COMPARISON OF GROWTH PERFORMANCE OF FIRST AND SECOND GENERATIONS OF *CLARIAS ANGUILLARIS* HYBRIDS.

***Onyia, L.U[1]., B.M.B. Ladu[2] and S.O. Olufeagba[3]**

Department of Fisheries[1], Department of Biological Sciences[2], Federal University of Technology P.MB.2076, Yola, Adamawa State. Centre for Genetics and Biotechnology, National Institute for Freshwater Fisheries Research, P.M.B.6006, New Bussa[3].*Correspondence author:uchelucky2005@yahoo.com,Phone number: +2348058047800

ABSTRACT

Growth performances of Clarias anguillaris intraspecific hybrids first and second generations were carried out at the indoor hatchery of Aquaculture and Biotechnology Centre, National Institute for Freshwater Fisheries Research, New Bussa, in Nigeria. Nine mating groups were generated in the F_1 involving three wild strains of C. anguillaris [Jos (JJ) Kainji (KK) andYola (YY)]. F_2 intraspecific crosses were also carried out using males and females with best individual growth performance in the mating combination. From the results, (♀) KK x JJ♂) had the best weight gain in the F1 generation though not significantly different (p>0.05) to (♀) YY x JJ♂) (274.3g/fish) and (♀) YY x KK♂) (274.2g/fish). The best crosses in F_2 (♀) JJ x YY♂) (297.2g/fish) though not significantly different (p>0.05) to (♀) YY x KK♂) (295.8g/fish). The second generation had better growth in weight gain and length increase, except in (♀) YY x JJ♂). Based on this result, F_2 intraspecific hybridization provides better results than the F_1.

Keywords: Growth, improvement, second generation, *Clarias anguillaris*, hybrids.

INTRODUCTION

Teugels (1982) revised the subgenus *Clarias* and found only two species (*Clarias gariepinus* and *Clarias anguillaris*). It is important to note that both *Clarias gariepinus* and *Clarias anguillaris* are teleost fish of the *Clariidae* family. Both *Clarias gariepinus* and *Clarias anguillaris* are closely related based on appearance and other characteristics.

Clarias anguillaris has a more restricted distribution unlike *Clarias gariepinus* which is widely considered to be one of the most important tropical catfish species for aquaculture and which has an almost Pan-African distribution from the Nile to West Africa and from Algeria to Southern Africa. They also occur in minor-Asia (Israel, Syria, and South of Turkey). *Clarias anguillaris* is found in Mauritania, in most West African basin and in the Nile. In general, *C. gariepinus* lives in most river basins sympatric ally with *C. anguillaris*.

Artificial propagation of fish species constitutes the only practicable means of proving enough quality seed for aquaculture and possible production of important species at a widely separated geographical areas(Moses, *et al*.2005).Research in catfish genetics and breeding was responsible for the first release of genetically improved Channel catfish to the farming industry(Dunham *et al*,1986). Channel catfish originating from different geographic locations within the United States differ in growth rate, and domestic strains grow faster than wild strains (Chappell, 1979; Dunham and Smitherman, 1981, Green *et al*., 1979; Smitherman and Pardue, 1974 and Zhu, *et al.* 1985). According to Dunham and Smitherman(1984), the domestication of catfish increases growth rate 2-6% per generation. Size variability is more pronounced in some strains than others

(Brooks,1977).According to Chevassus and Coche(1986), productivity in carp, catfish and tilapia has been improved upon by intraspecific hybridization.

Researches on intraspecific hybridization of first generation of family clariidae have been reported by several authors (Moses *et al.*, 2005; Onyia *et al.*, 2010; Aluko, 1998; Ataguba *et al*, 2010; Aguigwo, 1993 and Adewolu *et al.*,2008) but little comparison of first generation and second generation had been carried out. This study was carried out to compare the growth performance of the first and second generations of intraspecific hybrids of three strains of *Clarias anguillaris.*

MATERIALS AND METHODS

Males and females *Clarias anguillaris* to be used for the work were collected from the wild from three ecological zones of Nigeria, viz (i). Kainji (n=37) within the Kaduna River Basin hydrological zone in Guinea Savannah belt around the Kainji Lake Basin (9.50^0–10.30^0N, 4.30^0–4.50^0E) (Nlewadim,2002)

2. Jos (n=32) within the Montanne terrain of the Hadejia River Basin (8.50^0-9.45^0N, 8.53^0-9.00^0E)(Olufeagba,1999)

3. Yola (n=32) within the Upper Benue River Basin (12^0-14^0N, 8^0-10^0E) in the Sudan Savannah. Adamawa State is located on latitude 9.14^0N, longitude 12.38^0E and an altitude of 185.9m. It has an average annual rainfall of about 759mm with maximum temperature of 39.7^0C. The rainy season run from May through October, while the dry season commences November and ends in April. The driest months of the year are January and February when the relative humidity drops to 13% (Adebayo and Tukur, 1999).

