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Research Article

Biology of Length-Weight Relationship and Condition Factor of Some Cichlids in Eleyele Lake, Oyo State, Nigeria

Adeosun Olubunmi*, Bankole Adebukola Folake, Otuogbai Irene Omokhafe

Department of Fisheries Technology, Oyo State College of Agriculture, Igboora, Nigeria

***Corresponding author:** Adeosun Olubunmi, Department of Fisheries Technology, Oyo State College of Agriculture, Igboora, Nigeria. Tel: +2347033832479; Email: moriyike2006@yahoo.com

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Abstract

The study was carried out to evaluate length-weight relationship and condition factor of five species of cichlids found in Eleyele Lake. Five species that were found throughout the study period are *Tilapia zilli, Tilapia guineensis, Hemichromis fasciatus, Oreochromis niloticus* and Sarotherodon melanotheron. The relationship between the length and weight of the fish species showed that they are allometric in growth and this implies that the fish species did not increase in weight faster than the cube of their lengths. The mean condition factor for the five species is 2.8 for Tilapia zilli, 2.3 for Sarotherodon melanotheron, 2.7 for *Tilapia guineensis*, 2.2 for Oreochromis niloticus and 2.1 for *Hemichromis fasciatus*. The study revealed that *Hemichromis fasciatus* and *Oreochromis niloticus* and *Tilapia zilli* dominated the lake during the study period.

Keywords: Cichlids; Condition factor; Length-Weight Relationship

Introduction

Growth fluctuations are more frequent in fishes of tropical subtropical water bodies due to several factors such as environmental variations, multiple spawning, dynamics of food compositions, physiological changes etc. Growth of fish is a mathematical function of length and weight and varies due to biological changes and seasonal dynamics [1]. The study of length weight relationship in fishes is of primary importance in setting up equations in estimating the number of fish landed as well as in comparison of population in time and space. The length-weight relationship of fish is an important fishery management tool. Its importance is pronounced in estimating the average weight at a given length group and in assessing the relative well being of a fish population [2]. Condition factor compares the well being of a fish and is based on the hypothesis that heavier fish of a given length are better-condition [3]. Condition factor has been used as an index of growth and feeding intensity.

Oyo State is completely land-locked and has no access to the sea. However, it is endowed with natural large water surface area and its domestic fish production is derived mainly from rivers, lakes and reservoirs (Dams) etc. Prominent among such water bodies are those lakes built by the water corporation of Oyo State and are located in various parts of the state (Table 1). Others include 14 lakes built by OYSADEP (Oyo State Agric. Development Programme): 1 by IITA: 1 by Railway Corporation: 3 by Ogun-Osun River Basin Development Authority (OORBDA) and 1 Natural lake at Ibusogbooro in Oyo West Local Government Area (Odo-Ogun). These lakes totaled 28 and covered a total water surface area of 10,175.19 hectares with 1,152 fisher folks, 962 canoes as at 1999 and 2,433.02 tonnes of fish were landed as at 2000 [4]. Therefore, the objectives of the study are to evaluate length-weight relationship and condition factor of five fish species in Eleyele Reservoir and investigate the species that is abundant during the study period.

Materials and Methods

The Study Area

The study was conducted at Eleyele reservoir, Ibadan Oyo State. Nigeria. The temperature of the area ranges from 25°C-30°C and the Longitude7°23'49"N, Latitude 3°52'2"E. Eleiyele reservoir was constructed by the Water Corporation of the old Western Region in 1939 primarily to supply water to Ibadan city by darning of the river Ona which itself covers a distance of 62Iun from its source to the dam. It has a surface area of 152.76ha and a storage capacity of 1550 million gallons; a maximum depth of 12m, and a

mean depth of 6.5m. Its basing is long and narrow and divided into two main stretches, with the narrowest part slightly over 20m and the widest slightly above 250 m. The dam receives water during the rainy season principally from the River Ona and other associated small streams, in addition to water from run-offs. The control of the fisheries of Eleiyele reservoir resides in the Oyo State Ministry of Agriculture and Natural resources acting through its Department of Fisheries. The Department of Fisheries exercises its powers under the relevant laws to formulate by-laws and regulations for the development, exploitation, management and protection of the fishery resources [4].

