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Some biological aspects of *Brycenus nurse, Hydrocynus forskali, Micralestes Acutidens* (Characidae) and *Labeo coubie* (Cyprinidae) from a reservoir in Ilorin, Nigeria

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ABSTRACT

The biological aspects of *Brycenus nurse*, *Hydrocynus forskali*, *Micraleates acutiden* (Characidae) and *Labeo coubie* (Cyprinidae) were studied from June, 2007 to December, 2008. The variability in egg size (i.e. diameter) were measured using the micrometer eye-piece. The fecundity was estimated by direct enumeration and related to the fish species population while the sex ratio was calculated as a ratio between the numbers of males to females. The mean egg diameter of *B. nurse*, *H. forskali*, and *M. acutiden* were 1133.33 ± 57.74, 1140 ± 54.77 and 875 ± 50 mm respectively, while that of *L. coubie* was 785.71 ± 86.22 mm. There was variability in the egg size with fish species. The diameter of the eggs also varied within each species. *L. coubie* contained the highest number of eggs but they were the smallest in size. *B. nurse* had fairly large number of eggs which were moderate in size. *H. forskali* and *M. acutiden* contained moderate number of eggs. *L. coubie* and *B. nurse* employed the strategy of the force of number to ensure survival of the offspring. *M acutiden* employed the strategy of many females with ripe gonads in the population. The reproductive strategy of *L. coubie* was inefficient but the strategies of *B. nurse*, *H. forskali* and *M. acutiden* were efficient. A sex ratio of approximately 1:1 (male:female) was obtained for *B. nurse*, *H. forskali* and *L.coubie* while a sex ratio of 1:1.5 (male:female) was obtained for *M. acutiden.*

Keywords: Fecundity, egg diameter, population.

INTRODUCTION

The characidae commonly known as Tiger, have elongated fusiform bodies which are silvery in colour with a deeply forked tail. They have an array of teeth which gave this family the name tiger fish (Holden and Reed, 1972). This family has three genera *Hydrocynus*, *Micralestes* and *Brycenus. Hydrocynus forskali* is a long slender fish with a deeply forked tail and an adipose dorsal fin. The sides are silvery while the colour on the back is grey. *Brycenus nurse* has a compressed body, a slightly projecting snout and both caudal lobes are bright red in colour. The body is silvery on the sides, olive – bronze on the back. The dorsal, anal, ventral and adipose fins are tinged red. *Micralestes acutidens* are very small fishes in size that serve as food fish. *M. acutidens* have complete lateral line with about 26 to 28 lateral line scales (Mc–Connel, 1972).

The cyprinidae is represented by genus *Labeo*. *Labeo coubie*, it has protractile mouth equipped with well developed lips forming

suckers with jaws devoid of teeth. Abdominally situated pelvic fin, with forked tail and rounded lobes. It is silvery in colour (Holden and Reed, 1972). There is little or no work on the fecundity, condition factor, sex ratio and length-weight relationship of these fishes.

Wotton (1987) stated that reproductive strategies are the traits or energy that an adult fish allocates into the reproductive processes in order to optimize total number of offspring which survive over the lifetime of spawning adults. Paugy (2002) identified high fecundity, absence of parental care and limited breeding seasons as the reproductive strategies of fishes in a tropical stream of the upper Senegal basin. Bustos et al. (2007) worked on spawning of southern Lake *Merluccinus australis* in Chilean fjords and showed that egg size ranged from 0.93 and 1.17 mm with a mean diameter of 1.05 mm in October 1995 while eggs of the southern lake collected in 2002 had a diameter of 1.09 and 1.30 mm with a mean value of 1.17 mm. There were significant differences in the size of the egg with location. This work will provide a baseline data on this important fish species namely Tiger fishes and African Carp in the reservoir in Ilorin, Nigeria.

Impoundments are utilized for fish production beside other primary uses such as: domestic water supply, generation of electricity and irrigation (Blay, 1985). Management practices that may lead to increased fish production are obtained from the study of the fish composition in the impoundment.

H. forskali, B. nurse, and *L. coubie* are commercially important food fish from the freshwater in Nigeria while *M. acutidens* is ecologically important in the population because it serves as fish food. There is paucity of knowledge on some aspects of the reproductive biology of *H. forskali, B. nurse, M. acutidens* and *L. coubie.* The objectives of this work were to examine the egg diameter, estimate absolute fertility, calculate sex ratio and condition factor in *H. forskali, B. nurse, M. acutidens* and *L. coubie* from the reservoir in the University of Ilorin, Ilorin Nigeria.

