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Survival and Growth of Hybrid (Female *Clarias gariepinus* (B) and Male *Heterobranchus longifilis* (Val.) Fingerlings: Effect of Broodstock Sizes

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Abstract: The survival and growth performance of hybrid (Female Clar*i*as *gariepinus* and male *Heterobranchus longifilis*) fingerlings raised from three brood stock size-range (small: = 250 g; medium: 300-650 g: large 700-950 g) were studied. After 56 days rearing period, the percentage fingerlings survival for the treatment were similar. Fingerlings from large size-range brood stock had the greatest average daily growth but fingerling from medium size-range had the best specific growth rate and was significantly different ($p<0.05$) from other treatments.

Key words: *Clarias* · *Heterobranchus* · hybrid fingerlings · broodstock sizes · survival and growth

INTRODUCTION

Food is a basic necessity of life, second only to air and water. The global food equation recognizes two major components namely: food crop component and animal protein component [1]. Animal protein source include fish, poultry and livestock. Fish consumption in Nigeria is higher due to its availability and comparatively cheaper prices than livestock production: Market survey in Akure, Ondo State, Nigeria for 2002-2004 revealed price per kilogram of fish to be ₦350 and beef ₦430.

Aquaculture has been accepted the world over as a means for increasing fish production and a developing country like Nigeria with her immense resources offer tremendous possibilities for fish culture [2]. Aquaculture expansion has been in slow process as private sector fish farmers face major constraints, such as lack of seed and quality feed [3]. Catfish family Clariidae is very popular in Nigeria due to its culture characteristic which has endeared it to many fish farmers. Ninety percent of the catfish supply in Sub-Saharan Africa in 2000 occurred in Nigeria [4].

Clarias gariepinus and *Heterobranchus* sp. are species of high aquaculture importance in Nigeria. They are widely cultured owing to their high market price, fast growth rate and ability to withstand adverse pond conditions especially low oxygen content. *Heterobranchus* grows faster and attain bigger size than *Clarias* which matures earlier, more adaptable and has higher fecundity [5-7] reported that inter-specific hybrid fishes transfer desirable traits between species, combine desirable trait of two species into a single group of fishes. The hybrids of *Heterobranchus* and *Clarias* exhibit the fast growing quality of *Heterobranchus* reaching up to 1.0 kg under eight months in ponds and resistant to diseases [6, 8, 9].

In Nigeria, getting fast growing fish seed have been a major problem to farmers targeting high yields. Hybrid clariid catfish has increased rapidly in the last few years and apparently market demand is still increasing. FAO [3] reported that Nigeria is one of the largest importers of fish in the developing world, importing some 600,000 metric tones (mt) annually. To solve the country's high demand for fish, Nigerians must turn to their under utilized inland waters for improved fish production and aquaculture. Ayinla and Nwadukwe [10] found that there are variations in the sizes of fingerlings produced from the same clariid broodstock at the same time and that the variations in sizes of the fingerlings might be related to the variations in sizes of their eggs.

Ufodike [11] noted that the largest mature *C. lazera* (*gariepinus*) would usually give the best spawn weight in induced breeding but there is no mention in any literature available as to whether the fish with the best spawn would equally give the best fry survival and best growth performance. This study was therefore designed

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to investigate the survival and growth performance of the hybrid between female *Clarias gariepinus* and the male *Heterobranchus longifilis*.

MATERIALS AND METHHODS

A total of two hundred and seventy (270) 14 days old hybrid catfish (*C. gariepinus* and *H. longifilis*) fry were used. Thirty fry were assigned to each one of three replicates of the three broodstock size-ranges. The treatments were randomly allocated to nine hapas (0.45×0.33×0.33 m) suspended in concrete tanks of size 1.0×1.0 m.

Prior to stocking, quicklime was applied to the tank bottom at 150 g m^{-2} to eliminate parasites and invertebrate predators. Ten days later, the tanks were filled with fresh water from the reservoir. Source of water used was pond water which had been sieved using improvised sieving cloths.

Feeding trial: Fry in each hapa were gradually weaned over a five-day period unto pelleted artificial diet (52% crude protein). Feeding was done twice daily at 5% body weight at 0900 and 1700 h for a period of 56 days.