The breeders were transported live to National Institute for Freshwater Fisheries Research (NIFFR), New Bussa in open plastic jerry can from three zones.

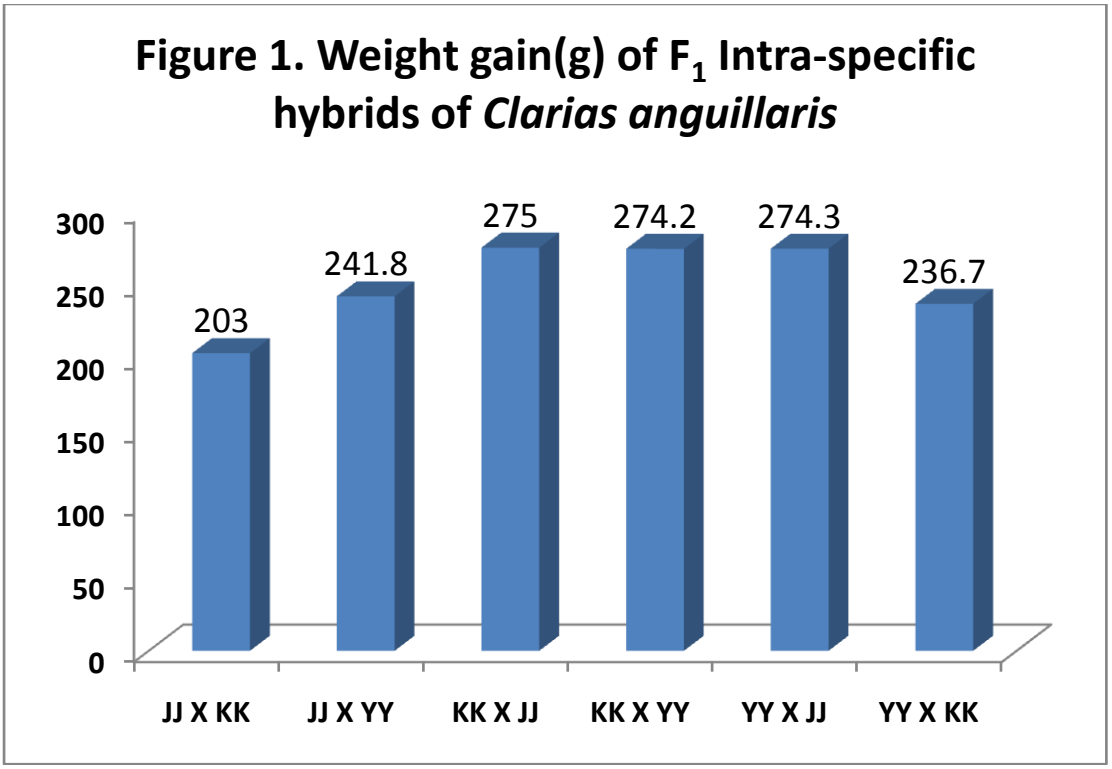
Breeders were acclimatized for two months in NIFFR Hatchery complex outdoor concrete tanks. Each of the three different strains was kept in separate tanks. Fish were fed *ad libitum* with NIFFR prepared feed containing 40% crude protein. Breeders were induced artificially by injecting them with 0.5ml ovaprim/kg fish. Eggs were stripped into a dry plastic bowl, milt from the male testis was spread on the eggs.The milt, and eggs were properly mixed using a feather. Fertilization took place after few minutes and the fertilized eggs were incubated for ten hours of latency period. One hundred fertilized eggs were incubated in each fully aerated aquarium (60 x 30 x 30) under ambient temperature of 26^0C.The eggs hatched and fry were fed until they reached fingerling stage. Twenty fingerlings were stocked in out-door concrete tank at a stocking rate of five fingerling per square metre and fed with varying sizes of Coppens feed at 5% body weight for 7 months.

