COMPARATIVE GROWTH AND SURVIVAL OF FRY OF *Clarias gariepinus* (B), *Clarias anguillaris* (L), *Heterobranchus bidorsalis* (G), *Heteroclarias*, *Clariabranchus* AND *Clarias* Hybrids UNDER OUTDOOR NURSERY MANAGEMENT SYSTEM.

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ABSTRACT

Hybrids of Clariid catfishes; *C. gariepinus* (Netherlands), *C. anguillaris*, *H. bidorsalis* and their parental species were monitored for 8 weeks in 2 x 2 x 1m outdoor concrete tanks. The fry were fed NIFFR diet (40% crude protein) twice daily, 7 days of the week. Growth and survival records were taken weekly. The ♂ HEB X ♀ CLG hybrid showed an overall highest performance in growth rate while the lowest was recorded in ♂ CLA X ♀ CLG hybrid.

The ♂ HEB X ♀ CLG hybrid grew at a faster rate than its reciprocal hybrid. In view of their growth rate, it is possible that the growth and survival rates of *H. bidorsalis* especially at the fry to fingerling stage could be improved through hybridization. The hybrid have potential as commercial food fish.

INTRODUCTION

It is an established fact that inadequacy of good fish quality and fast growing seed is one of the major constrain in fish culture in Nigeria today. The catfish species are very popular with fish farmers and consumers, and commands a very good commercial value in Nigerian Markets (Ezenwaji, 1985, Oladosu *et. al.*, 1993, Ayinla *et. al.*, 1994).

The catfish species are very important to the sustainabiltity of the aquaculture industry in the country. However, inspite of the breakthrough reported for the artificial propagation of the African catfish species (Richter and Vander hurk, 1982, Madu *et. al.*, 1987, Madu, 1989) the demand for the seeds still outstrip the supply. The increasing population and the desire to obtain nutritionally balanced level of protein intake is the major cause of demand outstripping supply for fish in Nigeria.

Considerable interest has been generated in the potential of catfishes genus *Clarias* for aquaculture in Nigeria. However, the National Institute for Freshwater Fisheries Research, New Bussa recently imported *Clarias gariepinus* from Netherlands because of the need for fast growing fingerlings that will satisfy the culture requirements of fish farmers with the belief that the imported fish have been genetically improved to imbibe fast growth traits. The aim of this study was to compare the growth and survival of *Clarias gariepinus* (Netherlands), *Clarias anguilllaris*, *Heterobranchus bidorsalis* and their hybrid as they grew from fry to fingerling stages under outdoor nursery management system. This

will therefore serve as an information and records to fish farmers with the aim to enhance catfish table size production taking the consumers preference into consideration.

MATERIALS AND METHODS

Clarias gariepinus (Netherlands), *Clarias anguillaris* and *Heterobranchus bidorsalis* were interbred and crossbred at the fish hatchery complex of the National Institute for Freshwater Fisheries Research, New Bussa by induced breeding. Mature catfish females and males were selected and induced to spawn with ovaprim injected intramuscularly in a single dose of 0.5m/kg fish weight. For the hybrid *Clarias*, male *Clarias gariepinus* was crossed with female *Clarias anguillaris* and reciprocal. Hatchlings of *Heterobranchus bidorsalis, Heteroclarias and Clariabranchus* were produced by artificial propagation (stripping method), while the others were produced by hormone induced natural spawning as described by Madu *et. al.* (1989).

The hybrids and parental species (control) fry were transferred to troughs where they were reared according to the procedures used by Madu *et. al.* (1989). They were fed ad. libitum with zooplankton for 21 - days prior to their transferred to outdoor nursery system for growth monitoring to fingerling stage.

Growth trials were performed in duplicate for each of the parental and hybrid crosses in outdoor concrete tanks of dimension 2 x 2 x 1 cubic metre. The crosses in each treatment were as follows:

Treatment I:
C. gariepinus (m) X *C. gariepinus* (f)

Treatment II:
H. bidorsalis (m) X *H. bidorsalis* (f)

Treatment III:
C. anguillaris (m) X *C. anguillaris* (f)

Treatment IV:
H. bidorsalis (m) X *C. gariepinus* (f)

Treatment V:
C. gariepinus (m) X *H. bidorsalis* (f)

Treatment VI:
C. gariepinus (m) X *C. anguillaris* (f)

Treatment VII:
C. anguillaris (m) X *C. gariepinus* (f)

The depth of the water was constantly been kept at half of the tank. Fry were stocked in each of the concrete tanks at density of 500 fish i.e 125 fish/m^2. Uniform size fry were used in order to reduce individual competitive advantages due to initial size. Fish were feed on NIFFR diet (40% c.p.) (Table 1) twice daily, 7 days of the week for 8 weeks.

