

## MORPHOMETRY AND DIET OF *Chrysichthys nigrodigitatus* (Lecepede) IN MAJIDUN RIVER, IKORODU, LAGOS STATE, NIGERIA.

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### ABSTRACT

The study was conducted to investigate the sustainability and availability of *Chrysichthys nigrodigitatus* one of the most commercial fish found in Majidun River, Ikorodu between October, and December 2020. Fifty (50), fish specimens were collected from fishermen at the landing site, the major fishing methods employed by the fishermen were cast netting and set netting. The total length ranged from 11.00 to 30.00cm (mean size  $19.67 \pm 4.56$ cm) while the standard length ranged from 8.30 - 24.50cm (mean size  $15.09 \pm 3.39$ cm). The length weight relationship was described by the equation:  $\text{Log } W = 1.6373 + 2.88 \text{ Log } SL$  and the condition factor ranged from 1.49 – 3.60. The results were obtained from the study of the stomach contents of the specimens in the laboratory using visual and microscopic examinations. Analysis of the stomach content were done by combination of frequency of occurrence methods and numerical methods were used to study the food. The diets revealed five (5) identified food items and unidentified mass. Sediments was the most abundant food items by occurrence (34.70%) followed by unidentified mass (19.80%) while crustaceans, molluscs, fishes, and insects were the least abundant with 17.82%, 16.83%, 6.93% and 3.92% respectively. Considering the numerical method, mollusks was the most abundant (97.4%), while insects was the least (0.23%).

**Keywords:** Growth pattern, food, sex ratio, Majidun River, Nigeria.

### INTRODUCTION

*Chrysichthys nigrodigitatus* also known as silver catfish is one of the most abundance fish in Africa and there are five species in Nigeria water bodies (Idodo-Umeh, 2005). *Chrysichthys* belongs to the family Claroteidae, order Siluriformes, superorder Ostariophysi and genus Claroteid. Ekanem (2000) reported that *Chrysichthys* species have high commercial importance. It is a highly prized fish in Nigeria and is among the principal fishes of commercial catches in Nigeria (Ezenwa *et al.*, 1986). Though widespread in the natural inland waters where the species grows and spawns actively, it is quite difficult to reproduce *C. nigrodigitatus* in captivity for aquaculture.

Abowei and Ezekiel (2013) also reported *C. nigrodigitatus* to be of a great ecological and economic importance as they play important role in the food chain and provide food for the local communities and Nigerian as a whole. *C. nigrodigitatus* is a demersal, potamodromous specie and it occurs in shallow waters, over mud and fine sand bottom, in rivers and in swamps. It is an omnivorous fish that feeds on bivalves, crabs, detritus, insects, and seed (Reed *et al.*, 1967). Feeding becomes specialized with size and age,

larger fish may also feed on fish and decapods (Laleye, 1995).

The study of length-weight relationships, condition factor, fish diet and eating patterns is continuous research as it is the foundation for developing a successful fisheries management programme based on fish capture and culture, and because aquatic ecosystem is also dynamic. Bolarinwa and Popoola (2013), reported that length-weight relationships provide important clues on climatic and environmental changes and the changes in human subsistence practices.

Condition factor is used as an index of growth and feeding intensity and decrease with increase in length (Fagade, 1979). The gut content reflects the water quality, all other factors being constant. The natural habitats offer a great diversity of organisms that are used as food by fish, which differ in sizes (microscopic and macroscopic) and taxonomy groups (Olojo *et al.*, 2003). The dietary analysis of fish in their natural habitats enhances the understanding of the growth, abundance, productivity, and distribution. (Fagade and Olaniyan, 1972).

A general survey of the distribution of *C. nigrodigitatus* in Nigeria has shown that it is

concentrated in the major rivers of the country and occurs in low brackish water, freshwater lagoon sand creeks in the coastal areas of Nigeria (Ezenwa, 1978). Artisanal fishermen in most fishing communities in Ikorodu depends on the fish, *Chrysichthys* species which is among their major source of revenue.

Although considerable information is available on varied aspects of the length weight relationship, condition factor and gut content of *C. nigrodigitatus* in Nigeria waters (Ezenwa *et al.*, 1986; Ekanem, 2000; Atobatele and Ugwumba, 2011; Okey *et al.*, 2017), little information exist on this species in Majidun river and Majidun fish landing site. As a result, this study will be beneficial in the management of this valuable fish species in the Majidun River by providing information on its length-weight relationship, condition factor, and dietary composition. The output will contribute to knowledge of this species in the study area.

