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Fecundity of two dominant fish species in Ado reservoir, Southwest Nigeria

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Abstract

The present study determined the fecundity and sex ratio of *Oreochromis niloticus* and *Clarias gariepinus* as the dominant species in Ado Reservoir, in Ekiti State, South West Nigeria between November 2011 and March 2012. The major fishing methods employed for collecting the fish specimens were cast netting and set netting. Biometric data such as total length, standard length and body weight measurements were recorded in the laboratory. Out of 40 *C. gariepinus* analyzed, 18 were males while 22 were females showing male to female sex ratio of 5:6. *O. niloticus* showed male to female sex ratio of 3:2 from 36 males and 24 females analyzed. Both *C. gariepinus* and *O. niloticus* showed high significant correlation between fecundity and gonad weight ($r=0.84$, $P<0.05$) for *C. gariepinus* and ($r=0.72$, $P<0.05$) for *O. niloticus.* Fecundity of *O. niloticus* ranged from 600eggs to 800eggs with a mean of 700eggs while *C. gariepinus* ranged from 4,000eggs to 7,200eggs with a mean of 5,588eggs. Most species of *O. niloticus* were not carrying eggs at the time of study. The study concluded that fecundity in the two species examined was low. This calls for an investigation into some prevailing conditions in the reservoir vis-à-vis availability and quality of food, the physical and chemical constituents of the water as well as the activities of fishermen operating in reservoir area.

Key words: Fecundity, *Clarias gariepinus*, *Oreochromis niloticus*, Ado Reservoir

1. Introduction

Fecundity is the rate of ripening of eggs in the female prior to the next spawning period. In reproductive studies, fecundity and gonad indices are used to estimate the reproductive potential of a population [1]. Knowledge of sex ratio, the state of maturity of individual fish species in a population and estimates of fecundity are important in studies of population dynamics, productivity or population estimates [2]. Fecundity estimates are also used as part of systematics in racial studies. The knowledge of fecundity of species is used to calculate the survival from eggs to describe a fish that is spawning for the first time.

Apart from genetic factors, environmental factors such as food can also affect fecundity [3]. Other factors include food, water, temperature and level of rainfall. [4] posited that *Clarias gariepinus* bred generally during raining season. [5] in his study of fecundity of fish revealed that the fecundity of ripe fish is related to length, spawning capability, and is very closely related to ovary weight. [6] also reported that there is relationship between body size, weight and fecundity. This study aims at providing information on the dominant fish species in Ado reservoir, a tropical reservoir in the Southwestern part of Nigeria with respect to fecundity with a view to determining the management approaches to ensure a sustainable management of the fishery.

2. Material and methods

Study Site

This study was carried out in Ado reservoir in Ekiti State, Southwest Nigeria. It is a tropical reservoir that was constructed by damming the Ureje River between1959 and 1960. It lies between latitude $7^0\ 37^l$ North and longitude $5^0\ 13^l$ East of the equator. It is situated on undulating plane of an average height of about 440m above sea level and surrounded by highlands.

Collection of Samples

Fresh fish specimens of *O. niloticus* and *C. gariepinus* were caught between November 2011 and March 2012. The gears used were majorly cast nets and set nets. The fish samples were transported immediately to the laboratory for further analysis. A total number of 100 specimens were procured comprising 60 specimens of *O. niloticus* and 40 specimens of *C. gariepinus.*

Laboratory Procedures

The routine measurements and analysis were carried out after counting and washing the specimens. The total length and standard length were measured using a measuring board to the nearest 0.1 cm while weights were taken using digital balance to the nearest 0.1g. Total length of the specimens was taken from the tip of snout to the tip of the caudal fin while the

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standard length was taken from the tip of the snout to the point of attachment of the caudal rays to the hypural bone.

