EFFECT OF DIFFERENT DIETARY ITEMS ON THE GROWTH OF AFRICAN CATFISH HYBRID *Heterobranchus bidorsalis* (♂) X *Clarias gariepinus* (♀)

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ABSTRACT

This paper describes the growth response of the developmental stages of hybrid catfish resulting from the crossing of Heterobranchus bidorsalis (male) and Clarias gariepinus (female), fed with different feed rations. Hatchlings of the hybrid catfish were cultured in plastic aquaria set up at the fish hatchery complex, Nnamdi Azikiwe University, Awka. The hatchlings were fed and observed for 91 days. Different food items such as artificially compounded feed, zooplankton / live organisms, Moina sp and Brachionus sp, and a mixture of zooplankton (Moina sp and Brachionus sp) and artificially compounded feed were administered. The mixture gave the best result with a mean weight of 7.92g ± 2.73g, followed by those fed Moina sp (1.93g ± 0.27) and Brachionus sp (1.80g ± 0.32) respectively. Hatchlings fed only artificially compounded feed exhibited the poorest growth. A mixture of live food organisms and artificially compounded feed is thus recommended for better growth response of catfish hybrid, (H. bidorsalis ♂ x C. gariepinus ♀).

Keywords: Catfish hybrid, Hatchlings, Juveniles, Diet, Growth

INTRODUCTION

The fish species *Clarias* and *Heterobranchus* (Family: Clariidae) are very common and widely distributed throughout Africa. They can grow to large sizes of over 10 kg and are in high market demand as table fish, being tasty and scaleless. *Clarias* do not grow as large or as quickly as *Heterobranchus*. *Heterobranchus* on the other hand, do not have the same survival rate as *Clarias*. The hybrid catfish referred to locally as "*Heteroclarias"* combines fast growth and high survival, thus, considerable attention is being given to the catfish hybrid, especially in intensive and semi-intensive pond culture.

A major pre-requisite for successful fish farming enterprise is a reliable and consistent source of fish seeds (fingerlings) of the commercially important species (Nwuba and Aguigwo, 2002). The surest and most reliable source of supply is to produce the fingerlings under a controlled system, usually in a hatchery. Not only is reproduction controlled, but the survival of hatchlings is maximized through adequate care and management (Madu and Ita, 1991). One of the major challenges in hatchery management is the provision of adequate and appropriate food for the fish hatchlings. This is because most formulated feed come either in pellets or sizes not small enough for the hatchlings to swallow; imbalanced or insufficient nutrient content, and probably, the adaptation of the fish gut to solid food from plant origin. As a result, there is usually high mortality rate when fish hatchlings change from endogenous to exogenous feeding after the first three to four days of their life. Growth may be retarded as development of sensory and motor capabilities and development of physiological characteristics occur during the early life stage and affect survival and competitive ability. According to Hyatt (1979), the first few months of life are perhaps the most critical for the survival of juvenile fish. Presently, most hatcheries are trying to make use of live zooplankton to meet the challenge of feeding fish hatchlings. According to Piggot and Tucker (1989), fish can swallow live prey of much larger size than dry formulated feed due to the elastic nature of live feed. Nwuba and Aguigwo (2002), however, reported that any single diet of either artificially compounded feed only or zooplankton only, could not sustain *Clarias anguillaris* hatchlings beyond a certain age but that addition of supplemental feed to live food offers better growth to growing hatchlings of the fish species. This paper investigates the effect of different food items on the growth response of the developmental stages of the catfish hybrid, *Heterobranchus bidorsalis* ♂ x *Clarias gariepinus* ♀**.**

MATERIALS AND METHODS

Hybrid: Hatchlings of hybrid catfish were produced through hormone induced breeding at Aquafish farms, Ihiala, and transferred to the fish hatchery complex, Zoology Department, Nnamdi Azikiwe University, Awka on the fourth day of life after hatching. The hatchlings were stocked in twelve forty (40) litre plastic aquaria with twenty (20) litres of water each and eighty (80) hatchlings per aquarium. The aquaria were divided into four groups according to the number of test diets, with each group having three replicates. The aquaria and groups were labeled accordingly, Diet I, II, III, and IV. Diet I was formulated diet, Diet II and III live organisms of *Moina sp* and *Brachionus sp* respectively and Diet IV a mixture of the formulated diet and the live organisms.

