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RESEARCH ARTICLE

REPRODUCTIVE PARAMETERS OF *Schilbe mystus* FROM LEKKI LAGOON IN LAGOS, NIGERIA

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ABSTRACT

The study was carried out at Lekki Lagoon which is part of the Lagoon system in the Western coast of Nigeria. Samples of *Schilbe mystus* were obtained from Epe fish depot for six months (January to June). A total of 337 specimens were examined. Identification of this species was done using the technique proffered by Olatunde (1977). Fecundity was estimated by using the gravimetric sub-sampling method (Dry technique). Overall sex ratio of 1.0: 2.5 in favour of the female was obtained. The sex ratio varies monthly. The highest sex ratio in June was associated with breeding activities. Condition factors (K) were found not to vary with stages of gonad maturity in both sexes while Gonadosomatic index (GSI) increased with the stages of maturity. Fecundity ranged from 10,906 to 23,700 eggs. Breeding condition was attained during the rains.

INTRODUCTION

Lekki Lagoon is part of the Lagoon systems in the western coast of Nigeria which is part of the Lagoons of Guinea coast of West Africa stretching from Cotonou, Republic of Benin up to Warri, Delta State, Nigeria (Webb, 1958). It is a large expanse of shallow freshwater covering an area of 247 square kilometers. It lies between longitude 4^{o} 00^{1} and 4^{o} 15^{1}E and latitude 6^{o} 25^{1} and 6^{o} 37^{1}N. It receives water from River Oni in the North eastern part and from Rivers Oshun and Saga in the North western part of the Lagoon. It opens into the sea through the Lagos Lagoon and Lagos harbor.

Catfishes (order Siluformes) constitute a large group of bony fishes embracing some thousand species inhabiting the freshwaters of all parts of the world but mostly from the tropics (Boulenger, 1907). *Schilbe mystus* belongs to the order Siluformes and the family Schilbeidae. Schilbeids are found in Africa and Asian freshwaters (Greenwood, 1957). *Schilbe mystus* serves as delicacy for many low income earners as it is cherished for its taste and affordable price since it does not attain large size and it is of considerable commercial importance (Reed *et al.,* 1967). It is listed among the endangered species in Lake Victoria and its affluent rivers (Kibaara, 1981) while it forms part of the basis for small but locally significant fisheries in River Nyando, Kenya and Oyan and Asejire Lakes in Nigeria (Omondi and Ogari, 1994; Ayoade *et al.,* 2008). Studies on aspects of biology of the fishes such as growth pattern, reproduction, feeding are necessary as they would provide relevant information for the formulation of fishery management policies (Everthart *et al.,* 1975).

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Researchers such as Olatunde (1978), Kibaara (1981), Omondi and Ogari (1994), Ogari *et al.* (1995) and Ayoade *et al.* (2008) reported on aspects of biology of members of the family Schilbeidae from various African rivers and lakes. However, little is known about this family from Lekki Lagoon. This paper examines the reproductive biology of *Schilbe mystus* in Lekki Lagoon, highlighting sex ratio, fecundity, gonodosomatic index, condition factor and stages of gonad maturation to enhance effective management of the species in its natural habits by legislation for optimal utilization by local fisheries.

MATERIALS AND METHODS

The specimens for this study were collected between January and June, from the fish depot at Epe. Identification of the species was done using the technique proffered by Olatunde (1977). The fish were chilled with ice-blocks in an ice-chest and transported to the laboratory where they were preserved by deep-freezing prior to examination. Specimens were measured (±0.1cm) using a meter rule, weighed (±0.5g) using Top loading weighing balance (Model P12OON) and sex was determined externally by the presence of genital papillae which are cone-like projections of the genital aperture of the males and are absent in females. The stages of gonad maturation (Stage I = Immature; Stage II = Developing; Stage III = Maturing; Stage IV = Matured; Stage V = Running) were determined according to the technique described by Nikolsky (1963). Ripe ovaries in stages IV and V were used in fecundity estimation. The gravimetric sub-sampling method (Dry technique) was used in fecundity estimation as described by Bagenal (1978). The condition factor (K) was calculated using Foulton's formular (1902).