F_2 intraspecific crosses were also carried out using males and females with best individual growth performance in the mating combination from F_1.

RESULTS AND DISCUSSION

The results showed that there were variations in the weight gained among F_1 hybrids (figure1). The hybrids from KK x JJ had the highest weight gain, followed by KK x YY and YY x JJ though there was no significant difference ($P \geq 0.05$). JJ x KK was the least followed by YY x KK and JJ x YY. This agrees with Dunham and Smitherman (1984) that within the first generation of channel catfish, there were growth variations. There were also variations in length increase at the end of the experiment. There was significant difference in the length increase in the first generation ($p \leq 0.05$). The cross YY x KK had the highest length increase (13.1cm), followed by YY x JJ(11.4cm),KK x JJ(9.8cm),KK x YY(9.3cm) and the least JJ x YY(8.2cm). Within the F_2 hybrids (Figure 2), there was significant difference ($P \geq 0.05$) in weight gained. The highest weight gained was in JJ x YY, followed by YY x KK, KK x JJ, KK x YY, JJ x KK and YY x JJ.This is in line with the fact

that fish strains originating from different geographic locations differ in growth rate, and domestic strains grow faster than wild strains (Chappell, 1979; Dunham and Smitherman, 1981, Green *et al.*, 1979; Smitherman and Pardue, 1974 and Zhu *et al.*, 1985). A domestic fish strain is one that had been bred to produce the second generation (Dunham and Smitherman, 1987).



According to Dunham and Smitherman (1984), the domestication of catfish increases growth rate 2-6% per generation. This is applicable to the results obtained in this study. The weight gain reported in this work showed that the F2 had better growth increase than the F_1 with the exception of KK x YY and YY x JJ(figures1, 2 and Table1). The increased weight gain observed in F_2 generation could be due to heterosis, since heterosis exhibited in F_1 generation is masked by additive variation (Dunham and Smitherman, 1984). The percent weight increase in comparison between the F_1 and F_2 (Table 1) agreed with Dunham and Smitherman(1984), though some of the hybrids had more than 6% increase while two had negative values showing that F_1 hybrids in the crosses had better growth than F_2. Dunham and Smitherman (1981) reported that F_1 crossbred population of different strains of channel catfish had some individuals that grew significantly faster than the remainder of the F1 individuals. This was the case in this study KK x JJ, KK x YY and YY x JJ that grew faster than the remainder hybrids in the F1 generation. Similarly, FishNews Desk (2008) reported that first generation crosses of Yellow Perch produced fish that grew 28-54% faster than the unimproved fish.

The mean weight gains of various F_2 combinations were more than the F1 that showed that the F_2 hybrids had increased body weight. This could be inferred that the individual selection of F_1 broodstocks used to produce the hybrids were selected for growth rate. Individual or mass selection improved body weight in channel catfish more rapidly than the domestication (Brussard, 1979; Burnside

et al., 1975; Chappell, 1979; Dunham and Smitherman, 1981, Green *et al.*,1979).

Conclusion

From this study, it was noticed that the F_2 generation increased in growth by 2-6% more than the F_1 generation. It could therefore be inferred from the study that domestication and mass selective breeding would increase body weight in every generation. Continual domestication and mass selective breeding of our indigenous catfish can grow as much as the dutch *Clarias*.Subsequently, catfish farmers will earn more culturing F_2 domesticated intraspecific hybrids, because bigger fish means more income.

