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Fecundity, Condition Factor and Gonado-Somatic Index of Hepsetus Odoe (African Pike) in a Tropical Reservoir, Southwest Nigeria

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Abstract: Fecundity, Condition factor and Gonado somatic index of the African Pike, *Hepsetus odoe* were studied in Ado-Ekiti Reservoir between September 2009 and December 2009. *Hepsetus odoe* is an important commercial species with high market value. Due to uncontrolled fishing activities in the area, there is need to consider some aspects of the reproductive biology of the species including fecundity, G.S.I. and condition factor (K). Fecundity of *H. odoe* from the study, ranged between a maximum of 4996eggs and a minimum of 387eggs. *H. odoe* is not really fecund in Ado-Ekiti reservoir at the season of the research work. The linear relationship in the length and weight of *Hepsetus odoe* reveals a positive allometric pattern of growth with (b>3). Condition factor K ranged between 0.72 and 1.61 for males while for females it ranged between 0.49 and 1.23. This revealed the condition factor (K) for *H. odoe* in Ado Reservoir is low. Based on the result of this study, there is need for proper management of this species in the reservoir to enhance its productivity.

Key words: Fecundity % Condition factor % Gonado-somatic index % Hepsetus odoe % Reservoir

INTRODUCTION

The African pike, *Hepsetus odoe* (Bloch, 1974) is widely distributed in rivers in Western and Central Africa and also in fresh water Lagoon systems of Africa and this has been attributed to the threat of predation by the larger tiger-fish in the open waters of the main river channel [1-3]. It is the sole representative of the family Hepsetidae. *Hepsetus* is piscivorous, feeding on several species of smaller fish. They lay ambush by hiding out in dense vegetation and lunging suddenly to seize prey, they feed primarily on cichlids and mormyrids [4]. Smaller specimens have been found to eat mochokid catfishes in greater amount than cichlids or mormyrids. *H. odoe* grows to a maximum of 300mm in length but about 200mm is the most common size seen in markets, it attains a weight of around 50 grams [5]. The species is an economically important fish in Nigerian fresh waters and particularly in Ado-Ekiti reservoir where it forms part of the major commercial catch. Despite its importance, a few works have been done on the biology of this species in Ado-Ekiti reservoir including the recent work of [6] based on available information. The author worked on the taxonomy, distribution and occurrence, age, growth, food and feeding habits, morphology of alimentary canal and reproductive biology of this species. There is therefore the need for further research work to be carried out on this species to harness its commercial viability in the area. Ado-Ekiti reservoir is open to fishing activities in which species resident can be over fished, knowledge of the fecundity of this common important species, *Hepsetus odoe* is essential in order to ensure its sustainable production with a view to protecting the species in the reservoir. This study considered the fecundity, the condition factor (K) and the gonado-somatic index (GSI) of the species as well as recommend appropriate steps to ensure sustainable management of the species in the reservoir.

Methodology: Ado-Ekiti reservoir is a tropical reservoir constructed by damming the Ireje river in 1958 primarily for the supply of water for domestic uses and production of fish for the people of area and its environs [7]. It is situated on an undulating plane of an average height of about 440m above sea level and surrounded by high lands. The lake lies between latitude 70° 37[1] North and longitude 5°13[1] East of the equator. Four sampling stations were selected. Station A was close to the dam, B was at the middle while C and D were at the extremes.

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Collection of Fish Samples: Fresh live adult specimens of *Hepsetus odoe* were bought from the fishermen and fish mongers at Ado - Ekiti reservoir. Specimens where kept in Ice block to preserve them to the laboratory.

Laboratory Examination of the Fish: In the laboratory the fish were removed from the Ice block and were washed properly.

Length and Weight Measurement: The length of the fish was measured using a measuring board to the nearest 0.1 cm. The weights were taken on a sensitive balance to the nearest tenth of a gram.

