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# Growth Pattern and Condition Factor (K) of Four Dominant Fish Species in Ero Dam in Ekiti State, Nigeria

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**Abstract:**

Growth pattern and condition factor (K) of four (4) dominant fish species in Ero Dam, Ekiti State, Southwestern Nigeria were considered in this study. A total of 90 fish specimens of *Clarias gariepinus*, *Heterotis niloticus*, *Oreochromis niloticus and Heterobranchus bidorsalis* were randomly procured from the local fishermen at the landing site. The parameters 'a' and 'b' were determined from the linear regression of the log length and log weight of fish when transformed into the growth equation, $W= aL^b$. The values of b for the fishes ranged from -0.294 to 0.408 and this shows that all the fishes collected from the dam displayed negative allometric growth pattern. The condition factor (K) ranged between 0.9455-4.3457 for the species studied. The 'K' value for *O. niloticus* fell within the recommended range described as suitable for matured fresh water species in the tropics while the other three species had values which were either close to or greater than 1. The difference in values may be attributed to variation in weight of individual fish sampled as well as the stage of maturity among other factors. It can be concluded that fish species thrive well in their habitats. However, the environment appeared more favourable for *O. niloticus* than other species in this present study.

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## 1. Introduction

Growth pattern is a change in magnitude which could be in size (weight and length) and is a morphometric feature which deals with body proportion. In fishery management, the importance of length–weight relationship according to some authors include allowing the conversion of growth in length equations to growth in weight for use in stock assessment models (Abowei *et al*., [1], Alex *et al*., [2]; Moradinasab *et al*., [3], estimation of biomass from length observations (Levent *et al*., [4]), estimate of the condition of the fish (Abowei *et al*., [1]; Moradinasab *et al*., [3]). It is helpful in studying the natural history of fishes, Levent *et al*., [4], and also useful in monitoring the state of health of fish species, Victor *et al*., [5]. Fishes, especially those of tropical and sub-tropical water systems are known to experience growth fluctuations due to many factors such as environmental changes, changes in the food composition and chemical properties of the aquatic medium. Therefore, condition factor is crucial for determining the health of population under consideration. It can alert a fish culturist at the onset of disease, stress due to overcrowding, feeding condition and intensity, water quality parameters, influence on the reproductive cycle or other physiological effects before high mortality rates are suffered (Petrell *et al*., [6]; Alex *et al*., [2]; Victor *et al*., [5]). Fagade [7] opined that condition factor can be used as an index of growth i.e. it decreases with increase in length. According to Riedel *et al*. [8], fish can attain either isometric growth, negative or positive allometric growth. Several studies have been done on length-weight relationship and condition factor of Nigeria freshwater fish species. Abowei [9], worked on five fish species from Nkoro River in the Niger Delta; Fafioye and Oluajo [10], five species inhabiting Epe Lagoon (Lagos); Ndimele *et al*. [11] on *Sarotherodon melanotheron* from Ologe Lagoon (Lagos); Kumolu-Johnson and Ndimele [12] for 21 fish species found in Ologe Lagoon (Lagos); Bolarinwa and Popoola [13] considered six fish species in Ibeshe waterside area (Lagos Lagoon); and Akombo *et al*. [14] studied four fish species from Lower Benue River (Makurdi). Considering the available information on the dam being investigated, there is a dearth of information on growth pattern and condition factor of the resident fish species. This study therefore aims at investigating the growth pattern and condition factors of four dominant fish species in Ero Dam, Ekiti State, Southwestern Nigeria

## 2. Materials and Method

### 2.1. Study Area

The area under study is Ero Dam situated at Ikun-Ekiti, Ekiti State, South-western Nigeria. Geographically, it lies between longitude 5°31" of the Greenwich meridian and latitude 7°35" of the equator. The dam is constructed on Ero River which takes its source from the highland region of Orin-Ekiti in Ido-Osi Local Government.

