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*Full Length Research*

# Length- weight relationships and condition factors of *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* in Mahin lagoon, Nigeria

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**A study of the icthyofauna resources of Mahin lagoon of Ondo State of Nigeria conducted for 18 months (June 2011-December, 2012) revealed the presence of 67 finfish species with the clariids( *Clarias gariepinus* and *Heterobranchus bidorsalis*) and cichlids (*Oreochromis niloticus* and *Coptodon zilli*) dominating the stock accounting for 42% and 16% respectively. Other predominant families were 'Claroitedae'(*Chrysichthys nigrodigitatus*) with 9.2% contribution, 'Channidae'(*Parachanna africana*) with 8.7%, Osteoglossidae (*Heterotis niloticus*) with 7.1%, Gymnarchidae( *Gymnarchus niloticus*), Mugilidae (*Mugil cephalus*) and Clupeidae (*Ethmalosa fimbriata*). The length-weight relationships and condition factor 'K' of 480 specimens of *O. niloticus* and *C. nigrodigitatus* of Mahin Lagoon were investigated for 6 months (May-October, 2013). Results showed that the growth patterns of *C. nigrodigitatus and O. niloticus)* were described by the formula. Log W = -0.253 + 2.102 log TL and log W = +0.590 +1.53 log TL respectively. A comparatively low positive correlation coefficient 'r' of 0.60exists between the length and weight of *O. Niloticus* while that of *C. nigrodigitatus* was 0.88. The b values of *O. niloticus* and *C. nigrodigitatus* at 1.53 and 2.10 respectively showed the growth patternsof both fishes were negatively allometric. K factor of 5.22 was recorded for *O. niloticus* while that of *C. nigrodigitatus* was 3.84. The fact that 'K' value of *O. niloticus* was higher than that of *C. nigrodigitatus* shows higher suitability of Mahin lagoon for the former. However, there is still a need to conduct a more indepth research on the physiochemical parameters of the lagoon in view of its on-going industrialisation and crude oil exploration around the lagoon.**

**Key words:** Allometry, condition factors, length-weight relationships, species composition.

## INTRODUCTION

Fish plays an important role in the development of a nation. Apart from being a cheap source of highly nutritive protein, it also contains other essential nutrients required by the body (Bolarinwa, 2013). The fishery sector is a very important sector in the Nigeria agricultural development matrix. It provides employment for citizens in the coastal areas. In terms of Gross Domestic product (GDP), the fishery sector recorded the fastest growth rate when compared with other agricultural subsectors like forestry and livestock. It has continued to grow in importance over the years particularly as proceeds from aquaculture contributed an average of 84.2% to the total domestic output in 1990 and 1994 (CBN, 2011; FDF, 2015).

Nigeria is blessed with abundant natural aquatic resources in marine, estuarine and freshwater environments. The marine components are within the Nigerian 200 nautical miles Exclusive Economic Zone (EEZ) and the coastal waters. The estuarine resources are found in the extensive mangrove ecosystem estimated to cover an area of about 858,000ha. The freshwater components are within extensive river systems, lakes, flood plains and reservoirs scattered over the entire land surface area of over 4,212,500ha (Ita,1993).

Previous works by Odulate (2010) and Bolarinwa (2012) have shown that fishing is better in the estuaries because there are more people, more permanent settlements and a better living conditions with constant

availability of water. e.g. Ilaje, Ijaw and Badagry axis of Lagos State. Nigeria is blessed with nine coastal states which are Ogun, Lagos, Ondo, Delta, Rivers, Bayelsa, Edo, Akwa-Ibom and Cross River. Out of the above listed maritime States, Lagos State covers 700 $km^2$ on the western part of Nigeria and the largest along the Western Africa coast. The seashore has a network of overflowing canals and reels which exhibit salinities between 29 – 33ppm and seldom vary with rainfall. Hydrologically, Lagos State belongs to the barrier lagoon complex which extends 700km eastward from the Nigeria/Benin Republic border (Omitoyin and Fregene, 2008).