The relationship between the fish standard length and weight was determined using the equation below:

$$W = a+bL$$

Whereas W = weight; L = standard length (cm) 'a' and 'b' are regression constants. This relationship was transformed into a linear form by the equation.

$$\text{Log } W = \log a + b$$

Where W = weight of fish in grams L = standard length of fish in cm 'a' and 'b' are regression constants.

Condition Factor: The condition factor 'K' refers to the relative robustness, or the total well being of the fish. This was calculated for both sexes separately and then for the combine sexes. The method of calculating the 'K' is given as:

$$K = \frac{W \times 100}{L_3} \quad [8]$$

Whereas: W = Weight of fish in grams
L = Condition factor
L = Length of fish in centimetres

Sex Ratio: Sex of each specimen collected was determined by examination of the gonads after dissection and the ratio of male to female calculated.

Fecundity: Fecundity in this study was taken as the number of ripening eggs in a female prior to the next spawning season [9]. Ripe ovaries were used for the estimation.

The method of [10] for gonad classification served as a guide in picking only the ripe ovaries for fecundity estimation. The ovaries were preserved in 5% formalin. The specimen bottles containing the preserved eggs were labelled to show date of collection, standard length, total length, weight of fish and weight of ovary.

The gravimetric method which involves sub-sampling by weight was used in fecundity estimation. Preserved eggs were washed with ordinary water to drain excess preservative and were left on filter paper for about 5-10 minutes after removing any ovarian tissue left. Eggs were then weighed and a sub sample of the egg was weighted and counted. By proportion the total number of eggs in the ovary was calculated.

The linearity of the fecundity - weight relationships were determined using the equation.

$$\text{Log } Y = a + b\text{Log } x$$

Y = Fecundity estimate
X = Weight (g), 'a' & 'b' are regression constants.

Gonadosomatic Index (GSI): The gonadosomatic indices of the gonads were calculated using the formula of [11].

GSI = Gonad weight x 100
Fish weight 1
Gonad weight and fish weight were taken in grams.

RESULT AND DISCUSSION

Length-Weight Relationship: 87 specimens of *H odoe* were examined. Standard length, ranged from 14.3cm to 29.4cm and body weight ranged from 48.2g to 339g. There were 52 females and 35 males. Weight of males was between 48.1 - 339g while that of the female was between 93.20-346.20g. The relationship between length and weight of the specimen is shown in figure 1.

Sex Ratio: The sex ratio revealed more females than males. The ratio of male to female was found to be 1:2

Breeding Season: Throughout the course of the study, it was observed that breeding period starts at the onset of raining season. The fish carries full ovary once a year with peak around May for some and around August for others. During this study the fish were not really carrying full ovaries in which case, most were at gonad stage 3.

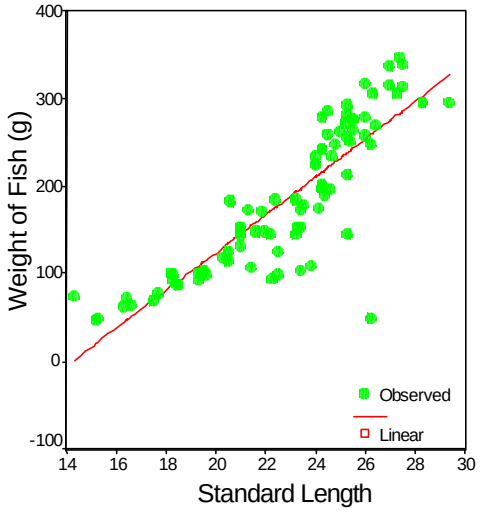

Fig. 1: Relationship between Weight and Standard Length

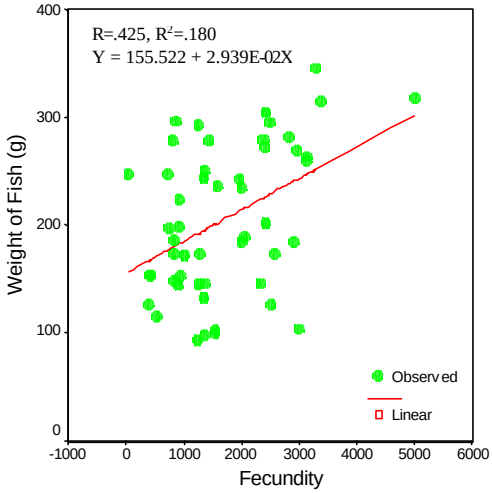

Fig. 2: Relationship of Weight of Fish and Fecundity of female *H .odoe* from Ado-Ekiti Reservoir