### 2.2. Sample Collection and Laboratory Procedures

Samples were procured randomly from the local fishermen at the study site. Two types of fishing gears, cast net of 64mm mesh size and fish basket locally called "manly" were used by the fishermen. Samples were transported in coolers containing ice blocks to the laboratory in the Department of Zoology and Environmental Biology, Ekiti State University, Nigeria for identification and further analysis. Samples were mopped with filter paper prior to measurement to remove excess water from their body surfaces and to ensure accuracy. Four fish species namely *Clarias gariepinus*, *Heterotis niloticus*, *Oreochromis niloticus* and *Heterobranchus bidorsalis* were identified. Weight and length of individual fish were measured to the nearest 0.1g and 0.1cm respectively. Standard length was measured from the tip of the snout (mouth closed) to the tip of the hypural bone (urostyle).

### 2.3. Data Analysis

Growth pattern for length-weight relationship of the species was determined using the equation,

$W= aL^b$

Where: W = Weight of fish in grams (g)
L = Standard length of fish in centimeters (cm)
a = Intercept of the regression
b = Regression coefficient (slope) [15]

The "a" and "b" values were obtained from the linear regression of the log length and log weight of fish. When b is equal to three (3), isometric pattern of growth occurs but when b is not equal to 3, allometric pattern of growth occurs which may be positive if >3 or negative if <3. The correlation ($r^2$)

that shows the degree of association between the length and weight was computed from the linear regression analysis:

$R = r^2$

The mean weight and length of the experimental fish were used to estimate the condition factor using the equation:

$$K = \frac{100W}{L^3} \quad (1)$$

Where: K = Condition factor

W = Weight of fish in grams (g)

L = Standard length of fish in centimeters (cm) [15]

The "a" and "b" values were obtained from the linear regression of the log length and log weight of fish.

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$R = r^2$

The mean weight and length of the experimental fish were used to estimate the condition factor (K) which shows the degree of wellbeing of the fish in their habitat using the equation:

$$K = \frac{100W}{L^3} \quad (2)$$

Where: K = Condition factor

W = Weight of fish in grams (g)

L = Standard length of fish in centimeters (cm) [15]

## 3. Results

Table 1 shows the ranges and mean values of standard length and weight of fish species studied. The standard length (SL) ranged from 19.8-32.5cm, 14.2-30.6cm, 10.3-17cm and 10.7-26.2cm for *C. gariepinus, H. niloticus, O. niloticus and H. bidorsalis* respectively while the body weights obtained for the four fish species ranged from 110-680g, 70.6- 178.5g, 55-177.3g and 58.5-177.3g for *C. gariepinus, H. niloticus, O. niloticus* and *H. bidorsalis* respectively.

Table 1: The ranges and mean values of standard lengths and body weights of four fish species

| Fish Species | Standard length (cm) | | Body weight (g) | |
|---|---|---|---|---|
| | Range | Mean | Range | Mean |
| *C. gariepinus* | 19.80- 32.50 | 25.29 | 110-680 | 212.20 |
| *H. niloticus* | 14.20- 30.60 | 23.69 | 70.6-178.5 | 125.70 |
| *O. niloticus* | 10.30- 17.00 | 13.68 | 55- 177.3 | 111.19 |
| *H. bidorsalis* | 10.70- 26.20 | 16.45 | 58.5-177.3 | 123.11 |

The length-weight relationship and condition factors of the four fish species are shown in Table 2. A total of 90 specimens were obtained from the dam during the research period with individual number of 25, 10, 35 and 20 for *C. gariepinus, H. niloticus, O. niloticus and H. bidorsalis* respectively. The following values were obtained for the condition factor: 1.3122 (*C. gariepinus*); 0.9455 (*H. niloticus*); 4.3457 (*O. niloticus*) and 2.7680 (*H. bidorsalis*). All the fish species studied showed negative allometric growth with b<3. The respective exponential equations for *C. gariepinus, H. niloticus, and O. niloticus* and *H. bidorsalis* were $W_t = 2.272(SL)^{0.014}$, $W_t = 2.484(SL)^{-0.294}$, $W_t = 1.557(SL)^{0.408}$ and $W_t = 1.819(SL)^{0.210}$.

