

Growth Patterns and Condition Factor of *Hepsetus odoe* (Bloch, 1794) Captured in Eleyele Lake, Southwest Nigeria

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Abstract

Hepsetus odoe is a commercially valuable fish and is considered as endemic to Nigeria. The growth patterns and condition factor of *Hepsetus odoe* from Lake Eleyele, Oyo State were investigated as an aspect of its biology essential for bringing it to culture. A Total of 205 specimens (55 and 150, males and females, respectively) were collected between June, 2012 and August, 2012. The morphometric indices such as Total Length (TL), Standard Length (SL), Body Weight (BW) and Stomach Weight (SW) were assessed using standard methods. Also, the length-weight relationship ($W=aL^b$) and Condition factor ($100W/L^3$) were calculated. Sex ratio of 1:3 (Males and Females) was obtained which shows a female dominated population. The Standard length (SL) and body weight (BW) ranged from 16.60-30.50 cm and 51.0-250.0 g respectively. Length-weight relationship equations were calculated as:

$$\text{Log BW}=2.051+3.105\log \text{SL} \quad (r=0.93)$$

This analysis showed significant relationship between the standard length, body weight and stomach weight. The relative condition factor (Kn) calculated ranged from 0.99-2.14 while the mean K value was 1.24. The condition factor fall within the range recommended for freshwater fish species in the tropics. The growth pattern indicates that the fish follows cube law and exhibited positive allometry growth. This information provides important tool in fishery management and guide for future culture trials.

Keywords: *Hepsetus odoe*; Length-weight relationship; Allometry; Condition factor; Eleyele Lake

Introduction

Eleyele dam, an artificial lake constructed in 1942 supports fish consumption and conservation in South-west, Nigeria. Although, the quest to create a modern water supply system to meet the challenge of water scarcity for the emerging Ibadan metropolis led to the construction of Eleyele Dam on the main River Ona with a reservoir storage capacity of 29.5 million litres [1]. The lake experiences both dry and rainy seasons typical of tropical environment. Adebisi documented families like Cichlidae, Channidae, Gymnarchidae, Latidae, Hepsetidae, Clariidae, Osteoglossidae, e.t.c., as fauna resources of the lake [2]. Among these resources, *Hepsetus odoe* form an important fish species of commercial fish resources whose bionomic has not been adequately studied.

H. odoe (Bloch, 1794) commonly known as African pike remain the sole representative of the family Hepsetidae. The species is widely distributed around Western and Central Africa [3]. It inhabits slow and shallow waters of rivers in the plains as well as estuaries and a variety of other freshwater habitats. *H. odoe* is piscivorous, feeding on several species of smaller fish by laying ambush in dense vegetation, and they feed primarily on cichlids and mormyrids [4]. The African pike is a highly priced freshwater food fish species in Nigeria especially in the

riparian community Nigeria, principally because of its availability (all year round), affordability, tasteful flesh, economic and nutritional value [5]. A medium size African pike contain 26.2% protein, 18.2% fat, 7.5% carbohydrate, 7.7% ash, 1.3% fibre and 128.5 µg/g [6]. This species prefers quiet and deep water, can reach up to about 70 cm in length and 4 kg in weight [7]. *H. odoe* form a significant part of commercial catches in Eleyele Lake but unfortunately little or no work has been reported on this specie from the Lake.

The study of length-weight relationships (LWRs) and condition factor of fishes has manifold importance in fisheries and fish biology. As much as LWRs provide valuable information on the habitat where the fish lives, it can also provide important clues on climatic and environmental changes and the change in human subsistence practice [8]. For effective fishery management and successful fish farming, knowledge of the growth patterns and condition factor is necessary. Hence, this study investigates the length-weight relationships and condition factor of *H. odoe* for effective management, sustainable exploitation and as a prelude to make it an aquaculture candidate.

Materials and Methods

Site description

Lake Eleyele is situated in North-west of Ibadan, Oyo State, Nigeria (Figure 1). The elevation is relatively low ranging between 100-150 m

above sea level and surrounded by quartz-ridge hills toward the downstream section where the dam barrage is located. A number of stream channels serve as feeding/recharge streams to the Eleyele wetland basin. The lake has a surface area of 546 km² with a mean depth of 6.0 m. The widest and narrowest arm of the lake is about 250 m and 20 m respectively, having forest reserve with much vegetation stretch on each side. Eleyele Lake is usually flooded with the water-level rising during early period of rainy season. It covers some parts of Ijokodo, Apete, Awotan, Ologun-eru, Agbaje, Idi-osan, Polytechnic of Ibadan and Eleyele area with the rural fishing communities mostly dominated by Ilaje and Yorubas. Human activities in the area include fishing, farming, agro processing and boat traffic.

