

Morphometric and meristic characteristics of M*ugil cephalus* (grey mullet) from wetland of Ogun water-side Local Government Area

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Abstract

Investigations on the morphometric and meristic characteristics were conducted on grey mullet, Mugil cephalus collected from wetland of Ogun waterside Local government Area, Ogun state, Nigeria. A total number of ninety-one live specimens were caught from the wetland of Ogun waterside Local government Area, for a period of March to June 2012. The fish were immediately preserved on ice in order to slow down rate of decomposition and their total length (TL) (cm), standard length (SL) (cm), head length (HL) (cm), body width (BW) (cm) and body weight (g), were measured fresh within 24 hours. Its sex was also determined by dissecting out the gonads to reveal eggs or testes. The mean values of total length TL, standard length SL, head length HL, body width and body weight for both male and female of M. cephalus for the month of March to June were 18.0±1.1 and for male and 18.6±0.9 for female (M/F), 14.7±1.0 and 14.7±0.6 (M/F), 3.3±0.2 and 3.2±0.1 (M/F), 3.8±0.2 and 3.0±0.5 (M/F), and 52.3±5.5 and 66.7±1.1 (M/F). Gill raker of M. cephalus gave a different result as there was difference between male and female,108 – 138 (male), and 104 and 148 (female).The growth pattern for male species were near isometric with b = 2.53, female species was negative allometric (b = 2.88) and combined sexes was isometric (b = 2.80). Information obtained from the study will contribute to the baseline data for carrying future studies on its ecology and conservation and development.

Key words: M*ugil cephalus*, Wetland, Ogun waterside, Morphometric, Meristic

Introduction

The flathead mullet (*Mugil cephalus* L.) is a cosmopolitan euryhaline fish distributed in coastal, lagoon, and estuarine waters. (Thomson, 1966). *Mugil cephalus* have worldwide distribution and inhabit tropical and temperate seas while few spend their lives in freshwater (Nelson, 2006).

It inhabits coastal waters, estuaries and freshwater in tropical and temperate waters of all seas (Render *et al*., 1995). The adults and juveniles of the grey mullet are hardy, euryhaline, eurythermal and not competitor for food. School occurs in shallow coastal waters; they enter lagoons and estuaries to feed (Rheman *et al*., 2002). In estuarine waters, grey mullet feed on detritus, diatoms, algae and microscopic invertebrates which they filter from mud and sand through their mouth and gills (Queensland Fish Management Authority, 1991; McDonough and Wenner, 2003). A proportion of the sand is ingested to assist in the grinding of food in the muscular stomach (Michaelis, 1993).

The Mugilidae family includes 17 genera and 72 species in the world (Harrison and Senou, 1999; Nelson, 2006). Eight species of Mugilidae inhabit the Mediterranean Sea, and originally classified as part of the single genus *Mugil*, under different names (*M. cephalus, M. ramada, M. labrosus, M.*

labeo, M. aurata, M. abu, M. saliens, and M. carinata).

Mugil cephalus has been farmed for centuries in extensive and semi-intensive ponds in many countries. Subsistence farming in ponds and enclosures has been traditional in the Mediterranean region, South East Asia, Taiwan Province of China, Japan and Hawaii. Flathead grey mullet is a very important aquaculture species in Egypt, where its farming has been traditional in the *Hosha* system in the delta region for centuries. Since the early 1960s, flathead grey mullet has also been cultured in semi-intensive ponds with tilapia and carps in Egypt (FAO, 2006)

In the Russian Federation mullet aquaculture has been practiced in the Black Sea and Caspian Sea regions since 1930. This species was first introduced to be cultured with carp in Israel in 1957. In the Philippines, mullet has been raised with milkfish since 1953. The intensive culture of mullet in Hong Kong was successful in fertilized ponds with the traditional practice of carp polyculture since 1940. It has been reported that mullet have been farmed in India since ancient times; for example, it has been extensively cultured in Bengal, Madras and Kerala since 1947. (Lazarus and Nandakumaran, 1991)

In Taiwan Province of China, nearly 40 percent of the total commercial production (fisheries and aquaculture) of *Mugil cephalus* has been pond reared since the 1960s, being cultured with carp in ponds. In the United States of America, mullet has been cultured as bait fish since the 1940s. Small-scale trials of mullet vulture have been carried out in Saudi Arabia and other Gulf States. Various techniques have been used to validate age in fishes in tropical water including Lagos lagoon (Bayagbona 1969; Fagade 1973; Ezenwa and Kusemiju 1981; Kendall *et al* 2010)

Statistical analyses for ageing fish and length frequency data as distribution mixture have been reported by Fagade and Olaniyan (1972) and Morales-Nin and Ralston (1990)

The aim of the study is to investigate the morphometric and meristic characteristics of M*ugil cephalus* (grey mullet) from wetland of Ogun water-side Local Government Area in order to contribute to baseline information on the biology of the fish species.

