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Condition Factor and Length –Weight Relationship of *Chrysichthys nigrodigitatus* from Asejire Reservoir and Lagos Lagoon, South-West, Nigeria

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Abstract

The status and well-being of *Chrysichthys nigrodigitatus* silver catfish species was investigated in Asejire Reservoir and Lagos Lagoon. Growth pattern relationship and condition factor were investigated. Result obtained revealed length of *C. nigrodigitatus* from both water bodies had no significant difference, but weight of the samples from Lagos lagoon were significantly higher than weight of samples from Asejire reservoir. Allometric value and condition factor of fish samples recorded significant differences between sexes. Negative allometric value was determined in female samples from the two water bodies, but positive allometric value was obtained in male from Lagos lagoon. Condition factors of male samples from the two water bodies recorded significant differences; while female from Asejire reservoir had higher K-factor than female in Lagos Lagoon. Analytical and descriptive statistics were used to analyse data collected. Regression analysis was used to determine sequence of length and weight of fish; further test was done using Duncan Multiple Range Test (DMRT) to determine level of significance among fish samples. The growth indices reveal *C. nigrodigitatus* from both environments is in good well-being status, indicating that the environments favours *C. nigrodigitatus*.

Keywords: *Chrysichthys nigrodigitatus*, Growth, Condition Factor, Lagos Lagoon, Asejire Reservoir

1. Introduction

Chrysichthys nigrodigitatus silver catfish is species of catfish of the family Bagridae (Lacepède, 1803); is a demersal potandromous scale less fish which utilizes shallow waters i.e lakes (less than 4m), over mud and fine bottom, in rivers and in swamps. It is an omnivore, and feeding becomes specialized with age and size^[1]. *C. nigrodigitatus* are substrate brooders and exhibits parental care; mature and fully grown male is usually distinguished from female by broader head which is used to dig out breeding nests in their habitat during reproduction^[2], (Table 1).

In Nigeria fisheries, a silver coloured catfish, *Chrysichthys nigrodigitatus*, commonly called siluroid fish of the family Bagridae is widely distributed in fresh and brackish water of West Africa^[3]. Efforts had been geared towards conservation of these species through fisheries regulation; and considerations for culture of the fish have resulted in several biological studies on the growth and fecundity of the fish species. *C. nigrodigitatus* exhibits omnivorous feeding habit, but has been reported as a generalized predator and it has been adopted for aquaculture,^[4].

C. nigrodigitatus can grow to a maximum length of 1.5m (4.9 ft). It has moderately elongated bodies, usually with four pairs of barbels covered by a layer of teste bud-enriched epithelium, an adipose fin, and strong pectoral and dorsal fin spines. The dorsal fin is large and its upper edge round as well as the adipose fin. The caudal fin is deeply forked with the upper forked extending beyond and ending in a curvature than the lower forked caudal fin (Plate 1),^[5]. Hence, the aim of the research is to assess the length-weight relationship and condition factor of *C. nigrodigitatus* in Asejire Reservoir and Lagos Lagoon. This will reveal state of well-being of the fish species



Magnification (x5) 1 cm

Plate 1: *Chrysichthys nigrodigitatus* Source: Azeroual *et al.*, (2010)

Table 1: Scientific classification of *C. nigrodigitatus*

Classification	Name
Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Siluriformes
Family	Bagridae
Genus	<i>Chrysichthys</i>
Species	<i>nigrodigitatus</i>
Scientific name	<i>Chrysichthys nigrodigitatus</i>
Common name	Silver catfish

Source: Mo, 1991

Asejire Reservoir: it came to be with damming of Osun River in Egbeda Local Government Area of Oyo State, Southwestern Nigeria (Figure 1). It is a man-made reservoir located 30 km East of Ibadan, Oyo state [6]. Asejire Reservoir lies between longitudes 4E and 4° 07'E and latitude 7°N and 7° 21'N. It flows approximately 5km from its source before breaking into series of rivers and streams [7].

Lagos Lagoon: It is part of the continuous system of lagoons and creeks found along the coast of Nigeria from the border with Republic of Benin to Niger-Delta. This lagoon bordering the Lagos Island is located between longitude 30° 10' and 30° 4' SE and latitude 60° 5' and 60° 36' N [8]. It is connected and non-parallel to Gulf of Guinea coastline over 237km (Figure 2).

