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Effect of feed rationing on growth performance of *Clarias gariepinus* reared in plastic tanks under normal culture conditions

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Abstract
The effect of feed rationing on growth performance of *Clarias gariepinus* post fry was investigated using 0.3m^3 plastic tanks. Nine hundred *C. gariepinus* post fry of mean weight 0.98 ± 0.02g were randomly allocated to three treatments replicated thrice. Fish in each treatment were fed twice daily with three different ration sizes of 5% (T1), 3% (T2) and 1% (T3) fish body weight per day, constituting the treatments. The fish were sampled on a weekly basis and the weight measurement taken. The culture water was changed completely twice in a week to maintain good water quality throughout the culture period. At the end of the five weeks culture period, percentage mortality was recorded for each treatment. Data collected were subjected to one way analysis of variance and level of significance was determined at $p < 0.05$. The results shows that T1 had the highest weekly weight increase of 1.27± 0.45g, 2.41± 0.57g, 3.08± 0.53g, 4.05± 0.88g and 4.92±0.88g for weeks 1,2,3,4 and,5 respectively, while T3 had the least weekly weight increase. There was no significant difference among the treatments' weekly weight incresse. T1 had the least mortality rate of 22.5%, followed by T2 (44.3%) while T3 had the highest value of 70.5%. It was recommended that fish farmers should feed *Clarias gariepinus* post fry with a ration size of at least 5% body weight per day.

Keywords: African catfish, post fry, ration, weight gain, mortality rate

Introduction
As aquaculture is gaining attention all over the world as means of improving world fish production which is currently on decline due to dwindling output from capture fishery (FAO, 2009) [8], one problem facing fish culturists is the need to obtain a balance between rapid fish growth and optimum use of the supplied feed (Ajani *et al*., 2010) [2[]. Both over- and underfeeding can be detrimental to the health of the fish and may cause a marked deterioration in water quality, reduced weight, poor food utilization, and increased susceptibility to infection (Priestley *et al*., 2006). This may also affect the specific growth rates and the efficiency of feed conversion as these have been observed to be directly related to feed ration and frequency (Dwyer *et al*., 2002) [5]. It has also been reported that feed takes between 40 – 75% of the cost of production (Falaye 2013; Elezuo *et al*., 2018) [7, 6] When fish are fed at suitable feeding frequency, growth and survival are expected to improve because this regulates their feed intake in relation to their energy demand (Schnaittacher *et al*., 2005) [13] and also reduces cost of production because wastage of feed will be reduced, good water quality maintained. According to Ali *et al*., (2005) [3], time of feeding and feeding frequency can affect feed intake and growth performance in fishes. Therefore, it is important to establish feeding ration relative to the species and size of fish. This study is designed to investigate the effect of feed rationing on the growth performance of African catfish (*Clarias gariepinus*) post fry reared in tanks under normal culture conditions. The establishment of a growth–ration relationship is important to aquaculture (Sun *et al*., 2006) [14], especially for an optimum feeding strategy.

Material and Methods
Study on the effect of feed rationing on growth performance of *Clarias gariepinus* was carried out in plastic tanks using the fish hatchery facilities of Nigerian Institute for Oceanography and Marine Research (NIOMR) Lagos for five weeks. Nine tanks measuring 0.3m^3 were stocked with 100 post fry each of average initial weight 0.98g ± 0.02 (three treatments and three replicates) and were fed at different percentage (%) body weight (5%, 3% and 1%) two times daily. Sampling was done weekly. The weight increase was recorded to the nearest 0.01g using a digital sensitive measuring scale and percentage mortality (cannibalism) were recorded at the end of five weeks. The water was changed completely twice in a week and no shooters were removed throughout the study period. The percentage mortality was calculated using the formula below.

