IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 4 Ver. II (Apr. 2015), PP 54-57
www.iosrjournals.org

Growth and Survival of *Clarias anguillaris, Heterobranchus bidorsalis* Fry and Their Reciprocal Hybrids Reared In Two Different Culture Units

Sanda, M. K., *Onyia, L.U., Ochokwu, I.J. and Michael, K.G.
Department of Fisheries, Modibbo Adama University of Technology P.M.B. 2076, Yola, Adamawa State Nigeria.

Abstract: *The growth and survival of Clarias anguillaris(Ca), Heterobranchus(Hb) fry and their reciprocal hybrids fed locally formulated diet (42.5% Crude protein) at 5% body weight for 56 days was studied in two different culture units (concrete ponds and circular plastic tanks). Fry were fed twice daily at 8:00hours and 18:00hours. Under the concrete ponds, results showed that final mean weight was higher in the pure breed Hb♀ x Hb♂ (9.20±0.42g), followed by Ca♀xHb♂ (7.20 ±0.62g) and Hb♀xCa♂ (6.70 ±0.64g). Ca♀xCa♂ had the least final mean weight (4.91±0.88g). The hybrid Ca♀xHb♂ had the highest survival rate (66.70±0.40%), followed by Hb♀xCa♂ and Ca♀xCa♂ (50.00±0.80% and 50.00±0.84%). However, Hb♀ x Hb♂ had the least survival rate (38.30±1.62%). Under the plastic tanks, the hybrid Ca♀x Hb♂ had the best final mean weight (3.10±0.08g), followed by Hb♀xHb♂ (2.43 ±0.10g) and Ca♀xCa♂ (1.71 ±0.14g). Hb♀xCa♂ had the least final mean weight (1.50±0.16g). Survival rate was higher (52.30±0.41%) at Ca♀xHb♂, followed by Hb♀xCa♂ (48.20±0.46%) and Ca♀xCa♂ (40.00 ±0.48%). The lowest survival rate was recorded at Hb♀xHb♂ (31.80±0.82%).*

***Keywords*:** *Growth, survival, Clarias anguillaris, Heterobranchus bidorsalis, Hybrids.*

I. Introduction

In recent years, the culture of species of the catfish belonging to the Claridae family is fast gaining global attention [1]. African catfish commonly cultured in Nigeria are Clarias gariepinus and C. anguillaris, Heterobranchus bidorsalis and H. longifilis and their hybrids. The reason for their suitability for culture include, their ability to withstand poor water quality, high stocking density, stressed condition and high feed conversion efficiency among others.

The African catfish, Clarias and Heterobranchus species are considered as a highly priced fish in Nigeria and Africa at large [2]. Heterobranchus species grows faster and attains bigger size than Clarias species which matures earlier [3]. One fish that has attracted great attention for culturing in Nigeria is the catfish hybrid often called 'Heteroclarias' [4]. The hybrid catfish grow fast and has a high survival rate [5]. Other desirable qualities that make this fish highly commendable for pond culture are high fecundity, better taste and nutritional qualities, tolerance to unfavorable environmental conditions ([6], omnivorous feeder, resistance to disease and high market demand [7].

Hybridization of the African catfish (Clarias gariepinus) with the Thai catfish (Clarias macrocephalus) resulted in the production of offspring that had better characteristics than their parents [8]. The current growth of aquaculture in Nigeria and most part of the world can only be sustained by the production of fish seeds with high fertilization and survival rates, high feed conversion efficiency, high growth rates and high disease resistance among other factors [9].

African catfish have been raised in different environment under different feeding condition without clearly defining which culture unit is most suitable. According to [10], cultivation techniques for Clarias species consist of three basic steps: (1) primary rearing phase (larva to fry), (2) secondary rearing phase (fry to fingerling/juvenile) and (3) final rearing phase (growing to marketable size). The aim of this study was to evaluate the growth and survival of Clarias angullaris, Heterobranchus bidorsalis fry and their reciprocal hybrids reared in nursery concrete ponds and circular plastic tanks fed locally formulated feeds.

