Production, Growth And Effect Of Varying Stocking Density Of Clariobranchus Fry

*Agbebi Olubunmi**[1], Ajagbe Olateju*, Makinde Latifat* and Afolabi Oluniyi*.

Introduction

In Nigeria, getting fast growing fish seed have been a major problem to farmers targeting high yields. Hybrid clariid catfish production has increased rapidly in the last few years and apparently market demand is still increasing. FAO (2003).Hybridization is the mating of genetically differentiated individuals or groups and may involve crossing individuals within a species (also known as line crossing or strain crossing) or crossing individual between separate species. This breeding technique is used by aquaculturist in the hope of producing aquatic organism with desired traits. The desired goal is to produce offspring that perform better than both parental species. Among the culturable fin fish in Nigeria, catfish is the most sought after fish species, very popular with fish farmers and consumers, it commands very good commercial value in Nigerian markets (Ezenwaji, 1985; Oladosu *et al.,* 1993; Ayinla *et al.,* 1994). The catfish is very important to the sustainability of the aquaculture industry in Nigeria. The blending of high survival rate and fast growth rate into the hybrid "*claricobranchus"* offers higher production prospects. The hybrid of *Heterobranchus bidorsalis* and *Clarias gariepinus* is a voracious omnivore, feeding on a wide range of food from live animal prey through aquatic plants to plankton organisms (Madu *et al, 1999*). Studies on the hybridization of catfish families abound but information of stocking density of *Clariobranchus* cultured in net hapas rearing medium is limited. This study report the production, growth and effect of varying stocking density of catfish hybrid between male *Heterobranchus bidorsalis* and female *Clarias gariepinus* reared in fish net hapas.

Materials and Methods

Broodstock of male *Heterobranchus bidorsalis* (HB) and female *Clarias gariepinus* (CG) were interbred (CG x HB) at the hatchery of HEPA Aqua Consultancy Farm Asero Abeokuta, Ogun State Nigeria, between the month of May and August 2008, following procedures describe by Fast (1998). Mature *Clarias gariepinus* catfish females of 1.3kg were selected and induced to spawn with Ovaprim hormone injected intramuscularly in a single dose of 0.5 ml/kg of fish.

Combination of *Clarias gariepinus* and *Heterobranchus bidorsalis* fish species were used in ratio (1: 2) of CG x HB respectively. Thirty minutes prior to stripping the females, the males were sacrificed because it was not possible to collect milt by manual stripping. The testes were dissected and the milt squeezed out after incisions were made in the tissue. The females were stripped 13 hours after hormone injection and the eggs fertilized by gently mixing them with the milt for 3 minutes. Fertilized eggs were incubated in standard hatching jars and hatched within 24-28 h.

Fry Rearing

The hybrids were transferred to rearing troughs where yolk-sacs were absorbed in 3-4 days after hatching. Fry were reared according to the procedure of Fast (1998). They were fed brine shrimp nauplii thrice for two weeks. Water conditions were similar to those for egg incubation. Two weeks old fry with mean initial weight (4.70g) were weighed and stocked in different treatment (T) and densities of 60 frys (T_1), 120frys, (T_2) 180frys, (T_3) 240frys (T_4) inside the fish net hapa (1 x 1 x 1 m) in triplicates. The net hapa was tied with the aid of kuralon twine No. 15 to the bamboo poles mounted horizontally on each of the twelve (2 x 2 x 1.2m) concrete fish tanks. A free board (above water space) of 0.5m was maintained in each cage throughout the duration of the experiment which lasted for eight weeks. The net hapa was suspended in water with weighty anchor at the base to stabilize the net and protect them from being disturbed by the wind in the rearing medium. The treatments were allocated to the twelve hapas suspended in concrete fish tanks for growth studies. Frys were fed with 46% dietary crude protein commercial feed from University of Agriculture, Abeokuta (UNAAB) Leventis Agro Allied pellets at 5% body weight twice daily. The caged fish were sampled for growth forthnightly using electronic top-loading balance (Model Mettler E200).