Condition Factor 'K': The mean condition factor "K" ranged between 0.72 and 1.61 for the males while in the females, it ranged between 0.49 and 1.23.

Gonadosomatic Index (GSI): The GSI result calculated shows that fish of gonad stage 1 were not used in this study and there was a gradual increase from stages II and III. A fall in stage IV shows that a few specimens fell within this stage. At stage V no specimen was recorded due to the season.

Fecundity: The fecundity of *Hepsetus odoe* ranged between 387 eggs to 4996eggs, the mean fecundity was 1707. A high correlation was obtained between fecundity

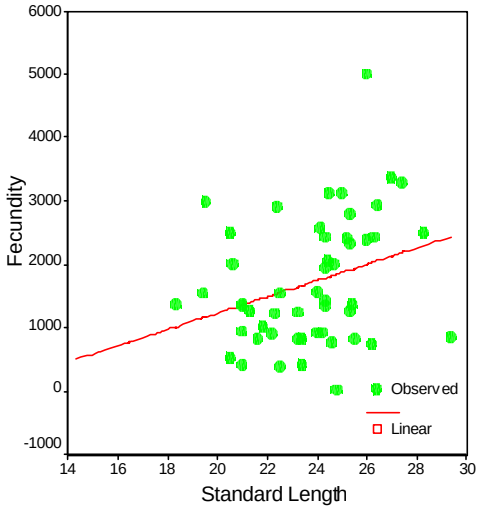

Fig. 3: Relationship between Fecundity and Standard Length of female *H. odoe* from Ado-Ekiti Reservoir.

and standard length (r = 0.304, P<0.00) and between fecundity and fish weight (r = 0.425, P<0.001). The relationship between fish weight and fecundity is expressed in figure 2 with low correlation between the parameters. Also figure 3 describes the relationship between length and fecundity which shows a low significant positive relationship.

A low positive relationship between standard length and gonad weight was obtained as shown in figure 4; while the relationship between fecundity and weight of gonads shows a high positive correlation (Figure 5).

Statistical analysis of the length-weight data showed that *H. odoe* male and female and combined sexes exhibited positive allometric growth in Ado - Ekiti Reservoir, since the value of b (the exponent) of the regression equation representing their length - weight relationship was greater than 3. This finding is similar to that of [6] on *H odoe* as well as [12] on *Sarotherodon galilaeus* in the same reservoir, suggesting that the reservoir is a good production site for fishes. [13] reported that *Oreochromis niloticus* in Ero Reservoir had a length - weight relationship b<3, i.e. the fish showed an isometric growth pattern. [12] also reported growth pattern in *Sarotherodon galilaeus* in Ado-Ekiti reservoir in which case the value of 'b' was less than 3.0.

Condition Factor: The mean condition factor K in males (1.17) was higher than in females (0.86). Wotton [14] reported that fish with higher 'K' values are in a better condition than fish with lower 'K' values.