**MATERIALS AND METHOD**

**Description of the Study Area**

Majidun River is relatively a small, narrow, and shallow water body with average depth of 3 m. The river lies within latitudes 3°48'E and 4°48'E and stretches between longitudes 6°61'N and 7°12'N (Figure 1). It is one of the numerous aquatic habitats that constitute Lagos lagoon complex. Others adjoining aquatic habitats include Ologe, Lekki and Epe lagoons, Yewa and Ogun rivers, Badagry and Ogudu creeks. However, Majidun River drains directly into Lagos Lagoon and empties into the Atlantic Ocean via Lagos Harbor (Lawson *et al.*, 2013). Due to seasonal distribution of rainfall, the river experiences seasonal flooding which introduces a lot of detritus, domestic and industrial wastes, and pollutants from the mainland.

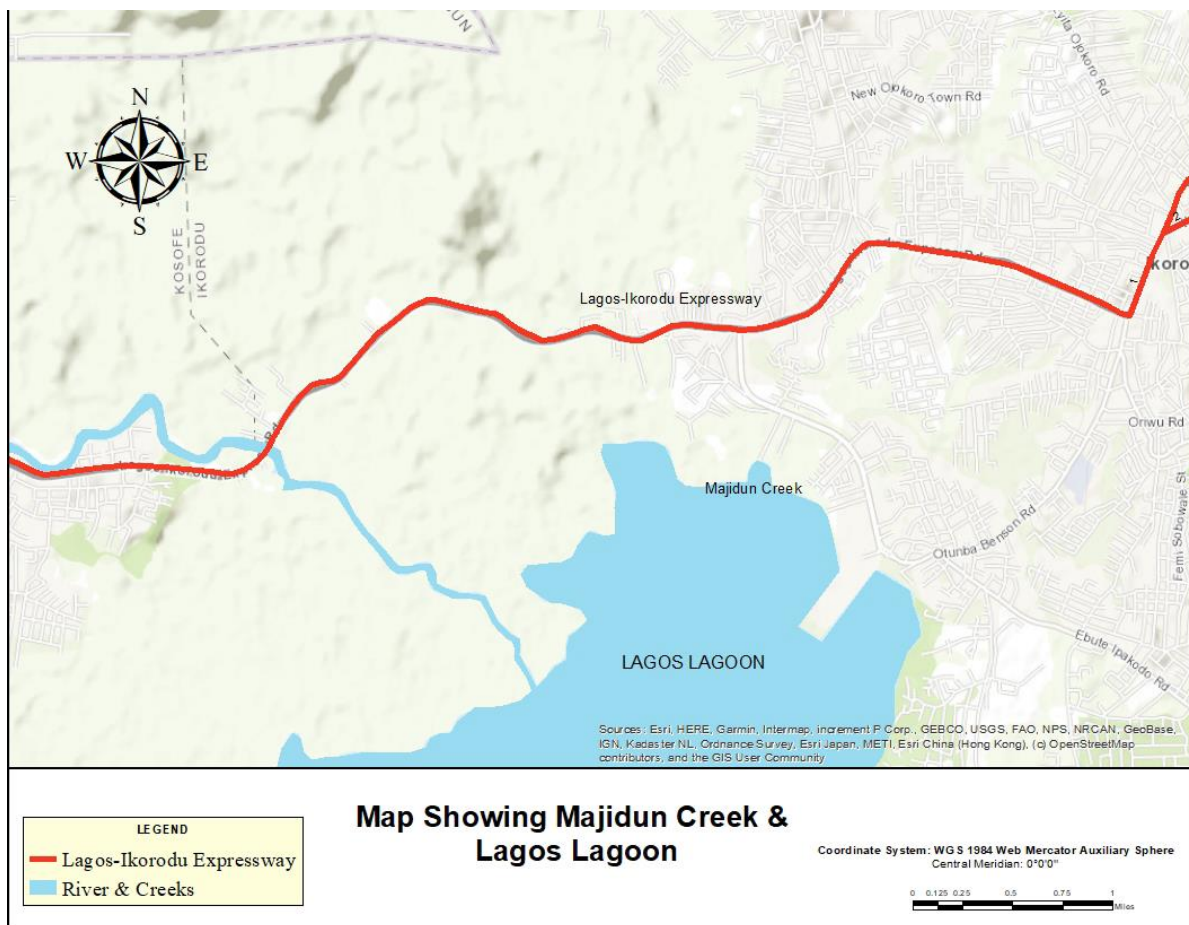


Figure 1: Map showing Majidun River and Lagos lagoon

### Sample Collection

Fifty (50) specimens of *C. nigrodigitatus* were collected from fishermen at the landing site of Majidun River caught with cast net, gill net, traps or hook and line, between October and December 2020. Immediately after collection, the fish samples were preserved in an ice chest containing ice cubes in the field and were transported to Nigeria Institute of Oceanography and Marine Research (NIOMR) Laboratory where they were stored in a deep freezer before further examination.

### Fish Measurement

The stored specimens were defrosted and wiped dry with towel before weighing to prevent excessive weights of the fish due to water droplets. The standard and total lengths were measured on a measuring board and the weights were determined using a sensitive weighing balance (Sartorius balance - Model 1106). The total weight of each fish was achieved by placing each *C. nigrodigitatus* on the sartorius sensitive weighing balance and the result was recorded to the nearest decimal point in grams.

