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Comparative Effect of Stocking Densities and Feeding Levels on Monthly Growth Response of Hybrid Catfish (*Heterobranchus longifilis* x *clarias gariepinus*) in Collapsible Tanks

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ABSTRACT

The comparative effect of stocking densities (SD) and feeding levels (FL) on growth response of Clarias gariepinus was examined for 12 months in collapsible tarpaulin tanks. Two hundred and forty (240) fingerlings spawned at the hatchery complex of Fisheries and Aquatic Environmental Management were used in a factorial experimental design consisting of five (5) different stocking densities (SD) and three (3) feeding levels (FL). SD were 100 fish/0.25 m^3, 75 fish/0.25 m^3, 38 fish/0.25 m^3, 18 fish/0.25 m^3, and 9 fish/0.25 m^3. Similarly, the three feeding levels established were: 1% Fresh Body Weight (FBW), 1.5% FBW and 2% FBW fed thrice daily. Each treatment was triplicated. Results show that SD at 100 fish/0.25 m^3 had the highest monthly Mean Weight Gain (MWG) (1165.8 g) while SD 18 fish/0.25 m^3 showed the least MWG (604.2 g) for FL 1%. At FL 1.5%, the trend was more uniform in progression with SD 75 fish/0.25 m^3 having the highest MWG and SD 38 fish/0.25 m^3 as the least in MWG (896.8 g and 709.8 g) respectively. FL 2% had MWG values from SD 75 fish/0.25 m^3 and SD 38 fish/0.25 m^3 as highest and lowest respectively (837.1 g and 836.3 g). For Specific Growth Rate (SGR) at 1% FL across all SD, there was a sharp increase in month May and a gradual decline through to the end. Specific Growth Rate at FL 1.5%and FL 2% followed a similar trend as in SGR of FL 1%. The values were notably higher in May and declined progressively to the end. Generally, SD 75 fish/0.25 m^3 and FL 1.5% gave the best MWG; hence fish for intensive culture can be carried out using tarpaulin tanks at high stocking density 75 fish/0.25 m^3 for maximum performances in growth.

Keywords: *Stocking density, feeding level, heteroclarias, hybrid catfish, specific growth rate*

INTRODUCTION

Fish is a vital source of animal protein for many households. World per capita fish consumption had risen from 9.9 kg in 1960s, and 14.4 kg in 1990s to 20 kg of animal protein intake in 2014 [1]. The vigorous growth in aquaculture, which according to FAO [1] now provides half of all fish for human consumption, is attributed to improvement in the state of the fish stock and fisheries management. According to the report, aquaculture marginally supplied 7% of fish for human consumption in 1974, which increased to 26% in 1994, and 39% in 2004 but in 2014 the total contribution of aquaculture to total global fish production rose to 44.1% [1].

The main goal of the aquaculture value chain is to optimize growth and to produce fish of high quality [2]. Fish farmers have the desire to produce table-sized fish within the shortest possible time [3], thus, the choice of species to culture is critical in the realization of this goal. In Africa, especially Nigeria, the species most cultured are *Clarias gariepinus*, *Heterobranch us* spp and their hybrids [4]. In aquaculture system, mostly aqua culturists cultivate their fish in high stocking density in order to maximize productivity [5].Therefore, knowing appropriate stocking density is recognized as an essential aspect because it plays a big role in increasing the fish production to meet the continuous increase in fish demand and maintain the profitable and economic sustainability for aqua culturist [6]. *Clarias gariepinus* possesses early maturity traits, while *Heterobranchus* spp are fast growers. In order to combine these traits in a cultural species, *Heteroclarias* was developed. *Heteroclarias* are in high demand by most farmers due to their hardness and fast growth [7]. Few studies have actually compared growth performance of *Heteroclarias* based on feed types, stocking

density, and feeding frequency. Some of these include [7-11]. The optimal stocking density based on feeding level for hybrid cat fish is yet to be clearly defined and this has led to uncertainty in the stocking density and feeding pattern used by many farmers. The objective of this study therefore is to find the appropriate stocking density and feeding level that will produce optimum growth for hybrid catfish.

Materials and Methods

Study Site

The study was carried out at the Department of Fisheries and Aquatic Environmental Management, University of Uyo, Uyo, AkwaIbom State, Nigeria. Forty-five (45) tarpaulin tanks measuring 1×1×1 m^3 were used. Each was designed with an outlet for easy drainage and was filled with 0.25 m^3 of water. The experiment lasted 12 months (365 days).

