Some morphometric and meristic characteristic of hybrid from albino clarias and normal clarias gariepinus (Burchell, 1822).

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Abstract

A research was conducted to determine the morphometric and meristic characteristic of hybrid (cross between normal Clarias and albino Clarias through artificial breeding using the following matting combination. *Clarias gariepinus* Albino male (♂) x *Clarias gariepinus* albino female (♀), *Clarias gariepinus* albino female (♂) x *Claris gariepinus* normal male (♀), *Clarias gariepinus* normal male (♂) x *Clarias gariepinus* albino female (♀) and normal *Clarias gariepinus* male (♂) x normal *Clarias gariepinus* female (♀). Ten (10) morphometric and meristic characters were examined in samples from each mating combination. A total of 40 fishes were considered. Total length were measured using measuring board, weight were taken using sensitive weighing balance and others parameters were evaluated to the nearest 0.1 mm with digital Vanier caliper. The meristic count were measured using hand lens and a dissecting microscope. From the result obtained, the intermediate morphological traits of the two different coloured hybrids suggest that they are product of true fission of the genome of two different coloured fishes, except for some of the hybrid especially the reciprocal hybrids of female albino and normal male. All the morphometric and meristic characters are the same with their parent. The crosses of normal pigmented and albino *Clarias gariepinus* produces normal pigmented heterozygote with white and black patches on the body. Combine in the offspring and the offspring simultaneously demonstrates both parent phenotypes. The hybrid of female albino and normal male (AA♀ x NN♂), male albino and female normal (AA♂ x NN♀) had brownish colour phenotypically. Therefore, this external features characteristic of both male and female used for each hybridization exercise seemed to have little to no influence to the external features of the resulting hybrid.

Key words: *Clarias gariepinus*, Albino Clarias, Morphometric, Meristic count and Mubi.

Introduction

Morphometric and meristic analyses are part of important rigorous tools used to differentiate closely related species of organism having huge similarity indices of various parameters [1]. Morphometric characters are not only essential to the understanding of the taxonomy but also the health of a species as well as its reproduction in an environment. The shape and structures are unique to each species and the variations in its features are probably related to the habit and habitat among the variant of the species [2]. Although morphological characteristics are phenotypically plastic and are influenced seasonally by the physical environment factors during spawning and early juvenile stages of their life [3]. Morphometric assessment of fish species determines the inter relation between the body parameters like length, weight, fecundity and so on. It is also helps in the understanding of the relation between body parts [2]. Morphometric assessment is also used in the identification of the differences in fish population [4,5]. Morphometric variation between stocks can form one of the bases for stock structure and may be applicable for studying a short-term, environmentally induced variation geared towards successful fisheries management [6]. These measurements are restricted to document the direction of the size of variation in fish stock. The measurement is believed to be a suitable technique for the recognizing the degree of reproductive maturation without sacrificing the fish [7].

Generally, species of fish that have different origin is morphologically differentiated from each other. According to the reported works of analysis of phenotypic differences in morphometric characters or meristic counts is the method most commonly used to delineate stocks of fish [8-10]. According to Onyia this is often being used in discrimination and classification studies by statistical techniques but despite the advent of techniques which directly considers the biochemical or molecular genetic variation, these conventional methods still play vital functions in stock identification even to date [8]. The general health of a population of fish can be accessed through the growth features. So possible variations in the measurable and countable characters will reveal the adaptation to environmental condition, crossing viability

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and help in clarifying their identity [11]. There has not been any previous documented morphological description of the interspecific hybrids of these species. On this background, it is necessary to determine the morphometric and meristic characteristic of cross between albino and normal Clarias.

Material and Methods

Offspring from mating combination of normal Clarias and Albino Clarias were obtained through artificial breeding of the following: *Clarias gariepinus* Albino male (♂) x *Clarias gariepinus* Albino female (♀), *Clarias gariepinus* Albino female (♂) x Clarias gariepinus normal male (♀), *Clarias gariepinus* normal male (♂) x *Clarias gariepinus* Albino female (♀) and Normal Clarias gariepinus male (♂) x Normal *Clarias gariepinus* female (♀).

