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Sibling Cannibalism of African Catfish (*Clarias Gariepinus)*, Fry Cultured Under Different Photoperiods

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Abstract

Experiment on how to mitigate sibling cannibalism in African cat fish *Clarias gariepinus* was carried out in the Department of Fisheries and Aquaculture Adamawa State University Mubi. Fry of six weeks old with 1.39±33g weight and 1.41±00cm length were stocked at the rate of 50 per 25 litre of water inside a rectangular plastic bowl after been fitted with water flow through system. Four different Photoperiod regimes (24hours, 12hour, 6hours, and total darkness) was used using artificial light (Sunking solar lantern Sunking Pro2) continuously in the hatchery at low power mode 25lumens. Length, weight, percentage mortality, percentage cannibalism, percentage survival growth rate and water quality parameters were monitored daily for the period of 30 days. At the end of the experiment, there significant different in cannibalism, mortality and survival rate of the fry. fry cultured under 24hours darkness has low cannibalism, low mortality, and high survival rate of 11.66±70 9.00±00 and 79.33±00, respectively. While fry cultured under 24hours light, and the control has the highest value of 36.33±30, 16.67±67, 57.00±00 and 12.33±30, 11.33±00, 76.66±00 respectively. from the research it was observed that sibling cannibalism can be reduced by controlling the light intensity during artificial propagation of African catfish *Clarias gariepinus* fry.

Key word: *Clarias gariepinus;* Fry; photoperiods; cannibalism; mortality; Mubi

Introduction

Cannibalism is an act of killing and consuming the whole or major part, of an individual belonging to the same species, irrespective of its stage of development, Smith and Reay, (1991). Environmental and nutritional factors as well as genetic parameters notably influence fish growth. In addition to temperature and other environmental factors, photoperiod is an important factor that affects living organisms including fish. Effects of photoperiod on growth rate and other variables have been studied in various species (Okomoda, 2012). Light and dark alternation is generally thought to be the main synchronizer of feeding activity (Hossain *et al.*, 1999). Photoperiod not only affects feeding activity, but also plays a decisive role in growth, survival and social behaviour (Boeuf and Falco 2001). Such influences are caused by physiological mechanisms; such as altered hormone production, which may improve feed conversion efficiency (Purchase *et al.*, 2000); however, photoperiod requirements are species specific and may vary for each developmental stage. Stocking density of African catfish has for long been considered the most important factor affecting cannibalism and aggression (Kaiser *et al* 1995; Almanza's Rueda *et al* 2004). In African catfish, however, aggressive behaviour is also affected by factors other than stocking density such as photoperiod (Almanza's Rueda *et al.*, 2004). As the growing awareness in the society about animal welfare puts increasing demands on the housing conditions, in fish farming facilities more information is needed on the social behaviour and the factors that can affect the social interactions in fishes, especially in fishes which exhibit aggressive behaviour and cannibalism. All these factors are crucial in intensive culture. In the case of hatchery seed production of finfish such as *Clarias gariepinus* one of the major setback is cannibalism, as most of commercially important fish show sibling cannibalism. Several

factors appears to influence cannibalism under natural and rearing conditions and these factors differ in different species as reported in fishes such as *Esox lucius* , *Stizostedion vitreum* and , *Clarias gariepinus* (Smith, 1952). Thus, understanding the parameters of optimum light intensity is an important prerequisite in ensuring sustainable development of *Clarias gariepinus* culture. Several studies related to optimal light intensities have been done to investigate the growth and survival of particular species of fish. High light intensities can increase the feeding time and improve growth and survival of *Clarias gariepinus* Solomon and Okomoda (2012). Cannibalism accounts for 15-90% of the total mortalities that occur during the larval rearing phase of finfish due to the aggressive behaviour of fish larvae caused by their high growth and food consumption rate (Hecht and Pienaar,1993; Baras and Jobling,2002).

This research was designed to assess the effect of different photoperiods on the growth, survival and cannibalism of African catfish *Clarias gariepinus* fry.

Materials and Method

Procurement of Fry and Fingerlings

Clarias gariepinus fry were obtained through artificial breeding of *Clarias gariepinus* of the same sibling in the hatchery unit of the Department of Fisheries and Aquaculture Adamawa State University Mubi, Admawa State Nigeria.

Experimental Design

Fry of six weeks' old was used for the research. Four different Photoperiod regimes (24hours, 12hour, 6hours, and total darkness) was used replicated three times. Artificial light was provided continuously in the hatchery at low power mode 25lumens using solar lantern (Sunking Pro2). Light period was adjusted by the height of the light from the water surface for all treatments except for control. Black box was used to provide 24hours darkness during the course of the research. Fry of 1.39±33g weight and 1.41±00cm length were stocked at the rate of 50 per 25 litre of water inside a rectangular plastic bowl after been fitted with water flow through system. This was done for all the treatment and the control. The experiment lasted for the period of 30 days. Feed was given at 10% body weight and the quantity of feed was adjusted based according to their growth to avoid under feeding. Data on growth rate (weight and length gain), was measured using a sensitive scale (model ANDEK – 4100I) and calibrated measuring Board, survival rate and mortality rate was determined by counting the number of fry stocked at the beginning of each experiment and at the end, percentage cannibalism, was determined by counting the number of dead fry fish excluding natural mortality. Feed intake, feed conversion ratio, condition factor was also determined. water quality parameters such as dissolved oxygen; pH, conductivity, ammonia and temperature required for growth and other biological processes were monitored daily throughout the period of the research using aqua test kit. All data collected were analysed using one-way analysis of variance (one-way ANOVA), using SAS. While means was compared for significant differences ($p<0.05$) using fisher LSD.