% mortality = TS – S/TS X 100

TS= total number of post fry stocked and S represents the total number of post fry (fingerlings) that survived
The quantity of feed given per day was calculated using the equation below

DF = % BW/100 × TS

DF = Daily feed, BW = Body weight and TS = the total number of fish stocked
Results were presented as mean and standard deviation of mean (± SD). The data collected were subjected to one way analysis of variance (ANOVA) and level of significance was determined at $p < 0.05$.

Result and Discussion
The result showed that fish fed 5% body weight (T1) had weight increase as follows:- 1.27 ± 0.45g, 2.41 ± 0.57g, 3.08 ± 0.53g, 4.05 ± 0.80g and 4.92 ± 0.88g for weeks (1,2,3,4, and 5) respectively, T2 (3% body weight) were as follows.- 1.20 ± 0.40g, 2.011 ± 0.84 g, 2.87 ± 0.70 g, 3.65 ± 0.93 g and 4.57 ± 1.09 g for weeks (1,2,3,4, and 5) respectively and for T3 (1% body weight) were as follows 1.15 ± 0.43g, 1.91 ± 0.82g, 2.47 ± 1.23g, 3.35 ±1.26g and 4.10 ± 1.61g for weeks (1,2,3,4, and 5) respectively. As seen in table 1,

Table 1: weekly growth rate of *C. gariepinus* fed at different feeding rates

Week	Weight gain (g)		
T1	T2	T3	
Week1	1.27 ± 0.45	1.20 ± 0.40	1.15 ± 0.43
Week2	2.41 ± 0.57	2.011 ± 0.84	1.91 ± 0.82
Week3	3.08 ± 0.53	2.87 ± 0.70	2.47 ± 1.23
Week4	4.05 ± 0.80	3.65 ± 0.93	3.35 ±1.26
Week5	4.92 ± 0.88	4.57 ± 1.09	4.10 ± 1.61

It has been reported that ration is an important factor affecting the growth of fish and a growth–ration relationship has been established for several species (Khan *et al*., 2004; Ahmed, 2007; Desai and Singh, 2009) [10, 1, 4]. According to Khan and Abidi, (2010) [9], the optimum ration level for better growth, conversion efficiencies and body composition of fingerling of *Heteropneustes fossilis* ranged from 5.9 – 6.8% body weight per day. A ration size of 6% of body weight per day has been reported to be optimal for good growth of *Cyprinus carpio* fry (Desai and Singh, 2009) [4]. Ahmed (2007) [1] observed that a ration size of 6.5 – 7.0% body weight per day was optimal for growth and efficient utilization in *Labeo rohita*. Among the different rations tried, 2% body weight per day has been reported to show highest growth in juvenile grass carp, *Ctenopharyngodon idella* (Zhen-Yu *et al*., 2006) [15]. A feeding ration of 5–5.5% was reported to be optimal for growth of *Cirrhinus cirrhosus* (Khan *et al*., 2004) [10]. Optimal feeding rate for good growth of a bagrid catfish, *Hemibagrus nemurus*, was reported to be 2.5% body weight per day (Ng *et al*., 2000) [11]. In this study, there was no significance difference in growth rate among the three treatments. Desai and Singh, (2009) [4] reported that feed rationing affects the growth performance of *Clarias gariepinus*. Percentage mortality was more among T3 followed by T2. T1 had the least mortality as shown in Fig. 1.

