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Cannibalism of Juvenile Catfish (Clarias Gariepinus Burchell)

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Abstract: *The study was conducted to examine the phenomenon of cannibalism among juveniles of the African catfish (Clarias gariepinus Burchell) of the same year class. At the start of the 21 day experiment, each catfish fingerling weighed approximately 4.1g. The fingerlings were stocked in a plastic tank at a stocking density of 100 fingerlings in the tank. There was unequal weight gain among all the fingerlings in the tanks, resulting in the significant difference of two fingerlings weighing 27.2g and 42.4g respectively. These two fingerlings accounted for over 68% mortality of the original stock. The two large fingerlings were isolated in two tanks of 0.23m^3 size and fingerlings weighing approximately 7.6g were introduced daily starting with two and increased in a geometric progression of four and eight for 13 days. In combination the catfishes A and B consumed a total of 42% of the juveniles in 9 days. In separate chambers Catfishes A consumed a total of 11 juveniles in 13 days accounting for 10.6% of entire number of juveniles introduced. Partial cannibalism which consisted of juveniles killed but not swallowed wholly was higher accounting for 19.2% of the total introduced. This is in contrast to Catfish B which consumed a total of 52 juveniles accounting for 50% of number introduced with only a 1.9% partial cannibalism. This accounts for the significant differences in the weight values with Catfish A gaining a total of 8.5g in contrast to 184.5g gained by Catfish B. It is evident from the study that cannibalism among juvenile catfishes within the same year class can be identified and with proper management of size variationimprove the survival rate of the population of each year class.*

Keywords: *Clarias gariepinus; Cannibalism; Juveniles; Intra specific.*

I. Introduction

Catfish species of the family Clariidae, particularly the African cat fish Clariasgariepinus, are becoming more important in world finfish culture, of which one of the principal factors limiting the juvenile rearing phase is the high rate of cannibalism (Kaiser et al, 1995). Smith and Reay, (1991) defined cannibalism as 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. Several experiments have been undertaken to understand the catfish at various stages of development. Obirikorang et al (2014), studied the intra-cohort cannibalism in Juveniles of the African Catfish, (Clarias gariepinus) under controlled conditions and discovered that size disparity between the relatively larger fingerling that exhibited the abnormal growth pattern and the other fingerlings was the major cause of cannibalism. Solomon and Udoji(2011) also discovered that cannibalism occurs among cultured catfish. Other studies (Smith and Ray, 1991; Fitzgerald and Whoriskey, 1992; Sargent, 1992; Hecht and Pienaar, 1993) revealed that cannibalism rates were as a result of intraspecific aggression. This study therefore seeks to assess the rate of cannibalism of juvenile catfish in order to demonstrate intra specific predation among young juveniles.

II. Methodology

130 fingerlings ranging from 2.5cm to 10.8 cm were collected fromAfrican Regional Aquaculture Centre at Aluu, Rivers State, Nigeria. The fishes were left to acclimate for two weeks. At the end of the acclimation phase, the total numbers of fingerlings were counted. Two Juveniles weighing 27.2g and 42.4g respectively which were the largest and observed to engage in cannibalism were isolated in a different tank and used to test the rate of cannibalism. The fishes in both tanks were fed with Copen feed of varying grain sizes – 2mm for the small ones and 4mm for the cannibals.

The fingerlings were introduced into the compartment of the cannibals daily starting with two and increased in a geometric progression of four and eight. Weekly length and weight of the cannibals were taken. At the end of this period(ie period when the cannibals were in the same tank (9 days)) the two cannibals were separated into two different tanks in order to compare rate of cannibalism per fish. The two cannibals were fed daily with Copen feed and eight (8) fingerlings and observed every 2hours to record the number of fingerlings eaten. Weekly measures of the weights and lengths of the cannibals were also noted.

III. Results

The results of total and individual rate of cannibalism are shown in tables 1 and2 respectively.Table1 shows the total juveniles consumed by the two catfishes in combination which werea total of forty two (42) in nine days. A total of 19 juveniles were consumed during the morning hours of 8am-10am, 9 juveniles between 10am-12pm and 2pm-4pm; and 5 juveniles between 12pm-2pm.