II. Materials And Methods

Two weeks old fry of Clarias anguillaris, Heterobranchus bidorsalis and their reciprocal hybrids were obtained from Bida fish farm in Karewa, Yola and transported to Department of Fisheries Research Farm, Modibbo Adama University of Technology, and Yola. Fry were kept in rearing tanks and allowed to acclimatize for two days before the commencement of the research.

Experimental fish: The study was conducted in 30litres (40cm diameter x 30cm deep) circular plastic bowls and concrete ponds (0.8m x 0.8m x 1m). Four treatments (the fry) were used in triplicates in both the concrete ponds and the circular plastic tanks and stocked with 15 fry each as follows:

- Female Clarias anguillaris x male Clarias anguillaris (♀Ca x ♂Ca);
- Female Heterobranchus bidorsalis x male Heterobranchus bidorsalis (♀Hb x ♂Hb);
- Female Clarias anguillaris x male Heterobranchus bidorsalis (♀Ca x ♂Hb);
- Female Heterobranchus bidorsalis x male Clarias anguillaris (♀Hb x ♂Ca).

Before stocking, the mean weight and mean length were taken and recorded. The experiment lasted for 56 days.

Feeding Trials: Each of the culture treatment was fed on experimental diet containing 42.5% crude protein at 5% body weight. Feeding rate was adjusted weekly as the fry increased in weight to maintain the 5% body weight throughout the experimental period. Feeding of fry was done twice daily (8:00hours and 18:00hours).

Weekly weight of fry was recorded using a digital sensitive weighing balance (model: Scout Pro SPU123, Ohaus Corporation, USA). The length of fry from each experimental group was measured with meter rule. The results were taken for eight (8) weeks. At the end of 56 rearing days, final weight (g), length (cm) and mortalities were recorded.

Growth indices were estimated using the following formulae:

Weight gain (g) = (Final weight−Initial weight) g

Mean daily weight gain (g/day) $= \frac{W_1 - W_0}{t}$

Where t = Culture period in days

Specific growth rate (%/day) $= \frac{\ln W_1 - \ln W_0}{T} \times 100$

Where W_1: final mean body weight (g)

W_0: initial mean body weight (g)

T: time in days

Relative growth rate $= \frac{\ln W_1 - \ln W_0}{T}$

Feed conversion ratio $= \frac{\text{Weight of dry feed fed (g)}}{\text{Live weight gain of fish (g)}}$

Survival rate (%) $= \frac{\text{Final number of fry}}{\text{Initial number of fry}} \times 100$

Statistical Analysis: Data collected were analyzed with SPSS statistics package (16.0) using analysis of variance (ANOVA), means were analyzed using LSD.

Table 1: Composition of Experimental Diet

Feed Ingredients (Calculated)	**(%)**
Fishmeal	20.9
Soya beans meal	23.3
Groundnut cake	15.5
Maize	32.9
Salt	0.5
Bone meal	0.5
Lysine	1.0
Methionine	1.0
Vitamin C	1.0
Groundnut oil	0.5
Binder	2.0
Total	100
Proximate Composition	**(%)**
Crude protein	42.5
Ash	10.0
Fat	6.5
Crude fibre	4.4
Moisture	3.0

III. Results

Table 2 showed the mean growth performance of fry reared in concrete ponds for 56 days. The final weight was higher (9.20±0.42g) in the pure breed of Hb♀xHb♂, followed by the hybrids Ca♀xHb♂ (7.20±0.62g) and Hb♀xCa♂ (6.70±0.64g). The pure breed of Ca♀xCa♂ had the least performance (4.91±0.88g).

There was no significant difference (p>0.05) in the MDWG between the pure breeds Hb♀xHb♂ and the hybrids (Ca♀xHb♂ and Hb♀ x Ca♂). However, Ca♀xCa♂ was significantly (p<0.05) lower (0.06g/day). There was no significant difference (p>0.05) in the SGR, RGR and FCR.

Survival rate was higher (66.70±0.40%) in the hybrid of Ca♀xHb♂, followed by the reciprocal hybrid Hb♀xCa♂ and the pure breed of Ca♀xCa♂ with 50.00±0.80% and 50±0.84% respectively. Hb♀xHb♂ had the least survival rate (38.30±1.62%).