$$K = 100W / L^3$$

Where L= Total length of fish (cm)

W= Total weight of fish (g)

The Gonadosomatic Index (GSI) was determined according to Meiden (1927).

$$GSI = \frac{100W_1}{W_2}$$

Where W_1 = Fresh gonad weight (g)

W_2 = Total weight of fresh fish including the gonad (g).

males range from 0.62 to 0.93, with a mean of 0.70. The lowest condition factor was observed in stage III male and the highest condition occurred in stage II male. There was, however, no significant difference in mean monthly condition factor of the fishes (Table 1).

In females with mature ovaries (stage IV), the fecundity ranged from 12,506 to 23,700 eggs. The mean fecundity of the fish was 16,693 eggs (Table 3). In January, 48.9% of the samples had gonads in stage I and 51.1% were in stage II. In March, 57.4%, 32.8% and 9.8% of specimens had gonads in stages I, II, and III respectively. In April, specimens with gonads in stages I, II and III were 36.7%, 31.7% and 31.7% respectively.

Table 1. Monthly variation of Sex Ratio, GSI (%) & K of *Schilbe mystus* in Lekki Lagoon

Months	Male (M)	Female (F)	Sex Ratio (M:F)	Monthly GSI Range	Mean Monthly GSI	Monthly K Range	Mean Monthly K
January	12	33	1: 2.75	0.04-0.61	0.18	0.53-0.89	0.72
February	19	34	1:1.79	0.23-0.70	0.25	0.52-0.75	0.71
March	26	35	1: 1.35	0.02-5.00	0.32	0.62-1.34	0.71
April	15	45	1: 3.00	0.08-6.20	1.10	0.63-0.81	0.73
May	13	46	1:1.35	0.52-12.23	6.47	0.64-0.91	0.72
June	11	48	1: 4.52	0.62-18.36	11.83	0.59-0.86	0.71

Table 2. Variation of GSI (%), K with stages of gonad maturity of *Schilbe mystus* in Lekki Lagoon

Stages of Maturity	Nos of Females	Nos of Males	Total Nos of Fishes	Range of GSI	Mean GSI	Range of K	Mean K
I	83	46	129	0.02-0.20	0.11	0.53-0.86	0.69
II	71	40	111	0.09-11.28	0.54	0.62-0.96	0.74
III	48	11	59	0.33-15.56	5.61	0.59-1.34	0.75
IV	27	2	29	1.33-22.86	14.25	0.62-1.01	0.74
V	8	1	9	0.83-14.00	9.78	0.61-0.79	0.71

Table 3. Fecundity data and percentage of stage of maturity per month for *Schilbe mystus* from Lekki Lagoon

Stage of Maturity	January Nos(%)	February Nos(%)	March Nos(%)	April Nos(%)	May (%)	June Nos(%)	Range of Fecundity	Mean Fecundity
I	22(48.9)	25(47.2)	35(57.4)	22(36.7)	25(42.4)	-	-	-
II	23(51.1)	28(52.8)	20(32.8)	19(31.7)	20(33.9)	1(1.7)	-	-
III	-	-	6(9.8)	19(31.7)	14(23.7)	20(33.9)	-	-
IV	-	-	-	-	-	29(49.2)	12,506-23,700	16,693eggs
V	-	-	-	-	-	9(15.3)	10,906-12,225	11,612eggs

RESULTS

Out of 337 specimens examined, 96 were males and 241 females which gave a ratio of 1.0 : 2.5 in favour of the females. The monthly sex ratio showed that the males were fewer in catch every month (Table 1).