Materials and methods

Study Area

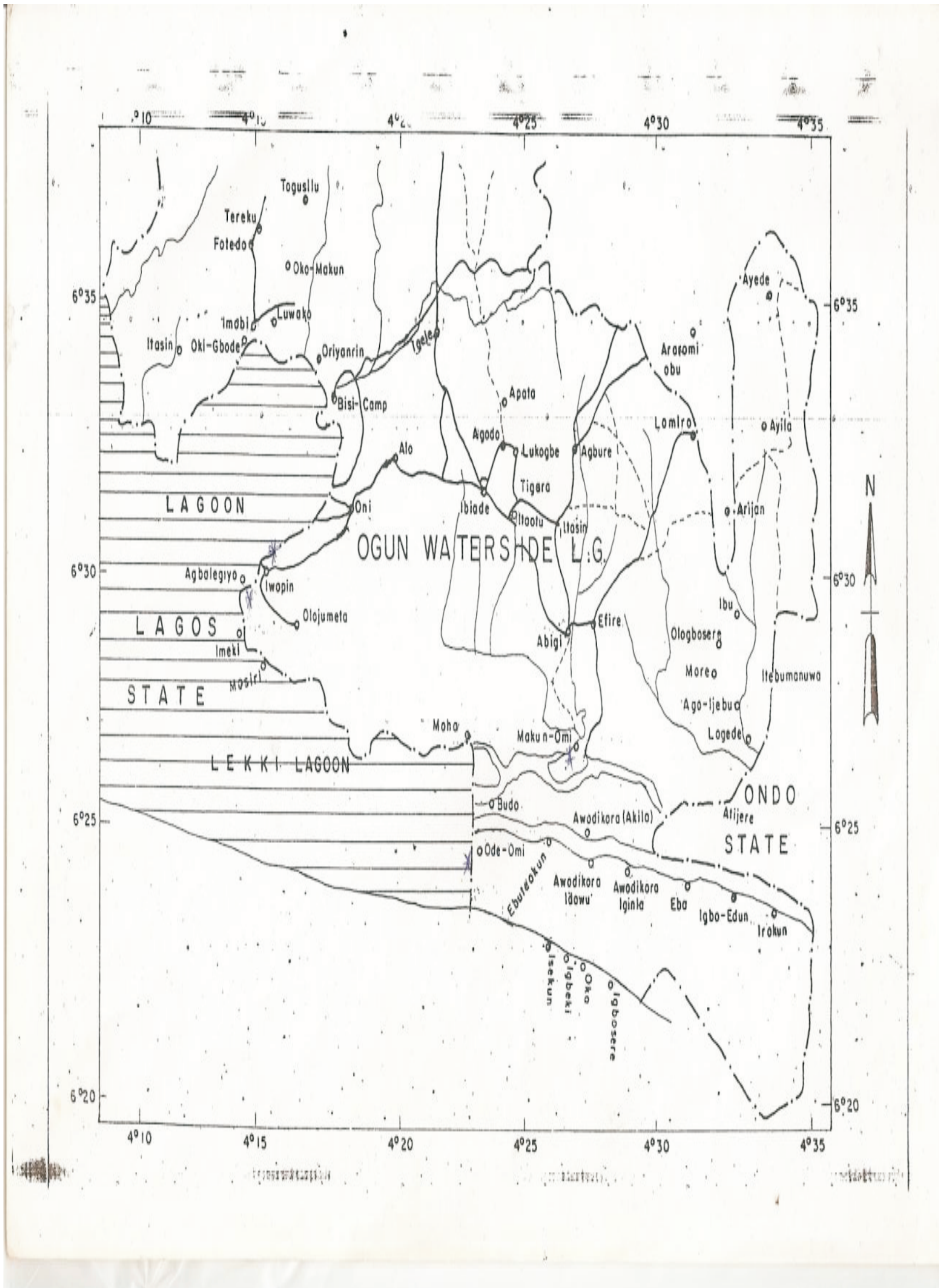
Ogun estuary is an extension of Lekki Lagoon located in Ogun waterside area, Ogun state Nigeria. It has border with Lagos Lagoon and which is one of the aquatic habitats in Ogun State, Nigeria. It is located between longitudes on $60^{0}29^{1}$N $40^{0}24^{1}$E (NIPOST, 2009) Odulate et al, 2011.