Measurements of the fish weight and length were taken weekly to determine weight gain, length gain, growth rate and revised feeding allowances based on the total weight of fish. To avoid sampling error at least 30% of the fish were weighed and counted weekly. At the end of the experiment, the total number of fish in each treatment and percentage survival were determined.

Sample of water from the concrete tanks was analysed weekly for temperature, dissolved oxygen and pH. The temperature of the water was monitored with the mercury-in-glass thermometer while the oxygen content was evaluated by Winkler's method and the pH by pH meter.

Analysis of variance of growth rate: weight gain, specific growth rate and average daily weight gain obtained from the studies were subjected to one-way- analysis of variance (ANOVA) using the analytical programs available in the statistical package - EPISTAT.

RESULTS

The results of the mean body weight, mean total length, specific growth rate (SGR) and average daily growth (ADG) of catfish; *C. gariepinus* (Netherlands), *C. anguillaris*, *H. bidorsalis* and their hybrid fry reared for 8 weeks under outdoor nursery management system are presented in Table 2. The greatest mean increase in body weight (2.99g), average daily growth rate (0.06g/day) and

Table 1: Ingredients and Proximate Composition of National Institute for Freshwater Fisheries Research, New Busssa, Fish Feed.

Ingredient composition	(% dry weight)
Yellow maize	15.0
Groundnut cake	47.0
Soybean meal	30.0
Fish meal	5.0
Vitamin premix	2.0
Bone meal	1.0
Proximate composition	(% wet weight)
Moisture	7.01
Ash	16.23
Crude protein	39.82
Crude lipid	23.15
Crude fibre	2.40
Nitrogen-free extracts	11.38

Table 2: Mean body weight, Mean total length, Specific growth rate (SGR) and average daily growth (ADG) of Catfish, *Clarias gariepinus* (Netherlands), *Clarias anguillaris*, *Heterobranchus, bidorsalis* and their hybrid fry reared for 8 weeks under outdoor nursery management system.

Parameter	C. gariepinus	C. anguillaris	H. bidorsalis	Heteroclarias	Clariabranchus	Hybrid Clarias	
						♂ CLG x ♀ CLA	♂ CLA x ♀ CLG
Initial							
Mean body weight (g)	0.03	0.02	0.02	0.02	0.02	0.04	0.07
Mean total length (cm)	1.52	1.06	1.15	1.15	1.16	1.39	1.82
Final							
Survival (%)	82.6	73.4	68.7	86.3	72.1	62.2	61.4
Mean body weight (g ± SD)	2.69 ± 0.94	1.07 ± 0.33	3.01 ± 1.03	3.30 ± 1.05	1.23 ± 0.51	1.02 ± 0.36	1.36 ± 0.47
Mean total length (cm ± SD)	8.68 ± 2.39	7.63 ± 2.01	8.05 ± 2.21	8.16 ± 1.81	6.26 ± 1.71	5.75 ± 1.20	5.08 ± 1.13
Increase in body weight (g)	2.66	1.05	2.99	3.28	1.21	0.98	1.29
Increase in total length (cm)	7.16	6.57	6.73	7.01	5.10	4.36	3.26
Average daily growth (g/day)	0.05a	0.02c	0.05ab	0.06ab	0.02c	0.02c	0.02c
Specific growth rate (%/day)	3.49d	3.09a	3.89d	3.96d	3.19ab	2.51abc	2.30abc

Mean values in the same row with similar superscripts are not significantly different (P. > 0.05)

(1) Average daily gain = (Wt. - Wo)/t.

(2) Specific growth rate = 100 X (lnWt. - lnWo)/t.

(3) Percentage weight gain = (Wt - Wo)/Wo X 100

Wt and Wo represent mean final and initial body weight of fish in grams and t, the duration of the experiment in days.

