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Length-Weight Relationship and Condition Factor of Pond Reared Juvenile *Oreochromis niloticus*

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Abstract: The length-weight relationship and condition factor of one hundred juvenile *Oreochromis niloticus* in Sanni Luba Fish Farm Ijebu-Ode, Ogun State were investigated. The value of the regression co-efficient obtained for the length-body weight relationship for the male was 3.14, while that for the female was 2.90 and for the combined sexes was 3.10. This suggests an isometric growth form in all the specimens sampled. There was no significant statistical difference ($p>0.05$) in the male and female regression co-efficients. The condition factor computed for male *Oreochromis niloticus* was 1.14, while for the female was 1.08 and for the combined sexes was 1.11, which suggests that the specimens were healthy.

Key words: Condition factor · *Oreochromis niloticus* · pond

INTRODUCTION

Oreochromis niloticus (Linnaeus) is a bony fish which belongs to the family Cichlidae and they are commonly referred to as tilapias. Tilapia can be broadly classified into three subgenera which are mainly the *Tilapia*, *Sarotherodon* and *Oreochromis* species, the latter two being mostly mouth brooders (Pauly, 1976.). The family Cichlidae is highly diversified with a wide area of distribution spreading across Africa and most parts of India and Ceylon (Balarin, 1979.).

Oreochromis niloticus could be easily identified by dark bands or stripes found on their bodies which are most prominent in mature forms. They inhabit fresh waters and water bodies of low salinity, as is typical of most *Tilapia* species. *Tilapia* ranks among the most commercialized fishes.They can also be termed plastic animals in the sense that whereas most animals conform fairly closely to a general pattern of growth and usually achieve a certain size and life span which is characteristic of the species, their growth rate and maximum obtainable size may be seriously affected by the physical and biological composition of their environment.

Length-weight relationships give information on the condition and growth patterns of fish (Bagenal and Tesch, 1978). Fish are said to exhibit isometric growth when length increases in equal proportions with body weight for constant specific gravity. The regression co-efficient for isometric growth is '3' and values greater or lesser than '3' indicate allometric growth.

Condition factor studies take into consideration the health and general well-being of a fish as related to its environment; hence it represents how fairly deep bodied or robust fishes are (Reynold, 1968).

The biology of many *Tilapia* species in natural systems is well documented (Fryer, F.E. and T.D. Iles; Galemoni de Graafi and Huisman, 1999; Getachew and Fernando, 1989; Gomez-Marquez, 2003; Robotham, 1990; Silva, 1985; Stewart, 1988; Tudorancea, C., 1988). However, not much work has been done on the condition factor or well-being of fishes in privately managed fish farms especially at the juvenile stage of development.

The condition of these juveniles is important as they are the ones used in stocking fish farms.

The present study aims at providing information on the length-weight relationship and condition factor of *Oreochromis niloticus* in Sanni-Luba fish farm, Ijebu-Ode with a view to determining whether the fishes are in good condition.

Description of experimental site: Sanni Luba fish farm is located in Ijebu-Ode, South-West Nigeria. It is located at approximately latitude 6°50' N and longitude 3°57' E.

The farm is about four by three kilometers large and there are four operational fish ponds for rearing various species.

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It lies within the tropical rain forest and it is surrounded by tall trees with green leaves. There are two seasons found in this area and these are: the dry season extending from October to March and the rainy season from April to September.

Mean annual temperature ranges between 22°C and 32.5°C reaching its highest value in the dry season.

MATERIALS AND METHODS

Field methods: One hundred juvenile fish specimens were collected from Sanni Luba fish farm using a gill net of 25 mm stretched mesh size. The specimens were transported to the laboratory in a large polythene bag.

Laboratory analysis: The specimens were mopped on filter paper to remove excess water from their body surfaces. Their total and standard lengths were then measured using a ruler to the nearest one-tenth of a centimeter. The total length was measured as the distance from snout to the tip of the caudal fin while the standard length was measured as the distance from the snout to the caudal peduncle.

The body weight was taken on a top loading Metler balance to the nearest 0.1g.