The fish fauna of the Nigerian fresh water systems has been a focus of research for quite sometimes (Idodo–Umeh, 1987). These studies concentrated more on the rivers, with less attention on the potentially productive brackish, natural lakes and coastal wet lands which are areas very susceptible to pollution and environmental degradation due to diverse anthropological activities capable of endangering some of these fishes. The present study aims at evaluating the length weight relationships and condition factors of *C. nigrodigitatus* and *O. niloticu*s which are two dominant fishes found in Mahinlagoon of Ondo State of Nigeria (Soyinka and Kusemiju, 2007). *O. niloticus* is the most versatile and widely distributed member of the family 'Cichlidae'. It lives in shallow areas with vegetation in which they also feed on. The scales between its pectorals and pelvics are much smaller than scales on its flanks. There are regular vertical black stripes with a maximum size of 60cm. The genital papilla of male and female are well developed. Other species include *Tilapia aurea, Tilapia nilotica, Tilapia guineensis, Tilapia mariae,* and *Tilapia dageti* (Fagade, 1979).

*Chrysichthys nigrodigitatus* (Silver catfish), a member of the family 'Claroteidae' and locally *known as* 'Obokun' possesses a pointed snout slightly longer than or equal to the with of the mouth. It also possesses pointed fins and acute spines not covered by a thick epidermal tissue. Mature specimens in reproduction usually have rounded snout smaller than the width of the mouth. The head is swollen, the fin often rounded and spines covered with thick epidermal tissue. It is widely distributed in Africa. These two fishes are of great economic potential and highly consumed by citizens of Nigeria (Olaosebikan and Raji, 2013).

Condition factor (K) compares the wellbeing of a fish and is based on the hypothesis that heavier fish of a given length are in better condition (Hart and Abowei, 2007). Condition factor has been used as an index of growth and feeding intensity (Bolarinwa, 2013; Olopade and Tarawallie, 2014). Condition factor decreases with increase in length (Beyer, 1987; Bolarinwa, 2012); and also influences the reproductive cycle in fish. Condition factors of different species of fishes have been reported. Condition factor is also a useful index for monitoring of feeding intensity, age, and growth rates in fish. It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live (Fafioye and Oluajo, 2005).

Previous works on the fish fauna in south-western Nigerian lagoons concentrated on aspects of the biology of some of the species and ecological conditions of the lagoons.

There is a dearth of information of length-weight relationships and condition factors 'K' of most coastal and brackish water fishes that could form a good data base which could be assessed for estimation of biomass and population dynamics of Nigerian aquatic ecosystems.

The present study therefore evaluated the length-weight relationships and condition factors of *Chrysichthys nigrodigitatus* and *Oreochromis niloticus* which are two dominant fishes found in Epe lagoon of Lagos State of Nigeria.

## MATERIALS AND METHOD

The study area is located in Ilaje local government area of Ondo State of Nigeria (Figure 1). The local government area with a population of 277,034 according to National Population Commission census was created on 1st of October 1996 by the Federal government of Nigeria and consists of over 400 towns and villages covering an area of 3000 $km^2$.

The study area is predominantly inhabited by the Ilajes. The primary occupation in this locality is fishing. Artisanal fisher folks within the lagoon mainly exploit the fisheries using wooden/dug-out canoes ranging in size from 3m to 8m long. The canoes are either paddled or powered by small outboard engines, and manned by an average of two men. From these boats, the fishers operate their cast nets, hook and lines, gillnet, stow nets, traps, lift nets, long line, basket traps etc. The study of Length and weight relationships were achieved by getting a total of 480 specimens of both fishes randomly obtained from the catches of local fishermen at Mahin landing site for a period of 18months (June, 2011- December, 2013). The fishes were identified using field guide to the commercial marine resource of Nigeria and fish base textbooks on taxonomy of fish species by Olaosebikan and Raji (2013) as well as Adesulu and Syndenham (2007). Measurement of the total length (cm) and weight (g) was determined with the aid of stainless steel measuring board to the nearest 0.5cm and weighing scale (Salter model) and electronic balance capable of measuring to the nearest 0.5g. The Length – weight relationship (LWR) was estimated by using the equation: W = a TL b where W = Weight (g), TL = Standard length (cm),a = Constant and b = Growth exponent. The equation was linearised by a logarithmic transformation to give: Log W = Log a + b Log TL. The value of the compiled growth exponent were used to calculate the condition factor, K = 100W/b3.

