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Culture potential of snakehead *Parachanna Obscura* juvenile fed with various protein sources

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Abstract
The research was conducted in the laboratory static water system of glass aquaria to determine the response and acceptability of *Parachanna obscura* fingerlings to different protein levels in artificially compounded feed. Three experimental diets A, B, and C were formulated with fish meal, blood meal and palm kernel cake as major protein sources containing 28%, 32%, and 18% dietary protein levels respectively. Three aquaria of the same size containing 20 fingerlings of the same size each were fed 20% body weight of feed daily. The fish increased in sizes by 1.22g (Diet A), 1.19g (Diet B) and 1.01g (Diet C) with the three diets in the 40 days of study. Growth rate determined for the diets were not significant (P>0.05). Mortality rate of 40%, 60%, and 59% were recorded in tanks 1, 2, and 3 (Diet A, B and C) respectively. The results indicated that Specific growth rate was higher in diet A though not significantly different (P>0.05) from other diets. The study has proven that *Parachanna obscura* fingerling can accept artificially compounded feed and can be listed as one of the aquaculture candidate in Nigeria.

Keywords: *Parachanna obscura*, Juvenile, Protein, Compounded feed.

Introduction
One of the major criteria for listing a fish species as an aquaculture candidate is its acceptability of compounded feed. Fish feed and feeding is an essential part in aquaculture processes and industries. Fish growth is a reflection of the food available to the fish whether from natural production or artificial source [1]. Formulated feed should be served in a readily consumable form with least microbial contamination [2]. Fish farming success depends on the fish feed and the feeding regime adopted. The ultimate goal of aquaculture is to obtain a meaningful turnover. Nutritionally, the best feed ingredients for any fish species are those whose biochemical composition approaches the animal body composition [2]. Since the natural food production in the pond and other culturing medium cannot satisfy fish budgetary need, a balanced diet that meets the fish species nutritional requirements must be provided. Fish meal had been the major source of dietary protein in aquaculture, but limited in availability. With the reduction and subsequent collapse of some fishery, fish supply is seriously hampered, thereby exposing fish farmers to the challenge of growing healthy and different species. The variability can highly influence aquaculture sustainability cum profitability, and therefore research in identifying alternative dietary protein sources has increased [3]. For cultured fish to grow well several factors are involved, such as temperature, dissolve oxygen, pH of the culturing system and feed. Feed acceptability by cultured fish is so essential that fish farmers must be sensitive to, if good yield must be achieved. Unacceptable and unconsumed feed can lead to the pollution of the culture medium resulting in the death of the fish. Nutritional requirement of any fish species is important in the preparation of complete diet. Feed and feeding represent about half of the operating cost in a wide variety of aqua-farming situations [4] and for a successful aquaculture production fish feed accounts for about 60% of the total production cost [5]. The main constraints of fish feed production include scarcity of fish feedstuffs, high cost of ingredients and competition of ingredients for human use. This constraints have motivated the research for local available and cheap alternative protein feed source that compete less with human for aquaculture industry which aim to reduce the cost of production without compromising fish quality Snakehead (*Parachanna obscura)* fish species is a freshwater species and are valuable food fish. In Nigeria Snakehead *(Parachanna obscura*) has not been cultured by fish farmers and this fresh water fish species is important because of

its seed availability in the wild, faster growth rate, acceptability by the locals and good market value. However, the nutritional requirements of the fingerlings and acceptability of artificially compounded food is yet to be understood for successful culture. Considering the above facts, this study was designed to determine the response and acceptability of *Parachanna obscura* fingerlings fed on different local formulated protein diets and also to observe its growth rate.

Materials and Methods

The study was carried out in the laboratory of the Institute of Oceanography, University of Calabar, Calabar, for a period of forty days. Three glass aquaria of sizes 60x30x30cm^3 having a capacity of 54L each was used as experimental tanks. During the study period tap water was the source of water to the aquaria. Aeration pump was used to maintain adequate level of dissolved oxygen. The water temperature ranged between 24^o and 27 ^{0}C while pH was within 6.4 and 6.9 throughout the experiment. The *Parachanna obscura* fingerlings were obtained from fishermen at Ayadehe beach who harvested them from the wild. The juvenile fish were transported in a plastic container half filled with the swamp water to the laboratory. The fishes were given a prophylactic treatment with 0.5% NaCl dip for 10 minutes followed by a methylene blue bath of 0.5 ppm for 2 days. During acclimatization, the fingerlings were fed on formulated diet at the rate of 1% body weight as maintenance ration. The initial mean weights of the ten fingerlings stocked in each tank before the commencement of the experiment measured thus; Tank 1: 1.82g, Tank 2: 1.86g, and Tank 3: 1.89g. The ingredients selected and the compositions of the experimental diets are specified in Table 1. The three aquaria were fed with three different types of compounded feed with major protein base of fish meal, blood meal and palm kernel cake. Other ingredients which comprise soya bean, bone meal, starch, vitamins premix and fat had the same proportion in the three. The crude protein levels for each unit of the formulated feed were 28%, 32% and 18% respectively. The feed was produced locally by mixing together the needed quantity of ingredients including water and oven dried at a temperature of 120^{o}C. The fish were fed 20% body weight twice daily, the unconsumed feed particles were siphoned from the aquaria the next day to avoid contamination. The growth parameters were calculated as follows: Specific Growth Rate (SGR) (% day-1) = 100 x [(final fish weight) – (initial fish weight)] / days fed. Feed Conversion Ratio (FCR) = feed intake (g) / weight gain (g) x 100. Production efficiency of the system was determined using [6]. PE = weight of fish stocked (gm)/weight of fish produced (gm)

