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Growth Performance of Wild Strains of *Clarias gariepinus* from Nigerian Waters

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ABSTRACT

The catfish (*Clarias gariepinus*) used in aquaculture are suffering from inbreeding depression with its attendant poor egg and sperm quality. There is the need to explore the natural population to improve performance. This study was carried out to evaluate the growth performance of strains of the catfish across the freshwater systems of Nigeria. Collections were made from Kogi, Adamawa, Kebbi, Oyo, Anambra, Delta states and domesticated strain obtained from Lagos. The fish were bred and fed for 12 weeks before subjected to growth study. The 25 juveniles of each strain were allocated in 1 m^3 hapas installed in a 0.4 ha at Badore fish farm, Lagos, Nigeria, fed 3% body weight twice daily while sampling forth-nightly. The results showed that the domesticated strain performed significantly better ($\alpha = 0.05$) than the six wild strains studied. There was, however, no significant variation in the SGR and FCR among the strains. However, the growth study showed that the strain from Kebbi did not perform as much as other strains in terms of these growth indices. However it had the highest survival (96%). The strains from Oyo and Anambra, however, showed better growth over the rest strains from the wild. The implication of the breeding potentials of *Clarias geriepinus* strain from Kebbi, Oyo and Anambra is that if several selective breeding of these strains are carried out and the gene pool of Kebbi is combined with any of these two, fish seed of better growth and survival are obtained.

Key words: Growth, performance, wild, *Clarias gariepinus*

INTRODUCTION

The catfish (*Clarias gariepinus*) is a remarkable fish species in Nigeria where it is the leading aquatic crop. It has the credentials of fast growth, resistance to disease and handling stress. It has air-breathing structure and can, therefore, tolerate very low oxygen levels in any aquatic environment as well as on land. Nigeria is presently the largest producer of catfish (FAO, 2005).

Growth is a complex process and it can be defined as an increase in size (length, volume, mass and body composition) of an organism over time. Growth can differ between species, strains or populations within the same species and different individuals within the same population. Among cultured animals, fish species exhibit the largest individual variation in growth. For most farmed

animals, the Coefficient of Variation (CV) for growth varies between 7 and 10%. However, for fish species, the coefficient of variation is between 20 and 35% (Gjedrem, 1997). Disparity of individual growth may result from individual differences in feed intake (Umino *et al*., 1997) or feed efficiency (Qian *et al*., 2002) or combination of both. More often, than not, social hierrhachies have been implicated as the main source of growth disparity, resulting in dominant (large individuals) and subordinate (smaller individuals). The dominant individuals often monopolize larger share of available resources, bringing about faster growth of these dominant fish with respect to subordinate ones. Other environmental factors that may affect size disparity include stock density, temperature, water current daylight and maternal effect (Kestemont *et al*., 2003), cannibalsm and protein turn-over (Bang *et al*., 2004). Apart from environmental factors, genetic factors may play a role in bringing about differences in the growth of individual fish (Qian *et al*., 2002). The study was carried out to evaluate growth performance of wild strains of the catfish (*Clarias gariepinus*) from different water bodies in Nigeria.

MATERIALS AND METHODS

The growth studies involved allocation of 25 juveniles each of 6 wild strains and domesticated strain of *C. gariepinus* in 1 m^3 hapas installed in a 0.4 ha at Badore fish farm. Fed 3% body twice daily while sampling forthnightly.

Experimental design and juvenile *Clarias gariepinus* strain collection: The experiment was designed to investigate the effects of strain variation on growth performance, survival rate, feed conversion ratio and growth pattern. Fish, for spawning, were collected from 6 states of Nigeria covering the 6 geo-political zones namely, North-Central (Lokoja: N6°49.02[1], E8°44.1°, Sakin Noma: N8° 12.13[1] E6° 24.2[1]), NORTH-EAST (Kiri lake: N09°61.2[1] E12°28.5[1], Gerio lake: N09°12.8° E 12°28.6[1], North-West (Argungun: N12°44.6[1]; E004°31.31[1], River Niger: N11°41.2[1]; E003° 37.3[1]), South-West (Eleyele lake: N07°26.2[1] E 03°54.2[1], Asejire lake: N07°23.5 [1]E03°55.0)[1] South-East (Otuocha: N06°20.2[1] 006°50.3[1], Igbariam: N06°23.5[1] 006 56.3[1]), South-South (Umuochi/Ona river: N06°16.1[1] E06°42.5[1], River Ethiope: N05°54.4[1] E05°40.4[1]) and Domesticated Strain obtained from Lagos. These were conditioned, fed and bred in the wet laboratory of the Nigerian Institute for Oceanography and Marine Research, Victoria Island, Lagos and reared to average weight of 22-44 g.

The experimental fish were fed twice a day at 10 and 17 h with the feed produced by coppens feed from The Netherlands while the daily surface water temperature was measured. The feeding rate was 3% of the body weight of the fish per day throughout the experiment. The amount of the feed was adjusted once in two weeks based on the body weight of the fish.

Data collection: During the experiment, water quality parameters such as temperature, Dissolved Oxygen (DO) concentration and pH were measured daily. Total Dissolved Solid particles (TDS), conductivity and salinity were also measured once in two weeks interval with the same instrument.