Table 2: Mean±SE Growth Performance of C. anguillaris, H. bidorsalis and their Reciprocal Hybrids Reared in Concrete Ponds

Parameters	Ca♀xCa♂	Hb♀xHb♂	Ca♀xHb♂	Hb♀xCa♂
Initial weight (g)	1.20 ±0.13^{a}	1.20 ±0.13^{a}	1.20 ±0.13^{a}	1.20 ±0.13^{a}
Final weight (g)	4.91 ±0.88^{c}	9.2 ±0.42^{a}	7.20 ±0.62^{b}	6.70 ±0.64^{b}
Initial length (cm)	1.61 ±0.11^{a}	1.61 ±0.11^{a}	1.61 ±0.11^{a}	1.61 ±0.11^{a}
Final length (cm)	5.80 ±0.51^{c}	8.03 ±0.23^{a}	6.53 ±0.45^{b}	5.93 ±0.50^{c}
Weight gain (g)	3.71 ±0.88^{d}	8.00 ±0.42^{a}	6.00 ±0.54^{b}	5.50 ±0.64^{c}
Length gain (cm)	4.19 ±0.50^{d}	6.42 ±0.32^{a}	4.92 ±0.50^{b}	4.32 ±0.50^{c}
MDWG (g/day)	0.06 ±0.02^{b}	0.14 ±0.05^{a}	0.11 ±0.05^{a}	0.10 ±0.02^{a}
SGR (%/day)	2.52 ±0.23^{a}	3.64 ±0.20^{a}	3.20 ±0.20^{a}	3.07 ±0.20^{a}
RGR	0.03 ±0.00^{a}	0.04 ±0.00^{a}	0.03 ±0.00^{a}	0.03 ±0.00^{a}
FCR	0.07 ±0.03^{a}	0.06 ±0.02^{a}	0.06 ±0.01^{a}	0.06 ±0.02^{a}
SR (%)	50.00 ±0.84^{a}	38.30 ±1.62^{b}	66.70 ±0.40^{a}	50.00±0.80^{a}

Means with the same superscript within a row are not significantly different (P>0.05)
MDWG=Mean Daily Weight Gain; SGR=Specific Growth Rate; RGR=Relative Growth Rate; FCR=Feed Conversion Ratio; SR=Survival Rate

Table 3 showed the mean growth performance of fry reared in plastics tanks for 56 days. The hybrid of Ca♀xHb♂ had the highest final weight (3.10±0.08g), followed by the pure breed of Hb♀xHb♂ (2.43±0.10g). Ca♀xCa♂ has a final weight of 1.71±0.14g, with Hb♀xCa♂ having the least final weight (1.50±0.16g). There was no significant difference difference (p>0.05) in the MDWG. SGR was higher at Ca♀xHb♂ (1.70±0.03%/day), followed by Hb♀xHb♂ (1.26±0.03%/day). There was no significant difference (p>0.05) in the SGR between the pure breed of Ca♀xCa♂ and the reciprocal hybrid (Hb♀xCa♂) with 0.63±0.03%/day and 0.41±0.03%/day respectively. There was no significant difference (p>0.05) in RGR and FCR.

Survival rate was higher (52.30±0.41%) in the hybrid of Ca♀xHb♂, followed by Hb♀xCa♂ (48.20±0.46%) and the pure breed of Ca♀xCa♂ (40.00±0.48%). The least survival rate was recorded in the pure breed (31.80±0.82%).