Experimental Fish

The fingerlings of *Heterobranchus longifilis x Clarias gariepinus* used was obtained from a breeding exercise using two brood stock females and two brood stock males employing the method of [12]. The hatchlings were reared in the tanks, feeding commenced on the third day using Artemia for four weeks and coppens starter feed 0.5 – 0.8mm was given to the fry for another four weeks after which they were used for the study.

Experimental Design

Factorial design was used for this study. The experiment was designed to have five stocking densities: 100 fish / 0.25 m^3, 75 fish / 0.25 m^3, 38 fish / 0.25 m^3, 18 fish / 0.25 m^3, and 9 fish / 0.25 m^3. Similarly, the three feeding levels established were: 1% Fresh Body Weight (FBW), 1.5% FBW and 2% FBW fed thrice daily. Each treatment was triplicate. The initial weight and length of the fingerlings were taken before stocking them in the various tanks which were randomly positioned. The fish were fed three times a day (8am, 1pm and 6pm) at the various percentage body weights using commercial feed (Coppens). The feed was adjusted monthly with increase in body weight.

Water Quality Monitoring

Water in each tank was refreshed at 100% daily by using a partial flow through mechanism. The various water quality parameters were monitored at monthly intervals. Temperature was determined using a mercury thermometer calibrated 0° - 50°C, pH using a pen type pH meter (pH-009 111) and dissolved oxygen using dissolved oxygen meter (HI 9461).

Data Collection

To calculate and monitor growth parameters, fish were randomly weighed from each tank and measurements was taken before the start of the experiment and same was done every month for twelve (12) months. The following formulae were employed in calculating mean weight gain (MWG), and specific growth rate (SGR).

Mean weight gain (g) (MWG):

$MWG = Wt2 - Wt1$ Where

Wt2 = final mean weight of fish at time T2 and

Wt1 = initial mean weight of fish at time T1

Specific growth rate (%/day) (SGR) [13]:

$$SGR = 100 \times \frac{[In\ (final\ mean\ weight) - In\ (initial\ mean\ weight)]}{Rearing\ duration\ in\ days}$$

Where In = Natural logarithm reading (Loge)

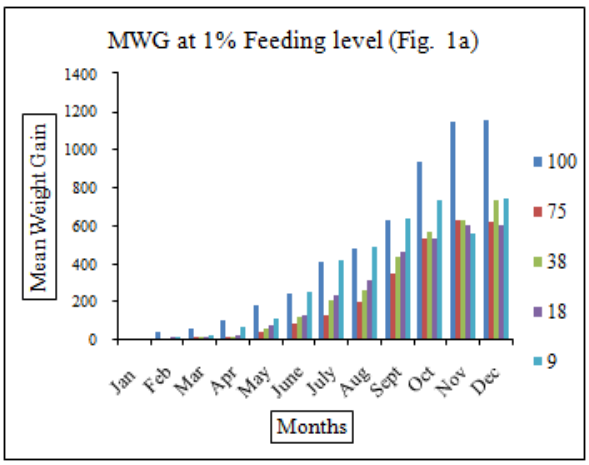
Statistical Analyses

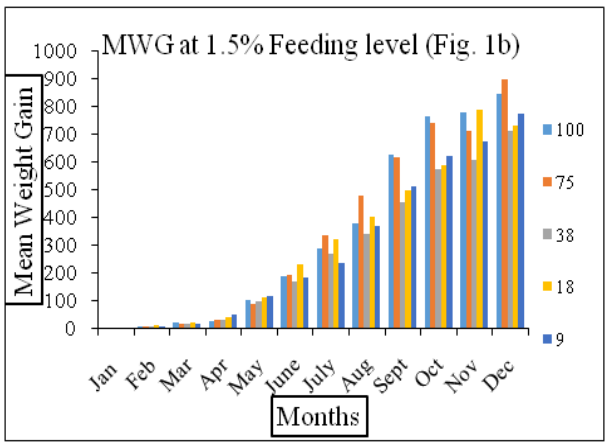
Growth data were subjected to Microsoft Office Excel (2010) to obtain graphical charts.