The following parameters were calculated in order to determine the growth response of the fish:

Mean Weight Gain (DWGg/day) = (Wf – Wi)g / Culture period (days)

Relative Weight Gain (RWG%) = (Wf – Wi) x 100 / Wf

Where: Wf = Final average weight at end of experiment

Wi = Initial average weight at beginning of experiment

*Department of Aquaculture and Fisheries Management, University of Agriculture, PMB 2240 Abeokuta, Ogun State, Nigeria.

$$\text{Specific Growth Rate (SGR \% per day)} = \frac{\log (Wf - \log e\ Wi) \times 100}{\text{Culture Period (days)}}$$

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Weight of feed given (g)}}{\text{Fish Weight gain (g)}}$$

$$\text{Survival Rate (\%)} = \frac{\text{Number of fish that survived} \times 100}{\text{Number of fish stocked}}$$

Proximate analysis of experimental diets and fish samples were carried out as described below by method of A.O.A.C (1990). Growth performances were analysed using analysis of Variance (ANOVA) test. The following physico-chemical parameters in the culture site: temperature, dissolved oxygen, conductivity, pH and chlorine were monitored to coincide with the growth monitoring using standard methods (APHA, 1995).

Result

Spawning and hatching: The results of the spawning are presented in Table 4. Administration of a single intramuscular dose of Ovaprim hormone (Syndel) at 0.5ml/kg fish in combination with a stripping (latency) time of 13hours at 26-28^{0}C successfully induced spawning and hybridization of *C.gariepinus* and *H. bidorsalis.* Earlier hatch was observed 23-25 h after fertilization. In the indoor hatchery, the growth of the hatchlings fed brine shrimp nauplii were uniform and stable until the fry were distributed outdoor for the growth performance of the hybrids. Table 1 contained 46% dietary crude protein commercial feed from University of Agriculture, Abeokuta (UNAAB) Leventis Agro Allied pellets.diet composition.

Table 1: Composition of Experimental Diet

Feed Items	% Crude Protein 45%
Fish meal	**37.00**
Soya bean	**37.00**
Maize	**23.25**
Vitamin	**1.00**
Fish premix	**1.00**
Bone meal	**0.05**
Salt	**0.25**

Table 2 shows the proximate composition of experimental feed.

Table 2: Proximate composition of experimental feed (% Dry matter)

Crude protein %	49.04
Crude fibre %	6.20
Fat content %	9.50
Ash content %	8.70
Carbohydrate %	26.34

The growth performance and survival of Clariobranchus is presented in Table 3. Growth performance parameters showed a proportional trend to the stocking density. Treatment 4 had the lowest final body weight of 20.10 ± 0.56g which was significantly lower ($P < 0.05$) than 173.90 ± 0.57g in Treatment 1.

Table 3: Growth Performance Studies of *Clariobranchus* for eight weeks

	Treatment / stocking density			
Growth parameter	T_1 (60 frys)	T_2 (120frys)	T_3 (180frys)	T_4(240frys)
Mean initial body weight (g)	4.70 ± 0.58	4.70 ± 0.58	4.70 ± 0.58	4.70 ± 0.57
Mean final body weight (g)	173.90 ± 0.57[a]	123.10 ± 0.56[b]	21.60 ± 0.57[d]	20.10 ± 0.56[c]
Total weight gain (g)	167.50 ± 0.00[a]	118.40 ± 0.12[b]	19.30 ± 0.12[d]	17.40 ± 0.06[c]
Daily growth (g)	1.53 ± 0.18[a]	1.21 ± 0.00[b]	0.20 ± 0.00[c]	0.18 ± 0.00[c]
Feed conversion ratio FCR	0.55 ± 0.05[a]	0.53 ± 0.08[a]	0.20 ± 0.00[b]	0.31 ± 0.01[b]
Specific growth rate	4.04 ± 0.00[a]	1.80 ± 0.33[b]	1.32 ± 0.01[b]	1.30 ± 0.00[b]
Mortality rate (%)	11.00 ± 0.57[b]	11.00 ± 0.58[b]	8.00 ± 0.57[c]	15.00 ± 0.56[a]

Values without common superscripts in horizontal rows are significantly different (P>0.05).