MATERIALS AND METHODS

Study site

Ilorin, Kwara state capital in Nigeria is located on longitudes 4° 30´ and 4° 45´ E and latitudes 8° 25´ And 8° 40´ N. The study area was the University of Ilorin, reservoir impounded in 2004.

Sampling

During the period of study, sampling for *H. forskali, B. nurse, M. acutidens* and *L. coubie* began in June 2007 and ended in December 2008. Fishing was carried out by cast-netting.

Determination of the parameters

In the laboratory, each specimen was measured to the nearest millimeters and weighed to the nearest 0.1 g, then the fish were dissected. The sex and stages of gonad development were determined using Kesteven (1960) scale. The matured ovaries were preserved in Gilson's fluid and agitated at intervals. The number of eggs in each ovary was determined by direct enumeration after removal of the surrounding tissues. The egg diameters were measured using Ocular micrometer in a binocular microscope. Condition factor was calculated using the equation $K = 100w/L^3$.

Where K = condition factor
W = weight in gramme
L = length in centimeters

The length – weight relationship was

$W = aL^b$

Where w = weight
b = exponent

A logarithmic transformation of the equation gives the straight line relationship
Log w = log a + b log l
b = regression coefficient
Log a = intercept of the line on Y- axis
Sex ratio was calculated by dividing the number of males with the number of females.

RESULTS

A total of 778 specimens were examined during the study period: *H. forskali* were 204*; B. Nurse,* 235; *M. Acutiden*, 303

and *L. Coubie*, 36. The maximum standard lengths for *H. forskali* , *B. nurse*, *M. acutidens* and *L. coubie* were 16.0 cm, 14.5 cm, 8.0 cm and 17.0 cm respectively. The maximum weights were 10 g, 60 g, 50 g and 110 g for *M. acutidens*, *B. nurse H. forskali* and *L. coubie* respectively. Egg diameter in *H. forskali*, B. *nurse*, *M. acutiden* and *L. coubie* varied with fish species. Also, the eggs in each ovary of each fish were of varying sizes (Table 1). The egg diameter ranged from 1100 to 1200 mm, 1100 to 1200 mm, 900 to 1100 mm and 700 to 900 mm for *H. forskali*, *B. Nurse*, *M. acutidens* and *L. coubie* respectively.

Table 2 shows the total number of eggs (Fecundity) contained in *B. nurse*, *H. forskali*, *M. acutidens* and *L. coubie.* The highest number of eggs was observed in *L. coubie* with a range of 3500-3812 eggs, while in *H. forskali* fecundity ranged from 1000-1142 eggs. In *M acutidens*, which were very small in size (maximum standard length 8.00 cm), fecundity were between 1250-1390 eggs.

Gonad Reproductive Stages: Six stages of gonad development were observed in the specimens examined. The stages were:

-Stage I – Immature: gonad very small in size;

-Stage II – Developing: ovary opaque, reddish with blood capillaries. Eggs vissible to the eye as whitish granular;

-Stage III – Maturing: ovary orange reddish. Eggs clearly discernible. Ovary occupying about two-thirds of ventral cavity;

-Stage IV – Mature (Ripe): eggs completely round and ripe. Ovary filling ventral cavity;

-Stage V – Ripe (Running): the eggs come out with slight pressure. Most eggs are translucent;

-Stage VI – Spent: no opaque egg left in ovary. Not fully empty (Bagenal, 1978).

The condition factor (Table 3) of *H. forskali*, *B. nurse*, *M. acutidens* and *L. coubie* were higher than one (1) indicating that the fishes were robust and in good condition. Changes in condition factor in males and females were calculated and the mean values shown in Table 3. There were little variation in condition factor with sex.

The length-weight relationship showed that length increased as weight increased as shown by the high correlation values (Table 4) and the value of b was higher than three indicating that growth of these fishes were positively allometric.

The sex ratio for *H. forskali*, *B. nurse*, *L. coubie* were approximately 1:1.03, 1:1.1 and 1:1.01, respectively. One male to one female while the sex ratio for *M. acutiden* was more than one female to a male 1:1.56.

Table 1: Egg diameter of *Brycenus nurse*, *Hydrocynus forskali*, *Micralestes acutidens* and *Labeo coubie*.

