ASSESSMENT OF MORPHOMETRIC VARIATION IN POPULATIONS OF TILAPIA STRAINS (*OREOCHROMIS NILOTICUS AND COPTODON ZILLII*) IN KANO STATE

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ABSTRACT
The study was aimed at assessing the morphometric variation of tilapia fish (Oreochromis niloticus and Coptodon zillii) from four water bodies in Kano State. A total of One hundred and ninety-two (192) fish sample of Coptodon zillii and Oreochromis niloticus were collected from (Bagwai dam, Tiga dam, Thomas dam and river Dundurun Gaya,) to assess their morphometric traits variation. A total of ten (10) morphometric traits (Body weight(BW), Total length (TL), Standard length (SL), Dorsal fin length (DFL), Caudal fin length (CFL), Anal fin length (AFL), Pectoral fin length (PFL), Pelvic ventral fin length (PVFL), Caudal peduncle depth (CPD) and Head length (HL)) were measured on each fish. The data from the morphometric measurements were computed in excel. Spss was used for Pearson correlation and Regression analysis. Results obtained revealed that there were significant differences (P<0.001 in the morphometric traits of the different populations. Correlation analysis revealed high and significant correlation coefficient between the measured traits, where the highest was observed from TL (0.981, P<0.01), and that of Coptodon zillii was higher. The correlation coefficients increase as all measured morphometric traits correlated with total length (TL), and decrease when correlated with caudal fin length (CFL). Conclusively, tilapia in the study area grows slender/strouter and heavier, and its increase in total length may not affect that of caudal fin length. It is recommended, the using Coptodon zillii in breeding programme will lead to enhancement of sustainability in tilapia production.
Keywords: Tilapia; *Oreochromis niloticus*, *Coptodon zillii*, Morphometric; traits; Variation, Breeding programme

INTRODUCTION

Variation in the morphological features of species is often used as the preliminary measurement of the genetic distinction that may exist in a population. Measurement of morphological traits is the simplest method used in identification and characterization of tilapia. Therefore, good estimation of morphometric traits is required for prediction of selection response, economic returns and breeding values of stocks required in breeding programmes (Ikpeme *et al*., 2017). Tilapias are plastic animals, their growth and maximum obtainable size can be seriously influenced by the physical and biological composition of their environment (Nehemia *et al*., 2012). It can be cultured in either fresh or salt water in tropical and subtropical climates (Lim and Webster, 2006). Studies on morphometric variations in fish populations are useful in phylogenetic and in providing information for subsequent studies on the genetic improvement of stocks. Morphological variation between populations provide basis for population structure, and may be applicable for studying short-term, environmentally induced variation geared towards successful fisheries management (Pinheiro *et al.,* 2005). The present research focused on the assessment of variation in morphological traits of tilapia fish (*Oreochromis niloticus* and *Coptodon zillii*) and estimation of the contribution of these traits to the body weight of these economically important strains as a step towards making relevant recommendations for selection in breeding and conservation programme.

MATERIALS AND METHODS

Study Area

The study was conducted in four selected water bodies in Kano State. These are Thomas Dam (Latitude 120 16 44" N - 120 18'35"N and Longitude 8 30'5"E - 8º 31'34"E), River Duddurun Gaya(Latitude: 11° 51' 38.30" N and Longitude: 9° 00' 9.72" E), Tiga Dam (Latitude: 11º26; 8.39"Nand Longitude: 8º 24;5.39"E,) and Bagwai Dam(Latitudes 11º 50'22"- 13º 01' 38"N and between longitudes 7º 81'42"- 8º 26'26" E) in the North, East, South and western part of Kano state respectively (NiMet, 2022).

Sample Collection of Tilapia Strains Form the Four Populations

The samples were identified using the identification keys prepared by Dunz and Schliewen (2013), and confirmed using local names provided by the fishermen. Samples of all strains from the four locations were collected from early august to early September, 2021. Fish samples of O. *niloticus* (96) and *C. zillii* (96) from the four (4) locations described above were purchased from commercial catch fishermen at the water side of each water body (location). Each fish sample, after draining off using filter paper, was subsequently given a serial identity number and transported in well-labelled large bowls to the Laboratory of the Centre for Dryland Agriculture, Bayero University, Kano, where measurements were taken immediately.