The mean fry size (weight, g and total length, cm) for each treatment and its replicates were measured every 7 days. The average daily growth (ADG) and specific growth rate (SGR) for each treatment were also calculated. Data were further subjected to one way analysis of variance and mean separation was carried out with TUKEY-HSD multiple range test.

Survival of fingerlings: At harvest, the fish were removed from each treatment and replicates, counted and weighed. Deaths were recorded and removed twice daily during cleaning and feeding. Distinction was drawn between cannibalistic and non-cannibalistic causes of death. The latter was identified by the presence of dead unmutilated fry lying at the bottom of the hapa, if left over night corpses were sometimes found with the abdomen removed and uneaten. Percentage survivals were subjected to analysis of variance and mean separation was done with TUKEY-HSD test ($p>0.05$).

Water analysis: The water quality was measured twice daily at 0800 and 1600 h. The parameters monitored were water temperature, pH and dissolved oxygen content (DO_2). Temperature determination was done using mercury-in-glass thermometer, pH was done with pH meter and DO_2 was done with water test kit. The water in the tank was replaced on weekly basis.

RESULTS

Growth performance of hybrid fingerlings:

Growth performance in weight: Figure 1 shows the growth performance in weight over 70 days of hybrid (*C. gariepinus* male and *H. longifilis* male) fingerlings raised from three broodstock size ranges. In all treatments, fish increased rapidly in weight with each successive 14-days as evidenced in the graph.

Average daily growth and specific growth rate: Mean body weight, Average Daily Growth (ADG) and Specific Growth Rate (SGR) of the fingerlings is presented in Table 2. The highest average daily growth was obtained in broodstock with the largest size. Fingerlings produced from large size broodstock gained significantly ($p<0.05$) more weight over each 7-day period

Table 1: Survival of Hybrid (*C. gariepinus* female and *H. longifilis* male) from three broodstock size-range

	Treatment			Level of significant
Parameters	1	2	3	(0.05)
% fingerling Survival	69.3±4.8	79.7±3.8	79.0±1.5	NS

NS = Not Significant at ($p>0.05$), 1 = Small broodstock (≤250g)

2 = Medium broodstock (300-650 g), 3 = Large broodstock (700-950 g)

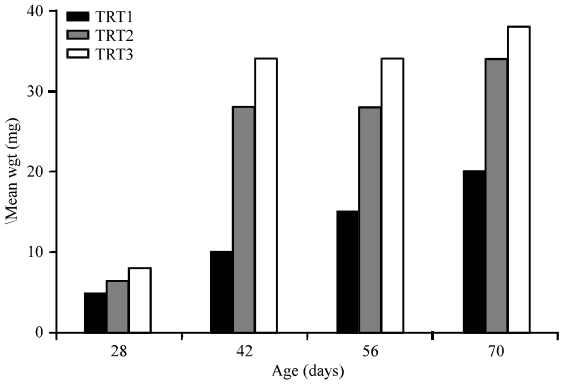

Fig. 1: Growth Performance in weight over 70 days of hybrid (*C. gariepinus* female and *H. longifilis* male) fingerling rose from three broodstock size-range,
TRT 1: Small sized broodstock ≤250 g
TRT 2: Medium sized broodstock (300-650 g)
TRT 3: Large sized broodstock (700-950 g)

Table 2: Mean body weight, Average Daily Growth (ADG), Specific Growth Rate (SGR) of Hybrid (*C. gariepinus* and *H. longifilis*) Fingerlings reared for 56 days

Parameter	TRT1	TRT2	TRT3	Level of significance (0.05)
Initial mean weight (mg) at day 14	2.47±0.09	2.97±0.09	3.80±0.12	
Final mean weight (mg) at day 70	20.27±0.12	32.00±0.00	34.83±0.60	
Mean weight gain (mg)	17.80±0.10	29.03±0.09	31.03±0.48	
ADG	0.32±0.10[a]	0.52[b]	0.55±0.10	
SGR	1.63±0.10	1.84±0.10[b]	1.72±0.10[a]	

* = Significant at 5% probability and figures, followed by different alphabet differ, ADG = Final weight-initial weight/rearing period, SGR = (Log final weight-log initial weight/rearing period) X 100, TRT1 = Small broodstock (≤250 g), TRT2 = Medium broodstock (300-650 g), TRT3 = Large broodstock (700-950 g)