2. Materials and methods

2.1 Description of sampling sites

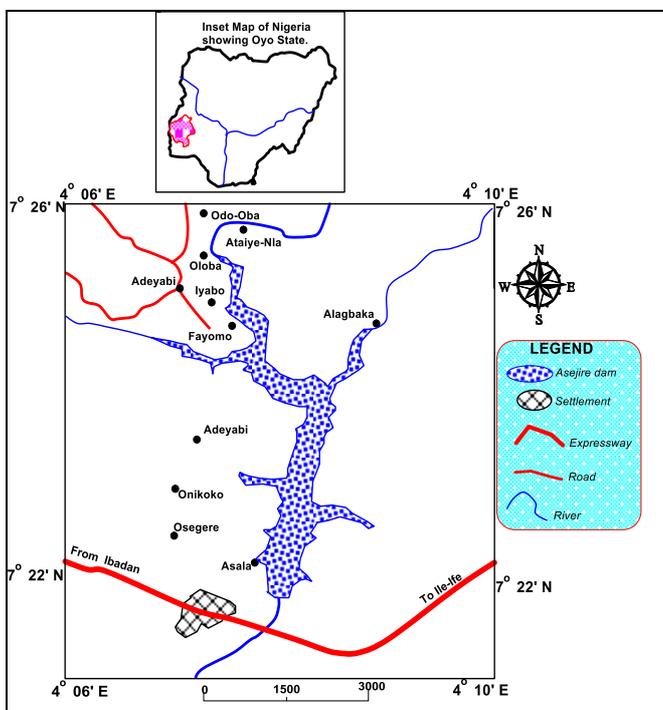


Fig 1: Asejire Reservoir

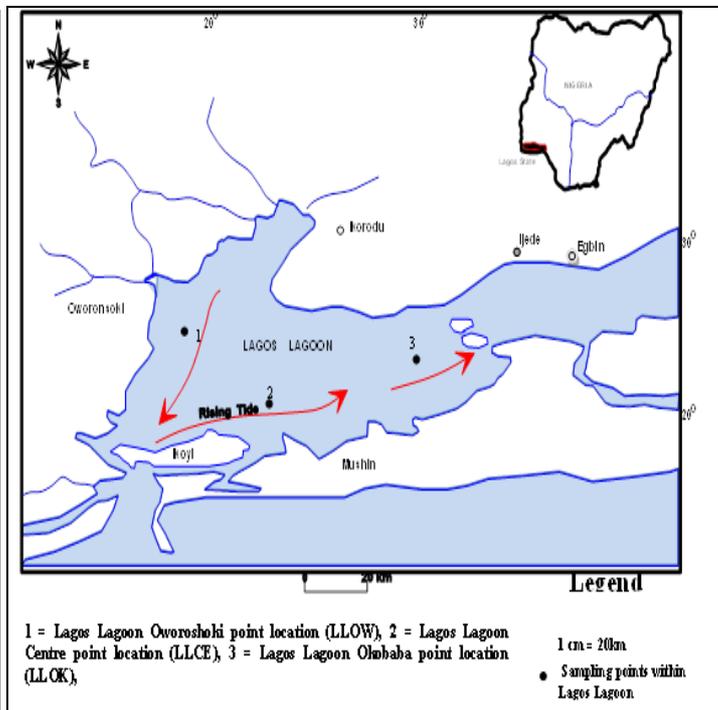


Fig 2: Lagos Lagoon

2.2 Field work duration and Field Sampling

Monthly studies were carried out in Lagos Lagoon and Asejire Reservoir from January 2012 to December 2013 on some ecological determinations. *C. nigrodigitatus* fish species

were randomly collected through the assistance of local fisherman using cage traps and set nets having multiple mesh sizes; within Asejire Reservoir and Lagos Lagoon, and immediately transported to the laboratory.

2.3 Length/Frequency Distribution and Growth Pattern Relationship

The length and frequency of occurrence of fish were recorded on *C. nigrodigitatus* fish samples collected throughout the study period. Length — Weight Relationship (LWR) of *C. nigrodigitatus* fish species was determined [9] using equation: $W = a L^b$ {Where W = weight (g) of fish, L = length (cm) of fish, 'a' = intercept, and 'b' = slope (regression coefficient which lies between 2 and 4; while isometric (symmetric) growth is indicated at 3, and values other than 3 will indicate allometric growth i.e values greater than 3 = positive allometric growth, and values less than 3 = negative allometric growth}. Linear regression of graphs of length-weight relationship was plotted.

2.4 Condition factor

The condition factors of fish samples collected were determined [10] using formular: $K = 100W / L^b$ {where K = condition, W = Weight (g), L = Length (cm), b = isometric value}.

2.5 Statistical Analysis: Analytical and descriptive statistics were used to analyse data collected; regression analysis was used to determine sequence of length and weight of fish; while Duncan Multiple Range Test (DMRT) was carried out to determine level of significance among fish samples; standard deviation of means were calculated using Statistical Package for Social Sciences (SPSS) 18 edition.