Collection of fish samples

The live fish samples were collected from fishermen from wetland of Ogun Waterside Local Government Area. A total number of *ninety-one species of M. cephalus* were obtained. Fish specimens were collected from March – June 2012.The fishermen used a wide range of fishing gear such as cast nets, gill nets, bamboo trap and non-return valve trap and the use of outboard engine canoe to convey the fish to landing center. The specimens were collected in three different sizes, the smaller size which the standard length ranges from 9.5cm-14.8cm while the medium and the largest sizes were 14.8cm-20.1cm and 20.1cm-25.4cm respectively

Morphometric Features

The morphometric features of *Mugil cephalus* was determined using Measuring Board in which the tip or snout of the fish is put against a stop at the beginning of the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Isekun
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Oko
Igbosere

measuring scale. It is measured in centimeter. The total length is the longest length of the fish i.e. measuring from its interior mouth to the anterior end of the tail fin. Other features measured were Standard length (SL) in cm, Head length (HL) in cm while the Body weight (BW), were measured in gram using a sensitive Sartorius balance (Model Eb3).

Determination of Meristic Features

The meristic characters determined were first Dorsal fin ray (DFR1), second dorsal fin (DFR2), Anal fin ray(AFR), Pectoral fin ray(PFR), Pelvic fin ray (PFR) using the method of Turan, 2011 while Gill rakers were counted with the aid of hand lens and binocular using x 100 magnification using the method adopted by Omoniyi, 2007.

Data Analysis

Data on morphometric and meristic were subjected to statistical analyses such as means, standardard deviations and analysis of variance using Statistical Package for Social Sciences (SPSS version 17.0) in this study to determine if there was any morphological and genetic diversity among the populations of *Mugil cephalus* from the study area.

Results

Table 1 shows the result of morphometric characteristics of *M. cephalus* in wetland of Ogun Water-Side Local Government Area. During the month of March – June, the mean total length in cm for male and female *M. cephalus* were 14.8±1.4 and 20.5±1.9 (M/F), 18.7±2.2 and 17.9±1.3 (M/F), 18.8±0.9 and 19.3±1.3 (M/F), 19.7±16.2 and 16.6±0.6 (M/F) respectively. Two-tailed t- test showed that they was no significant (>0.05) difference between means of the both sexes.

Standard length measurement of the fish samples for the month of March – June showed that the mean standard lengths for both male and female (M/F) values were 11.8±1.1 and 16.0±1.4 (M/F), 15.6±1.0 and 14.3±1.0 (M/F), 15.1± 0.7 and 15.3±1.0 (M/F), 16.1±12.7 and 13.2±0.5 (M/F) respectively. Two-tailed t- test showed that they was no significant (>0.05) difference between means of the both sexes.

The mean head length for male and female *M. cephalus* were 2.6±0.2 and 3.5±0.3 (M/F), 3.5±0.2 and 3.1±0.2 (M/F), 3.3±0.2 and 3.4±0.2 (M/F), 3.7±2.9 and 2.9±0.1 (M/F) respectively. Two-tailed t- test showed that they was no significant (>0.05) difference between means of the both sexes.

Table 1 shows the result of morphometric characteristics of *M. cephalus* in wetland of Ogun Water-Side Local Government Area. During the month of March – June, the mean body width for male and female *M. cephalus* were 3.2±0.4 and 1.7±0.3 (M/F), 3.8±0.2 and 3.5±0.3 (M/F), 4.1±0.4 and 3.9±0.3 (M/F), 4.0±3.0 and 3.0±0.1 (M/F) respectively. Two-tailed t- test showed that they was no significant (>0.05) difference between means of the both sexes.

For body weight of the fish samples, as shown in Table 1, for the month of March – June, the mean body weight measured in (g) for both male and female (M/F) values were 36.0±11.2 and 95.3±20.8 (M/F), 56.9±13.7 and 59.1±12.6 (M/F), 59.5±9.1 and 69.8±13.4 (M/F), 56.8±36.0 and 42.5±5.4 respectively. Two-tailed t- test showed that they was no significant (>0.05) difference between means of the both sexes.