### Stomach Content Analysis

Each specimen was dissected and gutted to determine food volume. The displacement method (Windell and Bowen, 1978; Hyslop, 1980) was used to determine the volume. Each gut was placed one after the other in a Petri dish in the laboratory containing known volume of tap water and the respective food volume reading (ml) were recorded with each of the standard length (cm) and weight (g) of each of the fish samples. The food contents of the species was analyzed using numerical and frequency of occurrence method (Hyslop, 1980). The stomach of each specimen was split open using a pair of dissecting scissors and emptied into the petri dish to determine its content. Drops of the mixture (stomach content) were placed on a glass slide using a dropper. The slide was covered with a cover slip and viewed under a light microscope (Olympus) to identify the various food items.

### Data analysis

Descriptive Statistics and Statistical Package for the Social Sciences (SPSS, version 22) were used in analyzing the data.

The length – weight relationship of each fish was studied using the formula:

$$\text{Log } W = \text{Log } a + b \text{ Log } L$$

Where a = regression constant

b = regression coefficient

W = Weight (g)

L = Total Length (cm)

The condition factor (K) shows the state (well-being) of the fish i.e., the leanness or fattiness of a fish, and computed using the formular:

$$K = [100 W] / L^3$$

Where K = Condition factor

L = Standard length (cm)

W = Weight (g)

The diet components were summarized using descriptive statistics and data were presented in tables, graphs, and charts.

## RESULTS

### Length Frequency Distribution

The total length of *C. nigrodigitatus* from Majidun River ranged from 11.00 - 30.00cm (mean size 19.67 ± 4.56cm) while the standard length ranged from 8.30 - 24.50cm (mean size 15.09 ± 3.39cm) as shown in Figure 2.

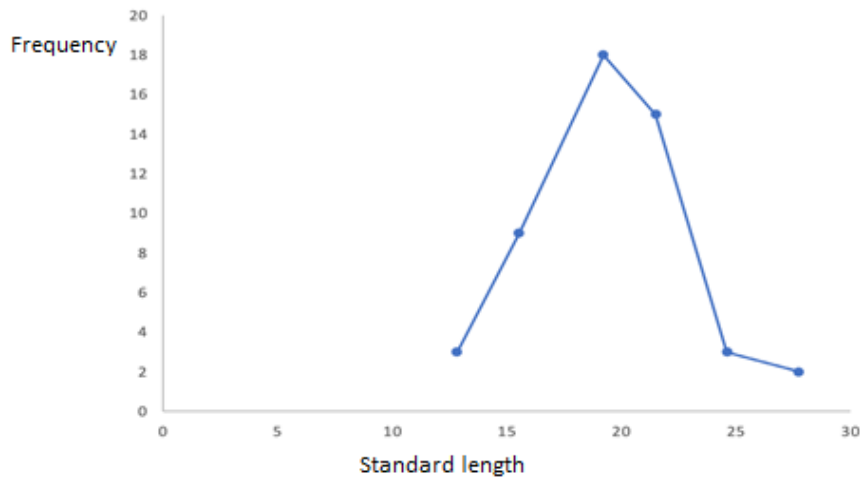


Figure 2: Standard length-frequency distribution of *C. nigrodigitatus* from Majidun River