Ten (10) morphometric characters (using flexible measuring tape), Body weight (BW) was taken in grams using a sensitive weighing electronic balance (GT4100 model) and five (5) meristic counts **(**Dorsal Fin rays Count (DFRC), Anal Fin rays Count (AFRC), Pectoral Fin rays Count (PFL), Caudal (tail) Fin rays Count (CFRC) and Pelvic ventral Fin rays Count (PVFL)) were taken on each specimen. The morphometric measurements are; Total length (TL), Standard length (SL), Dorsal fin length (DFL), Caudal fin length (CFL), Anal fin length (AFL), Pectoral fin length (PFL), Pelvic ventral fin length (PVFL), Caudal peduncle depth (CPD) and Head length (HL).

Statistical Analysis

The data from the morphometric measurements were recorded and computed in excel. Pearson correlation analyzed between the parameters was determined through multivariate analysis. Regression analysis was carried out to predict body weight where it was used as the dependent variable for the analysis of the relationships between different body traits. All analyses were carried out using SPSS software version 16.0.0.

RESULT AND DISCUSSION

Pearson Correlation Analysis for all the Variables Measured on *Oreochromios niloticus* and *Coptodon zillii*

All the morphometric measurements showed highly positive and highly significant ($P<0.01$) relationship between each other as shown in Table 1. The correlation coefficient (r) values of *Oreochromios niloticus* ranged from 0.370 - 0.959.the correlation between TL and SL had the highest coefficient (r) (0.959), while between CFL and SL had the least (0.59). That of *Coptodon zillii* ranged from 0.234-0.981, as TL-SL had the highest correlation coefficient (r) (0.981), while CF-CPD had the least (0.234). The remaining measured morphometric traits correlation coefficient (r) values fell within the range of 0.236 to 0,959. The correlation coefficients increase as all measured morphometric traits correlated with total length (TL), and decrease when correlated with caudal fin length (CFL).

Regression of Body Weight from Morphometrics Characteritics in *Oreochromios niloticus* and *Coptodon zillii.*

The prediction of body weight from characteristics of *Oreochromis niloticus* and *Coptodon zillii* in this study is presented in Table 2. Body weight of the fish was considered as the dependent variable in this study. All measured parameters of *Oreochromios niloticus* and *Coptodon zillii* are negaitive except CPD, and were highly significant ($P<0.01$). The regression intercept (a**)** ranged from -91.375 to 3.483, b value ranged from 0.507 to 0,931 and r^2 value ranged from 0.257 to 0.868 of the measured parameters of *Oreochromios niloticus*. that of *Coptodon zillii* are a(-188.226-12.151), b(0.316-0.956) and r^2(0.100-0.914).

Variations between Morphometric Variables

The relationship between morphological traits is very critical in any breeding programme (Ikpeme *et al*., 2017). Results obtained on correlation between body traits of the tilapia fish showed all significant positive and highly correlated values. This may be an indication that, morphological traits are influenced by the same or related genes (Etukudo, Okon & Ekerette, 2016). Regression analyzed reveals a strongest relationship between SL and TL. This agreed with the finding of Ikpeme *et al*., (2017) on assessed the morphometric variation of tilapia fish (*Oreochromis niloticus*) from different populations and revealed high and significant correlation coefficient between the measured traits. Also, Azua *et al*., (2017) reported that correlation analysis between morphometry of *Oreochromis niloticus* revealed a significant positive correlation between standard length and bodyweight, total length and body weight, standard

length and total length, dorsal fin length and body width and head length and dorsal fin length only whilst correlation analysis between morphometry of *Coptodon zillii* was significant between head

length and total length only. Asmamaw and Tessema (2021) revealed significant positive and negative correlations between the morphometric variables of Nile Tilapia (*Oreochromis niloticus*). Selection of one trait will lead to gains in other correlated variables in selection programmes. Importantly, TL, SL, DFL and CPD were highly correlated with body weight of the tilapia fish. The fish in the study area grows slender/strouter and heavier, and its increase in total length may not affect that of caudal fin length. *Coptodon zillii* grows taller and was advice to be used to enhance sustainability in tilapia production.