Meristic characteristics of *M. cephalus* in wetland of Ogun Water-Side Local Government Area, is shown in Table 2 for the month of March – June, there was no different between male and female *M. cephalus.* The meristic characteristic for male and female were (DF1) IV (M/F), (DF2) 7 – 9 (M/F), PVF I 5 (M/F), AF III 8 – III 9 (M/F), PEF 16 – 17 and 16 – 18 (M/F) respectively.

Table 1: Morphometric characteristics of *M. cephalus* in wetland of Ogun Water-Side Local Government Area

Morphological characteristics	Total Length (cm)		Standard Length (cm)		Head Length (cm)		Body Width (cm)		Body Weight (g)	
Month/Sex	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
MARCH	14.8±1.4 (11.9-24.1)	20.5±1.9 (11.9-32.2)	11.8±1.1 (9.5-19.1)	16.0±1.4 (9.6-25.4)	2.6±0.2 (2.1-4.1)	3.5±0.3 (2.1-5.8)	3.2±0.4 (2.3-5.6)	1.7±0.3 (0.4-4.2)	36.0±11.2 (17.0-115.0)	95.3±20.8 (15.0-26.9)
APRIL	18.7±2.2 (12.4-22.1)	17.9±1.3 (12.6-28.7)	15.6±1.0 (12.8-17.3)	14.3±1.0 (10.1-22.6)	3.5±0.2 (3.0-3.8)	3.1±0.2 (2.1-4.9)	3.8±0.2 (3.1-4.1)	3.5±0.3 (2.3-5.6)	56.9±13.7 (33.2-88.2)	59.1±12.6 (17.0-180.1)
MAY	18.8±0.9 (14.7-23.7)	19.3±1.3 (13.3-28.1)	15.1±0.7 (11.8-19.0)	15.3±1.0 (10.6-21.7)	3.3±0.2 (2.3-4.4)	3.4±0.2 (2.1-4.8)	4.1±0.4 (3.0-7.1)	3.9±0.3 (2.6-7.2)	59.5±9.1 (28.0-116.9)	69.8±13.4 (21.0-179.5)
JUNE	19.7±16.2 (5.0-14.7)	16.6±0.6 (13.5-23.4)	16.1±12.7 (4.8-11.3)	13.2±0.5 (10.2-18.6)	3.7±2.9 (1.1-2.6)	2.9±0.1 (2.2-4.4)	4.0±3.0 (1.5-2.5)	3.0±0.1 (2.5-4.2)	56.8±36.0 (30.7-26.1)	42.5±5.4 (19.3-102.6)
	18.0±1.1[a]	18.6±0.9[a]	14.7±1.0[a]	14.7.5±0.6[a]	3.3±0.2[a]	3.2±0.1[a]	3.8±0.2[a]	3.0±0.5[a]	52.3±5.5[a]	66.7±11.1[a]

Values with the same superscript in each column were not significantly (P>0.05) different

Table 1: Meristic characteristics of *M. cephalus* in wetland of Ogun Water-Side Local Government Area

Meristic features	Male	Female
GR	108 – 138	104 – 148
DF_1	IV	IV
DF_2	7 – 9	7 – 9
PVF	I 5	I 5
AF	III 8 – III 9	III 8 – III 9
PEF	16 – 17	16 – 18

GR = Gill raker, DF_1 = Dorsal fin, DF_2 = Dorsal fin (ventral), PVF = Pelvic fin, AF = Anal fin,(III distinct fin ray) *PEF = Pectoral fin*

Gill rakers of *M. cephalus* male ranged from 108 – 138 while female gill rakers ranged from 104 -148. There was significant difference between male and female gill rakers value.

Length – Weight Relationship of Male of *M. cephalus.*

The 'b', 'a', and r^2 values were 2.53, 0.0325 and 0.9076 respectively. The growth pattern of male *M. cephalus* was negatively allometric as 'b' value was significantly ($p<0.05$) different from 3, as shown in Figure 1.

Length – Weight Relationship of Female of *M. cephalus.*.

Result from length relationship of female *M. cephalus* shows that the 'b', 'a' and r^2 value were 2.8812, 0.012 and 0.9833 respectively. The growth pattern was not significantly ($P>0.05$) different from '3' indicating isometric growth as it is shown in Figure 2.

Length Weight Relationship of Combined Sexes of *M. cephalus*.

