



Research Article

Growth and Feed utilization of Catfish Hybrid (*Heterobranchus longifilis* ♂ x *Clarias gariepinus*) Fingerlings fed practical diets

Keremah R. I.^{1*}, Deekae S. N.² and Akalokwu U. A.²

¹Department of Fisheries and Livestock Production Technology, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria.

²Department of Fisheries and Aquatic Environment, Rivers State University of Science and Technology, Port Harcourt, Nigeria.

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*Corresponding Author

R. I. Keremah

E-mail: regreggie55@yahoo.com

ABSTRACT

The effects of four practical diets (3 commercial and one locally prepared) on growth, feed utilization and survival of catfish hybrid (*Heterobranchus longifilis* ♂ x *Clarias gariepinus*) fingerlings were compared in plastic aquaria in triplicates for 56 days. Diets differed in crude protein (CP) and digestible energy as follows: Commercial Diet 1 (39.73% CP, 3911.8Kcal/kg), Diet 2 (34.50% CP, 3926.8Kcal/kg), Diet 3 (45.37%, 3883.6Kcal/kg) and local Diet 4 (40.34% CP, 3861.8Kcal/kg). Observations made indicated higher performance in weight and percent weight gain (2.299g, 411%), specific growth rate (0.78% day⁻¹), condition factor (0.96), feed conversion ratio (2.67) and protein efficiency ratio (10.73) for fingerlings fed Diet 3 than other diets. Commercial Diet 2 appeared to perform least among the test diets. Fish survival was high and varied between 76.7% (Diet 4) and 96.7% (Diet 1). These results demonstrated that catfish hybrid fingerlings can be successfully reared in aquaria with good feed conversion, growth and high survival on commercially or locally prepared diets with 45.37% CP and adequate energy.

Keywords:

Nutrition, Catfish hybrid, Growth, Survival, Aquaria

INTRODUCTION

Intensive fish production involves the input of supplementary and complete feeds which often represent a large part of production costs (Chen and Tsai, 1994). Fish require proteins, fats, carbohydrates in addition to vitamins and minerals in appropriate proportions to enhance fast growth, optimum health and harvest (Falaye, 1988; Ufodike et al., 2011). Protein assumes a very important place in body -building and replenishing (Davies et al., 1997) and therefore must be considered as a critical or limiting nutrient. Huisman (1986) reported lack of suitable food as the major cause of mortality in larvae of most fish species and pointed out that food must be adequate, not only in quantity and quality but also in particle size.

One fish that has attracted great attention for culturing in Nigeria is the catfish hybrid often called 'Heteroclaris' (Nwadu et al., 1993). This hybrid is a product from the cross between *Heterobranchus longifilis* ♂ x *Clarias gariepinus* . Nwadu (1995) observed that this hybrid could be obtained in commercial quantity. It grows fast and has a high survival rate. Other desirable qualities that make this fish highly recommendable for pond culture are high fecundity, better taste and nutritional qualities, tolerance to unfavorable environmental conditions (Nlewadim and Madu, 2005), omnivorous feeder, resistance to disease and high market demand (Sogbesan et al., 2005).

Heteroclaris has been of considerable importance because of its large size and hardness as its *Heterobranchus* parent. It is therefore necessary that this valuable resource is properly managed and propagated for food. In its cultivation, proper feed and good water quality management will play a vital role. Reports available on development of proper and adequate diet for maximum growth and survival of this fish are limited. The aim of the present study was to investigate the effect of different feeds (farm and commercial products) on growth and survival of catfish hybrid in indoor rearing facilities.

MATERIALS AND METHODS

Collection of Experimental Materials

Three commercial feeds (Diets 1, 2 and 3) were purchased from the African Regional Aquaculture Centre, Aluu, Roone Feed and Copence Feed in Abuloma, Port Harcourt, Nigeria. The 4th feed (Diet 4) was formulated and prepared using locally available materials (Table 1). Proximate nutrient composition of all experimental feeds were analyzed according to AOAC (1990), Table 2.