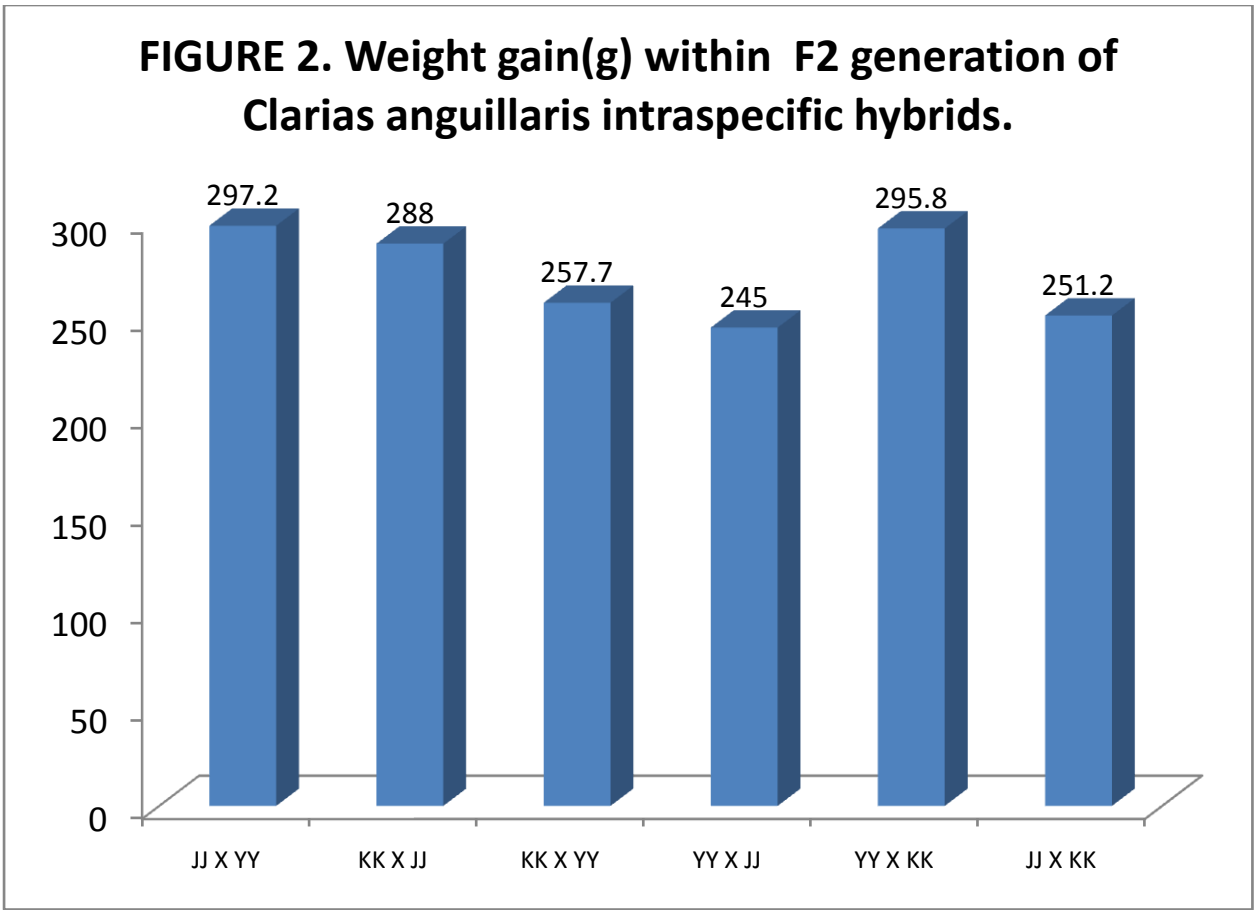


Table 1: Percent increase in weight between F_1 and F_2 generations

Intraspecific Hybrids	F_1 generation (g)	F_2 generation (g)	% increase in weight
JJ x KK	203.0	251.2	23.7
JJ x YY	241.8	297.2	22.9
KK x JJ	275.0	288	4.7
KK x YY	274.2	257.7	-6.0
YY x JJ	274.3	245.0	-10.6
YY x KK	236.7	295.8	25.0

REFERENCES

Adebayo,A.A. and A.L. Tukur(1999). *Adamawa State in Maps* EditionA1. Pararaclete Publishers, Yola, Nigeria.PP 11-13.

Adewolu, M.A.; Ogunsanmi,A.O. and Yanusa,A.(2008).Studies on Growth Performance and Feed Utilization of Two Clariid Catfish and their Hybids Reared Under Different Culture Systems. *European Journal of Scientific Research 23(2):353-260.*

Aguigwo, J.N.(1993). Inter and Intra-specific Hybridization of *Clarias albopunctatus* (Nicholas and Lamonte) and *Heterobranchus longifilis*(Cuvier and Valencienne) in natural and artificial conditions. *Journal of Aquatic Sciences8:45-50.*

Aluko P.O (1998) Growth characteristics of parental F1, F2 and backcross generation of the hybrid between *Heterobranchus longifilis* and *Clarias anguillaris*. *West African Journal of Biological Sciences volume pp. 16-21.*

Ataguba,G.A., P.A. Annune and F.G. Ogbe(2010). Growth performance of two African catfishes *Clarias gariepinus* and *Heterobranchus longifilis* and their hybrids in plastic aquaria. *Livestock Research for Rural Development 22 (2):1-6.*

Brooks,M.J.(1977).Astudy of length variation in Blue, Ictalurus furcatus, White,I. catus, and Channel, *I.puntatus*, Catfishes.M.S. thesis, Auburn University,Alabama.