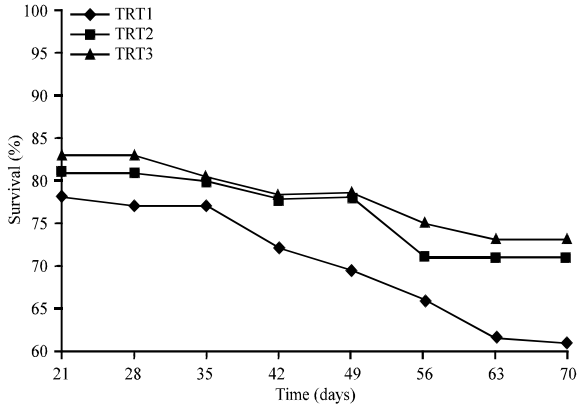

Fig. 2: The change in percentage fingerlings survival over time of Hybrid (female *C. gariepinus* and male *H. longifilis*) from three broodstock size range
TRT 1: Small sized broodstock ≤250 g
TRT 2: Medium sized broodstock (300-650 g)
TRT 3: Large sized broodstock (700-950 g)

Table 3: Proximate analysis of fish feed fed to the fish

Nutrient	% Composition
Moisture	6.02
Crude protein	52.00
Fat and Oil	8.57
Crude fibre	2.40
Ash	9.40
NFE	21.40

than those produced from lower size-range broodstock. Differences in average daily growth was significant ($p<0.05$) from those of medium size, it was also significantly different from those of small size range at 5% level.

Fingerlings produced from medium size-range broodstock have significantly higher growth rate than fingerling from large size-range and small size-range

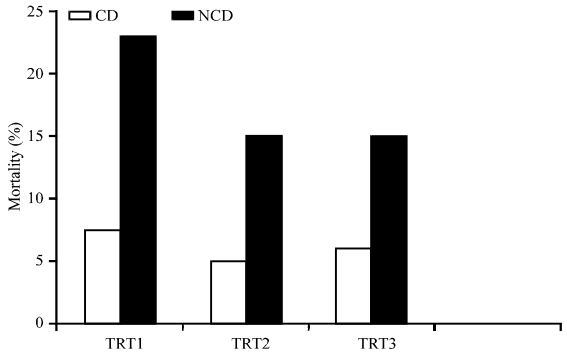

Fig. 3: Mean percentage causes of mortality

broodstock as evidenced by the Specific Growth Rate (SGR) values.

Survival of fingerlings:

Percentage fingerlings survival: Figure 2 presents the percentage fingerling survival for each successive 7-day period for each treatment between day 15 and day 70. At harvest, percentage fingerlings survival was highest in medium-sized broodstock than the other two categories as evidenced in Fig. 2 and Table 1. However, these differences were not significant ($p>0.05$). Mean survival was in excess of 60% in all treatments over the 56 days rearing period.

Percentage mortality: Deaths resulted due to handling stress during weighing rather than due to fluctuation in the physico-chemical parameters. Deaths due to territorialism were also observed in all the treatments. Type I cannibalism was observed but no type II cannibalism (consumption of whole siblings) took place. Figure 3 presents the mean percent causes of deaths (cannibalistic and non-cannibalistic) in all the treatments.

Water analysis: Table 4 presents the values of the physico-chemical parameters of the water used.

Table 4: Physico-chemical parameters of water

	Temperature (°C)			Dissolved oxygen (ppm)			pH		
Tank	Morning	Afternoon	Mean	Morning	Afternoon	Mean	Morning	Afternoon	Mean
1	27.50	28.50	28.00	5.30	7.50	6.40	7.09	7.60	7.35
2	27.50	28.55	28.03	5.30	7.60	6.45	7.10	7.60	7.35
3	27.50	28.50	28.00	5.35	7.55	6.45	7.10	7.60	7.35
4	27.40	28.60	28.00	5.40	7.40	6.40	7.00	7.10	7.05
5	27.00	28.40	27.70	5.50	7.60	6.55	7.00	7.05	7.03
6	27.20	28.00	27.70	5.50	7.60	6.55	7.00	7.00	7.00
7	27.40	28.50	27.90	5.40	7.55	6.48	7.10	7.30	7.20
8	27.50	28.55	28.03	5.30	7.64	6.47	7.10	7.50	7.30
9	27.55	28.60	28.08	5.35	7.55	6.45	7.00	7.40	7.20