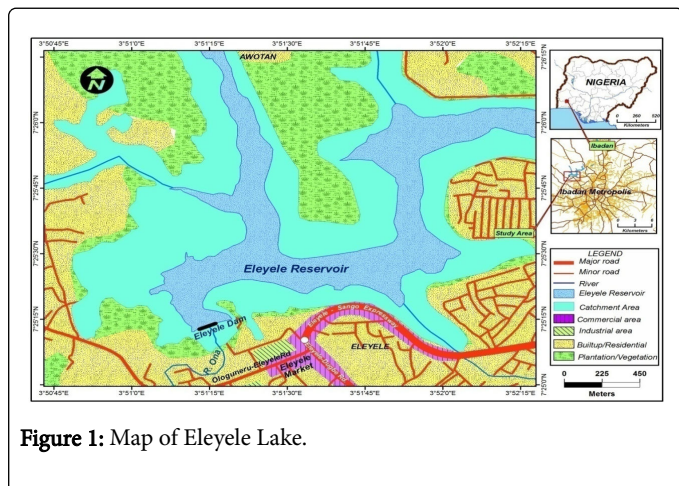


Figure 1: Map of Eleyele Lake.

Collection of sample

Samples of *H. odoe* for the study were collected fortnightly during June, 2012 to August, 2012 from catches landed by artisanal fishermen using baited longlines and gill nets of different mesh sizes. Two hundred and five (205) specimens of *H. odoe* were sampled, with length and weight ranging from 20.3 to 35.8 cm and 51.0 and 250.0 g respectively. Of the total number of specimens, 55 were males and 150 were females.

Morphometric measurements include Total Length (TL) and Standard Length (SL) (to the nearest cm) and Body Weight (BW) (to the nearest g) of each specimen were measured after blotting off water from their body. The TL was taken from the tip of the snout (mouth closed) to the extended tip of the caudal fin, and SL from mouth tip to the mid-point of caudal fin origin using a measuring board while BW was measured using a top loading Metler balance [9,10].

Length-weight relationships were estimated using the equation $W=aL^b$, where W is the total wet weight (g), L is the standard length (SL, cm), and a and b are the equation parameters calculated by the least squares method. To determine significant differences from the isometric value of b=3, and another t-test was applied. The condition factor which shows the degree of well-being of the fish in their habitat was determined by the formula: Condition Factor (K) = $\frac{100W}{L^3}$ [11].

where W=weight in g, and

L=length in cm

Results

The length-weight frequency distribution of *H. odoe* sampled from Lake Eleyele is shown in Table 1. Similarly, the total length frequency of specimen was illustrated in Figure 2. The males were found to range from 20.3 to 31.9 cm in total length and total weight was ranged between 51.0 to 219.0 g.

Sex	n	Standard length (cm)			Body weight (g)		
		Min	Max	Mean ± SD	Min	Max	Mean ± SD
Males	55	16.6	26.2	19.7 ± 5.43	51	219	109.5 ± 50.8
Females	150	17.8	30.5	23.2 ± 7.64	95	250	127.4 ± 45.3
Combined sex	205	16.6	30.5	22.1 ± 6.53	51	250	119.8 ± 36.8

Table 1: Length-weight relationship of *Hepsetus odoe* in Lake Eleyele. where n=Number of fish sampled, SD = Standard Deviation.

In case of females, the TL and BW were ranged from 21.8 to 35.8 cm and 95.0 to 250 g respectively. The mean TL for male was calculated as 22.3 ± 7.14 cm and the mean BW calculated 109.5 ± 50.8 g (N=55). For female, the mean TL and BW were calculated as 23.6 ± 6.3 cm and 127.4 ± 45.3 g (N=155) respectively. Also, the mean SL calculated for the species are, Males 19.7 ± 5.43 cm, Females 23.2 ± 7.64 cm and Combined sex 22.1 ± 6.53 cm. The length-weight relationship for the sampled fish is expressed by the regression equation:

$$\text{Log BW} = -2.051 + 3.105 \text{ Log SL} \quad (r = 0.93).$$

Log length against log weight revealed a linear relationship hence there is a direct proportionality between the log length and log weight.

Sex	n	Standard length (cm)			Stomach weight (g)		
		Min	Max	Mean ± SD	Min	Max	Mean ± SD
Males	55	16.6	26.2	19.7 ± 5.43	0.5	2.5	1.2 ± 3.56
Females	150	17.8	30.5	23.2 ± 7.64	0.5	4.5	2.1 ± 5.33
Combined sex	205	16.6	30.5	22.1 ± 6.53	0.5	4.5	1.7 ± 6.0

Table 2: Length-stomach weight relationship of *Hepsetus odoe* in Lake Eleyele. n=Number of fish sampled, SD=Standard Deviation.