**Length – Weight Relationship of Female *C. nigrodigitatus***

The weight of the female *C. nigrodigitatus* ranged from 11.40 – 80.73g. Figure 3 illustrates the Log length-Log weight relationship of the species. The length and weight relationship reflected a common

general increase in weight with increasing length. The least square common fit of the transformation of the data gave the following linear equation.

$$\text{Log } W = 1.5633 + 2.8085 \log \text{SL}$$

$$r = 0.85720, n = 17$$

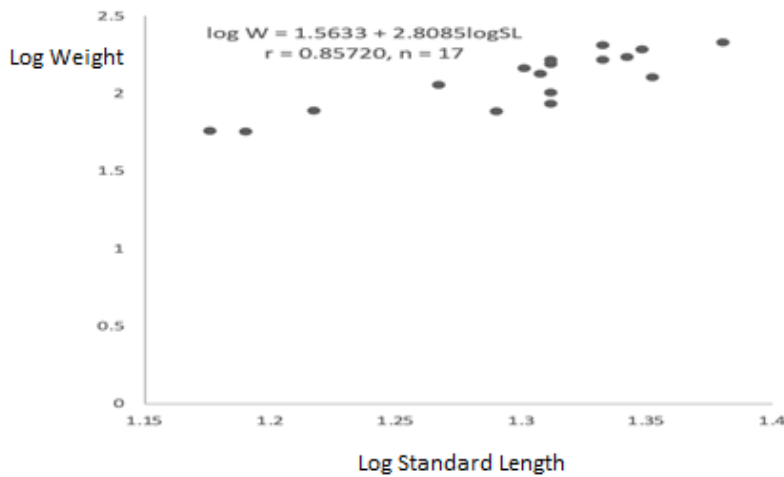


Figure 3: Log length-Log weight relationship of female *C. nigrodigitatus* from Majidun River

**Length – Weight Relationship of Male *C. nigrodigitatus***

The weight of the male *Chrysichthys nigrodigitatus* ranged from 12.50 – 102.62g. Figure 4 illustrates the Log length-Log weight relationship of the species.

The least square common fit of the transformed data gave the following linear equation.

$$\text{Log } W = 1.1614 + 3.6784 \log \text{SL}$$

$$r = 0.98590, n = 33$$

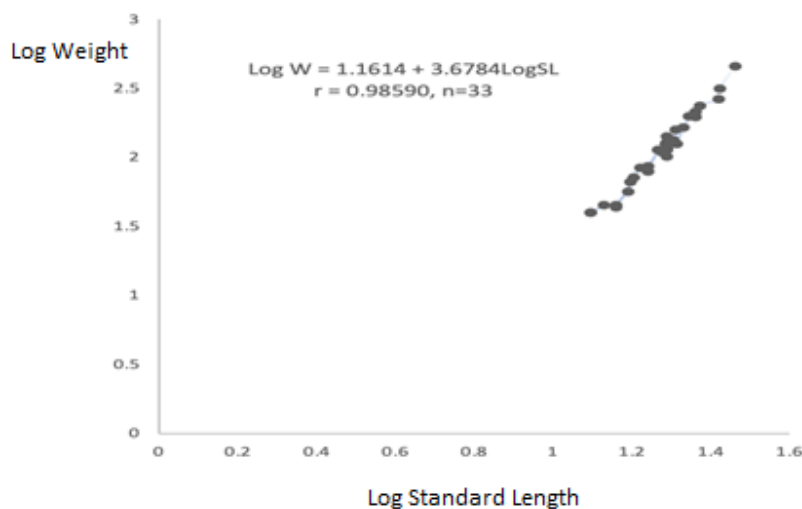


Figure 4: Log length-Log weight relationship of male *C. nigrodigitatus* from Majidun River

**Length – weight relationship of combined sex of *C. nigrodigitatus***

The weight of combined sex of *Chrysichthys nigrodigitatus* ranged from 14.60 – 106.52g. Figure 5 illustrates the log length-log weight relationship of the combined sex species. The least square common

fit of the transformed data gave the following equation.