In tables2a and 2b, the juveniles consumed by the catfishes placed in separate containers were a total of 63 in number in thirteen days. Out of the 63 juveniles consumed, catfish A was responsible for 11 cases, while catfish B was responsible for 52 cases (table 2a and 2b). The total quantity killed by Catfishes A and B but not wholly eaten were 22 in number; 20 juveniles by catfish A (table 2a) and 2 juveniles by catfish B (table 2b). The number consumed between times of observation shows that between 8am-10am, catfishes A and B consumed 6 and 33 juveniles respectively, between 10am-12pm they consumed 4 and 7 respectively, between 12pm-2pm they consumed 1 and 4 juveniles respectively and between 2pm-4pm they consumed 0 and 8 juveniles respectively.

Table 1: Total rate of Juvenile cannibalism

DAY	Quantity Introduced	8am–10am	10am-12pm	12pm–2pm	2pm – 4pm	Total Eaten
1	2	2	0	0	0	2
2	4	2	2	0	0	4
3	8	3	0	1	2	6
4	8	1	2	0	1	4
5	8	0	0	3	0	3
6	8	0	2	0	0	2
7	8	6	0	1	1	8
8	8	4	0	0	3	7
9	8	1	3	0	2	6
TOTAL	62	19	9	5	9	42

Table 2a: Rate of Cannibalism of Catfish A

DAY	Quantity Introduced	8am - 10am	10am - 12pm	12pm – 2pm	2pm – 4pm	Quantity Killed but not wholly eaten	Total Eaten	Total Alive
1	8	0	0	0	0	0	0	8
2	8	2	0	0	0	1	2	5
3	8	1	1	0	0	0	2	6
4	8	0	0	0	0	1	0	7
5	8	1	2	0	0	0	3	5
6	8	0	0	0	0	0	0	8
7	8	0	1	1	0	1	2	5
8	8	0	0	0	0	5	0	3
9	8	0	0	0	0	0	0	8
10	8	0	0	0	0	1	0	7
11	8	1	0	0	0	2	1	5
12	8	0	0	0	0	4	0	4
13	8	1	0	0	0	5	1	2
Total	104	6	4	1	0	20	11	73

Table 2b: Rate of cannibalism of Catfish B

DAY	Quantity Introduced	8am – 10am	10am - 12pm	12pm – 2pm	2pm – 4pm	Quantity Killed but not wholly eaten	Total Eaten	Total Alive
1	8	0	1	0	2	0	3	5
2	8	5	0	1	1	0	7	1
3	8	0	0	0	0	0	0	8
4	8	4	0	0	1	1	5	2
5	8	5	0	0	0	0	5	3
6	8	0	2	0	0	0	2	6
7	8	4	0	1	0	0	5	3
8	8	3	1	1	0	0	5	3
9	8	0	0	0	0	0	0	8
10	8	4	1	1	0	0	6	2
11	8	0	0	0	3	0	3	5
12	8	4	1	0	0	1	5	2
13	8	4	1	0	1	0	6	2
Total	104	33	7	4	8	2	52	50

Table 3: Weekly weight gain for Catfish A in relation to the quantity of juvenile eaten.

	Weight(g)	QUANTITY Consumed	MEAN Consumed
Initial values	188.6		
After week 1 (Day 1 to Day 5)	190.3	7	1.4
After week 2 (Day 6 to Day 10)	192.9	2	0.4
After week3 (Day 11 to Day 13)	197.1	2	0.7
Total	8.5	11	

Table 4 and 5 summarizes the weekly weight and length parameters for the various specimens respectively. From the tables, the specimen gained both weight and length during the exercise.

Table 4: Weekly Weight gain for Catfish B in relation to the quantity of juvenile cannibalised.

	Weight(g)	QUANTITY Consumed	MEAN Consumed
Initial Values	467.7		
After week 1 (Day 1 to Day 5)	522	20	4.0
After week 2 (Day 6 to Day 10)	558.2	18	3.6
After week3 (Day 11 to Day 13)	651.9	14	4.7
Total	184.2	52	12.3

Table 5: Weekly length gain for Catfish A in relation to the quantity of juvenile cannibalised.