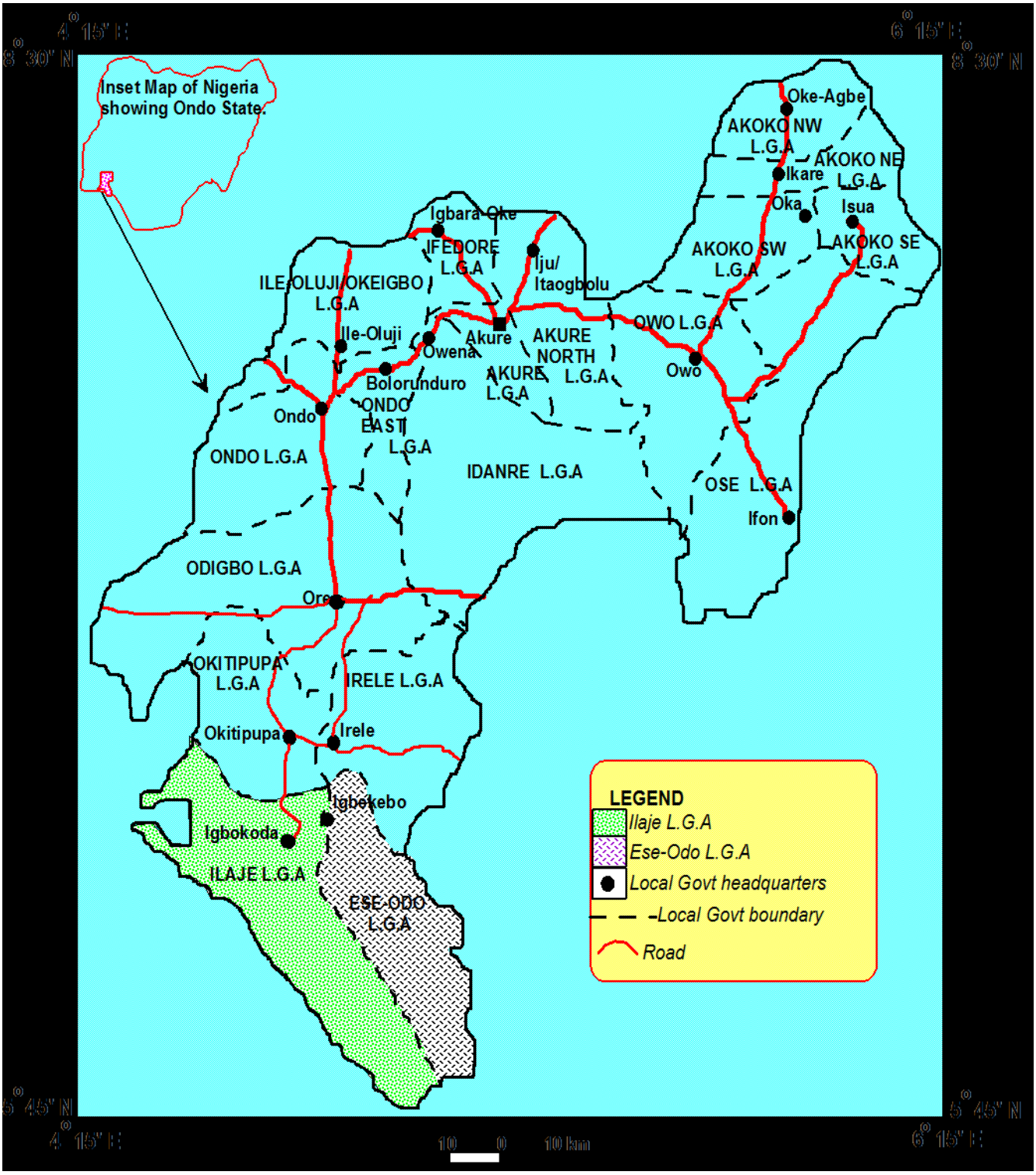


**Figure 1.** Map of Ondo State showing the study area.

## RESULTS

The Length-weight relationships and condition factors for *O. niloticus* (TL Range:16-43cm,WT Range, 150-1600g) and *C. nigrodigitatus* (TL Range:22-63cm, WT Range: 80-2200g) as presented in Tables 1 and 2 show the growth pattern of *O. niloticus* could be described by the formula, Log W = 0.590 + 1.526 log TL while that of