Table 2: The length- weight relationship and condition factor of the fish species

| Fish species | No of samples | Condition factor | Exponential equation |
|---|---|---|---|
| *C. gariepinus* | 25 | 1.3122 | $W_t = 2.272(SL)^{0.014}$ |
| *H. niloticus* | 10 | 0.9455 | $W_t = 2.484(SL)^{-0.294}$ |
| *O. niloticus* | 35 | 4.3457 | $W_t = 1.557(SL)^{0.408}$ |
| *H. bidorsalis* | 20 | 2.7680 | $W_t = 1.819(SL)^{0.210}$ |

## 4. Discussion

Among the number of samples recorded in this study, *H. niloticus* had the least sample size. This support the report made by Mustapha [16], that *H. niloticus* is among the most visible fish species on the decline in terms of population density and catch in Nigerian rivers, lakes and reservoir. The species is an important commercial fish highly sourced for because of its high protein content and hardy flesh thus it forms a very important component in the diet of many Nigerians.

The condition factors obtained in this study ranged from 0.9455- 4.3457 which varied slightly with the results from other studies. Ajani [17], reported 'K' ranges of 0.45- 2.25 for five tropical fish species of a coastal lake, Lagos, Nigeria; Ndimele *et al*. [11] reported 'K' values of 2.39 and 2.38 in 2006 and 2007 for *Sarotherodon melanotheron* in Ologe Lagoon, Lagos, Nigeria; Nwadiaro and Okorie [18] reported a range of 'K' between 0.49 - 1.48 in Oguta Lake. Kumolu-Johnson and Ndimele [12] obtained a 'K'value of between 0.91 and 8.46 for twenty- one fish species studied from Ologe Lagoon in Lagos. Abowei *et al*. [1] also reported 'K' value of 1.10 for *Cynoglossus senegalensis* in Nkoro river. According to Ajani [17] and Wade [19], 'K' values less than 1 implied that fish are not in good state of well-being within their habitat while values greater than 1 implied that fish are in good physiological state of well-being within their habitat. The K-values of species sampled in this study were close to and greater than 1. From this point of view, it could be said that all the species studied were in good condition within their habitat even though three of the species had their values less than the 2.9 to 4.8 reported by Bagenal and Tesch [20] for matured fresh water fish. The difference in values may be attributed to variation in weight of individual fish sampled and other factors such as stress, sex, stage of maturity, season, availability of feeds, and other water quality parameters as opined by Dan-Kishiya [21] and Khallaf *et al* [22]. Also, high K-value recorded for *O. niloticus* may be an indicator that the environmental condition such as habitat and prey availability favoured the species.

The result of the regression coefficient 'b' obtained from length-weight relationship in this present study showed that fish species in the dam exhibited negative allometric growth pattern. This means that the fish become thinner with increase in length or that the fish becomes more slender as it increase in weight (King, [23] and Riedel *et al*. [8]. Some authors have documented similar works from Nigeria inland water bodies. Among these are: Sangun et al. [24] who reported that 14 out of 39 species studied had negative allometries, Fafioye and Oluajo [10] showed in their work that the brackish environment of Epe Lagoon produced fish of lower '*b*' value, according to the work done by Victor et al. [5], *M. vittatus* were found to exhibit negative allometric growth patterns, the work done by Dan-Kishiya [21] showed that five fish species from a tropical water supply reservoir in Abuja had allometric growth pattern and Hart and Abowei [25] recorded allometric growth in their investigation of 10 fin fish species of Lower Nun River in Niger Delta.

The correlation coefficient 'r' for length-weight relationship of the species studied was low which indicates that the length decreases with increase in weight of fish. This is in disagreement with previous studies on different fish species from various water bodies: Fagade and Olaniyan [26], Fagade [27], Laleye [28], Ayoade and Ikulala [29] and Victor et al. [5]. However, the outcome this study leaves room for further investigation in this area.

## 5. Conclusion

The results of this study revealed negative allometric pattern in the development of the species under consideration and also the 'K' values obtained showed that the fish species were in good condition. These observations call for further investigations in some aspects of the biology of the fish species in the study area. More studies are also necessary in the area of genetic identification, food composition as well as the economic viability of the dam in terms of fisheries development. These array of information, if available, will assist local fish farmers and researchers who are directly or indirectly involved in the management of the fishery.

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