3.0 Results and discussion

3.1 Frequency and Growth Analysis of *Chrysiichthys nigrodigitatus* from Asejire Reservoir and Lagos Lagoon

Table 1: Frequency and Length-Weight Indices of *C. nigrodigitatus* collected from Asejire Reservoir and Lagos Lagoon during January 2012 – December 2013

Locations	Frequency	Mean length (cm) ± Std error	Mean Weight (g) ± Std error	Coefficient (b – value)	Condition Factor (K-factor)	Regression (R ²)	Regression (r - value)
Asejire Reservoir	288	20.02 ± 0.05 ^a	111.55 ± 0.14 ^b	1.98 ^c	1.64 ^d	0.61 ^c	0.78 ^c
Lagos Lagoon	288	22.68 ± 0.03 ^a	196.06 ± 0.16 ^a	1.40 ^c	2.43 ^c	0.58 ^d	0.76 ^c

Means with the same superscript along the column are not significantly different, (P> 0.05).

Table 2: Sex Frequency and Length-Weight Indices on *C. nigrodigitatus* from Asejire Reservoir and Lagos Lagoon

Locations	Frequency	Mean Std length (cm) ± Std deviation	Mean Weight (g) ± Standard deviation	Coefficient (b – value)	Condition Factor (K-factor)	Regression (R ²)	Regression (r - value)
Asejire Male	148	20.10 ± 0.09 ^b	108.08 ± 0.26 ^b	2.30 ^c	1.54 ^d	0.62 ^c	0.79 ^{bc}
Asejire Female	140	19.93 ± 0.11 ^b	115.89 ± 0.33 ^b	1.88 ^d	1.75 ^{cd}	0.70 ^b	0.83 ^b
Lagoon Male	137	22.56 ± 0.05 ^a	207.76 ± 0.29 ^a	1.22 ^d	3.26 ^{bc}	0.57 ^c	0.76 ^c
Lagoon Female	151	22.85 ± 0.07 ^a	180.46 ± 0.36 ^a	2.63 ^b	1.43 ^d	0.61 ^c	0.78 ^c

Means with the same superscripts along the column are not significantly different, (P>0.05).

Two hundred and eighty -eight fish were collected per location and the fish samples revealed no significant difference (P<0.05) in Length. Weight (196.06±0.16 g) recorded in Lagos Lagoon sample were significantly different (P<0.05) from Asejire Reservoir samples. Asejire Reservoir *C. nigrodigitatus* had 1.64 K-factor. Lagos Lagoon had isometric value of 1.40 recorded in Lagos Lagoon. This indicated a negative allometric value. Table 1 revealed the frequency and growth determination of the fish species in the two locations.

3.2 Sex frequency and Length-Weight Indices of *C. nigrodigitatus* collected from Asejire Reservoir and Lagos Lagoon:

Table 2 indicated sex frequency and growth trend in male and female *C. nigrodigitatus*. A total of two hundred and eighty - eight *C. nigrodigitatus* revealed male *C. nigrodigitatus* had highest frequency (299) among the samples from the two locations. There was significant different (P<0.5) between locations, but not within species on length and weight measurements. *C. nigrodigitatus* fish indicated a negative allometric value within and between locations and, but positive allometric in male Lagos Lagoon *C. nigrodigitatus* samples. The condition factor revealed female *C. nigrodigitatus* recorded lower value which may be reproductive, environmental and / or food availability linked. Figures 3 and 4 indicated regression analysis of *C. nigrodigitatus* collected from Lagos Lagoon and Asejire Reservoir. Table 3 showed the mean length and weight of *C. nigrodigitatus* by seasons and Asejire Reservoir wet season of year 2012 had lowest K- factor while Lagos Lagoon wet season of year 2013 had highest K-factor.