The SW of *H. odoe* ranged from 0.5 g to 4.5 g (Table 2). The length-stomach weight relationship was calculated as:

$$\text{Log STWT} = -3.487 \pm 2.787 \text{ Log SL} \quad (r = 0.24).$$

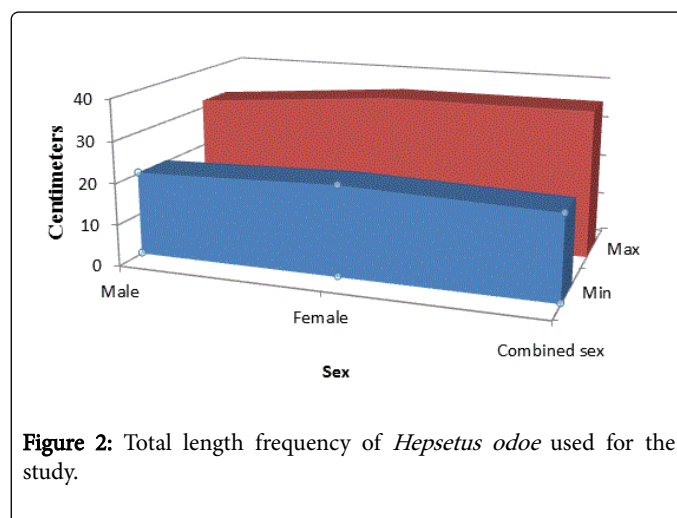


Figure 2: Total length frequency of *Hepsetus odoe* used for the study.

The Condition Factor (K) ranged between 0.99 to 1.24 for all the sexes (Table 3). The result showed that the females were significantly ($p < 0.05$) larger than males.

Sex	Condition factor (K)	Mean value
Males	$\frac{\sum K}{n} = \frac{67.52}{55}$	1.23
Females	$\frac{\sum K}{n} = \frac{185.65}{150}$	1.24
Combined sex	$\frac{\sum K}{n} = \frac{253.17}{205}$	1.24

Table 3: Condition factor of *Hepsetus odoe* in Lake Eleyele, Nigeria. where $\sum K$ =Summation of condition factors, n =Number of fish samples used.

Discussion

Length-Weight relationship is an effective tool for proper exploitation and management of the population of fish stock. According to Nagesh, LWRs have a significant importance in studying the growth, gonadal development and general well-being of fish population [12]. In the present study, the relationship between the standard length (SL) and the body weight (BW) of *H. odoe* shows a significant difference of 0.97 ($p < 0.05$). Also the significant difference of 0.49 was obtained as a relationship between the body weight (BW) and the stomach weight (STWT) of the species. This indicates that the standard length of the *H. odoe* increases as the body weight increases. Likewise, stomach weight increases as the body weight of the species increases. This shows that the growth pattern of the fish is allometric as indicated by the correlation coefficient (3.105). This result conformed to the findings of Adedokun who reported positive allometric growth in *Hepsetus odoe* in Ogbomoso reservoir [13]. Similar findings in *H. odoe* were reported by Idowu and Oso from Ado-Ekiti reservoir, Nigeria, with positive allometric, b value greater than 3 [14,15]. The Length-weight relationship of *H. odoe* in Eleyele Lake is also similar to that of other species in Nigeria water bodies. Nigeria. Ekelemu and Samuel recorded 3.03 for *Heterotis niloticus* in Ona lake, Bernard documented 3.04 for *Oreochromis niloticus* in Egah River while Ayoade and Ikulala found 3.34 for *Chromidotilapia guentheri* in Eleyele Lake [16-18]. However, Ayoade and Ikulala reported negative allometric growth patterns for *Sarotherodon melanotheron* and *Hemichromis bimaculatus* in Eleyele Lake [18].

Bagenal opined that a fish living in a favourable environment in term of food availability and good environmental conditions grow faster with " $K \geq 1$ " [19]. The mean condition factor of 1.24 was obtained for *H. odoe* captured in Eleyele Lake. This result is consistent with the findings of Adedokun and Winemiller who recorded mean condition factor of 1.58 and 1.25 for *H. odoe* captured in Ogbomoso reservoir and River Zambezi, respectively [4,13]. Balogun also reported a mean condition factor of 1.23 for *H. odoe* in Asejire reservoir [20]. Comparing K values in this study with other species, it was observed that this value varies from >1 to <1 . Abowei, reported 0.99 for *Ilisha africana* in Nkoro River, Kalu obtained 0.76 for *Clarias gariepinus* in

Lake Alau, Ikongben found 1.62 for *Bagrus docmac* in Lake Akata while Ayoade documented 1.11 for *Labeo oguensis* in Asejire Lake [21-24]. The condition factor value for male *H. odoe* (1.23) is lowered than that of the female (1.24). This agrees with the results obtained by Ugwumba and Idowu for male (1.23) and female (1.24) *H. odoe* in Ado Ekiti reservoir [9]. This indicates that females were in better condition than males during study period. This could be as a result of fatness and egg development in the females and hence increase in body weight.

Conclusion

This study has made available information on growth patterns and condition factor of *H. odoe* from Lake Eleyele. Also, significant relationships were established between the fish body weight, standard length and stomach weight. Based on the findings of this research, it is evident that the growth of *H. odoe* is positively allometric, therefore efforts should be directed to maintain and sustain the environmental condition of the lake for continuous thriving of this species and others.

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