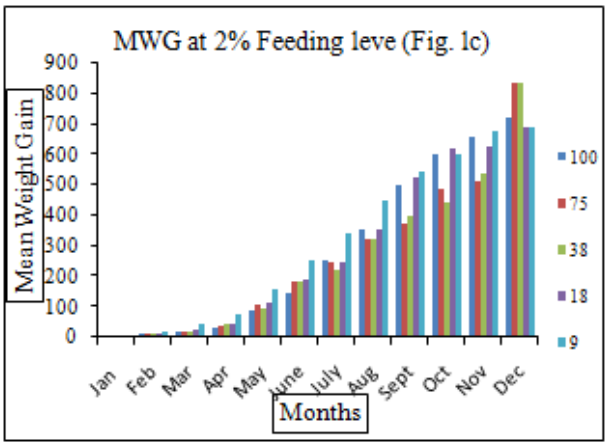
Results and Discussion

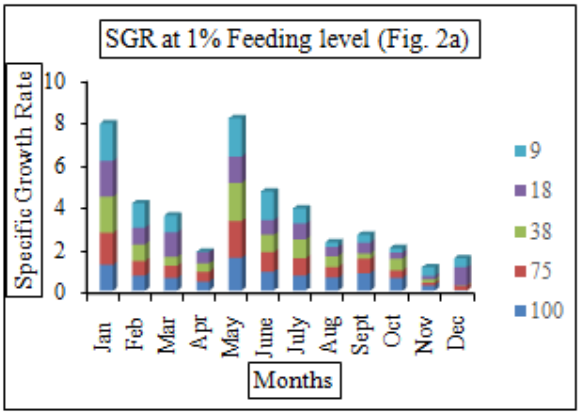
Figures 1a, 1b, and 1c show the monthly Mean Weight Gain (MWG) values for the different stocking densities at feeding level 1%, 1.5% and 2%. Stocking density at 100 fish/0.25 m^3 showed the highest monthly MWG (1165.8 g) while stocking density 18 fish/0.25 m^3 showed the least MWG (604.2 g) for feeding level 1.0%. At feeding level 1.5%, the trend was more uniform in progression with stocking density 75 fish/0.25 m^3 having the highest MWG and stocking density 38 fish/0.25 m^3 as the least in MWG (896.8 g and 709.8 g) respectively. Feeding level 2% had MWG values from stocking density 75 fish/0.25 m^3 and stocking density 38 fish/0.25 m^3 as highest (837.1 g and 836.3 g). Figure 2a showed monthly specific growth rate (SGR) for the different stocking densities at feeding level 1%. The bar chart showed an irregular trend. There was a sharp increase in month May and a gradual decline through to the end. SGR at feeding level 1.5% (Fig.2b) and feeding level 2.0% (Fig. 2c) followed a similar trend as in SGR of feeding level 1%. The values were notably higher in May and declined progressively to the end. The

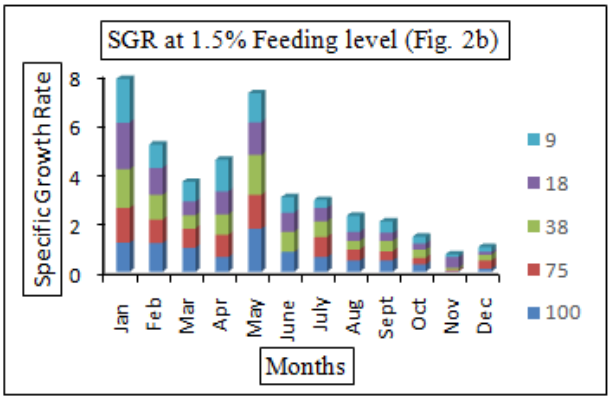
result disagrees with reports of [8, 10] who reported best growth performance at 7 fish/m^2 and 16 fish/m^2 respectively for hybrid catfish. The present study agrees with report of [11].

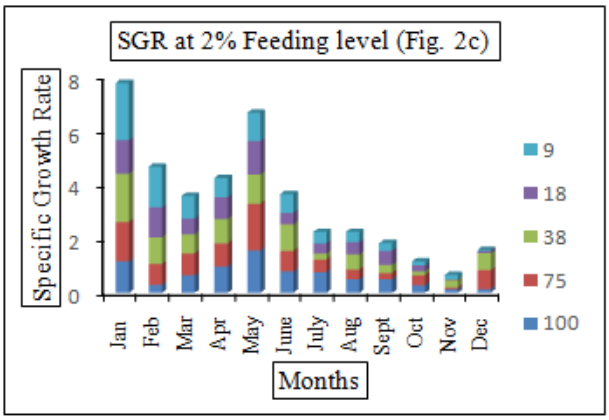












Figures1a, 1b, 1c and 2a, 2b, 2c. *Showing monthly MWG and SGR at different stocking densities and feeding levels*

CONCLUSION

Generally, Stocking density 75 fish/0.25 m^3 and Feeding level 1.5% gave the best mean weight gain for the 12 months. Hence, hybrid catfish for intensive culture can be carried out using tarpaulin tanks at a high stocking density 75 fish/0.25 m^3 for maximum performances in growth.

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