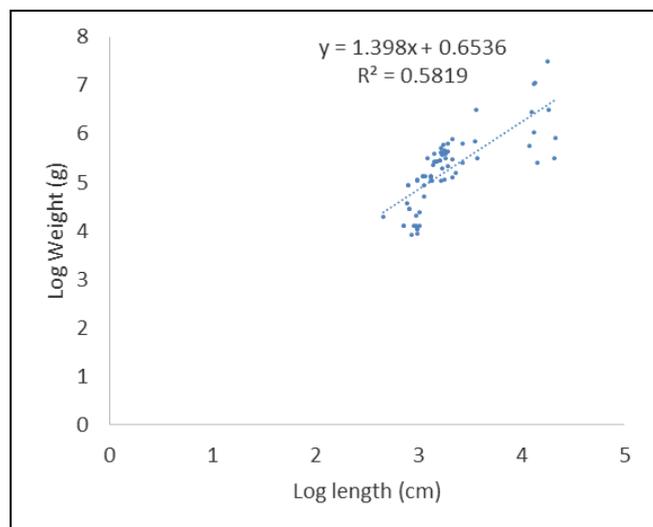


Fig 3: Length – Weight Relationship of *C.nigrodigitatus* in Lagos Lagoon

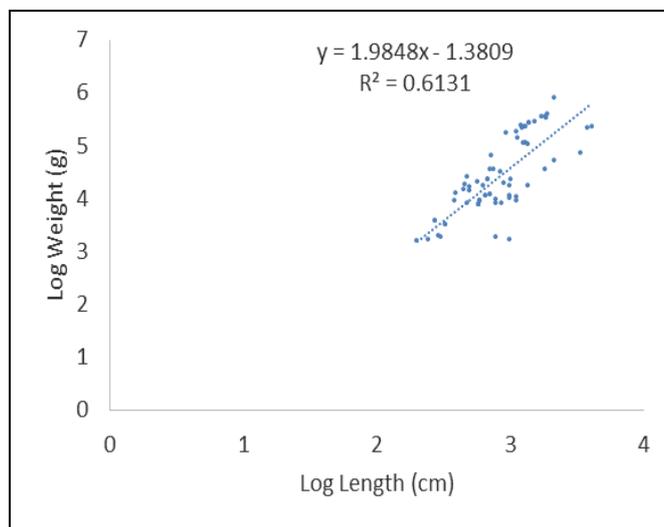


Fig 4: Length – Weight Relationship of *C. nigrodigitatus* in Asejire Reservoir

Table 3: Seasonal variation in growth of *O. niloticus* from Asejire Reservoir and Lagos Lagoon

<i>O. niloticus</i>	Mean±SEstandard length	Weight (g)	Condition factor (K)
ARONwet 2012	12.34±1.21 ^{ab}	45.56±5.28 ^d	2.42 ^c
ARONwet 2013	10.67±2.11 ^b	30.85±4.61 ^e	2.54 ^c
ARONdry 2012	14.43±2.18 ^a	127.25±9.72 ^a	4.24 ^a
ARONdry 2013	13.96±1.47 ^a	123.81±9.28 ^a	4.56 ^a
LLONwet 2012	13.65±1.12 ^a	69.04±7.30 ^c	2.71 ^c
LLONwet 2013	10.75±2.07 ^b	71.14±7.52 ^c	5.73 ^a
LLONdry 2012	14.24±2.52 ^a	86.13±7.81 ^b	2.98 ^b
LLONdry 2013	13.71±2.32 ^a	81.86±7.48 ^b	3.18 ^b

ARON- Asejire Reservoir *O. niloticus*; LLON- Lagos Lagoon *O. niloticus*

Means with the same superscripts along the column are not significantly different, (P>0.05).

Assessment of length and weight of *C. nigrodigitatus* from Asejire Reservoir and Lagos Lagoon revealed no significant difference in length of fish species sampled, but significant difference occurred in weight within specie; significant difference occurred in weight of fish samples collected between locations and not within locations. This inference is sequential to ecological condition influences as well as environmental functioning entities within the water bodies; as growth among specie is in normal sequence, ^[11]; as determined by genes and environmental factors to give required fish size, ^[12].

Male *C. nigrodigitatus* from Lagos Lagoon had higher condition factor (K) than the male *C. nigrodigitatus* in Asejire Reservoir, while female *C. nigrodigitatus* from Asejire Reservoir had higher K – factor than female *C. nigrodigitatus* in Lagos Lagoon. This is indicative of the nature of the fish and that it increases largely more in weight than in length; and the result is in line with the findings of Froese, ^[13] who stated that condition factor (K) of fish can be species specific, reproductive, sex specific, location specific, and feeding specific ^[13-15].

The measured value for condition factor (K) indicated that *C. nigrodigitatus* in Asejire Reservoir and Lagos Lagoon had K-factor, which ranged from 1.64 to 2.43. Lowest was recorded in Asejire Reservoir *C. nigrodigitatus* (1.64). While female Lagos Lagoon had lowest K-factor (1.43). This could be attributed to reproduction ^[16, 13 17].

4. Conclusion

The growth indices reveal *C.nigrodigitatus* from Asejire Reservoir and Lagos Lagoon had a good well-being status.

Among the male sex, male *C. nigrodigitatus* from Lagos Lagoon had higher condition factor than the male *C. nigrodigitatus* in Asejire Reservoir, while female *C. nigrodigitatus* from Asejire Reservoir had higher K – factor than female *C. nigrodigitatus* in Lagos Lagoon. A lower b - value (1.22) was recorded in *C. nigrodigitatus* from Lagos Lagoon, and this indicated a negative allometric b values which revealed the fish increase more in length than in weight as this is supportive of the nature of the fish. Hence both environments favour the growth of *C. nigrodigitatus*.

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