Fecundity and condition of *Chrysichthys nigrodigitatus* (Family Claroteidae) in Yewa Lagoon, Nigeria

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Abstract

The minimum and maximum standard length of females caught was 8.0cm (14.5g body weight) and 14.6cm (53.4g body weight) respectively while the males were 10.1cm (19.8g) and 17.1cm (68.6g). The gonadosomatic index (GSI) for females ranged between 6.55 and 25.57 while males ranged between 5.68 and 16.55. Significant ($P < 0.05$) relationships were observed between standard length, body weight, gonad weight and fecundity. There was significant ($P < 0.05$) relationship between body weight and fecundity. Body weight and GSI had no significant ($P > 0.05$) relationship with condition factor in *C. nigrodigitatus* in Yewa Lagoon. The condition factor (K) ranged between 1.58 and 2.92 for the females while males ranged between 1.08 and 2.79. The condition of female fish was slightly better than that of male fish of the same length.

Keywords: Fecundity, *Chrysichthys nigrodigitatus*

Introduction

Marked differences in the fecundity among species often reflect different reproduction strategies (Murua and Saborido-Rey, 2003). Within a given species, fecundity may vary as a result of different adaptation to environmental habitat (Withameet *et al.*, 1995). Even within a stock, fecundity is known to vary annually, undergo long-term changes (Horwood *et al.*, 1986; Rijnsdorp 1991; Kjesbuet *et al.*, 1998) and has been shown to be proportional to the fish size (and hence age) and condition. Larger fish produce more eggs, both in absolute and in relative terms in relation to body mass. For a given sizes, females in better condition exhibit higher fecundity (Kjesbuet *et al.*, 1991). Studies on reproduction including the assessment of size at maturity, fecundity, duration of reproductive season, daily spawning behaviour and spawning fraction permits quantification of the reproductive capacity of individual fish (Saville, 1964; Parker, 1980; Lasker, 1985). This has led to a better understanding of

observed fluctuations in reproductive output and enhanced the ability to estimate recruitment (Kraus *et al.*, 2002). Fish sizes and condition are thus key parameters to properly assess fecundity at the population level.

Chrysichthys nigrodigitatus (Lacépède: 1803) is a highly valued food-fish included among the dominant commercial catches exploited in major rivers of Africa (Offemet *et al.*, 2008). Bagenal and Tesch (1978) stated that condition factor is an index of the degree of fatness or well-being of a species. Thus, the study of the condition factor of fish species contributes to adequate management of the species and to keep the ecosystem at equilibrium (Haruna and Bichi, 2005). Condition index may be used to determine the reproductive time of fish species without sacrificing the organisms which could be a valuable tool to develop monitoring programs for the fish species (Arellano-Martinez and Ceballos-Vazquez, 2001). Knowledge of fish fecundity will also help in predicting

the level of fertilization of eggs and survival rate of hatchlings. It will also help the fish farmer to predict the level of fingerlings and adult fish production from time to time. This study was carried out to determine the condition factor and the relationship between weight and fecundity of *Chrysichthys nigrodigitatus* and its condition in Yewa Lagoon.

Materials and Methods

Fish specimens of *Chrysichthys nigrodigitatus* (300) were gotten live from fishermen at Yewa Lagoon, Ipokia Local Government, Ogun State during the rainy season (i.e. April – August). The specimens were caught with bamboo traps and preserved with crushed ice for transporting to the laboratory. A total of 300 specimens of *C. nigrodigitatus* were collected and used. The total and standard lengths of the specimens were measured to the nearest centimetres using a graduated measuring board. The body weight of the specimens were taken using a top loading weighing balance measured to the nearest grams.

The eggs were preserved using Gilson fluid (60% alcohol, 880ml water, 15ml nitric acid, 18ml glacial acetic acid, 20g mercury chloride). This made it easier to count the eggs because it liberated and broke down the ovarian tissue. Volumetric sub sampling method of estimating fecundity was used for counting the eggs (Fagade and Adebisi, 1979). The volume of a portion of

the subsample is determined and the number of eggs in that volume is counted and this is extrapolated to the total volume of the original ovary from which the subsample was taken.

Fecundity estimation =

$a/x \times y$.

x = Volume of subsample ovary

a = Number of eggs in "x"

y = Volume of ovary sample

The G.S.I of the fish was determined as weight of gonad/ body weight of fish $\times 100/1$. The condition of the fish was calculated using Fulton coefficient formula; $K' = 100W/L^b$ (Bagenal & Tesch, 1978); where K' = condition factor, W = body weight (g), L = standard length, and b regression (growth) coefficient. Regression analysis was used to determine the relationship between body weight, standard length and the gonado-somatic parameters of *C. nigrodigitatus*.

