The Ovarian Strategy of African Catfish (Osteichthys: Clariidae) Around Niger River Basin in Anambra State, Nigeria

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ABSTRACT---- ***The relative effects of breeding season on the condition and spawning potential of ovary of Clarias gariepinus were studied. Specimens were obtained from the lower area of the Niger River basin at Onitsha, and separated into gravid mature and gravid immature groups. Gonad (ovary) and relative size indices of the maturity groups were determined by the gonadosomatic index formula. The rate of development of the organs was determined by adapting methods, and the measurements of developmental rate of fish. Mean values of the indices followed an initial coincident pattern, with a mid-season differential. The gonad index (GI) varied monthly with peaks in May and September. Strong correlation existed between GI and relative size (RS) of the gravid immature group (r = 0.94), and weak correlation between GI and RS of the gravid mature group (r = 0.64). The high relative GI at early part and towards the end of the season possibly indicated that large ova quantity could be spawned at the peak periods. The GI could possibly serve as guide to spawning potentials of the fish species, especially during the artificial breeding.***

Keywords--- Ovary, Clarias gariepinue, breeding season, strategy

1. INTRODUCTION

The concentration of catfish in the main channel of Anambra River (Tributary of Niger River), and flood plain ponds increase during the dry season. During the early rainy season catfish undertake spawning migration, probably resulting in the relatively, large number of catch (Ezenwaji, 1992). Rainfall and changing water levels are some of the factors that bring about the reproductive activities of the fish. The reproductive cycle in most African countries starts at the beginning of rainy season, which coincides with natural phenomenon, stimulating both the environment and their reproductive behaviours. The period runs from April to September when most of the eggs are mature (Akpaniteaku, 2010). The amount of rearing facilities required, and extent to which various culture equipment would be put to use, could be determined by the quantity of eggs to be spawned (Eyo and Mgbenka, 1992).

However, female C. gariepinus divert more energy to lying down of food reserves in preparation for breeding, which is reflected in the gonadosomatic index (Tsadu and Adebisi, 1992). Relative size of C. gariepinus and other reproductive features of the fish species could contribute to the visual assessment of spawning capacity of the females (Akpaniteaku, 2012). The relationship between size of the catfish and their ovaries has been investigated (Akpaniteaku, 2012). The size of the ovary could increase progressively during the season, which might reflect in the weight of the Spawner (Akpaniteaku, Pers. Obs.). There is therefore need to determine the relative impact of season on the indicators of readiness of the ovary. The present work was aimed at studying the effects of the breeding season on development indices and spawning potentials of ovary of the C. gariepinus.

2. MATERIALS AND METHODS

The gravid specimens used for the experiment were collected from the live fish market on the bank of the Niger River at Onitsha in Anambra State. The collection of specimens started from the onset of the rainy season (April) till the end of the season (October). They were collated once every month for the period of 7 months. Owing to the small nature of the specimens targeted, identification methods of Vivien et al. (1986) was used to ensure that the smaller species of Clariid fish were not selected. The gravid mature and gravid immature groups were separated by methods of Akpaniteaku (2006). The weights of gravid mature ranged from 100g to 198g, and weights of gravid immature ranged from 107g to 200.4g. The size of the specimens ranged from 23.2cm to 30.5cm, and 24.5cm to 33.0cm respectively. They were

measured with paaco spring weighing balance. Length of the specimens were taken from the tip of the snout to the end of the tail fin. The ovaries were obtained by methods of Akpaniteaku (2012).

Encirclement of blood capillaries from dorsal to ventral section of the ovaries were properly examined in the two groups. The colour of those whose eggs could be singled out with naked eyes, by adapting methods of NACA, (1989) was identified for confirmation of gravid mature.

Gonad index (GI) was calculated by

$$\frac{\text{Weight of gonad (ovary)}}{\text{Weight of fish}} \times 100$$

Relative size (RS) of the ovaries was also calculated by

$$\frac{\text{Size of Ovary}}{\text{Size of fish}} \times 100$$

Group developmental rate of the organs with the period, was determined by calculating size differentials. The rate of development (DR) of the ovary of the gravid mature and gravid immature was calculated by adapting methods of Wootton (1992):

$$\frac{LSM - ESW}{t}$$

Where LSW and ESW were the early season (April) and late season (October) weights and t was the length of time period (number of months within the season). The generated data recorded according to the maturity groups. They were later subjected to correlation coefficient (r) and regression analyses.

3. RESULTS

The results of the experiments followed an initial coincident pattern. Mean GI of the gravid mature and gravid immature C. graiepinus during the breeding season is shown in Fig. I. Highest GI of the gravid mature was recorded towards the end of the season (16.2%). This was followed by the GI recorded in May (11.4%). Least GI was recorded at the end of the season (3.7%). For the gravid immature group, highest GI was the same as recorded in September but with a different value (8.5%). This was followed by the GI of May as in the gravid mature, and also with a different value (4.1). The least GI was recorded in June (1.7%).