Broussard,M.C.(1979).Evaluation of four strains of Channel Catfish, *Ictalurus punctatus* and Intraspecific Hybrids Under Aquacultural Conditions.Ph,D dissertation, Texas A&M Univ., College Station Texas.

Burnside,M.C., J.W. Avault Jr., and W.G. Perry(1975). Comparison of a wild and a domestic strain of Channel Catfish Grown in Brackish Water. *Prog. Fish. Cult.37:52-54.*

Chappel,J.A.(1979).An evaluation of Twelve Genetic Groups of Catfish for Suitability in Commercial Production.Ph.D dissertation, Auburn Univ.,Alabama.

Chevassus,B. and Coche,A.G.(1986).Report to the symposium on selection, hybridization and Genetic engineering in aquaculture of six fin and shellfish for consumption and stocking. EIFA Tech. paper Doc Tech. LRCPI (60)52.

Dunham,R.A. and Smitherman, R.O. (1981). Growth in Response to Winter feeding by Blue, Channel, White, and Hybrid Catfish. *Prog. Fish. Cult.43:63-66*.

Dunham,R.A. and Smitherman, R.O.(1984). Ancestry and Breeding of Catfish in the United States. Cir.273, Ala. Agr. Exp. Sta. Auburn Univ., Ala.100pp.

Dunham, R.A., Smitherman, R.O., Goodman, R.K. and Kemp, P. (1986). Comparison of strains crossbred and hybrids of channel catfish for vulnerability to angling. *Aquaculture 57:193-201*

Dunham, R.A. and Smitherman, R.O. (1987). Genetics and breeding of catfish. *Regional Research Bulletin 325. Southern Cooperative Series*. Alabama Agric. Extension Station, Auburn University, Alabama.

Fish News Desk (2008). Perch Production Boosted by better Genetic. Friday, May 16, 2008.

Green,O.C., R.O. Smitherman and G.B. Pardue (1979). Comparisons of growth and survival of Channel Catfish, *Ictalurus punctatus* from distinct populations. In T.V.R. Pillay and W.A. Dill (editors). Advances in Aquaculture. Fisheries News Books, Ltd. Farnham, Surrey, England pp626-628.

Moses, Y., Olufeagba, S.O. and Raphael, A.Z.(2005).Intraspecific Hybridization in two (2) strain of *Clarias anguillaris* Linnaeus 1758. Proceedings Genetic Society of Nigeria 30th Annual National Conference. Nsukka 5-8 September 2005 pp153-158.

Nlewadim,A.A.(2002).Hybridization studies in three clariid fishes.Department of Fisheries, Michael Okpara University of Agriculture, Umudike Ph.D Thesis.

Olufeagba, S. O. (1999). Induced triploid *Heterobranchus longifilis* (Val. 1840), Fam. (Clariidae) and its Aquacultural potential. PhD. Thesis submitted to Dept. of Biological Sciences, University of Ilorin.

Onyia, L.U, Ladu, B.M.B and S.O Olufeagba (2010). Survival, Growth, and Condition factor of fingerlings of *Clarias anguillaris* and their Hybrids. *Journals of Applied Science 13(1);8789-8801*.

Smitherman,R.O. and G. Pardue (1974).Genetic Experiments with Channel Catfish .*Catfish Farmer 6:43-44.*

Teugels G.G (1982) Preliminary result of morphological study of five African species of the subgenus *Clarias* (*Clarias*)(Pisces: Clariidae). *J. of Natural History. 16: 439-464.*

Zhu, Z.G. Li, L.He and S. Chen(1985). Novel Gene transfer into the Fertilized eggs of Gold fish (*Carassius auratus* L. 1758). *Journal of Applied Icthyology 1; 31-33.*