Sex Ratio

Sexes were determined by visual observation of external openings. The sex ratio was determined by counting the number of male and female in the samples. The ratio of males to females was calculated as follows:

$$Sex \quad Ratio = \frac{Number \quad of \quad Male}{Number \quad of \quad Female}$$

3. Result and discussions

Size Distribution

The standard length of *C. gariepinus* ranged between 21.30cm and 32.50cm. There were 22 females and 18 males. The males weighed between 70.9g and 305.8g while that of females was between 72.5g and 226.5g. The mean body weight for male was 172.1g while that of female was 146.7g. The standard length of *O. niloticus* ranged from 10.3cm to 29.0cm and body weight ranged from 40.2g to 227.0g. There were 36 males and 24 females. Weight of males ranged between 40.2g and 227.0g while that of female was between 55.0g and 145.0g. The mean body weight of female was 110.4g while that of male was 38.7g.

Fecundity

The fecundity of *C. gariepinus* ranged from 4000eggs to 7200eggs while that of *O.niloticus* was between 600 eggs to 900 eggs. There was a significantly high correlation between fish weight and fecundity ($r=0.707$, $P<0.05$) as shown in Figure 1; and fecundity and gonad weight ($r=0.837$, $P<0.05$) in *C. gariepinus* is shown in Figure 2. However, in *O. niloticus*, the relationship between fish weight and fecundity (0.295, $P<0.05$) is shown in Figure 3 with a low positive correlation while there was a high, positive and significant correlation between fecundity and gonad weight($r=0.721$, $P<0.05$) as shown in Figure 4. The prediction result of *C. gariepinus* also predicted that fecundity explained variation in the weight of fish and gonad weight to be 50% and 70.1% leaving the remaining 50% and 29.9% variation to extraneous parameters not specified in the regression model. The prediction result of *O. niloticus* shows that fecundity explained variation in fish weight, and gonad weight to be 8.7% and 51.9% respectively, attributing the remaining 91.3% and 48.1% to other parameters outside the regression model. In *C. gariepinus*, the effect of fecundity on fish weight and gonad weight was significant at 0.05 level. ($t=4.123$ and 6.312, $P<0.05$). While the effect of fecundity on fish weight and gonad weight was not significant. ($t=-0.308$ and -0.016, $P>0.05$). The overall regression model is significant in terms of goodness of fit for *C. gariepinus* ($F=16.995$, 29.419 and 39.835, $P<0.05$) while ($F=0.950$, 0.000 and 1.080, $P<0.05$) for *O. niloticus*.

Sex Ratio

The result shows that out of 40 *C. gariepinus* that were collected, 18 were males while 22 were females which showed a ratio of males to females of 5:6. Females were found to be more than males. The result also shows that out of 60 *O. niloticus* collected, 36 were males and 24 were females showing a ratio of 3:2. The sex ratio in *O. niloticus* shows that there were more males than females in Ado Reservoir which agrees with the findings of [7] who recorded a sex ratio of 3:1 for *O. noliticus* in a study carried out in Ero Reservoir but the sex ratio in *C. gariepinus* showed that females were more than males in ratio 2:1 throughout the period of the study. The result also agrees with the findings of [8] on reproductive biology of hatchery raised *C. gariepinus*. The dominance of males in Ado Reservoir can occur due to the fact that once fertilization of eggs is concluded, they emigrate from areas of spawning to where they are captured while the females possibly go towards submerged vegetation and other areas around the reservoir to avoid predators and also to carry out incubation and protection of the offspring. Furthermore, [9] also indicated in their study that for every female, there is a male specimen in *Sarotherodon galilaeus* while [10] cited that sex ratio varies considerably from species to species but in the majority of cases it is close to one, and may vary from year to year in the same population. The high correlation between fish weight and fecundity, and fecundity and gonad weight in *C. gariepinus* proved that there is positive relationship between fecundity and gonad weight. This study confirms the findings of [11] who studied *Tilapia galilaeus* and reported a relationship between fecundity and fish length. In *O. niloticus* there was also high, positive and significant correlation between fecundity and gonad weight but there was low relationship between fecundity and fish weight. These findings however were at variance with [12] which revealed that weight is more related to fecundity than length though both have positive relationship with fecundity.

