EFFECTS OF FEEDING FREQUENCY ON CULTURE WATER QUALITY AND PERFORMANCE OF *HETEROBRANCHUS LONGIFILIS* AND *CLARIAS GARIEPINUS* FRY.

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ABSTRACT
The effects of feeding frequency on some water quality parameters and performances were examined on *Heterobrachus longifilis* and *Clarias gariepinus* fry for 4weeks.The following parameters; pH, Ammonia, DO and Temperature of the water was monitored. The mean weight gain was 0.91+0.05(T1A), 0.93+0.028(T2A) and 0.95+0.025(T3A) for *C. gariepinus* while 0.93+0.04(T1B), 0.92+0.032(T2B) and 0.94+0.035(T3B) was recorded for *H. longifilis* which showed no significant difference ($p<0.05$) in both fish species. Specific Growth Rate, Feed Conversion Ratio, Protein Efficiency Ratio and Average Daily Weight Gain showed no significant difference ($p<0.05$). Survival rate was highest in T3A and T3B which showed a significant difference ($p<0.05$) among the treatments. The T3A and T3B had the best survival and water quality while the other parameters showed no significant difference. Adequate feeding frequency is necessary to enhance the performance of fish especially the survival rate at fry stage.
Key words: Feeding, frequency, performances, water quality, fry

INTRODUCTION
Aquaculture in Nigeria revolves mostly around catfish farming and the hope of fish farming development in Nigeria hangs on the proper management and innovations in its culture practices. For aquaculture to achieve increased fish production there must be efforts in ensuring availability of increased quantity and quality seedlings. Since the culture of *Clarias gariepinus* through hypophysation was initiated in Western Nigeria in 1973, the procedure has been widely practiced throughout the country leading to increase of farm-raised catfishes from the 1980's (Adewumi and Olaleye,2011). Nonetheless, the survival of fry and fingerlings has been a critical challenge. Several constraints to maximizing the performance of fish such as poor production, poor quality of seed; low survival rate and cannibalism in hatchery rearing abound (Appelbaum and Arockiaraj,2010).This poor performance is usually associated with size variation, limited food availability, high population densities, limited refuge areas and poor management (Hecht and Pienaar, 1993). Development and management of fish feed plays a vital role in aquaculture growth and expansion (Omovwohwovie *et al*. 2015).Feed conversion is essential in the performances of fish for a profitable aquaculture. Feed has also been noted to account for over 60% of production cost in fish farming (Anderson *et al*., 1997). With this in mind, it is very paramount to establish a feeding frequency that will be optimal at different developmental stage of the fish in different environments (Bascinar*et al*., 2001). This optimal feeding frequency may vary according to feed quality, life stage, species and environmental factors (Goddard, 1996). Young fish exhibit allometric growth patterns and show higher growth potentials than older individuals, the intensity of cannibalism would reach a maximum in the early weeks or months of the life history when the variability of individual growth would be maximum (Melard *et al*., 1996). Hence establishing a feeding frequency at the fry stage of *H. longifilis* and *C. gariepinus* is necessary to improve performances of fry, ameliorate the scarcity of fish seed, and increase the profitability of hatchery operations. This study looks at the effect of feeding frequency on the performances and water quality parameters of *H. longifilis* and *C. gariepinus* fry.

MATERIALS AND METHOD
The experiment was carried out in the wet laboratory of the Department of Fisheries and Aquatic Resources Management, Michael Okpara University of Agriculture Umudike (MOUAU). The experiment was carried out using 18 containers of 50 litres each. Two species of fish, *C. gariepinus* and *H. longifilis* were studied in three treatment and three replicates. Five days old fish fry of the species were stocked at 40 fry in 40 liters of water. Shell free artemia and other fry feeds were used for feeding. Each experimental unit were fed the same quantity of feed per day. The quantity of feed fed was adjusted accordingly every week while the feed remnants and waste was siphoned out daily. Feeding frequency of 6 hours interval for treatments (TIA and T1B), 4 hours interval for (T2A and T2B), and 2 hours interval for (T3A andT3B) was applied to the treatments in 3 replicates for *C. gariepinus* and *H. longifilis* respectively from 6am to 6pm.All the treatments and replicates were fed the same quantity of feed each day shared into number of feeding time based on feeding time interval. The experiment lasted for four weeks. During the experiment, observations were made and recorded. The following

