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EFFECT OF FREQUENCY OF SORTING ON THE GROWTH AND PRODUCTION OF HETEROCLARIAS FINGERLINGS

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African catfish, Catfish Hybrid, *Clarias gariepinus*, *Heterobranchus longifilis*, Heteroclarias, Sampling.

ABSTRACT

The study was conducted to determine the effects of different sampling frequency on growth performance and production of Heteroclarias fingerlings. The experiment was set up in a completely randomized design (CRD) with three treatments (Treatment A, sampling was carried out once a week; Treatment B, sampling was carried out twice a week; and Treatment C, sampling was carried out three times a week) and each treatment was replicated three times. The result showed that Treatment B had the highest mean values for percentage survival (67.66%) and was significantly different from the other treatments. It also has higher value for final number of fish harvested (406) compared to treatments A and C with 341 and 384 mean values respectively. There was also significant difference in terms of the final weight observed among the treatments with treatment B having the highest weight (7,140g) compared to the other treatments. The present investigation demonstrated that hybrid catfish could be sampled twice a week for optimum growth and production of the fingerlings.

1. Introduction

The desire of fish farmers is to produce table-sized fish within the shortest possible time. Long term success in meeting this goal and having an all-year round supply of fish depends on the ability of the farmer to control the life cycle of the fish (Ezenwaji, 1989; Ekelemu and Ekokotu, 1999).

The catfishes especially *Clarias* and *Heterobranchus* are highly valued aquaculture species in Nigeria and elsewhere (Odedeyi, 2009). However, cannibalism associated with the young of these species has been identified as a challenge in the rearing of the young to juvenile stage and beyond. According to Gobler *et al.* (1992) and Van der Waal (1998), a considerable growth variation has been exhibited in African catfish both in aquaculture and in nature. The heterogeneity in size often leads to social dominance, which results in aggressive behaviour and cannibalistic responses (Hecht and Appelbaum, 1988).

Several studies showed that cannibalistic behaviour is intensified by increasing size difference (Hseu, 2002; Smith and Reay, 1991). Diana and Fast (1989) reported strongly size-dependent mortality in *C. fuscus* whereby most of the mortality occurred in fish weighing 5.4-26.9g. Qin and Fast (1996) reported that in Snakehead *C. striatus*, large variation in fish size in the stocked individuals may not only increase the cannibalism but can also increase other mortalities due to injuries. Size variation in fishes caused by either genotype differences or inadequate food supply has already been found to be a major cause of cannibalism (Hecht and Appelbaum, 1988). Further, De Angelis *et al* (1979) reported that minimizing the size variation could be more important than the availability of food for controlling cannibalism.

Although the hybrids of *Heterobranchus* and *Clarias* (*Heteroclarias*) exhibit the fast-growing quality of *Heterobranchus,* the factor of cannibalism is a common problem associated with the survival and production of their fingerlings. Occasionally, sorting to remove what is commonly called 'jumpers' is thought to be a solution to the problem. Consequently, this study is designed to investigate the effect of sorting on the survival and growth of *Heteroclarias* fingerlings

2. Materials and methods

2.1 Broodstock selection

The experiment was carried out at the hatchery complex of National Institute for Freshwater Fisheries Research, New Bussa Nigeria. The broodstock for the experiment were collected and conditioned at the outdoor section of the hatchery prior to the commencement of the experiment.

2.2 Experimental design

Twelve number broodstock were used in the experiment in a Completely Randomized Design (CRD) (3 males and 9 females). The broodstock were distributed into three treatments thus; Treatment A where sorting was carried out once per week, Treatment B where sorting was carried out twice per week and Treatment C where sorting was carried out three times per week.

2.3 Induced breeding

2.3.1 Injection of hormone

Ovaprim hormone was used to induce ovulation in the broodstock at the recommended dosage of 0.5ml/kg body weight of the female fishes while half dosage was administered to the male broodstock. Injection was carried out intramuscularly above the lateral line towards the dorsal section and pointed towards the ventral side (Viveen et al. 1985).

2.3.2 Collection of eggs and milt

Checking of ovulation started 6 h after injecting the fish with hormone and continued at one-hour intervals (Brzuska, 2004). The female broodstock were tested for ovulation by hand stripping of the abdomen gently (Richter et al. 1987). The collection of eggs and milt were done according to the procedure of (Viveen et al. 1985) thus; the eggs were collected from each ovulated female through stripping by gently pressing the abdomen of the fish. The eggs were collected into clean bowls labelled according to the treatments. Milt was obtained by sacrificing the males. Each male was dissected carefully and their milt sac obtained. A small incision was made on the lobes of the testes with a sharp razor blade and the milt was squeezed into a dry Petri dish containing the collected eggs.