One hundred and sixty hybrid catfish (*Heterobranchus longifilis* ♂ x *Clarias gariepinus*) fingerlings (weight, 0.556-0.560g; total length, 5.60-6.68cm) were also obtained from a private Fish Farm in Port Harcourt, Nigeria. They were acclimatized and fed with a commercial feed containing 25% crude protein for 7 days and later used for the experiment.

Experimental procedure

The experiment was conducted in 45x35x28 cm³ capacity plastic aquaria. Dechlorinated tap water was used to fill and maintain each aquarium to the 40-l mark. Continuous aeration was provided by Tecas Air Pumps (AP 1500) fitted with air tubes and air stones. Body weights and total lengths of fish were measured at the start and on weekly basis to the end of test period in all the aquaria, using a beam balance and a metal meter rule.

Stocking and Feeding of Fish

Ten fingerlings of experimental fish were stocked in each aquarium in triplicate per diet. Fish were fed 5% of their body weight daily of the corresponding test diet. Each diet was divided into two equal portions and fed twice at 0900 and 1600 hours local time. The leftover feed, excreta of fish and nearly two-thirds of water from each aquarium were removed daily by siphoning and replaced with clean fresh aerated water. The experiment was conducted for 56 days in the Department of Fisheries.

Table 1. Composition of locally formulated experimental diet for hybrid catfish.

Ingredient	% Composition
Fish meal (65% CP)	14.36
Soybean meal (44% CP)	57.44
Corn (10% CP)	3.27
Shrinip waste (37.7% CP)	14.36
Bone meal	4.00
Vitamin premix	0.25
Red palm oil	5.00
Table salt (NaCl)	0.32
Binder (Starch)	1.00
Total	100.0

Table 2. Proximate composition (% dry weight basis) of experimental diets fed to Catfish hybrid ♀ (*H. longifilis*) x ♂ (*C. gariepinus*) fingerlings

Nutrient	Experimental Diets			
	1	2	3	4
Moisture, %	5.58	8.56	5.79	7.55
Crude protein, %	39.73	34.50	45.37	40.34
Crude fat, %	12.14	12.35	9.47	11.95
Crude fibre, %	5.76	3.66	4.48	3.59
Ash, %	2.33	3.05	2.46	3.72
Nitrogen free extract, %	34.46	37.88	32.43	32.85
Digestible energy (Calculated), Kcal/kg	3911.8	3926.8	3883.6	3861.8

Laboratory, Rivers State University of Science and Technology, Port Harcourt from May to June, 2005.

Water quality and performance indices determination

Water temperature was taken with a graduated laboratory mercury-in-glass thermometer (0-100°C), pH was determined with a pH meter (Model Jenway 3150) and dissolved oxygen (DO) was by Winkler's method described by Boyd (1979). This was carried out on a daily basis for temperature and weekly for other parameters in all the aquaria throughout the experimental period.

Daily mortality of fish in each aquarium was also observed. Standard formulae were used to determine growth parameters as gain in body weight and length (Okoye et al., 2001), % gain in body weight, specific growth rate (Brown, 1957), condition factor (Bagenal and Tesch, 1978), feed conversion ratio (Adikwu, 2003), protein efficiency ratio (Utne, 1979) and survival rate (Alatise and Otubusin, 2006).

Data analysis

The data collected were subjected to statistical analysis using Analysis of Variance and Duncan's Multiple Range Test (Wahua, 1999).

RESULTS

Observations on growth, nutrient utilization and survival of catfish hybrid fingerlings fed different types of diets are shown in Table 3. Least percent weight gain of 150% was observed with Diet 2 while Diet 3 fed fingerlings showed the highest gain of 411%. Fish fed Diets 1 and 4 had a little difference in percent weight gain values of 207% and 193% respectively. Diet 3 also showed significant difference ($P < 0.05$) in condition factor (0.96) and protein efficiency ratio (10.73) over other diets except in specific growth rate and feed conversion ratio where performance appeared similar among most of the diets.