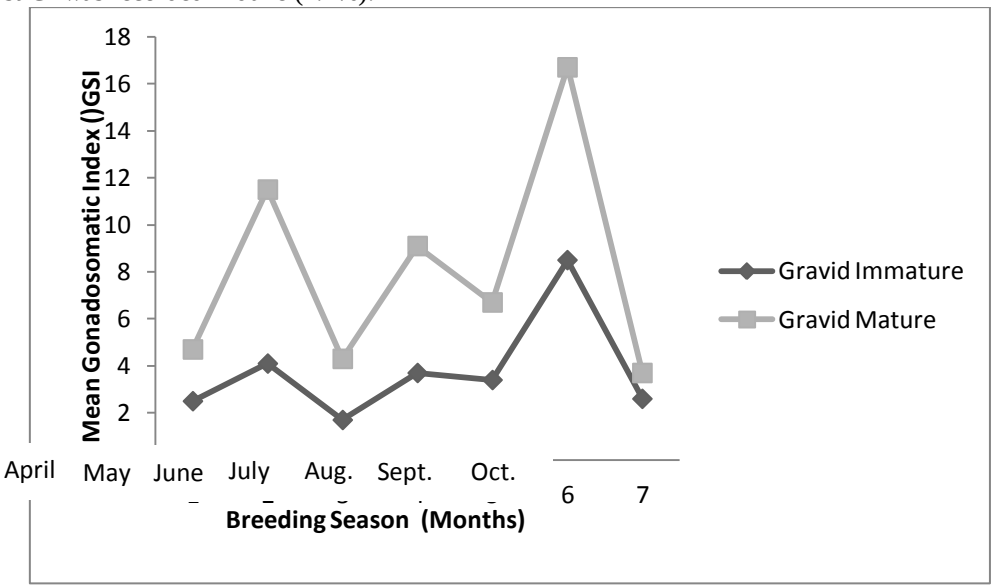

Figure 1: Gonadosomatic Index of the Spawners during the Breeding Season

The RS of ovaries of the two groups is shown in Fig2. The values did not follow the same pattern as those of GI. Differential areas were the values of the gravid immature, which was recorded in April. The third value of RS of the gravid immature recorded in October, was also different. However, highest RS values for the two groups were recorded

in September (25.5% and 21.0% respectively). The least values for the groups were recorded in October and June (11.3% and 7.7% respectively).

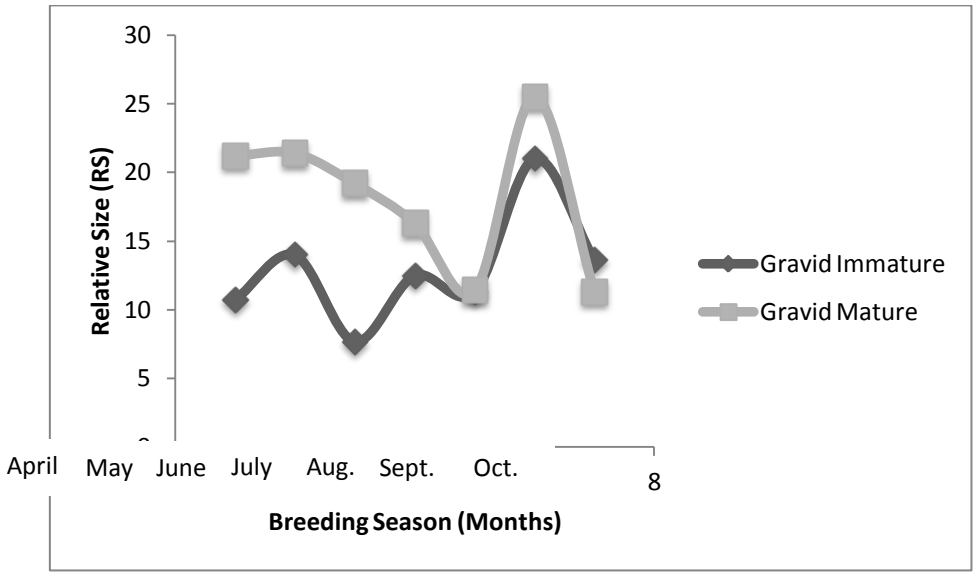

Figure 2: Relative Size of the Ovaries during the Breeding Season

The developmental rate of ovaries in the two groups (GDR) is shown in Fig 3. Periodic value of development of ovary of the gravid mature was –1.12g. While that of ovary of the gravid immature was 0.15g. The relationship between size and weight of ovaries of the gravid mature and gravid immature C. gariepinus is shown in Fig 4. Weak correlation existed between size and weight of ovary of the gravid mature (r = 0.72). The correlation between size and weight of ovary of the gravid immature was strong (r = 0.9).

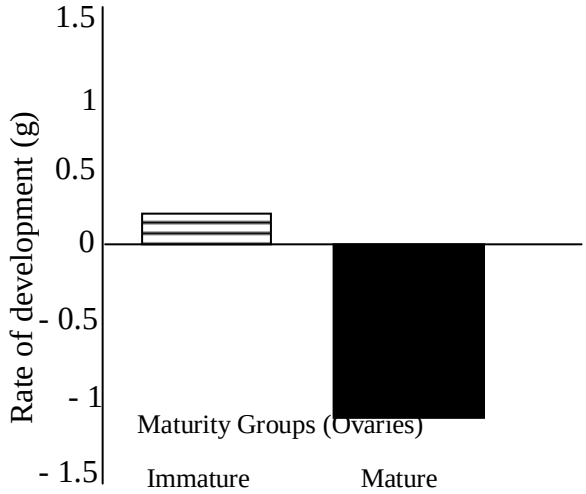

Figure 3: Developmental Rate of Ovaries of Gravid Mature and Gravid Immature C. gariepinus during the Breeding Season.