Table 1: Pearson Correlation of the Measured Morphometric Traits for Oreochromis niloticus (Below Diagonal) and Coptodon zillii (Above Diagonal)

	BW	TL	SL	DFL	PFL	PVFL	AFL	CFL	HL	CPD
BW	-	0.953**	0.944**	0.914**	0.691**	0.709**	0.802**	0.316**	0.850**	0.906**
TL	0.931**	-	0.981**	0.947**	0.798**	0.760**	0.857**	0.348**	0.897**	0.921**
SL	0.918**	0.959**	-	0.911**	0.766**	0.752**	0.840**	0.285**	0.910**	0.909**
DFL	0.870**	0.876**	0.828**	-	0.751**	0.770**	0.885**	0.362**	0.821**	0.877**
PFL	0.742**	0.739**	0.682**	0.668**	-	0.585**	0.639**	0.339**	0.727**	0.745**
PVFL	0.831**	0.846**	0.817**	0.796**	0.700**	-	0.873**	0.236**	0.773**	0.633**
AFL	0.839**	0.871**	0.826**	0.862**	0.652**	0.784**	-	0.312**	0.820**	0.773**
CFL	0.507**	0.618**	0.370**	0.572**	0.534**	0.506**	0.566**	-	0.254**	0.234**
HL	0.836**	0.816**	0.810**	0.715**	0.715**	0.719**	0.756**	0.428**	-	0.815**
CPD	0.804**	0.782**	0.765**	0.734**	0.600**	0.752**	0.752**	0.441**	0.634**	-

**= p<0.01 TL =Total length, SL =standard length, BW= body weight, CPD=Caudal peduncle depth ,PFL= pectoral fin = dorsal fin length, PVFL-=pelvic ventral fin length, AFL =anal fin length, HL= head length, CFL= caudal fin length , ML=male, BG=Bagwai dam, TG =Tiga dam , TD =Thomas dam ,DG= Dundurun Gaya, CZ=*Coptodon zillii*, ON *s niloticus.*

Table 2: Regression for both *Oreochromis niloticus* and *Coptodon zillii* Strains

Oreochromis niloticus						*Coptodon zillii*					
Y	a	b	X	R^2	LOS	Y	a	b	X	R^2	LOS
BW	-91.375	0.931	TL	0.868	***	BW	-188.226	0.956	TL	0.914	***
BW	-82.122	0.918	SL	0.843	***	BW	-177.802	0.944	SL	0.892	***
BW	-62.968	0.870	DFL	0.757	***	BW	-138.529	0.914	DFL	0.835	***
BW	-23.347	0.742	PFL	0.550	***	BW	-78.170	0.691	PFL	0.477	***
BW	-38.976	0.831	PVFL	0.691	***	BW	-79.577	0.709	PVFL	0.503	***
BW	-43.239	0.839	AFL	0.704	***	BW	-101.817	0.802	AFL	0.672	***
BW	3.483	0.507	CFL	0.257	***	BW	12.151	0.316	CFL	0.100	**
BW	-62.474	0.836	HL	0.699	***	BW	-137.974	0.850	HL	0.723	***
BW	-34.689	0.804	CPD	0.646	***	BW	-158.116	0.906	CPD	0.822	***

Y: Trait to be estimated, X: Independent variable, a:intercept *= p<0.05, **= p<0.01, ***= p<0.001 SL =standard length, BW= body weight, CPD=Caudal peduncle depth, PFL= pectoral fin length, DFL= dorsal fin length, PVFL-=pelvic ventral fin length, AFL =anal fin length, HL= head length, CFL= caudal fin length

CONCLUSION AND RECOMMENDATION

Conclusively, tilapia in the study area grows slender/strouter and heavier, and its increase in total length may not affect that of caudal fin length. It is recommended, the using *Coptodon zillii* in breeding programme will lead to enhancement of sustainability in tilapia production.

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