$$\text{Log W} = 1.6373 + 2.88\log\text{SL}$$

$$r = 0.67856, n = 50$$

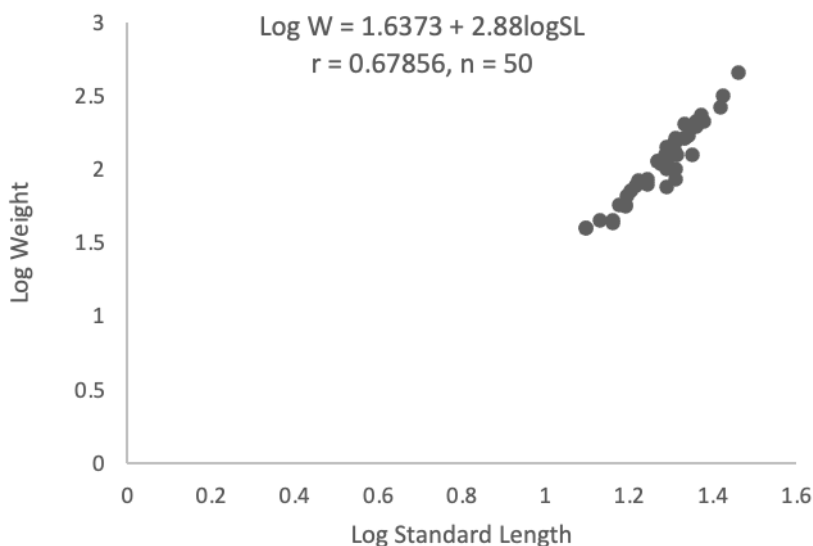


Figure 5: Log length-Log weight relationship of combined sex *C. nigrodigitatus* from Majidun River

**Condition factor (K)**

The value of the condition factor ranged from 1.69 – 1.70, 1.86 – 1.97 and 1.97 – 3.60 for males,

females and combined sex respectively. The mean K value were 1.64, 1.70 and 2.28 for males, females and the combined sex respectively as shown in Table 1.

**Table 1: Condition factor of *C. nigrodigitatus* from Majidun River**

Size range	Male				Female				Combined sex			
	F	SL	W	K	F	SL	W	K	F	SL	W	K
11.50 - 14.40	-	-	-	-	3	12.83	41.6	1.97	3	12.83	41.6	1.97
14.50 - 17.40	2	15.6	64.55	1.70	7	15.53	61.3	1.63	9	15.54	558.2	1.49
17.50 - 20.40	14	19.4	116.71	1.59	4	18.5	108.05	1.70	18	19.23	2066.2	2.90
20.50 - 23.40	13	21.3	161.25	1.66	2	22.75	161.4	1.37	15	21.51	161.27	1.62
23.50 - 26.40	3	24.6	237.5	1.58	-	-	-	-	3	24.63	237.5	1.59
26.50 - 29.40	1	26.5	314.8	1.69	1	29	453.6	1.86	2	27.75	768.4	3.60

**Key:** F = Frequency; SL = mean standard length (cm), W = mean weight (g) and K = mean condition factor

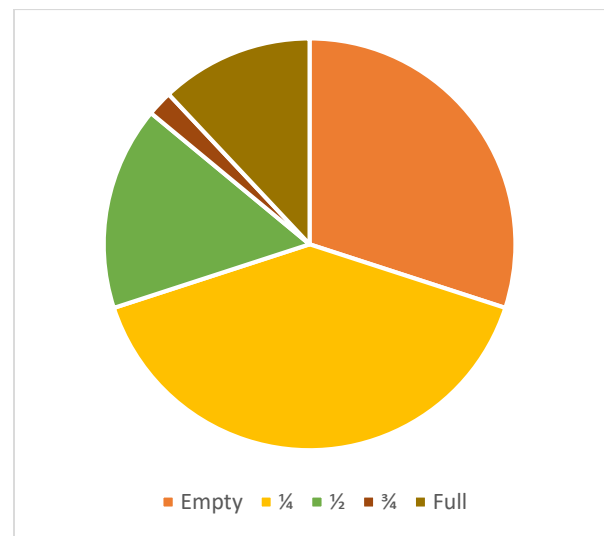
**Stomach Food Volume**

The results of the stomach food volume in the samples of *C. nigrodigitatus* from Majidun River are shown in Table 2 and figure 6, while Table 3 shows

stomach condition of different size range of *Chrysichthys nigrodigitatus* from Majidun River. 30% of the sampled population had empty stomach while 12% had their stomach full.