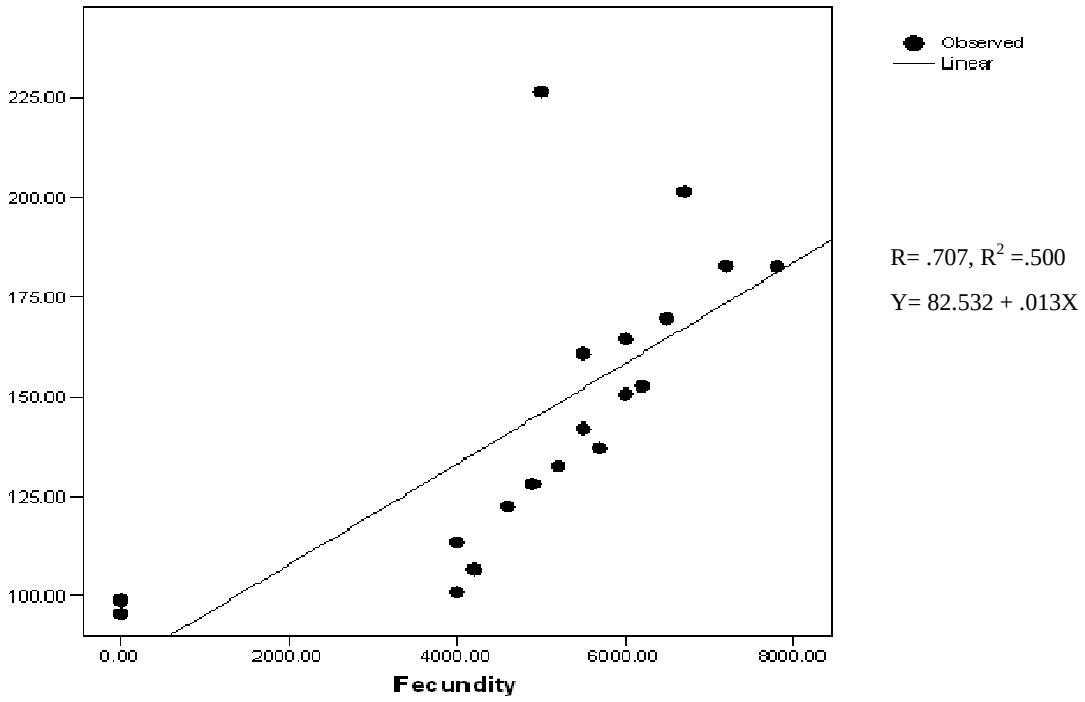

Figure 1: Relationship between fish weight and fecundity of female *C. gariepinus*