The mean final body weight varied from 20.10 ± 0.56g to173.90 ± 0.57g in all the Treatments. The highest weight gain was recorded in (T_1) 173.90 ± 0.57g followed by Treatment (T_2) 123.10 ± 0.56g while the least was recorded in (T_4) 20.10 ± 0.56g. Highest mean weight gain and specific growth rate were recorded in (T_1) 4.04 ± 0.00g and 1.80 ± 0.33g in (T_2) followed by (T_3) 1.32 ± 0.1g and the least in (T_4) 1.30 ± 0.00g. The same trend with daily weight gain and total weight gain for the four treatments. There was statistical significant differences among the treatments (P<0.05).

Table 4: Survival rate of *Clariobranchus* fry per unit time reared at different stocking density in outdoor concrete tanks during the period of stocking.

DAY	A (%)	B (%)	C (%)	D (%)	S.E
0	100	100	100	100	0.00
14	91.7	98.33	96.66	95.00	1.41
28	88.33	93.33	96.11	94.17	1.66
42	85.00	92.50	96.11	94.17	2.43
56	83.33	92.50	96.11	94.17	2.83
70	83.33	92.50	96.11	94.17	2.83
84	81.67	90.83	95.56	93.75	3.09
98	81.67	90.83	95.96	93.25	3.09
TOTAL	695.03	745.82	772.22	759.18	
X̧	86.88	93.23	96.53	94.90	
±	2.24	1.03	0.51	0.74	

Physico-chemical parameters of the reservoirs at the culture medium was recorded as shown in below.

Table 5: Water quality in the fish net Hapas

Water quality parameters	Range
PH	6.9 – 7.2
Temperature	27 – 29^0C
Dissolved Oxygen Concentration	6.8 – 8 mg/L
Total ammonia	0.098 – 0.125 mg/L

Discussion

Successful hybridization between *C.gariepinus* and *H. bidorsalis* was established. The high fertilization and hatching rates obtained in the spawning indicate that the dosage Ovaprim hormone (Syndel) injected intramuscularly in a single dose of 0.5 ml/kg of fish are satisfactory for inducing hybridization of *C. gariepinus* and *H. bidorsalis.* These conditions are similar to Salami *et al.*, 1993, in production and growth of Clariid catfish and Agbebi, 2008 in growth and survival of diploid and triploid *Heterobranchus bidorsalis*.

The procedure for artificial hybridization described in this study provided a large quantity and percentage of normal fry with large survival rates, which were used for subsequent growth experiments. This was possible as a result of conducive water quality conditions. Mortality of the hybrid was observed during the outdoor rearing period when the frys were transferred into net Hapas rearing system for growth performance. The use of high stocking density as a technique to maximize space usage to increase stock production has been shown to have an adverse effect on growth. (Trzebia – Towski *et al*, 1981). Table 3 recorded that the stocking level of 60 fry/net hapa produced the best growth rate of 173.90 ± 0.57g and highest percentage survival in (T_3) 95.5%. The decline in growth performance of Treatments 2 and 3 respectively can be attributed to the fact that the lower the stocking density, the higher the growth. Similar result were found in other mudfish: *C. gariepinus*, maintained at a density of 100fry /m3 grew faster than maintained at 500/m^3 (Madu, 1989). Fish stocked at higher densities showed a significant decrease in the mean fish weight, specific growth rate as well as survival, compared to those at the lower stocking densities.