Specific growth rate (3.96%/day) was achieved by the hybrid *Heterobranchus* followed by the parent strains of *H. bidorsalis* and *C. gariepinus* respectively. Similarly *Heteroclarias* attained a final weight of (3.30g) compared with *H. bidorsalis* (3.01g) and *C. gariepinus* (2.69g). However. the mean growth rates for the hybrid *Heteroclarias, C. gariepinus* and *H. bidorsalis* were not significantly different at ($P > 0.05$). The growth of the hybrid *Heteroclarias* was significantly faster when compared with its reciprocal hybrid *Clariabranchus.*

The hybrid ♂ *C. gariepinus* X ♀ *C. anguillaris* had the lowest increase in weight (0.98g). However the mean growth rates for the hybrid and its reciprocal hybrid ♂ *C. anguillaris* X ♀ *C. gariepinus* and *C. anguillaris* were not significantly different at ($P > 0.05$).

The hybrid *Clariabranchus* was not as fast growing as either *C. gariepinus* or its reciprocal hybrid but was better than *C. anguillaris* and hybrid ♂ *C. gariepinus* X *C. anguillaris. C. gariepinus* (Netherlands) attained the highest mean increase in total length (8.68cm) followed by the hybrid *Heteroclarias* (8.16cm) and *H. bidorsalis* (8.05cm). the lowest increase in total length (3.26cm) was achieved by the hybrid ♂ *C. anguillaris* X ♀ *C. gariepinus.*
Percentage survival was highest (82.6%) in *C. gariepinus* while the hybrid ♂ *C. gariepinus* X ♀ *C. anguillaris* has the lowest survival value. Percentage survival values for the hybrids *Heteroclarias* and *Clariabranchus* were neither as low as that of *H. bidorsalis* nor as high as the value of *C. gariepinus.*

Figure 1 shows the Cumulative weight increases of the different species. It is cleared from the figures that hybrid *Heteroclarias* performed better than its reciprocal hybrid followed closely by the parent strains of *H. bidorsalis* and *C. gariepinus* respectively.

Table 3 shows the water quality in hatchery system during the experimental period. The water temperature range from 29 - 30°C while the pH range from 6.9 - 7.6. The dissolved oxygen range from 6.0 - 8.4mg/l and all the water parameters were within the range which is suitable for fish growth.

Table 3: Mean water quality parameters measured during the experimental period

Parameter	Maximum	Minimum	Mean ± S.E
Temperature(°C)	30	29	29.5 ± 0.44
pH	7.6	6.9	7.3 ± 0.25
Dissolved oxygen mg/l	8.4	6.0	7.2 ± 0.85

DISCUSSION

The highest performance of the hybrid *Heteroclarias* could be attributed to improved. hybrid vigour. Since similar diets feeding regimes. hatchery conditions and techniques were provided. This agrees with the findings of Bakos (1982): Jensen *et. al.* (1983), Madu and Ita (1990) and Salami *et. al.* (1993) who observed that hybrid in most cases were superior to the parental strains in growth: food conversion and resistance to diseases.

The mortality that occurred was due to handling stress during the initial stocking and sampling because sampling was done every week. The high survival rate could be attributed to the acclimatization of the fry in the experimental site and proper management of the stock (fry).

The water quality parameters during the experimental period fell within the range suitable

for fish growth. Madu *et. al.*(1984) recommended temperature range of 20 - 30°C as optimum growth for *Clarias* species.

The hybrid *Heteroclarias* imbibed the fast growth characteristics of *Heterobranchus bidorsalis* coupled with the fast growth traits of the *C. gariepinus* (Netherlands) bud did not inherit the poor survival trait. Similarly *Clariabranchus* inherited the high survival nature of *C. gariepinus* but was not as better in growth rate as the *C. gariepinus*.

The *C. gariepinus* (Netherlands) and hybrid ♂ *H. bidorsalis* X ♀ *C. gariepinus* (netherlands) have a great potential for fingerling production by virtue of their fast growth rate and should be encouraged. It is believed that most factors responsible for growth and survival in management of catfish fry are the availability of suitable food which must be adequate not only in quantity but in quality, suitable dissolved oxygen level and management skill. Therefore before any successful breeding operation could take place there should be adequate provision for the source of food and desirable water quality parameters.

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