Table 3: Mean±SE Growth Performance of C. anguillaris, H. bidorsalis and their Reciprocal hybrids Reared in Plastic Tanks

Parameters	Ca♀xCa♂	Hb♀xHb♂	Ca♀xHb♂	Hb♀xCa♂
Initial weight (g)	1.20 ±0.13^{a}	1.20 ±0.13^{a}	1.20 ±0.13^{a}	1.20 ±0.13^{a}
Final weight (g)	1.71 ±0.14^{c}	2.43 ±0.10^{b}	3.10 ±0.08^{a}	1.50 ±0.16^{c}
Initial length (cm)	1.61 ±0.11^{a}	1.61 ±0.11^{a}	1.61 ±0.11^{a}	1.61 ±0.11^{a}
Final length (cm)	2.45 ±0.15^{b}	2.89 ±0.15^{a}	3.03 ±0.04^{a}	2.49 ±0.15^{b}
Weight gain (g)	0.51 ±0.20^{b}	1.23 ±0.10^{a}	1.92 ±0.09^{a}	0.31 ±0.37^{b}
Length gain (cm)	0.84 ±0.15^{b}	1.28 ±0.04^{a}	1.42 ±0.04^{a}	0.88 ±0.10^{a}
MDWG (g/day)	0.01 ±0.00^{a}	0.02 ±0.00^{a}	0.03 ±0.01^{a}	0.01 ±0.00^{a}
SGR (%/day)	0.63 ±0.03^{c}	1.26 ±0.03^{b}	1.70 ±0.03^{a}	0.41 ±0.03^{c}
RGR	0.01 ±0.00^{a}	0.01 ±0.00^{a}	0.02 ±0.00^{a}	0.01 ±0.00^{a}
FCR	0.17 ±0.05^{a}	0.04 ±0.01^{a}	0.02 ±0.03^{a}	0.01 ±0.08^{a}
SR (%)	40.00 ±0.48^{b}	31.80 ±0.82^{c}	52.30±0.41^{a}	48.20±0.46^{a}

Means with the same superscript within a row are not significantly different (P>0.05)
MDWG=Mean Daily Weight Gain; SGR=Specific Growth Rate; RGR=Relative Growth Rate; FCR=Feed Conversion Ratio; SR=Survival Rate

IV. Discussion

The SGR of this study was lower than the 5.01±058%/day reported by [11]. Diyaware and Onyia [2] recorded their highest SGR in the cross between ♀Cax♂Hb (0.76±0.13%/day). A similar result was obtained in this study under the plastic tanks. However, the result in the concrete disagreed with to their result. The result in the plastic tanks also confirmed the work of [12, 13] and [14] who stated that hybrid catfish had the fastest growth rate and showed a better feed conversion into flesh than the pure breed.

Ndimele and Owodeinde [11] reported that survival rate of 40.00±0.58% for hybrid catfish (C. gariepinus♀ x H. bidorsalis♂). This result was lower than the survival rate obtained in this study for hybrids. The survival rate recorded by [2] and [8] were higher than what was obtained in this study. The MDWG of the

hybrids recorded in this study in the concrete ponds was similar to the result recorded by [15]. The survival rate in both culture units are similar to the results reported by [16].

V. Conclusion

The results of this study revealed that purebred Heterobranchus bidorsalis had the best growth performance than the hybrid crosses between Clarias anguillaris♀ x Heterobranchus bidorsalis♂. However, for better survival rate, the hybrid catfish would be a better choice for fish farmers. Further studies can be conducted to verify these results.

References

[1]. Adewolu, M.A., Ogunsanmi, A.O. and Yunusa, A. (2008). Studies on Growth Performance and Feed Utilization of Two Clariid Catfish and their Hybrid Reared Under Different Systems. European Journal of Scienctific Research 23: 252-260.

[2]. Diyaware, M.Y. and Onyia, L.U. (2014). Growth and Survival of Intergeneric Hybrids of Clarias anguillaris and Heterobranchus bidorsalis in Semi-Arid Zone of Nigeria. Journal of Fisheries and Aquatic Science, 9(5):398-406.