The 'b' value was 2.8029, 'a' value was 0.015 were r^2 was equal to 0.9667. This shows that the growth pattern was not significantly different ($p>0.05$) from '3' (one tailed t-test) indicating isometric growth as it is shown in Figure 3.

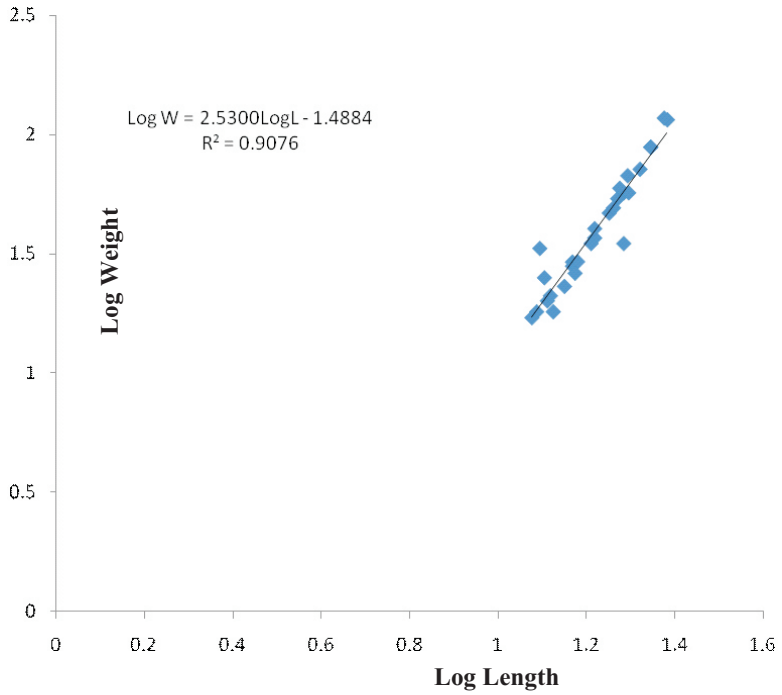

Figure 1: Log Length – Log Weight Relationship for Male *M. cephalus* in wetland of Ogun water-side local government area.

The equation of LogL LWR representing is as below:
Log W = 2.53LogL – 1.4884

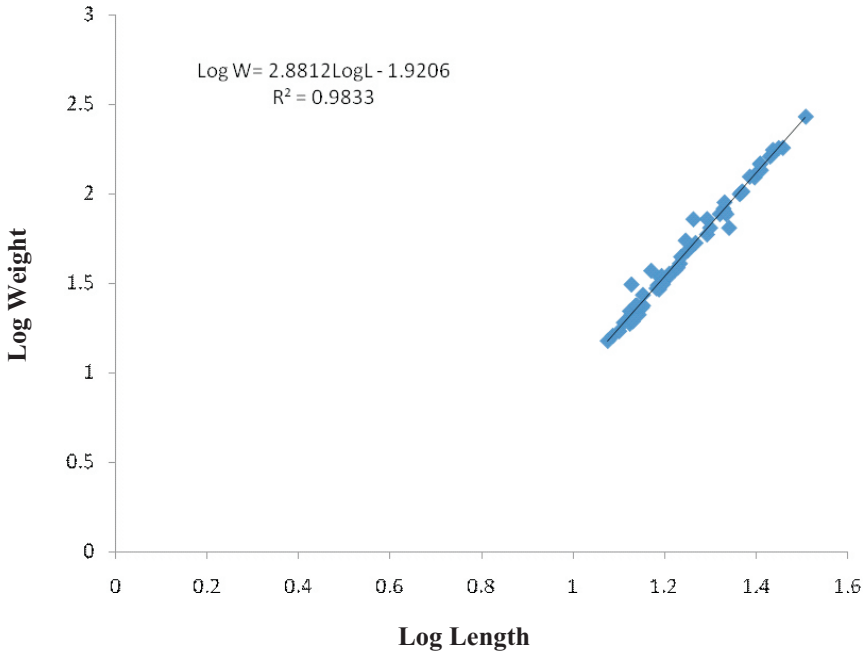

Figure 2: Log Length – Log Weight Relationship for Female *M. cephalus* in wetland of Ogun water-side local government area.

The equation of LogL LWR representing is as below:
Log W = 2.8812LogL – 1.9206

Discussion

Taxonomy description of fish has commonly relied on the description of unique sets of morphological characteristics and meristic characters. In the presently study, there were no differences in the morphological characteristics of *M. cephalus* for both male and female as they were not significantly different (P>0.05). the mean values recorded for the morphological characteristics recorded for both male and female of *M. cephalus* for the month of March to June were were in agreement with Turan *et al*, (2011) who investigated the systematic status of nine mullet species (Mugilidae) in the Mediterranean Sea.