Hatchlings from this mating combination were cultured for the period of one to determine the morphometric and meristic character. Ten (10) Morphometric and meristic characters were examined in samples from each mating combination. A total of 40 fishes were examined. The morphometric characters were measured using the conventional method described by Hubbs and larger [12]. The characters examined are: Total Length Standard Lengths, Weight, Head Width, girths, eye diameter, inter orbital distances, nasal barbel lengths, and maxillary barbell length. The other Morphometric character are dorsal fin length, dorsal fin height, caudal peduncle length, gap between adipose and dorsal fins, and fin length, and fin height, pectoral fin to pelvic fin, pelvic fin to anal fin, frontal frontanelle length, and occipital frontanelle width. Total length were measured using measuring board, weight were measured using sensitive weighing balance and others parameters were measured to the nearest 0.1mm with digital Vanier caliper, the meristic count were measured using hand lens and a dissecting microscope. The characters counted includes dorsal fin rays, pectoral fin rays, pelvic fin rays, and fin rays and caudal fin rays. All data obtained were subjected to one way analysis of variance (ANOVA) (SAS), while mean were separate using fisher LSD.

Results and Discussion

The result of the measurement are shown in table 1. The low mahalanobis square distance between the two different pigmented Clarias species indicated their level of similarities to each other. The mahalanobis is square distance (D2) between male albino and female normal (AA ♂ x NN ♀) female albino and male normal (NN♂ x AA♀), Albino male and Albino female. (AA♂ x AA♀), and normal male and female (NN♂ x NN♀) C. gariepinus including their offspring in f1 of the interspecific hybrid were not significantly different ($p<0.05$). This clearly indicate how extremely difficult it could be to distinguish this species from their interspecific hybrid using their morphological and meristic features. There are varying pattern of inheritance of some character by offspring of the various mating combination, the hybrid for the offspring of mating combination of normal and albino in F1 shows positive heterosis in the inheritance of brown eyes colour, head width, premaxillary width, and vomemine width in which case they possess different body color (brown) compared to the both parental width pink and black colored eyes. The head of all the mating combination shows the same flattered like the positive parent of *C. gariepinus* species. Therefore, this external features characteristic of both male and female used for each hybridization exercise seemed to have little to no influence to the external features of the resulting hybrid offspring except for the brown eyes and brown body observed in some offspring at the end of the research.

The mating combination are as following;

Clarias gariepinus Albino male (♂) x *Clarias gariepinus* Albino female (♀)

Clarias gariepinus Albino female (♂) x *Clarias gariepinus* normal male (♀)

Clarias gariepinus normal male (♂) x *Clarias gariepinus* Albino female (♀)

Normal *Clarias gariepinus* male (♂) x Normal *Clarias gariepinus* female (♀).

Keys

NN----NORMAL *Clarias Gariepinus*

AA----ALBINO *Clarias Gariepinus*

AA/NN---- ALBINO/NORMAL *Clarias gariepinus*

NN/AA----NORMAL/ALBINO *Clarias gariepinus*

The interspecific hybrids however also show some level of positive heterosis in the inheritance of frontal fontanelle length similar to their parents as shown in (Table 1) and also as a reflection of head length as shown in the same table which there were no significant differences in other cephalic traits between the interspecific hybrids and the parental. In the inheritance of the adipose fin length, the dorsal fin, shows no significant difference ($P<0.05$) in the hybrid of f1. The intermediate morphological traits of the two different colored hybrids suggest that they are product of true fission of the genome of two different colored fishes, except for some of the hybrid especially the reciprocal hybrids of female Albino and normal male (AA♀ x NN♂), male Albino and female normal (AA♂ x NN♀) had brownish color when observed phenotypically as discussed earlier. The findings differed from the finding of Rothbard and Wohlfarth (1993), who reported that inheritance of albinism in grass carp, was as a results of a cross between wild-type heterozygote male and albino female. Among the resulting progeny 52.0% fish were of wild-type color while 48.0% were albino. The crosses of normal pigmented and albino *Clarias gariepinus* produces normal pigmented heterozygote with white and black patches on the body in agreement of Onyia et al [10]. The findings were relevant with the co-dominant and incomplete dominant cases reported by Murtala and Onyia [10-17]. One allele is not completely dominant over the other. There is a blending with the heterozygous offspring or both alleles contribute to the phenotype. Co dominant is a system in which alleles are from each homozygote parents. Combine in the offspring and the offspring simultaneously demonstrates both parent phenotypes (Table 2).