**Table 1.** Length-weight Relationships of *O.niloticus* and *C. nigrodigitatus* in Mahin lagoon, Ondo State, Nigeria.

| Species | Total length range (cm) | Total weight range (g) | Mean total length (cm) | Mean weight(g) | Bo | Bi | R |
|---|---|---|---|---|---|---|---|
| *O.niloticus* | 16-43 | 150-1600 | 31.3 | 483 | 0.590 | 1.53 | 0.60 |
| *C. nigrodigitatus* | 22-63 | 80-2200 | 65.2 | 1106.8 | -0.253 | 2.10 | **0.88** |

**Table 2.** Condition factors 'K' o f*O. niloticus* and *C. nigrodigitatus*.

| Species | Family | Local name | k ( factor) |
|---|---|---|---|
| *O.niloticus* | Cichlidae | Epiya | 5.22 |
| *C. nigrodigitatus* | Claroiteidae | Obokun | 3.84 |

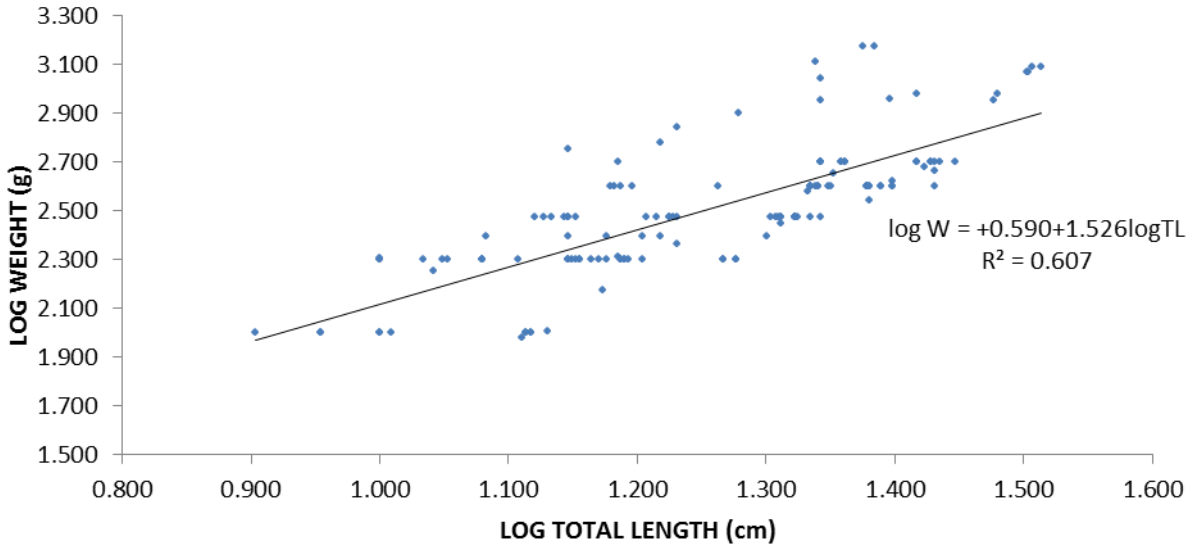


**Figure 2.** Length-weight Relationship of *Oreochromis niloticus* in Mahin lagoon, Ondo State, Nigeria.

*C. nigrodigitatus* was described by Log W=-0.253+2.102 logTL. The b values of 1.53 and 2.10 obtained for *O. niloticus and C. nigrodigitatus respectively* revealed a negative allometric growth. A positive correlation existed between the weight and total length of both species. Pearson correlation coefficient 'r' was 0.60 in *O. niloticus* and 0.88 in *C. nigrodigitatus* (Figures 2 and 3).