2.3.3 Artificial fertilization, incubation and hatching

Dry method of fertilization was used where the milt obtained from the male fishes was squeezed onto the stripped eggs obtained from the females accordingly and stirred gently and thoroughly using plastic spoon for about 1-2 minutes to allow contact and adequate fertilization (Megbowon et al. 2013), after which normal saline was added before spreading the eggs on the spawning nets in the incubation units for incubation (Delince et al. 1987; Viveen et al. 1985).

After hatching viable and dead eggs were determined and counted. The viable eggs were translucent while the non-viable eggs were white and opaque and these were carefully removed by siphoning. Percentage hatchability was estimated 24 hours after hatching was completed. One hundred of the hatchlings from each spawning unit were weighed, their weights multiplied by total weight of larvae in each unit to estimate total hatchability.

2.4 Growth performance

After hatching, the fish was reared for two weeks indoors and they were fed with artemia, three times a day. At the age of six weeks the fishes were randomly distributed into triplicate tanks of the same dimension (2m x 2m) at the outdoor section of the hatchery (9 tanks in total). In each tank 200 fishes were stocked to serve as experimental units and the treatments were replicated three times which make a total of 600 fishes per treatment. The tanks were labelled A1- A3 as treatment A in which sorting was carried out once in a week, B1-B3 as treatment B in which sorting was twice in a week and C1-C3 as treatment C which sorting was three times in a week.

Fishes in the different tanks were fed twice a day with the same commercially prepared Coppens feed at a rate of 5% body weight. Length and weight of the fishes were measured once every week for the assessment of growth of the fish.

2.5 Data collection

From the beginning of the experiment through to the end of the experiment the following data were collected; Total number of fry stocked, initial weight of the fry stocked, total number of jumpers per treatment, weight of jumpers, total number of non-jumpers, weight of non-jumpers and survival rate.

2.6 Data analysis

Data obtained at the end of the experiment was analysed using analysis of variance (ANOVA) and treatment means were separated using Duncan Multiple Range Test where significant differences exist. The analysis was carried out using SPSS ver. 20.

3. Results

The result of this study is presented in Table 1 which shows the number of jumpers and non-jumpers, percentage survival and total biomass of Heteroclarias fingerlings subjected to varying sampling/sorting frequency. Figures 1 and 2 present the percentage survival of Heteroclarias fingerlings and the number of jumpers and non-jumpers respectively. Fingerlings subjected to sorting twice per week (Treatment B) recorded the highest percentage survival (67.66%) followed by treatment C (64.0%) where sorting was three times per week and then treatment A (56.83%) where sorting was once per week and there was significant difference (P<0.05) between the treatment means (Figure 1).

Total weight of fish (non-jumpers) obtained at the end of the experiment showed that treatment B has the highest value (7,140g) followed by treatment C that has a total weight of 6,600g and the least weight recorded was obtained in treatment A with a value of 6,636g and there was significant difference between the treatment means. In terms of the final number of normal fish (non-jumpers), there was significant difference between the treatment means where treatment B (where sorting was twice a week) has the highest number (406) followed by treatment C with 384, while the lowest number (341) was observed in treatment A where sorting was carried out once a week.

The highest number of jumpers (38) was observed in treatment C (three sampling per week) and the lowest number but large jumpers (25) was recorded in treatment A (one sampling per week) and significant difference exist between the treatments (Figure 2).

Table 1: Number of jumpers and non-jumpers, weights and percentage survival of *Heteroclarias* fingerlings subjected to varying sampling/sorting frequency.

	Treatments		
Parameters	A	B	C
Initial No.	600	600	600
Initial Total Weight (g)	265.6	263.6	272.4
Initial Mean Weight (g)	0.44±0.04	0.44±0.01	0.45±0.01
Total no. of jumpers	25^{a}	29^{ab}	38^{b}
Total Weight of jumpers (g)	562.5^{a}	588.7^{b}	695.4^{c}
Mean Weight of jumpers (g)	22.5 ± 0.20^{b}	20.3 ± 0.30^{b}	18.3 ± 0.40^{a}
Final no. of non-jumpers	341^{a}	406^{c}	384^{b}
Total Weight of non-jumpers (g)	6336 ± 6.00^{a}	7140 ± 10.00^{c}	6608 ± 2.00^{b}
Mean Weight of non-jumpers (g)	18.58 ± 0.02^{c}	17.58 ± 0.10^{b}	17.20 ± 0.20^{a}
Survival rate (%)	56.83 ± 0.98^{a}	67.66 ± 1.00^{b}	64.0 ± 4.00^{b}

Note: means with different superscripts on the same row are significantly different (P<0.05).