Experimental design

Fish specimens were procured from artisanal fishers and middlemen at the landing site. Sampling of landed catches was done once a month for a period of six months. The fishers used a range of fishing gear such as gill net, cast net set nets and traps. From the catches the fish specimens that were abundant were selected and kept in insulated containers for onward transportation to the department laboratory for further analysis.

Length-Weight relationship and Condition Factor of fish

The total length of the fish was measured from the tip of the mouth to the caudal fin using meter rule calibrated in centimeters. Fish were measured to the nearest centimeter. Fish weight was taken using a sensitive scale to the nearest gram. The mean length and weight of the different species were used for data analysis.

The relationship between the length (L) and weight (W) of fish was expressed by equation (Pauly, 1983) [5].

$$W = aL^b$$

Where

W = weight of fish in (g)

L = total length (TL) in (cm)

a = constant (Intercept)

b = the length exponent (Slope)

The 'a' and 'b' values were obtained from a linear regression of the length and weight of fish. The correlation 'r' that is the degree of association between the length and weight was computed from the linear regression analysis.

$$R = r^2$$

The condition factor (K) of the fish specimen was estimated from the relationship

$$K = \frac{100W}{L^3}$$

Where

K = condition factor

W = weight of fish (g)

L = length of fish (cm)

Analysis of Data

Regression analysis was performed to determine the relationship between length and weight of fish.

Results and Discussion

Fish Species in Eleyele Reservoir

Fish species that were found throughout the study period are *Tilapia zilli, Sarotherodon melanotheron, Tilapia guineensis, Oreochromis niloticus* and *Hemichromis fasciatus* Other fish species that were captured once or twice during the study period are *Hespetus odoe, Hemichromis elongates, Clarias gariepinus, Heterotis niloticus* and *Tilapia galileaus*. Akinyemi et al. (1986) [6] observed that fishing was done in Eleyele reservoir only during the dry season months of November to April and from visual observation and identifications of fish landing made by cooperative fishermen, they found out that the Cichlidae were most abundant and were dominated by *Oreochromis niloticus*, *TIlapia zilli* and *Hemichromis fasciatus*. The results obtained from this study also corroborate with the findings of Akinyemi et al. (1986) [6]. They also found out that in most cases, species of *Hemichromis bimaculatus* and *Hemichromis fasciatus* were observed to be thrown back into the reservoir by the fishermen whenever they were encountered in the catch but now all their catches were sold to the fish mongers.

Length-Weight relationship

The Length-weight relationship of the five fish species most abundant during the study period is presented in table1. The relationship between the length and weight of the fish species showed that they are allometric in growth and this implies that the fish species did not increase in weight faster than the cube of their lengths. Fish are said to exhibit isomeric growth when length increases in equal proportions with body weight for constant specific gravity. The regression co-efficient for isometric growth is '3' values greater or lesser than '3' indicate allometric growth (Gayando and Pauly, 1997) [7]. Several authors have reported both isometric and allometric growth for different fish species from various water bodies. King reported allometric growth for *Tilapia* species from Umuoseriche Lake. Abowei et al. (2009) [2] reported isometric growth for *Ethmalosa Fimbriata, Illishia* Africana and allometric growth for *Sardinella. maderensis* and *Cynoglossus sengalensis* from Nkoro river, Niger state.