	Length(cm)	Quantity Consumed	Mean Consumed
Initial values	31.6		
After week 1 (Day 1 to Day 5)	31.6	7	1.4
After week 2 (Day 6 to Day 10)	32.6	2	0.4
After week3 (Day 11 to Day 13)	32.6	2	0.7
Total	1.0	11	0.8

Table 6: Weekly length gain for Catfish Bin relation to the quantity of juvenile cannibalised.

	Length(cm)	Quantity Consumed	Mean Consumed
Initial values	40		
After week 1 (Day 1 to Day 5)	40	20	4.0
After week 2 (Day 6 to Day 10)	41.2	18	3.6
After week3 (Day 11 to Day 13)	41.2	14	4.7
Total	1.2	52	4.0

IV. Discussion

The study has shown evidence of cannibalism among young juveniles of C. gariepinus.In combination the catfishes A and B consumed a total of 42% of the juveniles in 9 days. In separate chambers Catfishes A consumed a total of 11 juveniles in 13 days accounting for 10.6% of entire number of juveniles introduced. Partial cannibalism which consisted of juveniles killed but not swallowed wholly was higher accounting for 19.2% of the total introduced. This is in contrast to Catfish B which consumed a total of 52 juveniles accounting for 50% of number introduced with only a 1.9% partial cannibalism. This accounts for the significant differences in the weight values with Catfish A gaining atotal of 8.5g in contrast to 184.5g gained by Catfish B.

This finding agrees with those reported by Obirikorang et al (2014) for a study of intra-cohort cannibalism in juveniles of the African catfish, under controlled conditions. Their result showed that the larger catfish juvenile ate the number introduced with very low partial cannibalism of which alone accounted for more than half of the mortality due to cannibalism (58.3%) in tank 2. These findings are supported in fig 1.0 by the ANOVA test of the weekly mean of cannibalism between the specimenswhich shows a significant difference in rate of juvenile cannibalism between specimens A and B plausibly attributed to the sizes ofthe specimens.

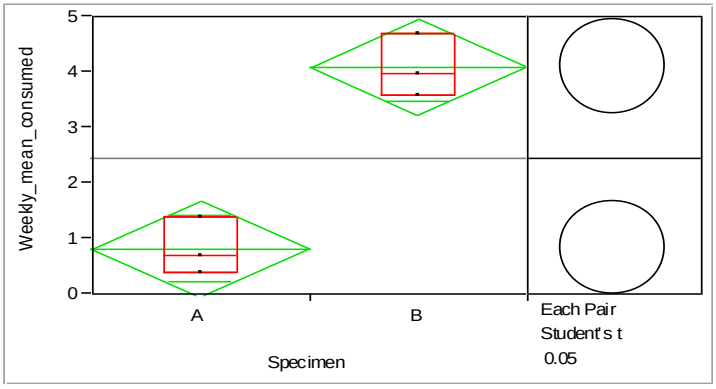

Figure 1.0 One way Analysis of Variance of weekly mean of cannibalism between catfishes A and B

Further findings showed that the rate of cannibalism waspronounced during the morning hours between 8am-10am. This is attributed to the day light and the weather conditions at that time.Similar finding was observed by Mukai and Lim (2011) who showed that increased cannibalism among catfish was observed during periods of light and reduced during the dark periods which might mean that they use their sight to feed.

Both specimens also increased in length during the study. Specimen A gained a total length of 1cm, while Specimen B gained 1.2cm. The weight measurements for the specimen also recorded marked increment. Specimen B that accounted for over 82% of the cannibalism gained a total weight of 184.2g and the weight gained by specimen A was 8.5g.

The causes of the differences in the rate of cannibalism (54%; 13% ;17%) between periods of the study (13 days) for Catfishes A and B cannot be deduced as there were neither many factors that affect cannibalism such as stocking density, reduction in food availability or size variation as documented by Solomon & Udoji, (2011). As observed by Patrick & Stéphane et al., (2011) differences in rates of cannibalism and growth heterogeneity can be influenced by a wide range of intrinsic and environmental factors, of which the respective influences are largely unknown.

The study has however shown evidence of intra-cohort cannibalism with the potential of selectively eliminating the smallest individuals with dramatic consequences on the population of juveniles with significant wide differences in sizes. The improvement of survival rates can be achieved by a design management practises that focus on the selective removal of faster growing juveniles among the same year class or full sibling group with obvious wide variations in the population.

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