[3]. Oladosu, G.A., Ayinla, A.O., Adeyemo, A.A., Yakubu, A.F. and Ajani, A.A. (1993). A Comparative Study of the Reproductive Capacity of the African Catfish Species Heterobranchus bidorsalis (Geoffroy), Clarias gariepinus (Burchell) and their Hybrid Heteroclarias. African Regional Aquaculture Centre Technical Paper, No. 92, Pp 1-5

[4]. Nwadukwe, F.O., Ayinla, A.O. and Abby-Kalio, N.J. (1993). Effects of Various Doses of Acetone Dried Powdered Carp Pituitary Extract and Seasons of Hatchery Propagation of Heterobranchus longifilis (Val. 1840) (Pisces: Clariidae). Journal Aquaculture Tropics, 8: 333-340

[5]. Nwadukwe, F.O. (1995). Hatchery Production of Five Hybrid Groups by Artificial Hybridization of Clarias gariepinus (B) and Heterobranchus longifilis (Val.) (Clariidae) Using Dry Powdered Carp Pituitary Hormone. Journal of Aquaculture in the Tropics 10:1-11

[6]. Nlewadim, A.A. and Madu, O. (2005). Growth Response and Survival of F_1 Hybrid Fry of Heterobranchus longifilis and Clarias gariepinus Reared in Glass Aquaria and Plastic Basins. In: Proc. Of 19th Annual Conference of FISON at Ilorin, 29th Nov-3rd Dec. 2004. Pp. 334-340

[7]. Sogbesan, A.O., Ajuonu, N.D., Madu, C.T., Omojowo, F.S. and Ugwumba, A.A.A. (2005). Growth Response, Feed Conversion Rate and Cost Benefits of Hybrid Catfish Fed Maggot Meal Based Diets in Outdoor Tanks. In: Araoye PA (Ed.) Proc. of 19th Annual Conf. of FISON, Ilorin 29th Nov.-3rd Dec. 2004. Pp. 231-237

[8]. Ndimele, P.E., Owodeinde, F.G., Kumolu-Johnson, C.A., Jimoh, A.A., Whenu, O.O. and Onyenania, O.B. (2011). Growth Performance of the Reciprocal Hybrids of Clarias gariepinus (Burchell, 1822) and Heterobranchus bidorsalis (Valenciennes, 1840). Current Research Journal of Biological Science 3: 137-140

[9]. Adebayo, O.T. and Popoola, O.M. (2008). Comparative Evaluation of Efficacy and Cost of Synthetic and Non-Synthetic Hormones for Artificial Breeding of African Catfish (Clarias gariepinus, Burchell, 1822). Journal of Fisheries and Aquatic Science 3:66-71

[10]. Sahoo, S.K., Ciri., S.S and Sahu, A.K. (2004). Effect of Stocking Density on Growth and Survival of Clarias batrachus (Linn.) Larvae and Fry during Hatchery Rearing. Journal of Applied Ichthyology 20:302 – 305.

[11]. Ndimele, P.E. and Owodeinde, F.G. (2012). Comparative Reproductive and Growth Performance of Clarias gariepinus (Burchell, 1822) and its Hybrid Induced with Synthetic Hormone and Pituitary Gland of Clarias gariepinus. Turkish Journal of Fisheries and Aquatic Science 12: 437-444

[12]. Madu, C.T. Ita, E.O and Mohammed, S. (1991). Preliminary Study on the Intergeneric Hybridization of Clarias anguillaris and Heterobranchus bidorsalis. Annual report NIFFR New Bussa. 68 – 73.

[13]. Madu, C.T, Mohammed S, Hezie, A. Isa, J. and Ita E.O (1992). Comparative Growth Survival and Morphometric Characteristics of Clarias anguillaris, Heterobranchus bidorsalis and their Hybrid Fingerlings. Annual Report NIFFR, New Bussa 7P.

[14]. Okoye, F.C., Falaye, A.E. and Asekome (2000). Growth Performance of Pure Strain of Clarias gariepinus and Oreochromis niloticus with the Hybrid of Heterobranchus longifilis and Clarias gariepinus in Polyculture System in Earthen Pond. Annual Report NIFFR 2000 New Bussa. 24(3): 12-15

[15]. Owodeinde, F.G., Ndimele, P.E., Jenyo-oni, A. and Onyenania, O.B. (2012). Survival, Growth and Feed Utilization of the Reciprocal Hybrids of Clarias gariepinus (Burchell, 1822) and Heterobranchus bidorsalis (Geoffroy, 1809) in Concrete Tanks. Journal of Fisheries and Aquatic Science 8:122-128.

[16]. Ataguba, G.A., Annune, P.A. and Ogbe F.G. (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.