

## LENGTH-WEIGHT RELATIONSHIPS AND CONDITION FACTORS OF *Oreochromis niloticus* IN GUBI DAM, BAUCHI STATE, NIGERIA

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### ABSTRACT

Length-weight relationships and condition factor of *Oreochromis niloticus* in Gubi were conducted to determine the growth pattern and condition of well-being of the fish species in the dam. Four hundred and seventy two (472) fish species were obtained from fishers fishing with 1 inch cast nets between June - November, 2019. *Oreochromis niloticus* obtained in the dam had a total length range (5.5 - 24.5 cm) and weight range (3.1 - 234.45g). The fish species had allometric growth pattern ( $b = 2.9063$ ). Condition factor range from 0.307502 - 4.38052 with average value of 1.831002 indicating that the fish species population was in good condition of well-being in the dam. Repeating similar research in the dam for other fish species and in other water bodies intermittently is recommended as part of eco-bio - monitoring strategies for developing and implementing conservation programmes.

**Keywords:** *Oreochromis niloticus*, Length-weight relationships, eco-biomonitoring strategies, conservation

### INTRODUCTION

Length-weight relationships (LWR) are of great importance in fishery assessments (Ayoade and Ikulala, 2007). Length and weight measurements in conjunction with age data can give information on the fish stock, age at maturity, life span, mortality, growth and reproduction (Kumar *et al*, 2014). Length-weight relationships of fish is widely recognized as an important tool in fisheries science especially in ecology population dynamic and stock management (Abdoli and Rasooli, 2008). Fish is said to exhibit isometric growth when length increases in equal proportion with body weight, the regression co-efficient for isometric growth is '3' and values greater than or less than '3' indicates allometric growth (Olurin and Aderibigbe, 2006).

Condition factor is good parameter that shows the wellbeing of fishes in their natural habitat or in aquaculture and it is represented as by the coefficient of body condition. It is an indicator of different biological and ecological factors in relation to fishes feeding habits.

*Oreochromis niloticus* is a species of tilapia, a cichlid fish native to Africa from Egypt; south to east and central Africa, and as far as west (Gambia). It is also native to Israel (Froese and Pauly, 2015). There is paucity of information on the length – weight relationships in Waya dam.

The effective management of any fishery requires considerable knowledge of population parameters such as length-weight relationships. This relationship is allow estimation of average weight of the fish of a given length group and stressed the importance in modelling aquatic ecosystems (Kulbicki *et al*, 2005).

### MATERIALS AND METHODS

#### STUDY AREA

The study area is Gubi Dam, Bauchi local government area, Bauchi state. The state is in the Sudan Savannah of the Northern Nigeria. Gubi Dam is located on latitude 10.4203N and longitude 9.8789E with two distinct seasons (dry and wet), with reservoir capacity of 38millions meters cube and with a height of 27m. The dam had total surface area of 179 km<sup>2</sup>. It was created from the damming of four converging rivers (Gubi, Makaranta, Ran and Tagwaye) located at Piro, a village about 12 km North-East of Bauchi metropolis and 8 km off Bauchi - Maiduguri road for the primary purpose of providing potable and palatable water to Bauchi and its environs (Ezra and Nwankwo, 2001). The dam lies within

the boundary of longitude 10° 25'N to 10° 26'N and latitude 9° 51' E to 9° 52'E (Wufem *et al.*, 2009).

### DATA COLLECTION

Four hundred and seventy two (472) *Oreochromis niloticus* were randomly collected with 1 inch cast net from the fishers fishing in the Gubi dam in wet and dry seasons (2020). The fish species were identified using field guide by Olaosebikan and Raji (1998) and FAO (1992).

### FISH MEASUREMENT

Total length (TL) and standard length (SL) were measured in centimetres with measuring tape to the nearest centimetre. The weight of the fish species were measured with a top loading weighing balance (model LP502.A) to the nearest 0.01g.

### STATISTICAL ANALYSIS

The length-weight relationships were determined using conventional formula described by Ekeng (1990).

$$W = a \times L^b \quad \dots 1$$

Where: W = weight of fish in grams; L = standard length or total length of fish in cm; a = constant; b = an exponent.

The equation was therefore transformed into  $\ln W = \ln a + b \ln L$  Microsoft Excel 2007 was used for the analysis.

### CONDITION FACTOR

The condition (k) was determined for each fish using the conventional formula described by Worthington and Richard (1931) as adopted by Afamdi (2009):

$$K = 100W/L^3 \quad \dots 2$$

Where: K = condition factor; W = weight in grams. L = standard length or total length in cm. Microsoft Excel 2007 was used for the analysis.

## RESULT AND DISCUSSION

Table 1: Length-weight Relationships Parameters of *Oreochromis niloticus* from Gubi Dam, Ganjuwa Local Government Area, Bauchi State 2019.

| Species                | Range of Length (cm) | Range of Weight (g) | Regression coefficient A | Regression coefficient b | Correlation coefficient (r) | Model (W= a x L <sup>b</sup> )    | ±SE  | N   | Growth pattern |
|------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------------------------|-----------------------------------|------|-----|----------------|
| <b>Total Length</b>    | 5.5 - 24.5           | 3.1 - 234.45        | 0.0227                   | 2.9063                   | 0.9391                      | W= 0.0227X<br>L <sup>2.9063</sup> | 0.16 | 472 | A              |
| <b>Standard Length</b> | 4.1- 19.6            | 3.1 - 234.45        | 0.0757                   | 2.6620                   | 0.8409                      | W= 0.0757X<br>L <sup>2.6620</sup> | 0.26 | 472 | A              |

N=number of Specimen used, A= Allometric, SE = Standard Error

Table 1 shows that four hundred and seventy two (472) *Oreochromis niloticus* with total length range (5.5 - 24.5 ±SE 0.16) and weight range (3.1 - 234.45 ±SE 0.26) were obtained from the dam between June to November, 2019. The fish species had allometric growth pattern (2.9063). This may be due on set of early reproductive cycle of the fish in the dam. Bhatt (2004) reported that most fish attained maturity when they were approximately 10 cm long. Lagler *et al.* (1971) reported that for most fish

the b values are closer to 3. Model equation for length- weight relations of *O. niloticus* was  $W = 0.0227X L^{2.9063}$ .

Table 2: Condition Factor Values of *Oreochromis niloticus* from Gubi Dam, Ganjuwa Local Government Area, Bauchi State

| Minimum Value | Maximum Value | Average Value | N   | Remark         |
|---------------|---------------|---------------|-----|----------------|
| 0.307502      | 4.38052       | 1.831002      | 472 | Good condition |

Condition factor ranges from 0.307502 - 4.38052 with average value of 1.831002 indicating that the fish was in good condition of well-being. Ipinjolu *et al.* (1996) reported that individual condition factor of *Hyperopisus bebe ocidentalis* ranged from 0.69 to 1.10 ( $0.87 \pm 0.08SD$ ) this suggests good nutrition and adaptation to habitat (Table 2). However, this is contrary to the suggestion of Nehemia *et al.*, (2012), who reported that K-values greater than 1 suggests the fish is in good condition and the mean K value found in this research for *O. niloticus* is greater than one.

## CONCLUSION

Based on biological analysis *Oreochromis niloticus* had allometric growth pattern and in good condition of well-being in the dam. Model equation for LWR of the fish species:  $W = 0.0227X L^{2.9063}$  is recommended for predicting weight from length of *O. niloticus*. Repeating similar research in the dam for other fish species and in other water bodies intermittently is recommended as part of eco-biomonitoring strategies for developing and implementing conservation programmes.

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