Results

More females were collected with a female: male ratio of 2:1 (Table 1). The body weight – standard length relationship of *C. nigrodigitatus* showed that body weight proportionally increased as the standard length increased with a high R^2 of more than 70 (Fig. 1). The larger (body weight) the fish, the higher the relative fecundity with an $R^2 = 0.59$ (Fig. 2). Gonad weight -body weight relationship of female and male *C. nigrodigitatus* showed that the gonad

Table 1: Sex ratio of *Chrysichthys nigrodigitatus* in Yewa Lagoon

Month	Females	Males	Sex ratio (F:M)
April	33	28	0.5:0.4
May	40	20	0.6:0.3
June	38	17	0.7:0.3
July	40	8	0.8:0.2
August	34	22	0.6:0.4
September	15	5	0.7:0.3
Total	200	100	2:1

Fig. 1: Body weight–Standard length relationship in female (a) and male (b) *C. nigrodigitatus*

weight increased with the body weight, however, $R^2 = 0.59$ (Fig. 3a) and 0.75 (Fig. 3b) respectively. Gonad weight –standard length relationship of female and male *C. nigrodigitatus* showed that the gonad weight increased with the body weight but not proportionately, $R^2 = 0.48$ (Fig. 3a) and 0.56 (Fig. 3b) respectively. The Body weight and GSI of *C. nigrodigitatus* in Yewa Lagoon had no significant ($P > 0.05$) relationship with condition factor.

Discussion

The body weight – standard length relationship was highly significant with R^2 values of more than 70% which showed that body weight and length increased proportionately. Offemet *al.* (2008) got similar results from another water body in Cross River State, Nigeria. Figures 3, 4 and 5 showed the significance of body weight with fecundity and gonad weight, indicating that the more the eggs and weight of the gonads the larger the fish. This study revealed that fecundity varied with body weight among fishes of the same body weight. This variation becomes more pronounced with increase in body size. Ayaosi (2002) obtained similar results from *C. walkeri* in Asejire Lake.

Females had a minimum and maximum standard length of 8.0cm (14.5g body weight) and 14.6cm (53.4g body weight) respectively while the males were 10.1cm (19.8g) and 17.1cm (68.6g). The sizes of fishes obtained were lower than that reported by Taiwo and Odunaiya (2004) and Taiwo and Olopade (2009). The minimum standard length of matured

Fig. 2: Fecundity - Body weight relationship in *C. nigrodigitatus*

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Fig. 3: Gonad weight –Body weight relationship in female (a) and male (b) *C. nigrodigitatus*

Fig. 4: Gonad weight – Standard length relationship in female (a) and male (b) *C. nigrodigitatus*

female fish of *C. nigrodigitatus* was found to be 10.1cm with body weight of 28.6g and estimated fecundity of 730eggs while the maximum standard length recorded for the fecund fish was 13.7cm with body weight of 54.4g and estimated fecundity of 1100 eggs at gonad stage II. This fecundity is similar to that recorded for *C. walker* and *C. nigroigitatus* from Asejire Lake which was 124 eggs for a 20g fish and 13,746 eggs for a fish weighing 475g (Taiwo and Odunaiya, 2004 and Taiwo and Olopade, 2009). The gonadosomatic index for females ranged between 6.55 and 25.57 while males ranged between 5.68 and 16.55. Significant ($P<0.05$) relationships were observed between standard length, body weight and gonad weight. There was a strong significant ($P<0.05$) relationship between body weight and fecundity. The mean condition factor (K) of 2.92 for the females was slightly higher than that of males of 2.79. This was in agreement with Offem et al. (2008) and Atobalele and Ugwumba (2011). Adedeji and Araoye (2006) also observed that female *Synodontis schall* were in slightly better condition than their male counterparts. The condition factor indicated that the females were slightly heavier than their male counterpart of the same length which could also be due to the weight of the gonads.

Conclusion

Size of fish in relation to length and body weight has an influence on the fecundity of *C. nigrodigitatus*. Hence the nutritional state and condition of the parent fish under culture are very important factors influencing the number of eggs produced. It can be inferred that more females are in abundance than males of *C. nigrodigitatus* in Yewa lagoon.

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