The meristic characteristics recorded for both male and female of *M. cephalus* were DF_1 IV (M/F), DF_2 7 – 9 (M/F), PVF I5 (M/F) respectively were in accordance with Turan *et al*, (2011).

Growth of fish can be described as either allometric or isometric depending on the exponent b (regression coefficient) of the length – weight relationship which is normally between 2.0 or 4.0. The value b = 3.0 indicates that the fish grows symmetrically or isometrically while values other than 3.0 indicates allometric growth (Tesch, 1971). In isometric growth, the shape of the fish is maintained throughout life while aspect of growth in populations that exhibits allometric growth may be out of proportion or the adults may

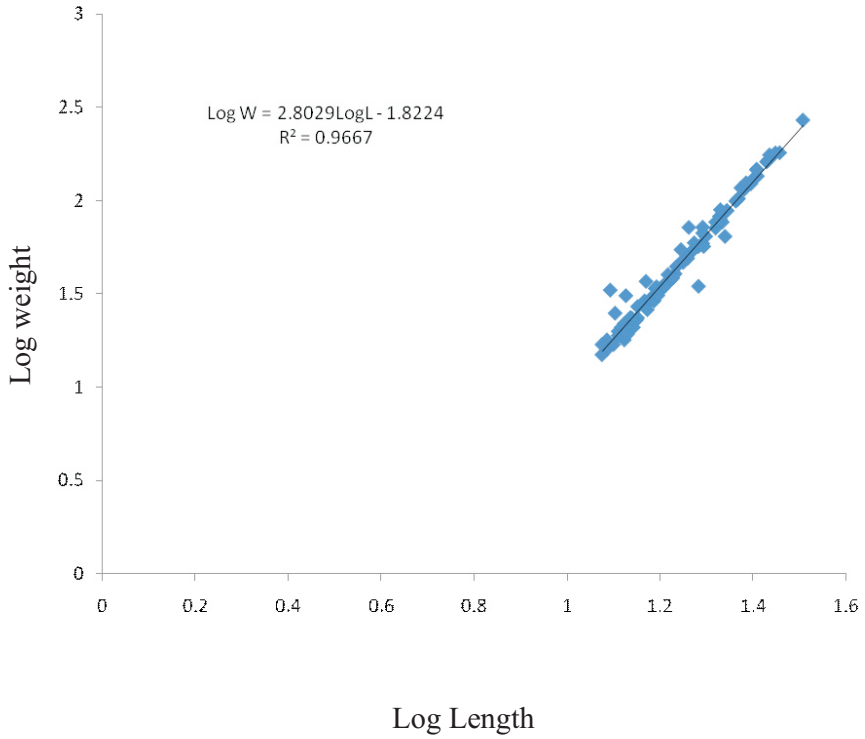

Figure 3: Log Length – Log Weight Relationship for combined sexes *M. cephalus* in wetland of Ogun Water-Side Local Government Area.

The equation of LogL LWR representing is as below:

Log W = 2.8029LogL – 1.8224

appear different from the young ones (Tesch, 1971). In the present study, the grey mullet were grouped into male, female and combined sexes, the growth pattern for male species indicate negative allometric which have b value of 2.53. The growth patterns for female and combined sexes were isometric which have b value of 2.88 and 2.80 respectively indicating that the weight of the fish were not too much for the length. This may be responsible for its robustness in wetland of Ogun Water-side Local Government Area. This is similar to what Grant *et al* (1977) reported on the Australian Mullet and Soyinka (2008) on Mullet from Lagos Lagoon. A positive correlation of r = 0.9076, 0.9833 and 0.9667 for male, female and combined sexes respectively.

Conclusion

This study provides some important information on biological aspect of *M. cephalus* that will be useful for fisheries biologist to propose adequate regulation for sustainable fisheries management, ecology and conservation of these commercially and economically valued fish species in wetland of Ogun Water-side Local Government Area. This study revealed that diatoms are the most abundant food in the

diet of *M. cephalus* in wetland of Ogun Waterside Local Government Area. The knowledge of morphological and meristic characteristics has greatly contributed to the understanding of the population structure of the species in wetland of Ogun Waterside Local Government Area. It has also provided useful information on the growth pattern.

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