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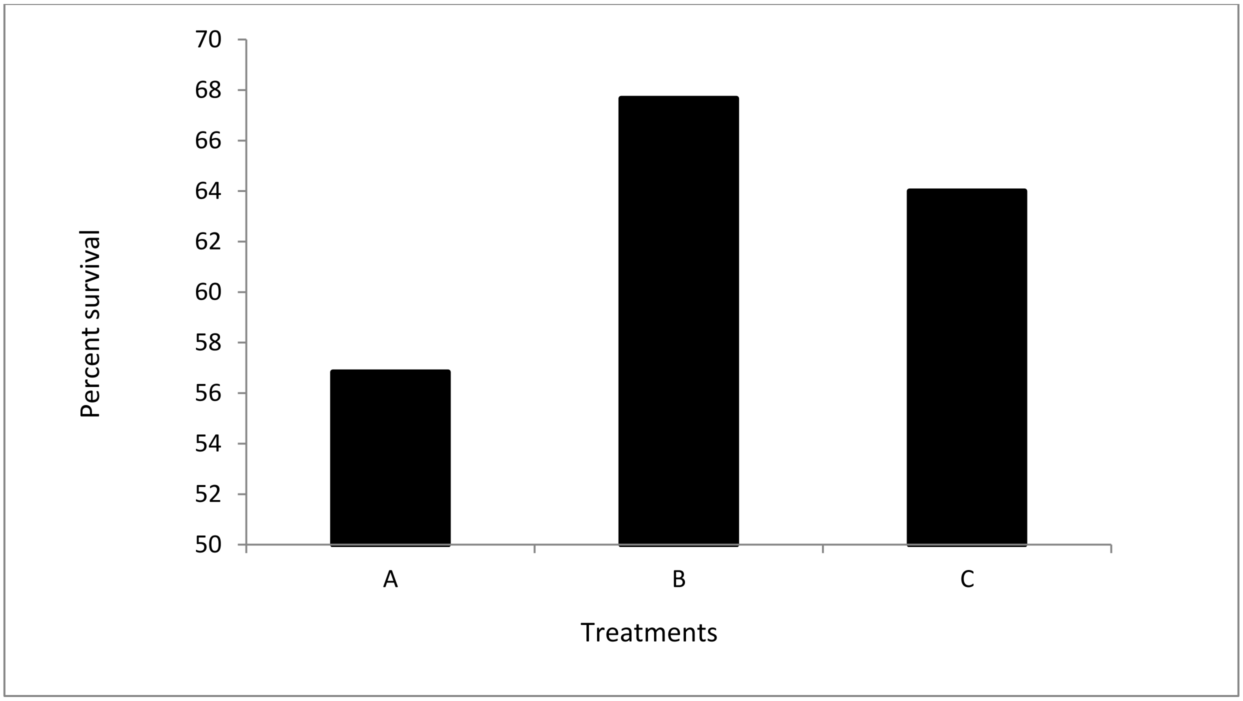

Figure 1: Percent survival of *Heteroclarias* fingerlings from treatments subjected to different sampling frequency**.**