The mean monthly Gonadosomatic Index (GSI) increased in value from January to June with a remarkable increase in the month of June (Table 1). The mean GSI increased with maturation stages up to stage IV and then decreased. The peak mean GSI value at stage IV was 14.25% and the lowest value of 0.11% was recorded for stage I gonads (Table 2). Condition factor (K) in this species varied from 0.53 to 1.34, with a mean of 0.72. Lower condition factor was recorded for stage I of maturation when compared to stages II, III, IV and V in both sexes (Table 2). The condition factor of females ranged from 0.53 to 1.34, with a mean of 0.73. The highest condition factor was observed in stage III female with the lowest in stage I female. The condition factor of

Similar trend of result for the stages of maturity was obtained in May as for April. Specimens with gonad stage I were absent in June with a considerable decrease in specimens with gonad stage II. At this period, there was an increase in the number of specimens with gonad stage III and specimens with gonad stages IV and V were collected in large number (Table 3).

DISCUSSION

Condition factor (K) is used to assess the degree of well-being of fish. Seasonal changes had been studied with the use of condition factor, which correlates with gonad cycle or rate of feeding . It is also used to monitor short term cycles of alternating growth in weight and length. Fish conditions are often known to vary with the stage of maturation. During pre-spawning and early spawning, there is high K value in some fishes but sometimes there is low K value for the mature fish, particularly those which have recently spawned. Thus fish conditions had been correlated with spawning activities

(Mann, 1976). However, the correlation of K value with spawning activities should be taken with wary view of the fact that factors other than spawning activities such as age, feeding, environment, food supply and degree of parasitation are known to affect fish condition and in most cases, it is difficult to separate the effect of one from the other (Le Cren, 1951). In this study, there was no significant difference obtained in the mean K values of mature and immature fish. The K values obtained showed that the fishes were in good condition irrespective of their sex or gonad maturation. This trend may not be unconnected with the feeding activities which have been found to be intensive in the schilbeids. This report is in agreement with the work of Fagade (1978) who indicated that the condition factor showed less fluctuation in *Tilapia guineensis* obtained from Lekki Lagoon and this he reported as due to the abundance of food in the Lagoon all round the year.

The sex ratio indicated more females than males in this study and it varies monthly. The high sex ratio in June was associated with breeding activities. During the breeding season, more females are expected to associate with males particularly in a situation when few males are in the population. The greater number of females may be an adaptation for survival of the species in the environment, since more females means greater population. This report is in accordance with the work of other researchers. Reynolds (1974) had earlier reported that sex ratio differences in fish might be due to partial segregation of ripe forms either through habit preferences or school formation, thus making one prone to capture than the other. Although Olatunde (1978) reported a high female to male sex ratio for *Schilbe mystus* when it was not breeding season, he attributed this to the sampling variation and behaviour pattern of the fishes.

The increase in Gonadosomatic index (GSI) observed in this report may be due to deposition of large amount of lipids in the development of gonads. This could explain why *Schilbe mystus* spawns in June in which the GSI was highest and the fall in GSI in stage V of gonad maturation could be due to the decrease in gonad weight resulting from the milt and eggs released during spawning. The high value of GSI and fecundity in June suggest that *S. mystus* may be utilizing a comparatively large proportion of their energy reserve for egg production and the high value of GSI in female is an indication that they spawn less frequently since an increase in the frequency of spawning in fishes is usually accompanied by fall in the GSI (Htun-Han, 1978).

The findings on fecundity range obtained in this study is similar to that obtained by Imevbore (1970) who reported similar fecundity for *Schilbe mystus* of similar sizes from Lake Kainji. However, it does not agree with Olatunde (1978) who reported lower fecundity for fishes of similar sizes. It is well documented that fish species exhibit wide variation in fecundity even among the same species (Bagenal, 1966). This may be as a result of changes in environmental factors or increased food supply. The high fecundity observed in this study may be due to low frequency of successfully fertilization, existence of predation on eggs by other organisms in the environment; or to large percentage of the eggs being unviable. Further research work will be needed to establish this. The presence of mature stage of gonad only in June shows that *S. mystus* does not spawn frequently and also agrees with earlier report that several species of fish including the schilbeids, breed during the rainy season (Motwani and Kanwa, 1970).

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