatial scale of habitat types and landscapes may promote divergence within a species (Wang *et al.* 2003). Morphological variability among spatially and ecologically separated fish populations may be induced by genetically manifested polymorphism or by phenotypic plasticity (Wimberger 1991, 1992).

Morphological characters, such as body shape and meristic counts, have long been used in stock identification (e.g. Villaluz and MacCrimmon, 1988; Haddon and Willis, 1995; Silva, 2003; Turan *et al.*, 2004). In Nigeria, information on the morphometric and meristic characteristics of this important fish is scanty despite its role in the socio-cultural life of the country. The present study was therefore carried out to compare the morphological characteristics of *G. niloticus* in fresh (Oyan dam in Ogun State) and partly brackish (Epe lagoon in Lagos State) water bodies.

Methods

Samples of fish were collected at monthly intervals from January to December 2007 in Epe creek and Oyan dam in south-western Nigeria. Epe creek is part of a continuous system of lagoons and creeks that extends along the coast of Nigeria from the border with Benin in the west to the Niger Delta in the east. Its water is fresh or weakly brackish for most of the year (Ezenwa, 1981). The Oyan dam (7^0 15'N: 3^0 16'E) lies at an elevation of 43.3m above sea level and was

constructed on the Oyan River at its confluence with the Ofiki River. It has a catchment area of approximately 9,000km^2 and lies within the southern climatic belt of Nigeria. Its water is completely fresh throughout the year.

Fifty specimens of *G. niloticus* were collected from local fishermen at landing sites at the two locations and taken to the laboratory. Eleven morphometric and three meristic characteristics were measured according to descriptions given in Gupta and Gupta (2006). The morphometric characters were: total length (TL), standard length (SL), head length (HL), head depth (HD), tail length (LT), pectoral fin length (PFL), dorsal fin length (DFL), body depth (BD), pre-orbital length (PRL), post-orbital length (POL), eye diameter (ED). The meristic characters were: number of soft dorsal fin rays (SDR), number of soft pectoral fin rays (SPR) and number of branchiostegal ray (BR). In order to standardize the different of overall body size among specimens, all morphometric measurements data were divided by standard length (SL) and presented as ratio.

Results and Discussion

Fish from Oyan dam were rather larger than those from Epe creek with mean total lengths of 102.2 cm and 84.4 cm, respectively (Table 1). These differences were reflected in all the other morphometric characters. The size differences may be a result of more effective regulation measures being enforced on Oyan dam, where the relatively large mesh sizes of nets permitted there were in common use by the fisher men and were clearly selecting larger fish. Layman *et al*. (2005) noted that the composition of the fish assemblage in combination with commercial netting played an important role in the production of morphological differences.

Table 1: Average values (cm), for morphometric and meristic characters of *G. niloticus* from Oyan dam and Epe creek.

Character	Oyan dam	Epe creek
TL	102.2 (44.5-160.0)	84.4 (44.0-160.0)
SL	92.6 (39.0-149.0)	75.8 (37.6-149.0)
HL	13.6 (7.6-18.6)	11.8 (7.3-18.0)
HD	4.5 (2.5-6.5)	4.0 (2.5-8.4)
LT	9.6 (6.8-11.0)	8.8(5.0-11.0)
PFL	3.4 (2.4-4.5)	3.0 (2.2-6.2)
DFL	77.8 (29.0-129.1)	62.1 (29.0-129.1)
BD	10.6 (4.3-17.6)	8.6 (4.0-17.9)
PRL	9.6 (5.2-12.8)	7.6 (4.9-12.4)
POL	4.0 (2.0-7.0)	3.5 (2.0-7.0)
ED	0.40 (0.35-0.40)	0.37 (0.35-0.50)
SPR	10.7 (9-13)	10.3 (9-16)
SDR	195.7 (129-205)	185.6 (130-211)
BR	4	4

The dorsal fin ray counts ranged from 129 to 205 with a mean of 195.7 for fish from Oyan dam and from 130 to 211 with a mean of 185.6 in Epe creek. These were slightly lower than the values obtained from Lake Chad, which ranged from 168 to 215, with a mean of 205 (Sagua, 1986). Slight differences were obtained from the pectoral fin ray counts from the two locations. The number of soft pectoral fin rays in specimens from Oyan dam ranged from 9 to13with a mean of 10.7 while in the specimens from Epe creek it varied from 9 to13 with mean of 10.3. Branchisotegals did not vary in the two locations. The differences in the morphological and meristic characters of specimens are supposed to be in association with aquatic ecosystems from which they originated (Cakić *et al*., 2002; Franičević *et.al.* 2005). Naesje *et al.* (2004) stated that the variation among populations of fish characters could be induced by ecological factors interacted with fundamental genetic roles.

Table 2. Morphometric characters of *G. niloticus* expressed as a proportion (%) of total length. The data from Oyan dam and Epe creek were not significantly different (*t*-test, $p > 0.05$). Lake Chad data are from Sagua (1986).

Proportions	Oyan dam	Epe creek	Lake Chad
SL/TL	90.60	89.81	
BD/TL	10.37	10.19	
HL/TL	13.31	13.93	17.00
LT/TL	9.39	10.43	9.55
PFL/TL	3.33	3.55	
DFL/TL	76.12	73.58	
HD/HL	33.09	38.13	
ED/HL	2.94	3.39	3.09
PRL/HL	70.59	81.36	
POL/HL	29.41	33.90	
PFL/HL	25.00	25.42	26.29

There was some variation in morphometric characters expressed as a proportion of total length (Table 2) but these were not significantly different (t-test, $p > 0.05$). Some measurements of specimens from Lake Chad were very similar except that their head length was rather larger as a proportion of total length. The may reflect the findings of Turan *et al.* (2005) who reported that the differences between populations of *Clarias gariepinus* were reflected mostly in head measurements.

These data confirm that there was no appreciable variation between the two populations and that environmental conditions in Epe creek (fresh to low brackish water) and Oyan dam (fresh water) have little influence on the morphometry of *G. niloticus*. This indicates that there is little genetic differentiation between the two populations, which is to be expected since the two river systems are connected. Data from Lake Chad, on a completely different river system, also suggest that there has been little genetic separation in this species, although further research is needed to confirm the extent to which stocks can be separated and the role of the environment in morphological differentiation.

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