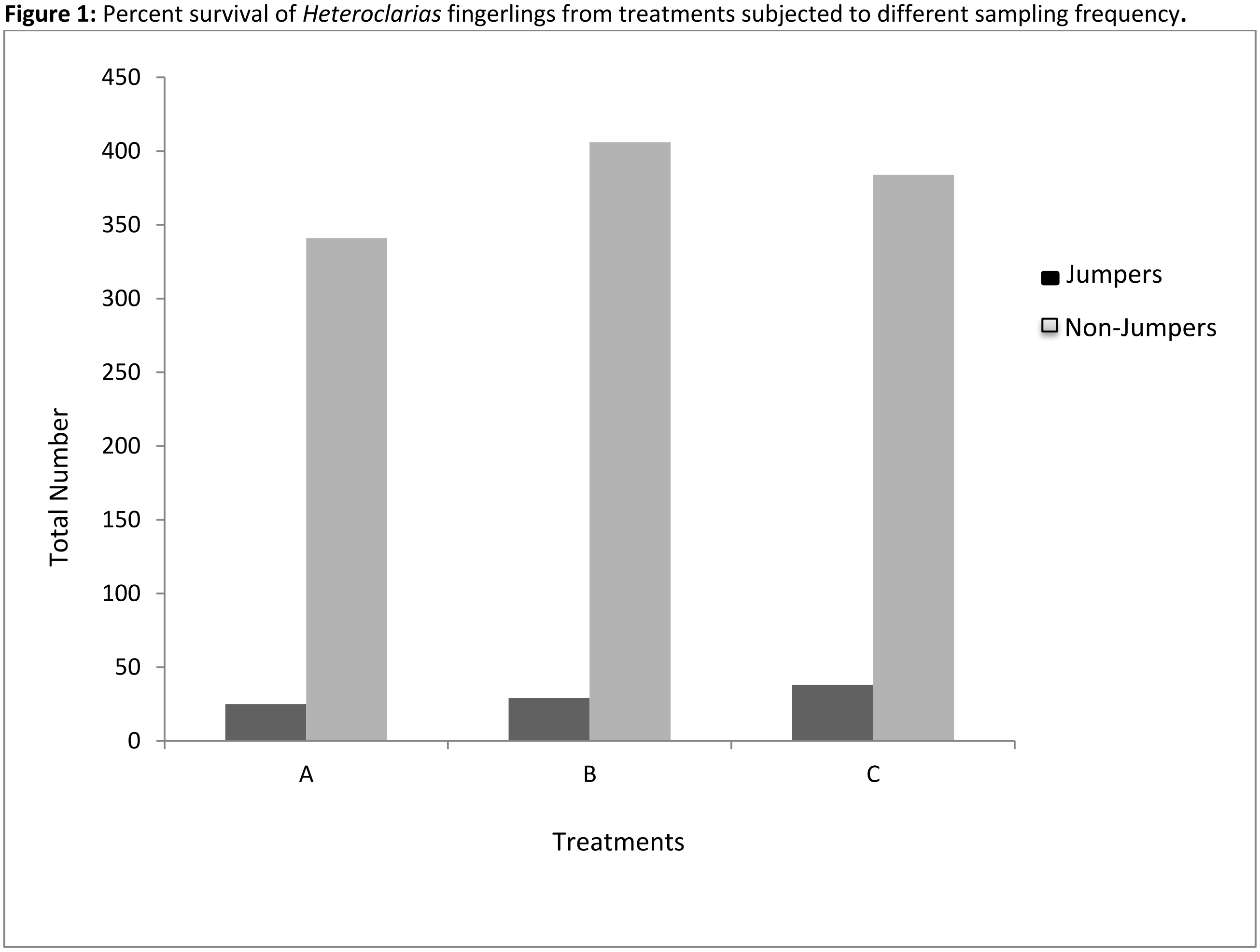

Figure 2: Total number of jumpers and non-jumpers of *Heteroclarias* fingerlings from treatments subjected to different sampling frequency.

4. Discussion and conclusion

The high percentage survival (67.66%) observed in treatment B (sampling twice a week) can be attributed to the sampling effect that took place in which fish can stabilize from next sampling to another without much jumpers doing more harm to the fish, while the low percentage survival (56.83%) observed in treatment A (sampling once a week) could be as a result of the cannibalism that occurred during the period from one sampling to another.

The final number of non-jumpers was observed to be higher (406) in treatment B where sampling was twice a week compared to treatment C (384) where sampling was three times a week, in which the low number in treatment C might be attributed to handling stress the fish goes through during sampling as there was no time to recover from one sampling to another, which agrees with Omitoyin, 2007 and Wedemeyer (2001), that frequent sampling of fish tank/ponds induces handling stress in fish which could lead to total mortality. Treatment A was observed to have large but lowest number of jumpers (25) and lowest number of non-jumpers (341), which, according to Madu and Keke, 2010, could be as a result of the jumpers developing and cannibalizing on the non-jumpers and even the smaller jumpers.

From the result of this investigation therefore, it can be concluded that the best percentage survival (67.66%) and the highest number (406) of fish harvested (non-jumpers) at the end of the experiment was observed in treatment B indicating that sampling of *Heteroclarias* fingerlings twice a week should be considered for optimum growth and production of the fingerlings thereby not exposing the fish to too much stress as in treatment C and reducing the rate of cannibalism as in the case of treatment A.

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