TRT 1: Small sized broodstock ≤ 250 g, TRT 2: Medium sized broodstock (300-650 g), TRT 3: Medium sized broodstock (700-950 g)

DISCUSSON

The average daily growth performance of the fingerlings produced from the large broodstock size-range was significantly different from those of medium size-range and highly significantly different from those of small broodstock size-range. The significant difference in average daily growth of the fingerlings from the treatments observed in this experiment is ascribed to generic variance, since similar milt, diet, feeding regimes, hatchery condition and techniques were provided. Histogram of growth performance over 70 days (Fig. 1) of the fingerling clearly shows this disparity.

Fingerling from bigger size broodstocks has higher mean weighty gain as evidenced in the graph. The growth performances of the fingerlings were also assessed based on specific growth rate values. Statistical analysis shows that there were significant differences in the specific growth rate of the treatment. Fingerling produced from medium size-range broodstock performed best and was significantly different from the other two (Fig. 1). Since specific growth rate measures growth performance over a long period of time as against the average daily growth which is a daily effect, specific growth rate would therefore be a better parameter to determine which size range would be the best candidate for the optimum production of fingerlings. Medium size-range *C. gariepinus* broodstock would be the best as the good growth performances was not an environmental effect but genetical. The result of this experiment agrees with that of Ayinla and Nwadukwe [10] where they recorded that when broodstocks of *C. gariepinus* average weight of 664.5 g were used highest percentage of shooters were obtained. The weight relatively falls into medium size-range in this experiment.

After 56 days of rearing, percentage survival of fingerlings was highest for medium size-range broodstock. The result was however not statistically significant. (Fig. 2).

CONCLUSIONS

This study has established that growth performance of hybrid (female *C. gariepinus* and male *H. longifilis*) fingerlings were best when medium size-range (300-650 g) broodstock were used.

REFERENCES

1. Balogun, 1998. The sanctity of fish as food. Inagural lecture series 14, Federal University of Technolgy, Akure, pp: 79.
2. Dada, B.F. and D.A.S. Gnanadoss, 1983. Nigeria fisheries development challenges and opportunities F.I.S.O.N. Conference paper, pp: 14.
3. FAO., 2003. Opportunities for aquaculture development in Nigeria, FAO Aquaculture Newsletter No 29. FAO, Rome, pp: 39.
4. FAO, 2004. World Aquaculture supply of catfish and tilapia. FAO fisheries report No 733 FAO Rome, pp: 46.
5. Oladosu, G.A., O.A. Ayinla, A.A. Adeyemo, A.F. Yakubu and A.A. Ajani, 1993. A comparative study of the reproductive capacity of the African catfish species Heterobranchus bidorsalis Geoffroy, *Clarias gariepinus* Burchell and their Hybrid "Heteroclarias" NIOMR Technical Paper No. 92.
6. Hogendoorn, H., 1981. Controlled propagation of the African catfish, *Clarias lazera* (C and V) IV. Effect of feeding culture. Aquaclature, 24: 123-131.
7. Bartley, D.M., K. Rena, A.J. Immink, 2000. The use of inter-specific hybrids in aquaculture and fisheries. Reviews in Fish Biology and Fisheries, 10: 325-337.
8. Ajana, A.M. and P.E. Anyanwe, 1995. NIOMR Aquaculture Extension Guide, 7: 15.

9. Hecht, T. and W. Lublinkhof, 1985. Clarias gariepinus x Heterobranchus longifilis (Clariidae: Pisces) a news hybrid for aquaculture? South Afr. J. Sci., 81: 620-621.
10. Ayinla, O.A. and F.O. Nwadukwe, 1989. Fingerlings size variation among freshwater catfish: Effect of broodstock sizes. In: Onyia, A.O. and G.N. Ajana (Eds.). Fish for food: Meeting the demand. Proceeding of a Conference, 13-17 November 1989. Fish. Soc. Nig., pp: 43-47.
11. Ufodike, E.B.C., 1987. Gonadal histogenesis in African catfish *Clarias lazera*. Nig. J. Appl. Fish. Hydrobiol., 2: 55-58.