Sex determination: Each specimen was dissected ventrally with the aid of a small scissors inserted through the vent. Also a semi circular cut was made laterally on the side of specimens for better observation. The gonads which are two parallel tubules located on the dosal wall of the abdominal cavity were then examined with the naked eye in the case of sexually mature forms and a dissecting microscope was employed for examination of the sexually maturing forms.

The males have gonads with smooth exterior, while the females have gonads with a rough exterior.

Length-weight relationship: A scatter plot of log body weight against log. total length was made for the species. The regression of weight against length was computed from the relationship;

$$w = al^b$$

where;
w = Weight (g)
l = Total length (cm)
a = Constant
b = Exponent of values between 2 and 5 (Tudorancea, 1988).

The log transformed data gave a regression equation.

$$\text{Log } w = \log a + b \log l$$

where;
a = constant and
b = the regression co-efficient

Condition factor: The condition factor (k) was calculated from the relationship.

$$K = 100w/l^b$$

where;
w = Weight (g)
l = Total length (cm)
b = Regression co-efficient (Tudorancea, 1988).

RESULTS

Male length frequency distribution: The total length ranged between 5.5 and 11.4cm with corresponding standard length of 4.1 to 8.6cm.

Male length-weight relationship: The male length-weight relationship is expressed by the regression equation:

$$\text{Log } w = -2.03 + 3.14 \log l$$

Female length frequency distribution: The total length for females ranged from 7.9 to 11.6cm with corresponding standard lengths ranging between 4.7 and 9.0 cm.

Female length-weight relationship: The female length-weight relationship is expressed by the regression equation:

$$\text{Log } W = -1.96 + 2.90 \log l$$

Combined length-weight relationship: The combined length-weight relationship is expressed by the equation:

$$\text{Log } w = -2.00 + 3.10 \log l$$

Condition factor: The condition for the species is shown in Table 1. The mean values were higher than one.

DISCUSSION

Very scanty information exists on the biology of juvenile tilapia (Bagenal, 1968).

Table 1: Condition factor of juvenile *Oreochromis niloticus*

Sex	Range	Mean value
Male	0.86-1.58	1.14
Female	0.78-1.40	1.08
Combined sex	0.78-1.58	1.11

Juvenile *O. niloticus* in this study showed isometric growth. This result agrees with the findings of Fagade (1983) on a related cichlid, *Chromidotilapia guntheri* in a man-made lake in Ibadan, South-west Nigeria. In constrast, Olurin and Sotubo (1989) reported allometric growth in three cichlids (*C. guntheri, Tilapia mariae* and *Hemichromis fasciatus*) in Owa stream, South-west Nigeria.

Regression coefficients obtained from length-weight relationships (L-W) which are indicative of isometric or allometric growths differ not only between species but sometimes also between stocks of same species. The development of fish involves several stages, each of which has its own length-weight relationships. There may also be differences in the relationships due to sex, maturity, season and environmental conditions (e.g. pollution).

In a comparative study on L-W relationships of *O. niloticus* and *O aureus* in polluted and non-polluted parts of Lake Mariat, Egypt, it was reported by Bakhoum (1994), that there were highly significant variations of L-W relationships of both species in polluted and non-polluted parts of the lake. Similarly Khallaf *et al*., (2003) reported differences in L-W relationships of *O. niloticus* in a polluted canal compared with those of other authors in different localities and times. These differences were attributed to the effect of eutrophication and pollution on growth and other biological aspects of *O. niloticus*.

The specimens in the study were observed to be in good condition, as the values were higher than one.

A number of factors (e.g. sex, seasons, environmental conditions, stress, availability of food) also affect the condition of fish. Stewart (1988) observed stress as a result of the reduction in the breeding and nursery grounds of *O. niloticus* in lake Turkena, Kenya, as contributing to dramatically lower condition factors. Pollution was also seen to affect the condition factors of *O. niloticus* in lake Mariut, Egypt (Bakhoum, 1994).

Variations in condition factor with seasons and pollution has also been documented by Khallaf *et al*., (2003) in Shanawan drainage canal in Egypt.

It is concluded that the juvenile *O. niloticus* examined were in good condition and healthy and can be use for commercial production.

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