Table 2 shows the condition factor 'k', a measure of well beingness of the aquatic ecosystem for the fishes. K value for *O. niloticus* was 5.22 while that of *C. nigrodigitatus* was 3.84 in Mahin lagoon.

## DISCUSSION

The b values obtained for *O. niloticus* and *C. nigrodigitatus* revealed a negative allometric growth pattern. This means that as they increase in size, it gets thinner (growth in age with reduction in size). Bolarinwa (2015) observed an isometric growth for *C. nigrodigitatus* in Epe lagoon but positive allometry in Ibeshe waterside of Lagos lagoon. Onyia *et al.* (2008) also observed a positive allometric growth in cultured *Clarias gariepinus*, 'b' value being 3.4779. Other previous workers like Fafioye and Oluajo (2005), Laleye (2006) and Yem *et al.* (2007) observed positive allometryin cichlids like *Hemichromis fasciatus* and *O. niloticus* in Epe lagoon, Lake Kainji and Ocueme River in Benin.

Occurrence of isometry' b=3'( a situation where growth of length, width and depth) is occasional in nature. The fish will not change its shape as it grows from juvenile to adult stage. The slope (b) value obtained for *C. nigrodigitatus* is not significantly different from 3 isometric value. Anene (2005) reported that the cubic function could be safely applied within the indicating length range. Soyinka and Kusemiju (2007) observed isometric growth

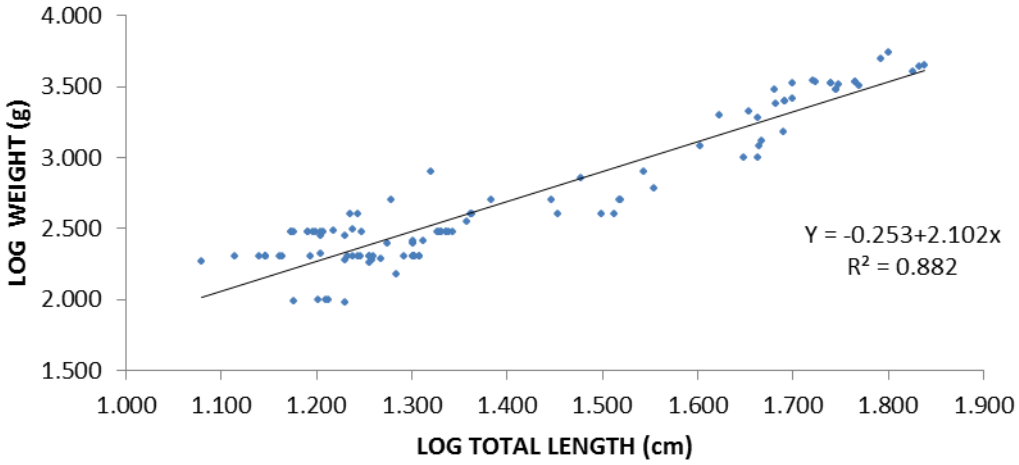


**Figure 3.** Length-Weight Relationship of *Chrysichthysnigrodigitatus*in Mahin lagoon, Ondo State, Nigeria.

pattern in *Ethmalosa fimbriata* in Lagos and Lekki lagoons. The mean condition factors were 1.66 and 1.88 for Lagos lagoon and Lekki lagoon respectively.

Change in b values is subject to the shape and fatness of the species and it is also dependent on factors such as sex, spawning frequency, season, biogenic capacity of the environment (Olapade and Tarawallie, 2014). The length-weight relationship is very important for proper exploitation and management of the population of fish species (Anene, 2005). Other works on length-weight relationship include (Ayoade, 2011; Kamaruddin *et al.,* 2011).A higher K values were observed for the fishes during the dry season.Being higher than 1, Mahin lagoon could be considered conducive for the two fishes.

## CONCLUSION AND RECOMMENDATIONS

The study revealed the growth pattern and condition factors of *O. niloticus* and *C. nigrodigitatus* found in Mahin lagoon. The results reflect the level of wellbeing of these two highly consumed fishes by Nigerians. Mahin Lagoon is still favourable to fishes but there is a need for constant monitoring of the water to establish the suitability of the lagoon for fish survival.

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