Results and Discussion

The results of the experiment are shown in table1 bellow fry cultured under 24hours light has the highest weight and length gain of 2.75±00g and 1.72±73cm while fry cultured under 24hours darkness has 1.89±00g and 1.21±67cm weight and length gain respectively. The results also show high specific growth rate of 1.57±33/day in treatment that has 24hours light, compared to 24hour darkness which has 1.24±67/day. This is in line with what Solomon Okomoda (2012) stated that high light intensities can increase the feeding time and improve growth of *Clarias gariepinus*. Fry culture under 24hours darkness on the other hand has high percentage survival rate of 79.33±00 with percentage cannibalism of 11.66±70 and low percentage mortality of 9.00±00 table 1. The reason for low cannibalism and mortality among fry cultured under total darkness is attributed due to alteration of light intensity. Fry culture under 24hour light has 36.33±30 percentage cannibalism and 16.69±67 percentage mortality. This shows that high light intensity causes high mortality and cannibalism in catfishes. Alteration of this environmental factor influences the organisms' feeding behaviour by altering visual cues used to recognize and capture prey consequently; cannibalistic behaviours also will be altered. Fry cultured in 24hour light has low

survival rate of 57.00±00 Hecht and Pienaar, (1993); Baras and Jobling, (2002) stated that cannibalism may also be induced by environmental factors that affect the behaviour of the fish. There is no significant different in some of the water quality parameter observed during the course of the research. The slight different that occurs in dissolve oxygen content was due to the exposure of the experiment to 24hour light. From the research it was discovered that in *Clarias gariepinus* seed production in hatchery, need proper care because the proportion of the cannibals in the population need not be very high to cause high mortalities. Two large *Clarias gariepinus* individuals are capable of consuming 56 siblings (56% of the population) within 4 weeks. Complete elimination of cannibalism in the larviculture of carnivorous fish species is virtually impossible, but it may be possible to mitigate its impact through a better understanding of some of the environmental factors that affect the intensity of cannibalism. Cannibalism in fish is of special concern because it causes a lot of mortality in aquaculture production. Cannibalism is one of the main factors that affects the growth and survival of fishes, especially during the early life stages of carnivorous species. Cannibalism is chiefly influenced by environmental factors, but parental effects cannot be excluded. Sibling cannibalism in artificial production of *Clarias gariepinus* most especially at the fry stage can be reduce by altering the hours of exposure of the fry to light.

Conclusion

It was discovered during the course of the research that under intensive aquaculture conditions, cannibalism can be significantly reduced by controlling the level of light intensity during fry rearing phase.

Table 1: The effect of different Photoperiod on Cannibalism of *Clarias gariepinus* Fry

Parameters	**Photoperiods** 24hours' light	12hours' light	6 hours' light	24hours darkness	LSD
Mean initial weight(g)	1.40±00[a]	1.39±33[a]	1.36±67[a]	1.39±33[a]	0.10
Mean final weight (g)	4.15±33[a]	3.35±67[b]	3.49±30[b]	3.28±00[c]	0.11
Mean weight gain(g)	2.75±00[b]	1.90±00[b]	2.17±00[a]	1.89±00[a]	0.17
Mean initial length(cm)	1.41±00[b]	1.43±33[b]	1.43±33[a]	1.41±00[a]	0.20
Mean final length(cm)	2.62±67[b]	2.93±33[b]	3.05±33[a]	3.14±00[a]	0.36
Mean increase in length (cm)	1.21±67[b]	1.54±67[b]	1.67±67[a]	1.72±73[a]	0.33
Feed Intake (g)	10.00±00[a]	10.00±00[a]	10.00±00[a]	10.00±00[a]	0.00
Feed conversion ratio FCR(g)	5.28±33[a]	5.28±33[a]	4.61±33[b]	3.633±33[b]	0.44
Specific Growth Rate SGR(%day)	1.57±33[a]	1.28±33[b]	1.35±67[a]	1.24±67[b]	0.12
Condition Factor(K)	1.17±17[a]	0.94±60[b]	0.92±40[b]	0.74±97[b]	0.17
Survival Rate (%)	57.00±00[c]	76.66±70[b]	76.66±70[a]	79.33±00[a]	23.53
Mortality Rate (%)	16.67±67[c]	11.33±00[b]	10.33±00[a]	9.00±00[a]	7.1
Cannibalism Rate (%)	36.33±30[a]	12.33±30[b]	13.33±30[c]	11.66±70[d]	8.61

Mean in the same raw having the same superscript do not differed significantly p< (0.05)

Table 2: The water quality parameter of Fry reared for 30 days under different Photoperiods

parameters	**Photoperiods** 24hours light	12hours light	6 hours' light	24hours darkness	LSD
Ammonia (mg/l)	0.21±67[b]	0.20±67[c]	0.20±33[b]	0.28±67[a]	0.02
Temperature (^{0}C)	28.57±33[c]	28.07±00[c]	27.90±60[b]	28.20±00[a]	1.48
Conductivity (mho/cm)	0.47±33[b]	0.49±00[b]	0.49±67[b]	0.68±00[a]	0.02
Dissolved Oxygen (mg/l)	7.81±67[a]	6.73±33[b]	6.22±00[a]	5.25±33[b]	0.37
P^H	7.70±00[a]	7.60±00[a]	7.50±66[a]	6.50±00[b]	0.00

Mean in the same raw having the same superscript do not differed significantly p< (0.05)

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