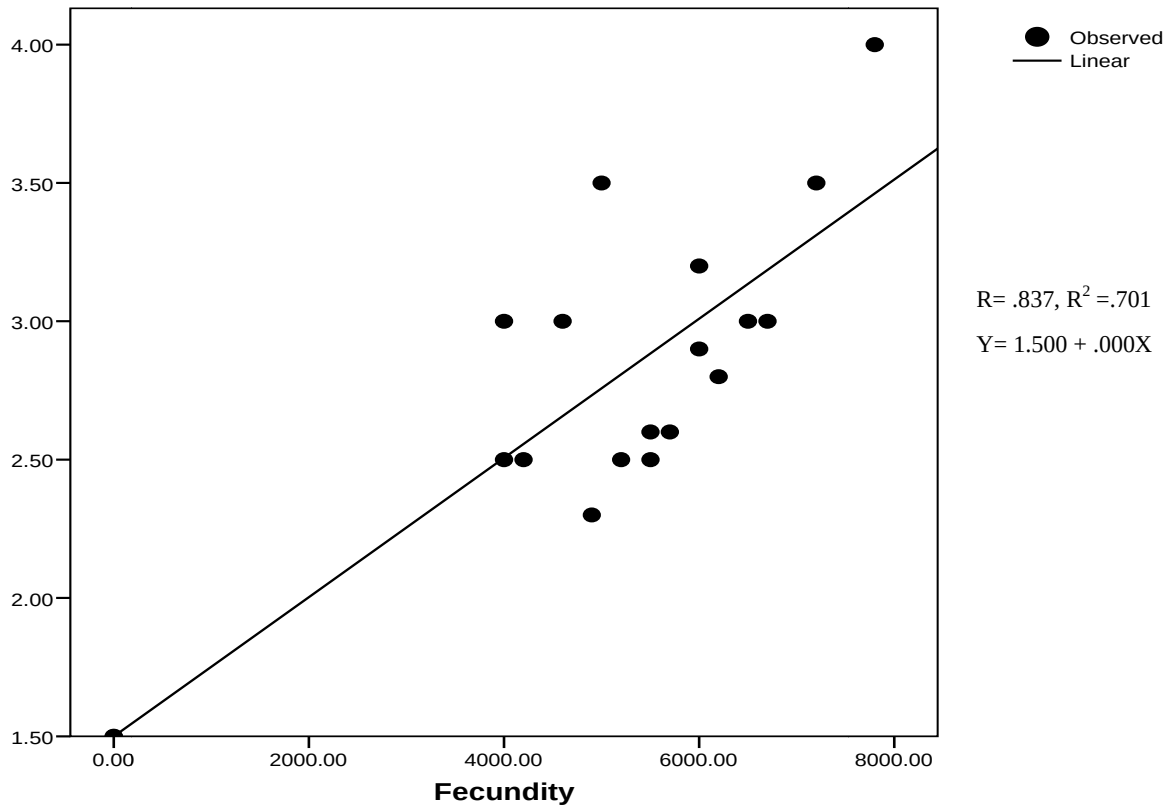

Figure 2: Relationship between fecundity and gonad weight of female *C. gariepinus*

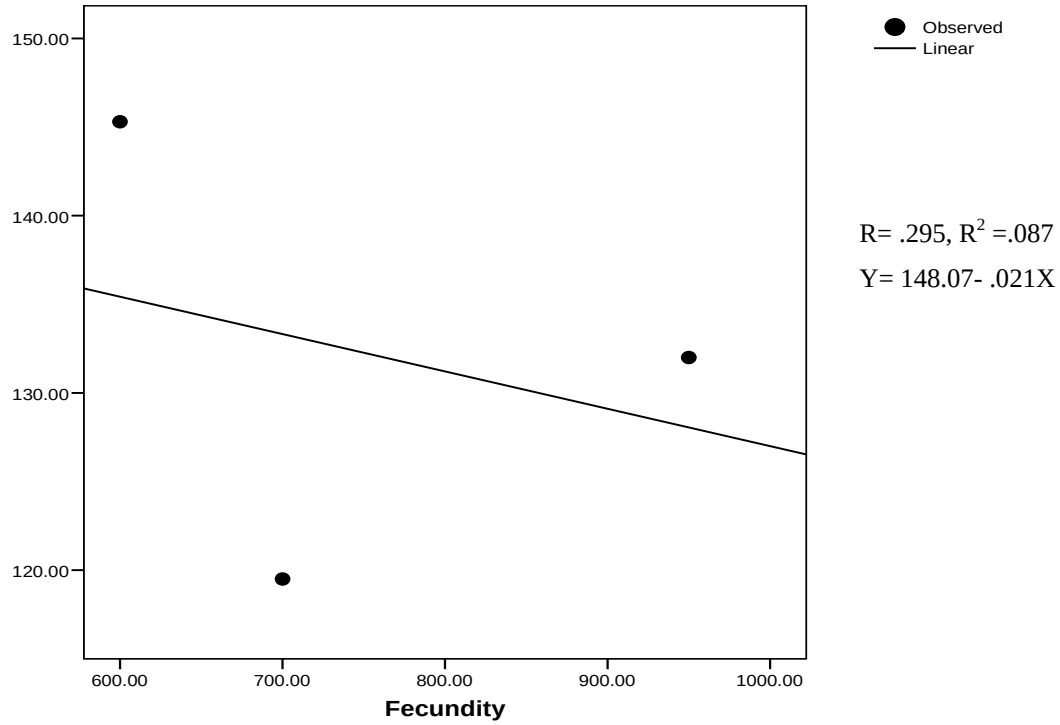

Figure 3: Relationship between fish weight and fecundity of female *O. niloticus*