Change in body weight was calculated with following formular [7].

$$WG = \frac{wt - wo}{t}$$

Where,

WG = the average weight gain (gmd-^{1})

Wt = the final weight of the specimen after the experiment

Wo = the initial weight of the specimen after the experiment

t = time taken for the experiment

The specific growth rate in percentage of the specimens were calculated according to [8]

$$SGR\% = \frac{LnWt - LnWo}{t} X\ 100$$

Results

The results of the study are shown in table 2, the specimen fed with diet 1 showed mean body weight increase of 1.87gm, while specimen fed with diets 2 and 3 exhibited mean weight of 1.41gm and 1.05gm respectively. The analysis of variance indicated that the growth rate were not significant (P>0.05). Although there was no significant different in the growth rate from the three experimental units, minor differences were still noticeable. 'T'- statistics showed that diet 1 is significantly different from diet 3 (P>0.01), but not different from diet 2. Mortality rate of 30%, 20% and 40% were recorded from tank 1, 2 and 3 respectively. The specific growth rate (SGR) of 1.77, 1.41 and 1.11 were recorded from diets 1, 2 and 3 respectively.

Table 1: The composition of experimental diets for juvenile *Parachanna obscura*

Ingredient	Quantity (g)	% of inclusion	% Crude protein	Feed protein %
Diet 1: Fish meal	400g	40	66.5	28%
Soya bean	300g	30	52.8	
Bone meal	200g	20	0.05	
Starch	50g	5	16.9	
Vit. Premix	30g	3	-	
Fat	20g	2	1.81	
Diet 2: Blood meal	400g	40	66.5	32%
Soya bean	300g	30	52.8	
Bone meal	200g	20	0.05	
Starch	50g	5	16.9	
Vit. Premix	30g	3	-	
Fat	20g	2	1.81	
Diet 3: PKC	400g	40	66.5	18%
Soya bean	300g	30	52.8	
Bone meal	200g	20	0.05	
Starch	50g	5	16.9	
Vit. Premix	30g	3	-	
Fat	20g	2	1.81	

Table 2: Growth performance and feed utilization of juvenile *Parachanna obscura* experimental diets

	Diet 1	Diet 2	Diet 3
Initial wt. Of fish (gm)	1.82	1.86	1.89
Final wt. Of fish (gm)	3.69	3.27	2.94
Growth rate (gm d^{-1})	0.05	0.04	0.03
Number of animal stocked	10	10	10
Number of animal harvested	7	8	6
SGR (%)^1	1.77	1.41	1.11
Protein efficiency (PE) (gm)^2	0.49	0.57	0.64
Mortality rate (%)	30	20	40

Discussion

Snakehead fish species (Para*channa obscura*) is known to be carnivorous, and it has not been commercially cultured in Nigeria though research has proved it to be aquaculture candidate [9]. This feeding trial experiment had shown Diet 1 with fish meal as the major protein source to exhibit the highest performance growth rate (Weight gain) of 0.27gmd^{-1} during the study period. Diet 1 was significantly different

from diet 3 (P>0.01). This confirmed the reports of other researchers that fish meal is the primary and best animal protein for aquaculture [10] but was not significantly difference from diet 2 (blood meal), however [11] observed that *Par-ophiocephalus obscurus* fingerlings reared in the earthen pond showed better growth rate with blood meal against fish meal, though statistically, was not different. *Parachanna obscura* showed an increase in weight in all the cultured tanks to indicate it acceptability of artificially compounded feed. In agreement with [12], it appears that feeding of ground meal is more conducive to production and growth of young *Channa striata* (Bloch). With result obtain from this study, it could be observed that *P. obscura* showed a lesser growth when compared with [13] on the growth and survival rate of *Channa striata* (Bolch) reared in rice farm. The differences in the growth rate might be that the former was in a strange environment while the later occupied a natural habitat [14]. Reported that Ophirocephalidae cultured and fed with natural food showed good response to growth than with formulated feed. The growth rate obtained from this study differ in comparison with the result obtain when feeding Heteroclarias with natural feed with 50 – 60% protein [15]. *Heterobranchus longifilis* accepted compounded feed and showed increase in growth rate from 1.8g to 2.6g body weight in 62 days [16]. Diet 3 exhibited the least growth rate of 0.03 gm d^{-1} during the trial study which might resulted from the high crude fibre present in palm kernel cake which can reduce digestibility. This confirmed the report of [17], when substituting fish meal with palm kernel meal for Nile tilapia *Oreochromis niloticus*. However, [18] noted that the inclusion of up to 30% PKC in the diet of red tilapia did not cause any significant reduction in growth. Mortality rate of 40% was recorded in the tank fed diet 3 which was the highest occurrence, unacceptability of food may result in starvation with death at the end and this might have been the situation with fish fed diet 3.

Conclusion/ Recommendation

The trial experiment was successful, *Parachanna obscura* is proven to be a good aquaculture species. But with unreliable electricity supply further studies on this species should be conducted in experimental ponds. Studies on other compounded feed with different protein basis should be continued to determine a near substitute to natural food for the juveniles. *Parachanna obscura* is a potential aquaculture candidate which may compete in culture with other aquaculture species. It is hereby recommended to fish farmers in Nigeria especially the south south region to culture for increase variety.

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