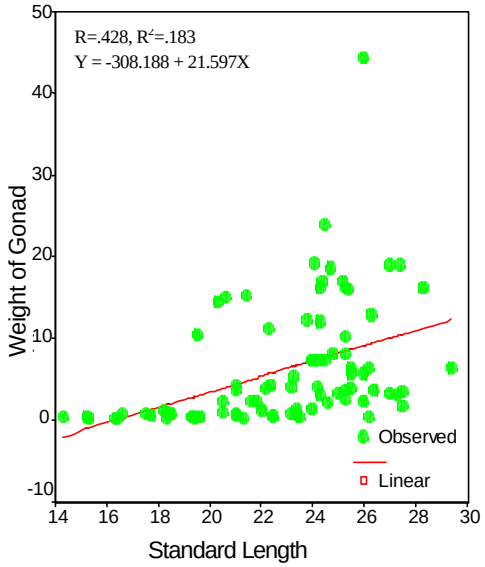

Fig. 4: Relationship between Weight of Gonad and Standard Length

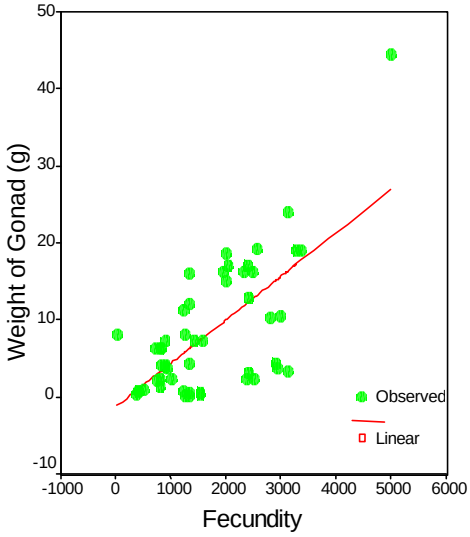

Fig. 5: Relationship of Gonad weight and Fecundity of female *H .odoe* from Ado-Ekiti Reservoir

From the combined sexes, the condition factor agreed with the result gotten by [6] whereas she related the higher value of 'K' in the males to their feeding intensity which is higher than the females. [13] reported low K values for *Clarias gariepinus* in Ero reservoir. During the research other species of fish were seen and this suggests that there is high competition between the species for food and other material needed for proper growth or for the robustness of the fish. Condition factor was more related to weight than length showing that weight of fish is a better measure to the state of well being of fish than length. Since bigger fish is better conditioned than smaller ones, then males of *H odoe* were in better condition than the females in Ado - Ekiti reservoir.

Fecundity: The sex ratio in this study was 1:2 (male - female) which shows that there were more females than males. Although [15] reported that a successful reproductive strategy required the maintenance of 1:1 male - female ratio, the sex ratio obtained in this study (1:2) still falls within reasonable limit for the sustainable production of the species in Ado-Ekiti Reservoir. All the four maturation stages occurred throughout the study except the spent stage (stage v). Breeding in *H odoe* was observed to mostly occur during rainy season. However from the study it was seen that *H odoe* bred both during rainy and dry seasons in the reservoir, only that breeding levels reduced during the dry season. The sex ratio obtained in this study agreed with the report of [13]. The author recorded a sex ratio of 1:3 (males-female) of *O niloticus* in Ero reservoir. The relationship between fecundity and weight and relationship between fecundity and length represented in figures 4 and 5 respectively reveals that weight is more related to fecundity than length, although both have a positive relationship with fecundity. This agrees with the report of [13]. Higher GSI values recorded in female specimens may be due to additional weight gain of ovary in the breeding period as a result of accumulation of yolk and due to uptake of fluid by ripe oocyte [6].

Food availability is an important factor that affects fecundity as reported by [16] shortage of which may cause low fecundity. The low fecundity of *H odoe* ranging from 387eggs - 499eggs could be as a result of high competition for food in the ecosystem.

Conclusion/ Recommendation: Based on the findings of this research it is evident that the well being of the fish is poor and this may have accounted for the low fecundity of the species under consideration. Availability of food may be a limiting factor as food plays a key role in the general well being of fish in the aquatic environment. Therefore there is need for an efficient management system to enhance fish productivity particularly *Hepsetus odoe.*

It is therefore recommended that fertilization of the reservoir should be done to enhance the growth of food (Plankton) also regulation of access of fisher men and other casual operators in the reservoir should be considered as well as gear regulation. All these will require surveillance and enforcement.

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