performance indices were calculated. Mean Weight Gain (MWG) = Final body weight – Initiated body weight. Specific Growth Rate (SGR %) = 100(log final body weight – log initial body weight)/Time. Feed Conversion Ratio (FCR) =Dry weight of feed fed/Fish weight gain. Protein Efficiency Ratio (PER) =Wet body weight gain/Crude protein fed. Survival rate (%) = (initial number of fish stocked – mortality) x100. Average Daily Weight Gain (ADWG) = Average Weight Gain/ Time (Days). Water change was done on a daily basis (50%) while water parameters such as pH, Dissolved Oxygen, Temperature, and Ammonia were monitored daily. One way Analysis of Variance (ANOVA) was used to analyze the data while Duncan's multiple range test was used to separate the means at P<0.05.

RESULTS AND DISCUSSION

The result shows that the mean weight gain for T1A, T2A, and T3A was $0.91^{\pm}0.05$, $0.93^{\pm}0.028$ and $0.95^{\pm}0.025$ respectively while T1B, T2B; T3B has $0.93^{\pm}0.04$, $0.92^{\pm}0.032$ and $0.94^{\pm}0.035$ respectively. There was no significant different at p<0.05 (Table1 and Table 2). The SGR was highest in T3A and T1B which was $3.37^{\pm}0.09$ and $3.41^{\pm}0.15$. There was no significant difference observed see Table 1 and 2 below. The result also showed no significant difference (p<0.05) in the FCR, PER and ADWG in both *C. gariepinus* and *H. longifilis* feed with different feeding frequencies. This result agrees with the findings of Aderolu *et al*., 2010 which showed that there was no significant difference in the feeding frequencies of 3meals, 4meals and above per day. The result of this study went contrary to the findings of Hafeez-ur-Rehman *et al*., (2015) who reported a significant difference in the growth of *Carassius auratus* fed different feeding frequencies. The FCR and SGR were best in T3A, T3B and T2A, T3B respectively for *C. gariepinus* and *H. longifilis*. This supports the hypothesis of (Aderolu *et al*., 2010 and Bascinar *et al*., 2007). Investigations has revealed that, regardless of feeding rate, increasing the feeding frequency from four to eight per day significantly increased growth and feed efficiency of fish by 20% (Lee, et al., 1997). The authors opined that, more frequent feeding over a long period would be an efficient strategy for culturing *Chanos chanos* in the ponds.

TABLE 2: Performance of *Hlongifilis* fed at different feeding frequencies.

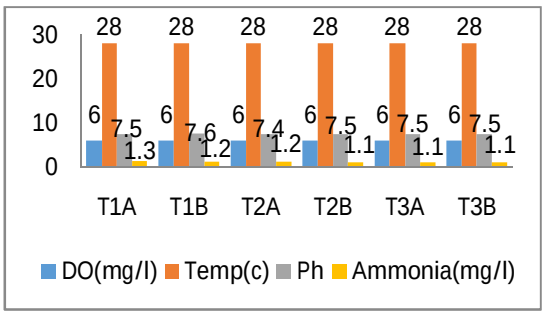
	T1B	T2B	T3B
MWG(g)	$0.93^{\pm}0.04^{a}$	$0.92^{\pm}0.032^{a}$	$0.94^{\pm}0.035^{a}$
FCR	$0.97^{\pm}0.06^{a}$	$0.95^{\pm}0.03^{a}$	$0.95^{\pm}0.04^{a}$
SGR (%)	$3.41^{+}0.15^{a}$	$3.29^{+}0.11^{a}$	$3.37^{+}0.12^{a}$
PER	$0.019^{\pm}0.0008^{a}$	$0.018^{\pm}0.0006^{a}$	$0.018^{\pm}0.0007^{a}$
ADWG	$0.0341^{\pm}0.014^{a}$	$0.0329^{\pm}0.011^{a}$	$0.0337^{\pm}0.012^{a}$
SURVIVAL	$16^{\pm}3.5^{a}$	$27^{\pm}2.6^{b}$	$28^{\pm}1.5^{c}$

*figures in the table with the same superscript in a row are not significantly different

TABLE 1: Performance of *C. gariepinus* fed at different feeding frequencies.