The appropriate food items were administered in the various aquaria from the fifth day of life and the effect of the food items on the growth of the hatchlings was monitored for ninety-one (91) days.

Artificial Diet: Artificial diet was prepared to contain 40 % crude protein (Table 1). The mass of individual feed ingredients used was calculated using the Pearson's square method (Pearson, 1976). The feed ingredients were milled and finely sieved. Each ingredient was separately weighed out, to a total of 200g of ingredients. The feedstuffs were thoroughly mixed together, with 80 ml of water added to form homogenous and well-kneaded dough. The dough was pressure cooked to help gelatinization of the feed and aid the release of necessary nutrients. The cooked dough was extruded as semi-moist pellets using a hand cranked pelletizer. The pellets were sun-dried, milled again, finely sieved and stored in sealed polythene bags.

Table 1: Weights of dietary ingredients and proximate composition of formulated diet

Ingredients	Weight(g)
Crayfish	63.0
Soya bean	63.0
Corn meal	72.0
Vitamin/Mineral Premix	1.0
Salt	0.5
Oil	0.5
Proximate composition	
Food class	**% composition**
Protein	39.81
Fibre	2.40
Ash	6.12
Moisture	10.83
Fat	11.90
Carbohydrate	28.92

The milled feed was dispensed manually into the water in the appropriate aquaria at 5 % body weight of the fish in the aquaria once daily. The proximate composition of the formulated diet fed to the hybrid catfish hatchlings was as shown in Table 1.

Live Diet: Zooplankton, *Moina sp* and *Brachionus sp* were isolated and cultured in plastic aquaria using slight modifications of techniques reported by Adeniji and Ovie (1986) and Ovie *et al* (1993). The live diets used were identified by viewing water samples under an Olympus Tokyo (HSB 376700) microscope and using the identification key given by Jeje and Fernando (1988). *Moina sp* was harvested from the culture aquaria very early in the morning and fed to the fish hatchlings twice daily at an estimated rate of five hundred (500) organisms per litre of water. *Brachionus sp* was also harvested in the morning and fed to the fish hatchlings twice daily at the rate of six hundred (600) organisms per litre of water. The density of harvested zooplankton was estimated using the volumetric method: Density of organisms = X/W x V; where X = number of organisms in a drop of culture water, W = volume of drop of water and V = total volume of water fed to aquarium. Another method of Escritor and Javallana (1981) as described by Ovie and Fali (1989) was used to determine feeding volume of harvested zooplankton in which: N = X /Y x V; where: N = volume of water (with zooplankton) to be fed the aquarium, X = actual count / density at source and V = volume of water in aquarium.

A beaker was used to take up the zooplankton and water, which was then poured gently into the appropriate aquaria when feeding.

Fish hatchlings were counted every five (5) days to minimize stress due to excessive handling

The length and weight of hatchlings were also monitored. Measurement of fish length started on the thirty-first day from when feeding started. A graduated test-tube was used for measuring the length of the fish. Measurement of fish weight started on the forty-first day.

The water in the aquaria were initially changed daily (for the first ten days) and then every other day. The aquaria were washed every five days, when the hatchlings were weighed. Water parameters such as temperature, pH and dissolved oxygen were also monitored.

Data Analysis: The data for hatchling growth were analyzed using a one-way Analysis of Variance (ANOVA) and Fisher's Least Significant Difference (F-LSD) at P = 0.01 and 0.05.

RESULTS

The growth performance of hybrid catfish hatchlings fed different diets for 91 days is shown in Tables 2 and 3. The length and weight were used as index of growth. Fish fed a mixture of zooplankton and artificial diet with a final mean weight of 7.92g ± 2.73g exhibited better growth, over those fed single diets of only zooplankton or artificial diet. The mean daily temperatures were similar for all the aquaria and stood at 25.2^{O}C ± 0.024^{O}C. Average pH for treatment aquaria stood at 6.80 ± 0.01 for *Moina sp* and *Brachionus sp*; 6.92 ± 0.018 for mixture of artificial feed and zooplankton and 6.95 ± 0.03 for artificially formulated feed. Dissolved oxygen (DO) stood at 5.84 ± 0.014 mg / litre on the average.