Sampling of fish and measuring of growth parameters: The 50% of fish were sampled every two weeks for their body weight and body length measurement. Length and weight of the fish were

measured using ruler and digital weight balance (Ohaus portable balance), respectively. Mortality of the fish was also registered throughout the experiment.

Statistical analysis: Based on the data collected during the experiment, growth performance and feed conversion ratio and rate of survival were calculated as follows:

$$\text{SGR\%(day)} = \frac{\text{lnFMBW} - \text{lnIMBW}}{\text{d}} \times 100$$

$$\text{FCR} = \frac{\text{FI(g)}}{\text{MBWG(g)}}$$

$$\text{Survival rate(\%)} = \text{NSF} - \frac{\text{NDF}}{\text{NSF}} \times 100$$

Where:

FBW and IBW = Final and initial mean body weight, respectively
d = Time interval in days during the study period
FI = Amount of feed intake (g)
MBWG = Mean body weight gain in gram (g)
NSF and NDF = No. of stocked and dead fish during, respectively

RESULTS

ANOVA ($\alpha = 0.05$) revealed significant variation in the percentage weight gain, average daily weight gain, average daily growth and survival of fingerlings of the wild strain from the six geopolitical zones. The domesticated strain of *Clarias gariepinus* performed much better than the six wild strains (Table 1). This may be attributable to selective breeding which probably had been carried out by the farmers from which the broodstocks were purchased. It could equally be due to the use of the Dutch strain which is known to have superior growth over the traditional strain found in Nigeria. There was, however, no significant variation in the SGR and FCR among the strains. The growth study showed that the strain from North-West (Kebbi) did not perform as much as other wild strains in terms of these growth indices. However, it had the highest survival (96%).

Table 1: Growth performance of *Clarias gariepinus* fingerlings reared over 10 weeks in Hapa

Parameters	NW (Kebbi)	NE (Adamawa)	NC (Kogi)	SW (Oyo)	SE (Anambra)	SS (Delta)	Domesticated
Initial weight (g)	26.0±4.1	42±4.3	22.0±3.9	43.3±5.6	32.1±2.6	22.0±3.6	32.1±3.5
Final weight (g)	129.8±24.6	185.8±14.4	161.8±9.6	204.7±4.8	196.1±18.9	150.2±16.2	240.0±14.6
Weight gain (g)	103.8±21.6	143.1±13.8	139.8±3.9	161.4±4.3	164.0±14.6	128.2±15.8	207.9±13.6
Weight gain (%)	399.2	393.6	635.1	372.7	523.1	582.7	647.7
Av. daily gain (g/fish)	1.482	2.40	1.20	2.31	2.40	1.83	2.97
FCR	1.74	1.91	1.70	1.62	1.61	1.65	1.36
SGR (%/day)	1.0	0.99	1.11	0.96	1.15	1.19	1.21
Survival	96	88	76	80	86	76	70

DISCUSSION

There were variations in the growth performance both within and between strains of *Clarias gariepinus* studied. This is in agreement with the finding of Van der Waal (1998), who reported that African catfish exhibits considerable growth variation both under aquaculture and in the wild. The causes of such variation are still not clear. However, it has been suggested that inherent differences genetic makeup and feeding behaviour may contribute to this variation (Valente *et al*., 2001; Sundstrom *et al*., 2003; Martins *et al*., 2005). The ability of an organism to utilize nutrients especially protein will positively influence its growth rate (Sogbesan and Ugwumba, 2008). Optimal water quality was maintained by frequently changing the water through the flow-through system. This also ensured that metabolic wastes did not accumulate in the facility. At the end of the experiment, there were significant differences in growth performance and nutrient utilization between the 6 strains and control (domesticated strain). The domesticated strain performed much better than all the wild strains. This was in agreement with Dunham *et al*. (2001), who reported that domesticated strains usually perform better in the aquaculture environment than wild strains probably due to the effect of inbreeding brought about by repeated use of fish of the same lineage. The author further maintained that reliance on wild broodstock is risky and negates the opportunity to enhance disease resistance (as well as other production traits) through selective breeding. The detrimental effects of inbreeding are well documented and can result in decreases of 30% or greater in growth production, survival and reproduction in some cases, the author reported. Wild strains of good spawning performance could however be selected for breeding programs. Dunham *et al*. (2001) reported that good broodstock management needs to be promoted to avoid inbreeding problems.

Another possibility of better growth observed in the domesticated strain is that most of the *C. geriepinus* in Nigeria farms are either exotic strain or a mixture of the genome of traditional strain with the exotic strain. The exotic *C. gariepinus* is marketed in Nigeria under different names: Exotic *C. gariepinus*, Albino *Clarias*, Holland or Dutch *Clarias* and it constitutes one of the major strains of the large African catfish cultivated (Oyeleye and Omitogun, 2007). *C. gariepinus* was thought to be the progenitor of exotic *C. gariepinus* (Dada and Wonah, 2003) which has undergone many years of selection and domestication (Cambray and van der Waal, 2006).

One of the problems associated with aquaculture development in Nigeria is that native species have not been selected and domesticated enough to be acclimated and suitable for rearing conditions. Thus, response to management is limited. High growth rate (6%) in the catfish *Ictalurus punctatus* from generation to generation was attributed to long period of domestication and adaptation to rearing condition (Dunham *et al*., 2001). This study therefore has important implication for *Clarias gariepinus* culture in Nigeria.

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