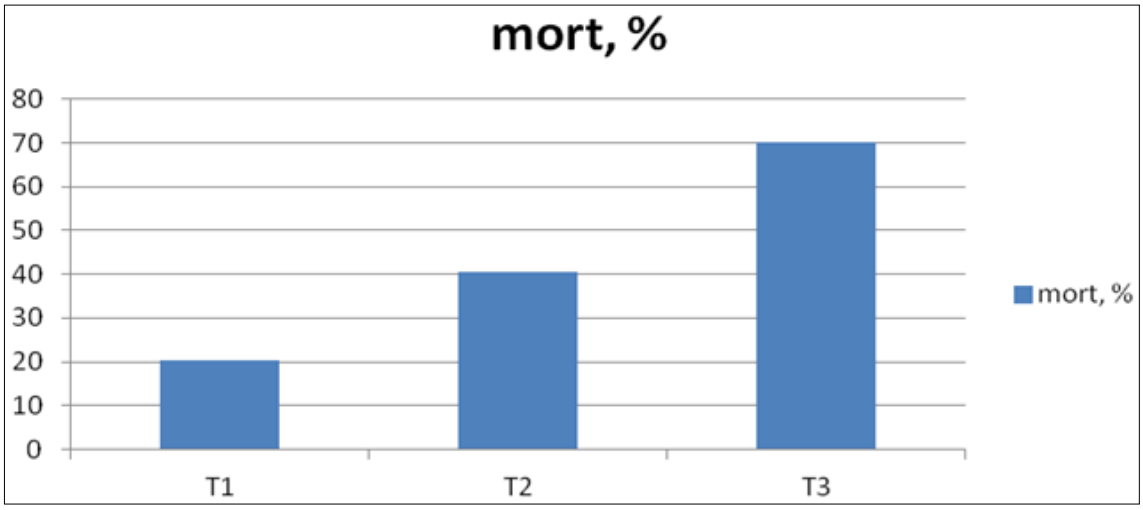

Fig 1: Percentage (%) mortality of post fry to fingerlings fed at different feeding rates

These result may have been an indicator that feeding rate does not only affect the growth rate of fish but also can increase cannibalism as seen in this result. As a result, more work is recommended on optimum feeding rate to reduce cannibalism in African catfish (*C. gariepinus*). Also fig. 2 below also showed weight increase in all the treatments. With those with lower

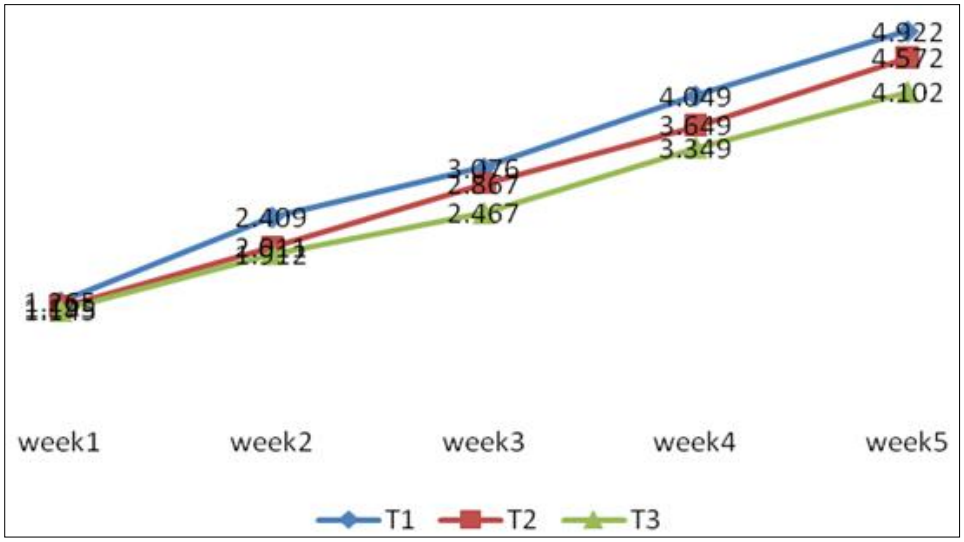

Fig 2: Weekly weight increase of Clarias gariepinus fed varying feed ration for five weeks

Feeding ration having more death due to canibalism. This could have resulted from the shortage of feed in those treatments. For better aquaculture practices, more studies is recommended to inveatigate the relationship between feed ration and canibalism.

Recommendations

From the result of this work, it is recommended that fish farmers should feed *Clarias garipinus* fingerlings with a ration size of at least 5% body weight per day. More work is needed on the optimum feeding rate to reduce cannibalism in African catfish (*C. gariepinus*) as well as the relationship between feed rationing and cannibalism.

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