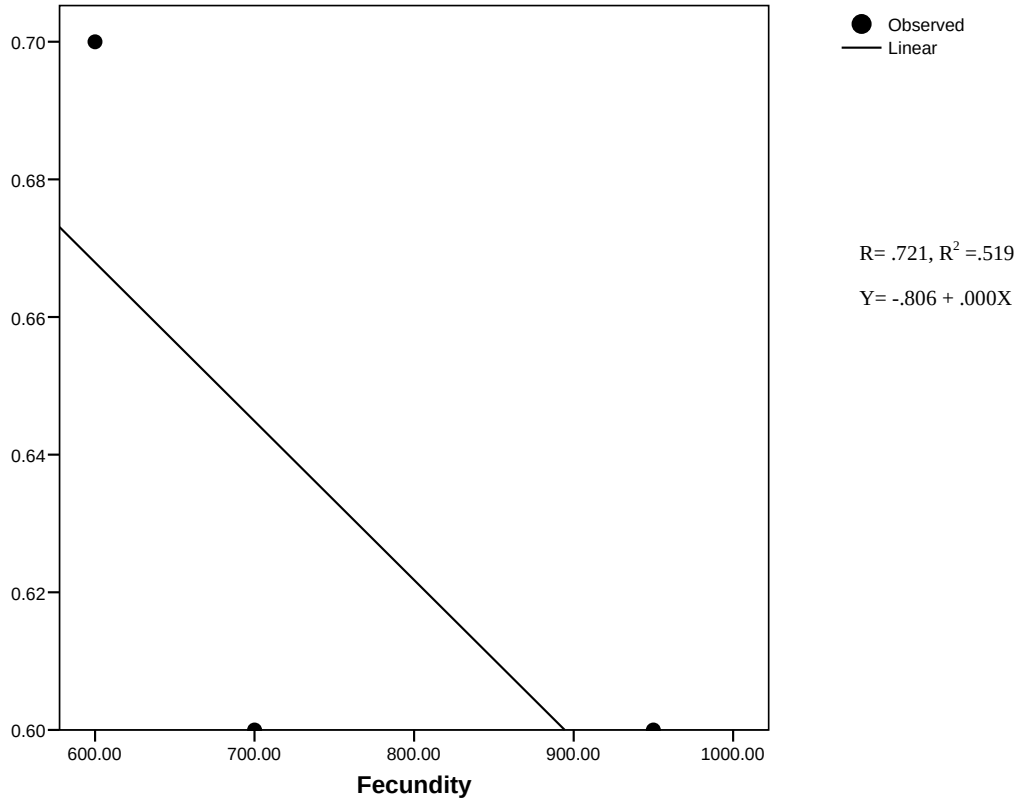

Figure 4: Relationship between fecundity and gonad weight of female *O .niloticus*

4. Conclusions

Based on the findings of this study, fecundity was found to be relatively low in both species sampled. However, *Clarias gariepinus* was found to be more fecund than *Oreochromis niloticus*. This could be as a result of over population of *O. niloticus* than *C. gariepinus* in the reservoir before attaining maturity. Also, the low fecundity of *O. niloticus* could be attributed to the fact the fish had not reached the stage of maturity during the period of study.

It is recommended that tilapia species be protected for them to reach maturity. Also the optimum mesh size that will allow small-sized fish to

escape and allow them to produce eggs at least once in their years, should be used and there should be a decrease in the number of fishing traps to avoid over harvesting.

5. Acknowledgements:

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