Fish Species	Exponential equation	R^2	K
Tillapia zilli	$W = 777.6e^{-0.27TL}$	0.870	2.8
Sarotherodon melanotheron	$W = 89.63\ e^{0.309TL}$	0.437	2.3
Tilapia guineensis	$W = 424.7\ e^{0.015TL}$	0.025	2.7
Oreochromis niloticus	$W = 195.3e^{0.015TL}$	0.079	2.2
Hemichromis fasciatus	$W = 154.2e^{0.108TL}$	0.880	2.1

Table 1: Length-Weight relationship for the five species of Cichlids found in Eleyele reservoir

Condition factor

The graphical representation of the condition factor of each species studied is shown in figs. 1,3,5,7 and 9. The condition factor ranged from 2.2 to 3.9 for *Tilapia zilli*, 1.7-3.0 for *Sarotherodon melanotheron*, 1.8-5.3 for *Tilapia guineensis*, 1.8-2.5 for *Oreochromis niloticus* and 1.5-2.8 for *Hemichromis fasciatus*. There was difference in the condition factors for the combined fish and the monthly factor for each fish species studied. The condition factors obtained in this study is very close with the results obtained from other studies. Hatikakoty and Biswas (2004) [8] reported mean condition factor between 1.48 and 2.89 for *Oreochromis mossambicus* in different seasons.