Table 1. *Mean and Standard Error of Some morphometric characters of various mating combination for Clarias gariepinus normal and albino Clarias.*

Mating combination	Number sampled	Head width	Eye diameter	Occipital fontanelle width	Frontal fontanelle length	Pre maxillary width	Vomerine length	Vomerine width	Pelvic fin length	Caudal peduncles length
NN♂ x NN♀	10	4.21±0.32^{b}	0.61±2.31^{a}	0.61±2.31^{a}	2.56±1.31^{a}	2.61±1.32^{a}	0.61±1.31^{a}	1.80±0.43^{a}	2.30±1.30^{a}	1.20±0.32^{a}
AA♂ x AA♀	10	5.20±1.31^{a}	0.52±1.31^{b}	0.40±0.61^{b}	2.13±0.22^{b}	2.41±0.13^{a}	0.32±1.34^{b}	1.60±0.31^{b}	2.10±2.30^{b}	1.32±0.36^{a}
NN♂ x AA♀	10	4.80±0.35^{b}	0.72±1.31^{a}	0.60±0.83^{a}	2.47±1.23^{a}	2.00±0.23^{b}	0.36±0.32^{b}	1.5±0.23^{b}	2.00±1.30^{b}	1.10±0.82^{b}
AA♂ x NN♀	10	5.30±1.34^{a}	0.51±1.33^{b}	0.50±0.13^{a}	2.12±0.21^{b}	2.20±1.34^{a}	0.52±0.35^{a}	1.8±0.34^{a}	2.41±1.31^{a}	1.00±0.31^{b}

Mean in the same row with the same super script do not differ significantly (P<0.05).

Table 2. *Mean and Standard Error of Some meristic characters of various mating combination for Clarias gariepinus normal and albino Clarias.*

Mating combination	Number sampled	Dorsal soft fin rays	Pectoral soft fin rays	Pelvic soft fin rays	Anal soft fin ray	Caudal soft fin rays	Number of spins in dorsal fin	Number of spins in pectoral fin	Number of spins in pelvic fin	Number of spins in anal fin
NN♂ x NN♀	10	70.50±0.30^{a}	10.50±0.33^{a}	12.50±1.31^{a}	55.00±1.41^{a}	46.50±0.00^{a}	0.0±0.00^{b}	1.00±0.43^{a}	0.00±0.00^{a}	0.00±0.00^{a}
AA♂ x AA♀	10	70.50±0.32^{a}	10.50±0.33^{a}	12.50±1.31^{a}	55.00±1.41^{a}	46.50±0.00^{a}	0.0±0.00^{b}	1.00±0.43^{a}	0.00±0.00^{a}	0.00±0.00^{a}
NN♂ x AA♀	10	70.50±0.32^{a}	10.50±0.33^{a}	12.50±1.31^{a}	55.00±1.41^{a}	46.50±0.00^{a}	0.0±0.00^{b}	1.00±0.43^{a}	0.00±0.00^{a}	0.00±0.00^{a}
AA♂ x NN♀	10	70.50±0.32^{a}	10.50±0.33^{a}	12.50±1.31^{a}	55.00±1.41^{a}	46.50±0.00^{a}	0.0±0.00^{b}	1.00±0.43^{a}	0.00±0.00^{a}	0.00±0.00^{a}

Mean in the same row with the same super script do not differ significantly (P<0.05).

Conclusion

The finding agreed with the work of Maliszewski who stated that progeny from a wild female and yellow albino male were half wild and half brownish yellow. These reports do not conform to the work of Gomelsky on dihybrid crosses that investigated the colour ratios in progenies obtained after crossing of two-color and tri-color koi. Result show from that study that the white-red color complex and the presence of black patches in koi were inherited independently and the presence of black patches was controlled by the dominant mutation of one gene. Morphological abnormalities observed in some offspring of the mating combination, the skin of the albino cat fish tends to be harder than the normal color *C. gariepinus*, this was observed during breeding when ovaprim was injected to the females to the parent fish. Therefore, this mating combination seemed to have little to no influence to the external features of the resulting hybrid.

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