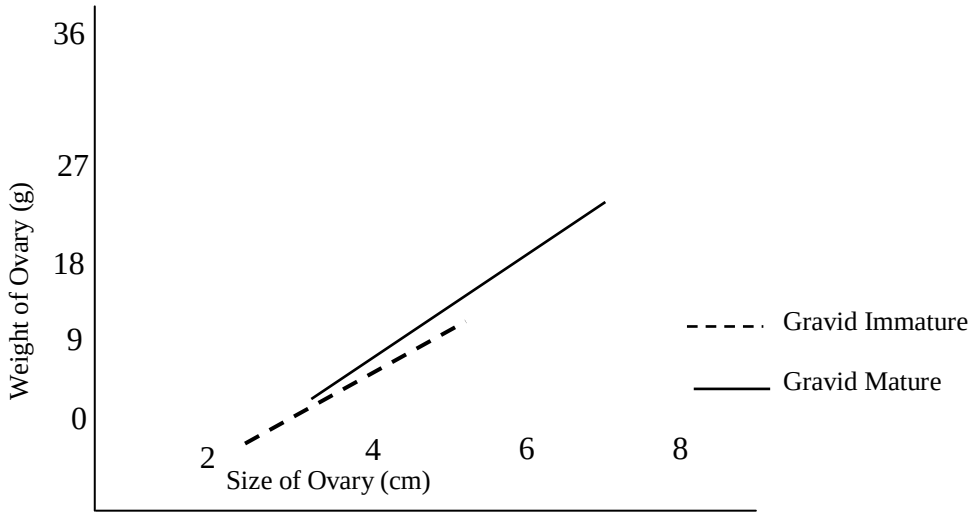

Figure 4: Relationship between size and weight of gravid-mature and gravid immature ovaries of C. gariepinus.

4. DISCUSSION

The relatively high GI obtained earlier and towards the end of the season (Fig 1.) possibly suggested that large quantity of eggs could be spawned during the periods. Akpaniteaku (2012) reported that gonadosomatic index of gravid mature C. gariepinus was higher than those of gravid immature, and the value for the gravid mature indicated that fish species could use up to 10.35%of the body weight for egg production. Judging from the diameter size of pituitaries obtained from gravid mature C. gariepinus andin size of their gonads, Akpaniteaku (2011) reported that the reproduction – inducing capacity of gonadotropic hormone may have a direct relationship with the size of ovary. Akpaniteaku and Nwuba (2008) reported a proportionate increase in the timing of ovulation and egg release, probably indicating that higher gonadosomatic index is a factor in the assessment of gonadotropic potency. Certain measurement aspects of the ovary of Chinese carp were adapted in the present research (methods) though, range index of gonad of the carp species - 12-22% (NACA, 1989) seems to be higher than those of the C. gariepinus. Difference in range index may probably depend on size of the fish used during the experiments.

According to Eyo and Mgbenka (1992) linear relationship exists between fecundity and length, and between fecundity and fresh weight of the fish species. In the present research, linear relationship exists between size and weight of ovary especially in the gravid immature group. Akpaniteaku (2012) reported a significant relationship between total length of spawner and weight of ovary. Weight range of the two groups though not prearranged for the present work, may serve as representatives of young adults in the water. Eyo and Mgbenka reported that fecundity and size at maturity are some of the prerequisite information desired to plan breeding programme. Perhaps, season may not have as much impact on the potential spawn as the size of spawner. The relationship observed in the present research seems to correspond with the report of other workers (Eyo and Mgbenka, 199 and Akpaniteaku, 2012) and infers that size is as relevant as weight in the estimation of potential spawn.

However, the DR in the present research (Fig 3) possibly confirms that the process of development is yet to be concluded in the ovaries of the gravid immature group. Wootton (1992) reported that specific growth rate is usually high during the early life-history stages, and decreases as the fish gets older and large. This may be implicated in the DR of ovary of the gravid mature, which seems to infer that the organs were ripe and getting ready for spawning. It could be inferred also that the rate of development of ovary in the gravid mature C, gariepinus during the season (Fig 3.), was <0g. Perhaps weight loss was incurred as a result of migration, and other reproductive activities.

5. CONCLUSION

The study of condition and spawning potential of ovaries of gravid mature and gravid immature C. gariepinus during the breeding season revealed that significant relationship existed between gonad index and relative size. A linear relationship exists between size and weight of ovary, especially that of gravid immature. The size of ovary could therefore play as important role as the weight in determining spawning potential of the fish species. However, relatively high gonad index obtained in May and September seemed to indicate that large ova quantity could be spawned during the period.

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