**Table 2: Stomach Food Volume of *C. nigrodigitatus* from Majidun River**

State of Stomach	No of Stomach	Percentage Volume
Empty	15	30
¼	20	40
½	8	16
¾	1	2
Full	6	12
<b>TOTAL</b>	<b>50</b>	<b>100</b>



**Figure 6: Stomach condition of *C. nigrodigitatus* (represented in %)**

**Table 3: Stomach Condition of Different Size Range of *C. nigrodigitatus* from Majidun River**

Standard Length (cm)	Empty	¼	½	¾	Full	TOTAL
11.50 - 14.40	2	1	-	-	-	3
14.50 - 17.40	2	5	2	-	-	9
17.50 - 20.40	4	9	4	-	1	18
20.50 - 23.40	5	4	2	1	3	15
23.50 - 26.40	2	1	-	-	-	3
26.50 - 29.40	-	-	-	-	2	2
<b>TOTAL</b>	<b>15</b>	<b>20</b>	<b>8</b>	<b>1</b>	<b>6</b>	<b>50</b>

**Food items found in the guts of *C. nigrodigitatus***

A total of 50 fish, 33 (66%) males and 17 (34%) females were collected during the study. Food was present in the gut of *Chrysichthys nigrodigitatus*. The summary of stomach content of *Chrysichthys nigrodigitatus* are presented in Table 4 and Table 5. Fifty (50) stomachs examined, fifteen stomach (30%) were empty, mollusks were the most important food item accounting for 94.4% and 16.83

by numerical and occurrence methods while crustaceans (1.98% in number and 17.82% in occurrence) and fish (0.39% in numbers and 6.93% in occurrence) made up the next food group in order of importance. Insects (0.23% in number and 3.92% in occurrence) were the next group. Other items encountered in the stomach were sediments (0% in number and 30% in occurrence) and unidentified mass (0% in number and 19.80% in occurrence).

**Table 4: Numerical Analysis of Food Preference of *C. nigrodigitatus* from Majidun River**

Food Items	Number of Food Item	% Number
Insects	6	0.23
Fish	10	0.39
Crustaceans	51	1.98
Molluscs	2509	97.4
Sediment	-	-
Unidentified mass	-	-
<b>TOTAL</b>	<b>2576</b>	<b>100</b>



Figure 7: Number of food items in the stomach of *C. nigrodigitatus* from Majidun River

Table 5: Frequency of Occurrence of Food Items found in *C. nigrodigitatus* from Majidun River

Food Items	No of Stomach	Percentage (%)
Insects	4	3.92
Fish	7	6.93
Crustaceans	18	17.82
Molluscs	17	16.83
Sediment	35	34.7
Unidentified mass	20	19.8
<b>TOTAL</b>	<b>101</b>	<b>100</b>