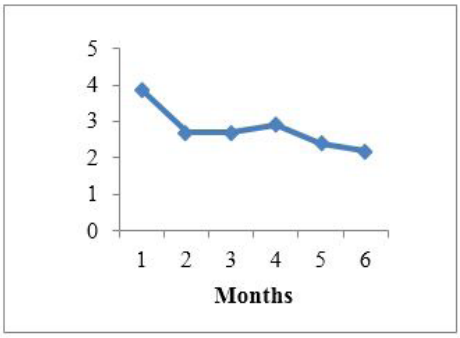

Figure 1: Condition factor of *Tilapia zilli*

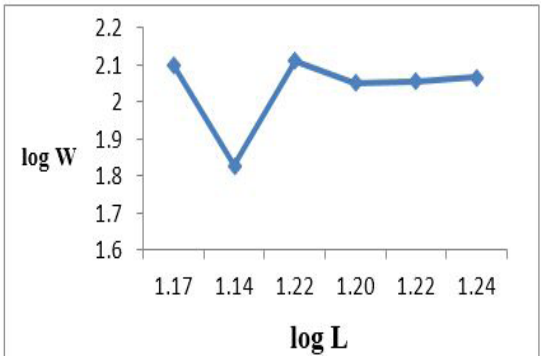

Figure 2: Length-Weight relationship of *Tilapia zilli.*

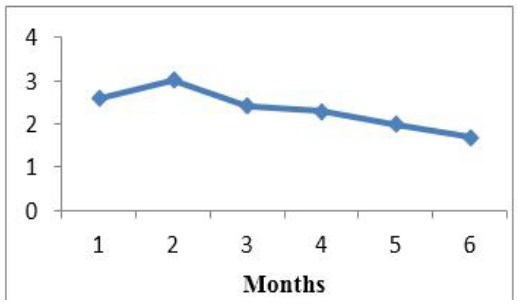

Figure 3: Condition factor for *Sarotherodon melanotheron.*

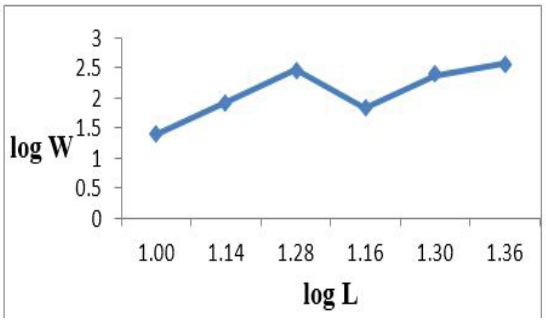

Figure 4: Length-Weight relationship for *Sarotherodon melanotheron.*

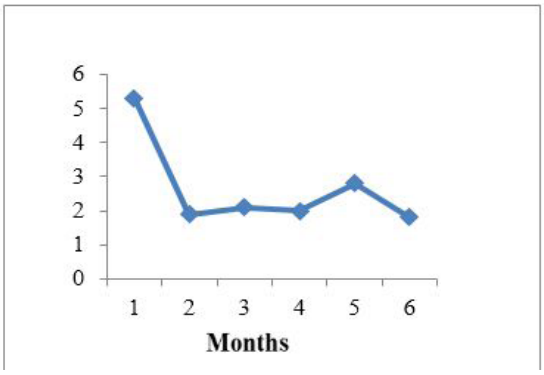

Figure 5: Condition factor for *Tilapia guineensis.*

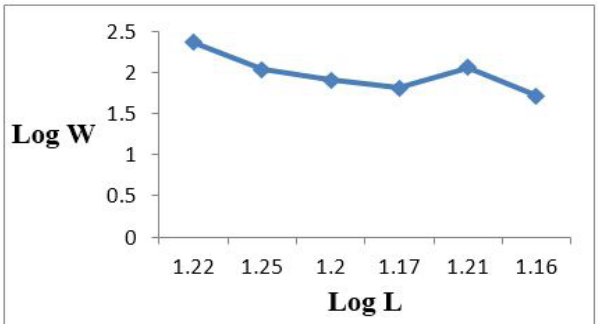

Figure 6: Length-weight relationship of *Tilapia guineensis.*

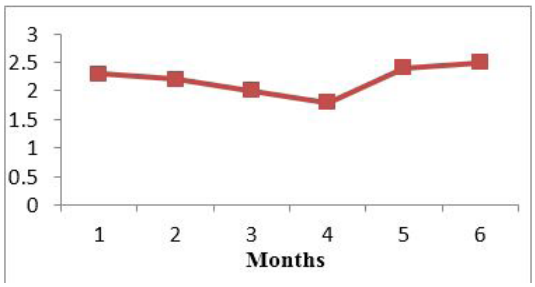

Figure 7: Condition factor for *Oreochromis niloticus.*

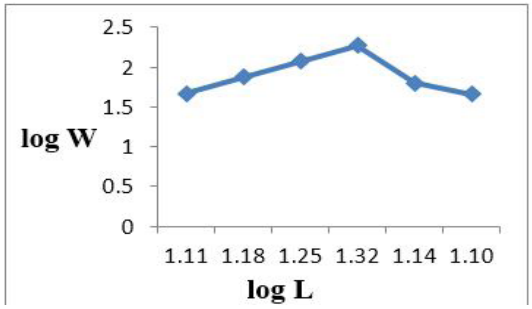

Figure 8: L-W Relationship of *Oreochromis niloticus.*

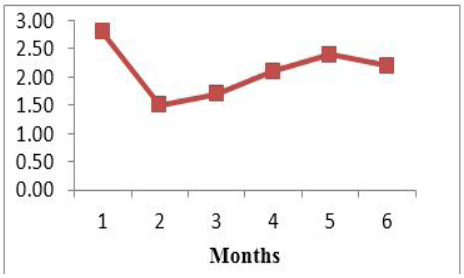

Figure 9: Condition Factor for *Hemichromis fasciatus.*

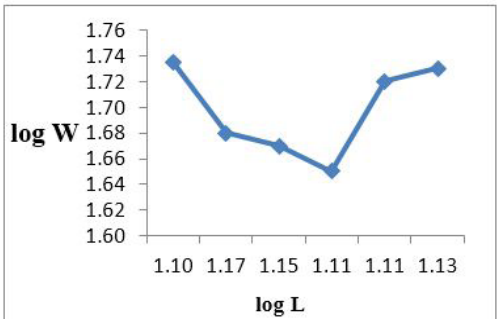

Figure 10: L-W relationship of *Hemichromis fasciatus.*

Conclusion

The value of condition factors obtained in this study showed that all the species studied were in good condition. Gayando and Pauly (1997) [7] reported that certain factors often affect the well being of a fish. The factors include data pulling, sorting into classes, sex, stages of maturity and state of the stomach [9].

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