DISCUSSION

The growth performance recorded in this study supports the view held by Tacon (1993) that it is erroneous to mislead researchers and farmers into believing that the only economic way of feeding fish is by using a high quality "complete" pelleted diet. Feeding of hybrid catfish hatchlings with live organisms, improved the growth performance over feeding with complete artificial diet as opined by Ovie and Fali (1989), Jeje (1992) and Bone *et al* (1995). The final mean weights of fish fed *Moina sp* (1.93g ± 0.27) and those fed *Brachionus sp* (1.80g ± 0.32) were not statistically different, suggesting that as long as the live organisms (zooplankton) is of acceptable size, the species of natural zooplankton used for feeding may not matter. Any freshwater zooplankton species could suffice, barring any defensive adaptations, although hardier and easier to propagate species like

Table 2: Growth in weight of *H. bidorsalis* x *C. gariepinus* hybrid juveniles fed different live and artificial diet combinations

Diets	Days										
	41	46	51	56	61	66	71	76	81	86	91
***Moina* sp**	0.174	0.225	0.299	0.386	0.496	0.621	0.803	0.987	1.233	1.544	1.933
***Brachionus* sp**	0.198	0.252	0.321	0.406	0.497	0.618	0.759	0.929	1.156	1.407	1.803
Artificial	0.043	0.046	0.047	0.049	0.050	0.051	0.052	0.053	0.053	0.054	0.056
Mixture	0.371	0.537	0.755	1.079	1.541	2.238	3.150	3.933	4.937	6.397	7.924

Table 3: Growth in length (cm) of *H. bidorsalis* x *C. gariepinus* hybrid juveniles fed different live and artificial diet combinations

Diets	Days												
	31	36	41	46	51	56	61	66	71	76	81	86	91
***Moina* sp**	1.56	1.73	1.83	2.02	2.18	2.61	2.93	3.49	3.68	4.21	4.33	4.96	5.09
***Brachionus* sp**	1.29	1.47	1.57	1.81	1.94	2.32	2.72	3.36	3.57	3.97	4.23	4.68	5.00
Artificial	1.03	1.07	1.08	1.12	1.15	1.28	1.40	1.65	1.77	1.78	1.78	1.79	1.82
Mixture	2.40	2.50	2.66	2.74	2.91	3.38	4.11	4.86	5.25	5.56	6.04	6.48	6.99

Brachionus sp (Ezechi, 2005) may however be preferred. The use of live zooplankton only, however, may not be the best feeding technique, as the result of this study shows that supplementary feeding is still very important. The best performance exhibited by hybrid catfish hatchlings fed a mixture of both zooplankton and artificially compounded feed indicate that mixing artificially compounded feed and live zooplankton in the diet of the developmental stages of the hybrid catfish would be a better practice in fish farm practice. This supports the observations of Nwuba and Aguigwo (2002).

According to Smith (1989), the maintenance cost of the animal (fish) has priority and must be met before any energy is available for tissue synthesis and growth. This may explain the result obtained in this study. Since zooplanktons are naturally more proteinous, the problem of consumption of enough easily digestible energy (DE) to support the fish's maintenance cost and tissue synthesis may have arisen. This may have been a major factor in the enhanced performance of fish fed a mixture of live zooplankton and artificially compounded feed over those fed only live organisms (zooplankton). The integration of the formulated feed into the diet of the fish as supplement, along with the natural live freshwater organisms, may have increased the digestible energy (DE) / metabolizable energy (ME) available to the fish, thus leaving more energy for tissue synthesis and growth after the maintenance cost of the fish was met. Feeding with both live organisms and compounded feed is thus recommended for hybrid catfish hatchlings for enhanced growth performance.

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