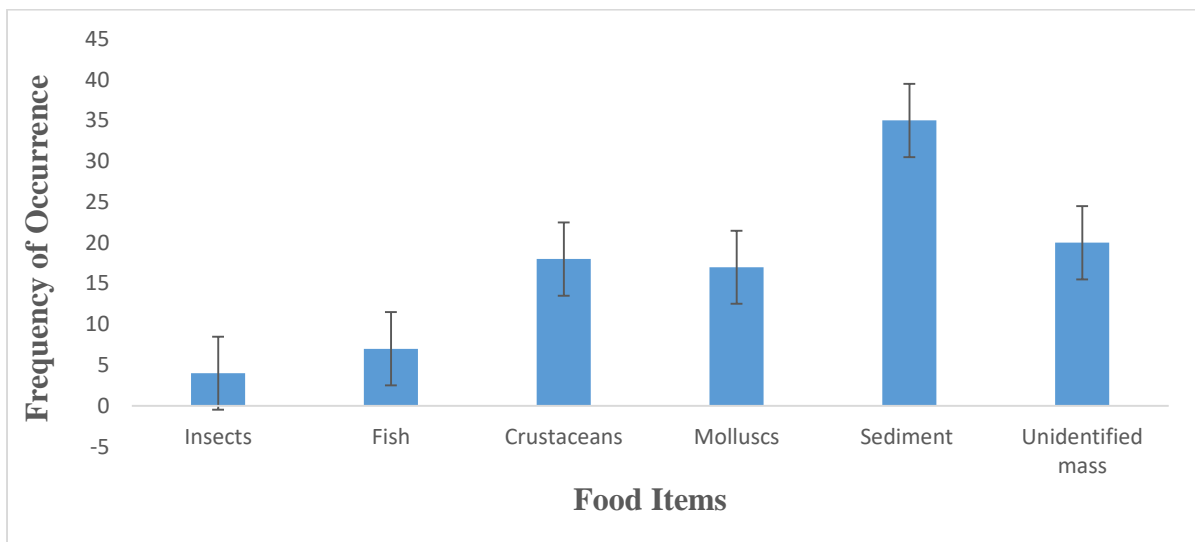


Figure 8: Frequency of occurrence of the stomach content of *C. nigrodigitatus*

## Discussion

The length frequency distribution showed a single mode, and this depicted that the species consisted of one age group during the study period. The length weight relationship of *Chrysichthys nigrodigitatus* reflected an increase in weight with corresponding increase in length. The value of the regression coefficient (b) was approximately 1 which showed that the species exhibited meristic growth in Majidun River (Bagenal and Tesch, 2008). The correlation coefficient (r) of 0.85720 showed a positive correlation between length and weight. There was a general decrease in the condition factor with increase in length of the specimens. This was due to the landing of mainly sexually immature and juvenile fishes in active growth stage of their life cycles. However, the mean condition factor of 1.70 obtained from the population of *Chrysichthys nigrodigitatus* in Majidun River was higher than 0.9673, 0.9159 and 0.7859 reported from Badagry lagoon, Warri River and Imo River respectively (Ezenwa *et al.*, 1986) and 0.996 reported for Cross River (Offem *et al.*, 2008). This was an indication of the food condition of the specimen (Bannister, 2006), therefore *Chrysichthys nigrodigitatus* from Majidun River would provide excellent broodstocks for culture. The feeding habit of any fish is often reflected in its general morphology. The general morphology of *Chrysichthys nigrodigitatus* suggested that it is an efficient bottom feeder although stomach contents of fish often reflect the ability of fish to obtain food item from different locations. *Chrysichthys nigrodigitatus* caught from Majidun River fed on a variety of food items of which insects, fish, crustaceans, sediments, unidentified mass and mollusk were the primary importance and food items that probably serve as indicating that *Chrysichthys nigrodigitatus* is an omnivorous feeder. A similar result has been obtained for *Chrysichthys nigrodigitatus* by (Udoh and Ekpo, 2017) in the lower Cross River and from Lekki lagoon (Ugwumba and Kusemiju, 1992). An indication of flexibility in trophic levels which gives the fish an ecological advantage to feed effectively on different categories of diet based on the availability of food items. Similar observation had earlier been recorded by Yem (2009) and George and Atakpa (2015).

The occurrence of fish in the diet of *Chrysichthys nigrodigitatus* showed its carnivorous in nature. This agreed with the findings of Ayoola and Abotti, (2010), that the dietary components of *Gymnarchus niloticus* a typical carnivorous fish were whole fish and fish parts. This is because the intestine of carnivorous fish has evolved for a highly digestible, nutrient dense diet that is high in protein and low in carbohydrate. Correspondingly, abilities to digest

protein are well developed, but carbohydrate digestion is low compared to omnivorous and herbivorous fish (Buddington *et al.*, 2007). The occurrence of crustaceans, mollusks and insects in the diet of *Chrysichthys nigrodigitatus* implied that the species is an opportunistic feeder in the water column. The presence of sediments in the diet of *Chrysichthys nigrodigitatus* may be attributed to accidental ingestion along with other food items. This agreed with the study of Ido-Umeh (2003) who reported that *Chrysichthys nigrodigitatus* is bottom feeding meso-predators in River Ase, Delta State, Nigeria due to the presence of sand, grains, and sediments in the fish stomach. The 19.8% percentage of unidentified mass in the diet of *Chrysichthys nigrodigitatus* could be as a result of part digestion of food items from the time of capture to the time of landing of the species. However, Lagler *et al.* (1977) recorded that time of capture and other factors influence the stomach fullness of any fish. The larger size *Chrysichthys nigrodigitatus* consumed a larger variety of food items than any other small food items.

## Conclusion

The silver catfish *Chrysichthys nigrodigitatus* from Majidun River is omnivorous as it fed on a variety of food items. An unidentified mass increased the stomach fullness. The same food items were in the juvenile and adult stages which were dominant throughout the study period, this information is useful in the formation and production of diets for the culture of this species.

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pattern of *Chrysichthys nigrodigitatus*  
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