Table 3. Growth, feed utilization and survival of hybrid catfish fed different diets for 56 days

Parameter	Experimental Diets			
	1	2	3	4
Mean initial weight (g)	0.556	0.559	0.558	0.560
Mean final weight (g)	1.721	1.398	2.859	1.641
Mean total length (cm)	5.96	5.60	6.68	5.96
Mean weight gain (g)	1.161 ^b	0.838 ^b	2.299 ^a	1.081 ^b
Percent body weight gain (%)	207 ^b	150 ^d	411 ^a	193 ^c
Specific growth rate (% day ⁻¹)	0.69 ^a	0.69 ^a	0.78 ^a	0.86 ^a
Condition factor (K)	0.81 ^b	0.81 ^b	0.96 ^a	0.76 ^b
Feed conversion ratio	2.74 ^b	4.39 ^a	2.67 ^b	2.91 ^b
Protein efficiency ratio	7.62 ^c	6.33 ^c	10.73 ^a	8.32 ^b
Survival (%)	96.7 ^a	93.3 ^a	80.0 ^b	76.7 ^b

Means with same letter for a given parameter in same horizontal row are not significantly different ($p>0.05$).

The survival of catfish hybrid fingerlings during the experiment range 76.7–96.7% with Diet 1 as highest and least with Diet 4. Fish survival values for Diets 2 and 3 were 80% and 93.3%.

Table 4 shows the results of observed water quality parameters in this study. Diet 1 showed water temperature range values as 26.5-27.4°C, pH (6.3 – 6.7) and dissolved oxygen (DO), 3.44 – 4.20mg/l. In Diet 2, temperature ranged 27.0 – 28.2°C, pH (6.4 – 6.8) and DO (3.50-4.70mg/l). In fish fed Diet 3, water temperature ranged 26.2 – 27.0°C, pH (6.1 – 6.6) and mean DO value, 4.9 mg/l. Diet 4 had water temperature range as 27.5 – 28.9°C, pH (6.8-7.5) and DO (3.72 – 4.94mg/l).

DISCUSSION AND CONCLUSION

All the test fish groups fed the different experimental diets gained body weights and lengths progressively to

the end of the experiment, thus showing that the fish responded positively to the diets. High growth performance was obtained in fish fed Diet 3 compared to fish fed with other diets. This could be attributed to the adequate consumption and utilization of the feed by the test fish. Keremah (2008) observed 40% and 35% crude protein (CP) for good growth performance in *Heterobranchus longifilis* fingerlings and juveniles. Fagbenro et al. (2003) reported earlier that *Clarias gariepinus*, *Heterobranchus bidorsalis*, *H. longifilis* and *Cyprinus carpio* had high growth performance when fed diets containing 40 – 50% CP. These workers suggested that catfish fingerlings should be fed with diets containing at least 40% CP. Observation in this study showed that the protein levels in Diets 1, 3 and 4 corresponded with the suggestion of these workers. Diet 3 which had the highest dietary protein level of 45.37% probably met the nutritional requirement of this experimental hybrid catfish, hence the higher growth performance.

Table 4. Means and Range values of water quality parameters for hybrid catfish fed different diets for 56 days

Parameter	Experimental Diets			
	1	2	3	4
Temperature (°C)	26.9 (26.5-27.4)	27.6 (27.0-28.2)	26.6 (26.2-27.0)	28.2 (27.5-28.9)
pH	6.5 (6.3-6.7)	6.6 (6.4-6.8)	6.4 (6.1-6.6)	7.2 (6.8-7.5)
Dissolved oxygen (mg/l)	3.8 (3.44-4.20)	4.1 (3.50-4.70)	4.9 (4.40-5.50)	4.3 (3.72-4.94)

Figures in brackets are range values of parameters for experimental diets.

The calorie requirement of juvenile *H. bidorsalis* and *C. gariepinus* was put at 3400Kcal/kg (Faturoti, 2003). All the experimental diets in this study had digestible energy content of 3861.8–3926.8 Kcal/kg. These amounts of dietary energy could have equally met the energy needs of this hybrid catfish, resulting in the overall good performance in growth of fish. The observed water

quality parameter values were found to be within the tolerance limit for warm water fish culture practice (Boyd, 1982). This implies that the high survival rate of fish in this study could also be attributed to the good quality water and experimental feeds tested.

In conclusion, the results of this study therefore suggest that good growth and survival of hybrid catfish

fingerlings may demand a feed containing a qualitative dietary protein of 45.37%, digestible energy (3883.6Kcal/kg) and good water quality environment.

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