In larvae and fry culture, several factors influence survival and growth, for example feeding and stocking density (Sahoo *et al*., 2004, Rahman *et al.*, 2005) recorded that stocking density have adverse effect on growth of fish fry. Suziki *et al.* (2001) observed that increase in stocking density results in increasing stress, which leads to higher energy requirements, causing a reduction in growth rate and food utilization.
The low mortality and appreciable growth recorded in Treatment 1 could be due to space availability which probably reduced stress related behaviors and low competition for feed compared to other Treatments.

Conclusion and Recommendation

The study has made possible mating of genetically differentiated individuals. The study has confirmed that cannibalism traits of both species has no effect on mortality rate but primarily dependent on their stocking density. The rearing medium guarantee Nigeria's greater fish supply through the net hapa culture system both in natural or artificial water bodies in lakes, estuaries, shallow rivers, ponds etc where these hapas could be mounted or anchored without acquire expensive land for culture. The net hapa rearing medium would be an eye opener for rural dwellers to participate in fish farming practices to boost their standard of living and eliminate malnutrition in diets. Stocking density had a significant effect on growth and survival of *Clariobranchus* fry. The experiment was conducted during rainy season (May – August) which aids the physico-chemical parameters and allow for easy dilution of water within the culture medium. At higher densities, Treatments 4 stocks suffer stress and mortality as a result of aggressive feeding interaction. It is advisable to stock the hapa of such size at the maximum of 180 frys eventhough, appreciable growth could be adequately be harvested at 120 frys per hapa. Bigger mesh size (8-12mm) of net hapas are recommended to allow free flow of water in and out of the hapas especially in the dry season to avoid turbidity. Furthermore, it is advisable to introduce catfish fry to outdoor rearing after five weeks of an indoor management for more environmental tolerance, survival and appreciable growth.

Reference

Agbebi O.T. (2008). Ph.D thesis, University of Agriculture, Abeokuta. Nigeria 144 pp

Ayinla, O. A., Kayode, O., Idoniboye-Obu, O., Oresegun, A., Adidu, V.E., (1994). *J. Aqua. Trop.* 9(I): 25-33. .

Ezenwaji, H.M.G., (1985). *Proceeding of the 4th Annual Conference of the Fisheries Society of Nigeria (FISON)* Port-Harcourt 26th -29th November 1985, pp. 191-196.

Fast, A.W., (1998). *Centre for tropical and subtropical Aquaculture.* No 134

Madu, C.T., (1989). Ph.D Thesis. University of Jos, Nigeria. pp. 1-156

Madu, C.T., Ita, E.O., and Mohammed, S., (1999). *11-14th of Nigeria Symposium* on the 31st Oct. Gingiya Hotel, Sokoto, Nigeria. 32pp.

Oladosu, G.A., Ayinla, O.A., Adeyemo, A.A., Yakubu, A.F., Ajani, A.A., (1993). *Acta Adviatica*, 47 (2): 211-216Pauly, D. (1984). *ICLARM* studies and reviews 8 *ICLARM*, Manila, Philippines, 325 pp

Rahman, M.A., Maizid, M.A., Rahman, M.R., Khan, M.N., Hossain, M.A., and Hussain, M.G., (2005). *Aquaculture* 249:275-284.

Salami, A.A., Fagbenro, O.A., and Sydenham, D.H.J., (1993). *Bamidgeh*, 45, 18-25.

Sahoo, S.K., Giri, S.S., and Sahu, A.K., (2004). *Journal of Applied Ichthyology* 20:302-305

Sparre P. (1992). *Manual, F.A.O. Fisheries Technical Paper* 306/1. Rev.1 1992, Rome

Suziki, N., Kondo, M., Günes, E., Özongun, M., and Ohno, A., (2001). *Turkish J. of Fisheries and Aquatic Sciences*, 1(1): 43-53.

Teugel, G.G., Denayer, B., and Legendre, M., (1990). *Zoological Journal of the Linnean Society* 98: 237-257.

Trzebia-towski,R., Filipiak, J., and Jakubowski, R., (1981). *Aquaculture*, 22: 289-295.