Fish Species	Range of egg diameter	Mean S.D
Brycenus nurse	1100 – 1200 mm	1133 .33 ± 57.74
Hydrocynus forskali	1100 – 1200 mm	1140.0 ± 54 .77
Labeo coubie	700 – 900 mm	785.71 ± 125.830
Micralestes acutidens	900 – 1000 mm	875 ± 57.74

Table 2: Fecundity of *Hydrocynus forskali*, *Brycynus nurse*, *Micralestes acutidens* *Labeo coubie.*

Fish Species	Range	Mean	SD	No of specimens
Hydrocynus forskali	1000 – 1142	1130	±8.56	204
Brycynus nurse	3000 – 3580	3300	±212	235
Micralestes acutidens	1250 – 1390	1333	±60.00	303
Labeo coubie	3500 – 3812	3750	±187	36

Table 3: Condition factor of *Brycenus nurse*, *Hydrocynus forskali*, *Micralestes acutidens* and *Labeo coubie*.

Fish	Condition factor	Mean Condition factor	
		Female	Male
Hydrocynus. Forskali	1.14 – 3.81	2.57	2.41
Brycenus Nurse	1.16 – 5.79	3.48	3.43
Micralestes acutidens	1.92 – 2.93	2.55	2.62
Labeo Coubie	1.82 – 3.46	2.71	2.77

Table 4: Length – Weight relationship of *Hydrocynus forskali*, *Brycenus nurse*, *Micralestes acutiden* and *Labeo coubie.*

Fish species	a		b	R
Hydrocynus Forskali	- 366.818	+	159.213	.66533
Brycenus Nurse	- 293.183	+	146.017	.4461
Micralestes Acutidens	- 35.923	+	24.115	.66707
Labeo Coubie	- 283.928	+	134.32	.9335

DISCUSSION

The sex ratio was one male to a female in *B. nurse*, *H. forskali* and *L. coubie* but the sex ratio of *M. acutidens* showed that there were many females than males. *M. acutidens* is small in size therefore it serves as food fish in this reservoir for all the predatory fishes in the water. Therefore, the strategy of more females to males is employed so that many eggs will be laid by these females and when they hatch and some are preyed upon by some piscivorous fishes, the population of *M. acutidens* in the water is not reduced drastically as to tend towards extinction The result obtained in this research indicates that the reproductive strategy of *M. acutidens* is efficient. In spite of the number eaten by predators the population in the reservoir is not threatened. The diameter of the egg varied with fish species. The lowest egg diameter was observed in *L. coubie* which had the highest number of eggs *L. coubie* employed the strategy of the force of number. Many eggs were found in *L. coubie* but they were the least in abundance in the water. Absence of parental care may have contributed to the low population, other factors that may be responsible are predation of the eggs and harsh environmental condition. Similar observations were found by Paugy (2002) in upper Senegal basin. Achionye-Nzeh (2008) observed that absence of parental care may be responsible for the low population of *L. coubie*. Egg size was moderate in *B. nurse* and *H. forskali* and the survival rate was fairly high.

Fertility was not size dependent and there were variations in egg diameter with size (Fawole, 2000). Bustos et al. (2007) obtained egg diameter which varied with fish species and the eggs in the ovaries were not of the same size, the results obtained by these authors were similar to the result obtained in the present work. Ecological observation in *B. nurse*, *H. forskali*, *M. acutidens* and *L. coubie* showed that matured eggs were obtained from June to November. This period coincides with the period of heavy rainfall in Nigeria, therefore, reproduction in *B. nurse*, *H. forskali*, *M. acutidens* and *L. coubie* occurred during the rainy season while a majority of the specimens caught during the dry season (December to April), when there was little or no rainfall, had no matured eggs. The tropics is characterized by abundance of food throughout the year therefore growth of these fishes is not affected by food, however during the season of rainfall the volume of the water in the lake increased due to run-off into the lake. This will be of advantage to the

fishes because the water will not be transparent but cloudy and will not expose the eggs to predators. The use of cast net in fishing may introduce bias in size however since fishing was done throughout the year most of the size groups were caught.

The results obtained from length-weight relationship in the present work indicated positive allometic growth for *H. forskali, B. nurse, M. acutidens* and *L. coubie*. Pervin and Mortuza (2008) obtained exponential value that was less than the one in *Labeo boga*, indicating negative allometric growth. The condition factor obtained by Pervin and Mortuza (2008) for both males and females of *Labeo boga* was 2.66. The condition factor obtained in the present work were slightly higher than the value obtained for *L. boga*. Generally, all the fishes examined were in good condition.

This study has shown that *M. acutiden* employed the strategy of many females than males in the population to ensure their survival while *L. coubie* and *B. nurse* used the strategy of the force of large number of egg to optimize the total number of offspring that survive. It has shown in this study that the spawning season was during the period of rainfall for all the studied species.

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