	T1A	T2A	T3A
MWG(g)	$0.91^{\pm}0.05^{a}$	$0.93^{\pm}0.028^{a}$	$0.95^{\pm}0.025^{a}$
FCR	$0.93^{+}0.036^{a}$	$0.91^{+}0.025^{a}$	$0.92^{+}0.026^{a}$
SGR (%)	$3.26^{\pm}0.05^{a}$	$3.30^{\pm}0.098^{a}$	$3.37^{\pm}0.09^{a}$
PER	$0.018^{\pm}0.0003^{a}$	$0.019^{\pm}0.0005^{a}$	$0.019^{\pm}0.0003^{a}$
ADWG	$0.0326^{\pm}0.005^{a}$	$0.0331^{\pm}0.009^{a}$	$0.0338^{\pm}0.014^{a}$
SURVIVAL	$15^{\pm}2.5^{a}$	$26^{\pm}2.6^{b}$	$26^{\pm}1.6^{c}$

*figures in the table with the same superscript in a row are not significantly different.



2: mean water parameters (Week 2)

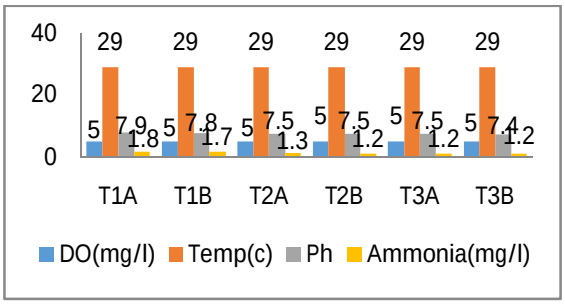
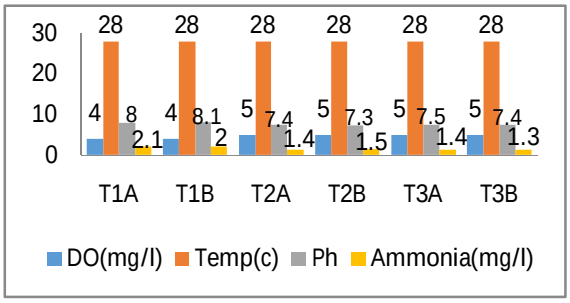


Fig 1: Mean water parameters (Week 1) **Fig**

This might be due to better assimilation of feed made availability more frequently at little quantities. There was a significant difference ($p<0.05$) in the survival rate. The highest was recorded in T3A and T3B which was $26^{\pm}1.5$ and $28^{\pm}1.5$ respectively. This may be connected to the favorable water quality caused by a higher feeding frequency compared to what was observed in T1A and T1B in different weeks (Fig. 1-4). The pH and ammonia levels were high especially in week 3 and 4. This agrees with the suggestions that feeding frequency may affect survival and water quality (Aderolu*et al.*, 2010). The water parameters showed a better result in T2A, T3A, T2B and T3B as the weeks progressed (Fig1-4). There is also a reduction in inter individual size variation in T2A, T3A, T2B and T3B which might have discouraged cannibalism hence a better survival. It has been documented that social interaction and dominance hierarchy encourages reduced food intake and growth in the less privileged fish individuals (Bascinar *et al.*, 2007)



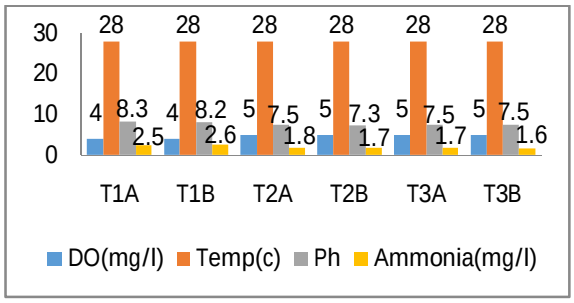


Fig 3: Mean water parameters (Week 3) Fig 4: mean water parameters (Week 4)

CONCLUSION

Feeding frequency is very paramount in the rearing of *H. longifilis* and *C. gariepinus* especially at early stages of their life. This study showed that adequate feeding frequency is necessary to enhance the performance of fish especially the survival rate at fry stage. High survival rate at the fry stage is important to ensure availability of fish seed which seems to be one of the backbones of sustainable aquaculture venture. A feeding frequency of above 4times per day encouraged a better performance in fry stage of *C. gariepinus* and *H. longifilis* and therefore advocated.

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