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# Quantitative and Qualitative Gut Content Analysis Of Chrysichthys Auratus and Notoglanidium Macrostoma In River Ogbese

**Ogunmoriye O.A**[*1], **Bello-Olusoji O.A**[1]

[1]Department of Department Fisheries and Aquaculture Federal University of Technology, Akure, Ondo-State Nigeria.

[*]**Corresponding author:** Ogunmoriye O.A,Department of Department Fisheries and Aquaculture Federal University of Technology, Akure, Ondo-State Nigeria., Tel: 2348135370142; E-mail: ogunmoriyeoluwaseun@gmail.com

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## Abstract

The quantitative and qualitative gut analyses of Notogladinum macrostoma (52) and Chrysichthys auratus (51) were investigated in River Ogbese, Ondo State, Nigeria. Standard length ranged from 15.9 to 19.5cm and 15.0 to 24.7cm and the weight ranged from 57.04 to 98.67g and 42.65 to 116.60g for N. macrostoma and C. auratus respectively. K-values for C. auratus ranged from 0.83 to 1.19, while that of N. macrostoma ranged from 1.27 to 1.48. The mean K-value was 1.33 and 1.01 for N. macrostoma and C. auratus respectively. Gut contents were analyzed using Numeric and Volumetric methods. The result revealed that N. macrostoma and C. auratus feed on various food items ranging from plant origin to animal materials with dietary preference classified into eight major groups: Phytoplanktons and Zooplanktons Macrophytes, Fish remains, Insect remains, Gastropods, Crustacean and Detritus. Of all the stomach examined, 21.2% of N. macrostoma, had an empty stomach, 19.2% had quarter full stomach, 25% had half-filled stomach, 21.2% and 13.4% had three quarter and full stomachs respectively, while C. auratus had 25.5% empty stomach, 21.5% quarter full stomach, 19.6% half full stomach, 15.7% and 17.7% were three quarter full and full stomachs respectively. The result revealed that N. macrostoma and C. auratus Feed on a wide variety of food materials and are therefore said to be omnivores. It is hoped that the present data will complement the limited information on the food, feeding habit of C auraus and N macrostoma in River Ogbese, and prove useful in the management and conservation of these important commercial fish species.

**Keywords**: Notogladinum macrostoma; Chrysichthys auratus; Condition factor; Gut Analysis

## Introduction

Fish is a major source of food for human beings and other animals, rich in proteins and vitamins, especially, vitamin A (Retinol) Alune. Statistics have shown that fish accounts for more than forty percent of the protein diet of two–thirds of the global population FAO (1999). It is unfortunate that the protein requirement of most African countries still grossly outweighs its supply. In Nigeria, less than 40% of the total protein requirement by the people is met, out of which fish constitutes about 41% Bernard, (2011). Fishes such as those in the family Claroteidae are highly used and commercialized.

Notoglanidium macrostoma, the flatnose catfish, is a species of claroteid catfish found in rivers in Angola, Cameroon, the Democratic Republic of the Congo, the Republic of the Congo and Gabon. It is active during twilight and at night and its diet consists of small fishes, crustaceans and insect larvae. It grows to a length of 24.0 cm (9.4 inches). Notoglanidium macrostoma is a demersal species, which is nocturnal and crepuscular It preys on insect larvae, crustaceans, and small fish (Burgess). The juveniles are almost polyphagous and tend to prefer small streams and pools of inundated zones (Matthes). They feed majorly on life feeds earthworms, prawns, cockles, mussels, crab, crayfish etc. some in captive will also take tablet food [1-3].

Chrysichthys auratus is widely distribution, with no known major threats. It is therefore listed as Least Concern. It has also been assessed regionally as Least Concern for central, eastern, northern, north eastern and western Africa. This species inhabits most of West African hydrographic basins, except in the coastal areas of Gambia and Liberia, where it is replaced by C. maurus, a very similar species. Chrysichthys auratus is found in lakes and coastal rivers (Risch). It occurs usually over soft, slightly muddy substrates or substrates with heavy layers of leafy detritus in deep, relatively quiet waters (Burgess). It feeds on molluscs and small crustaceans (Branchiopods, Copepods, Ostracoda), which it digs from the substrate (Laleye). It also feeds on fish and insects (Bailey). This species is harvested for human consumption.

Gut content analysis gives an overall reflection about the type of food material available to the animals in food chain and ultimately it is a representation of food in the ecosystem. Precise depiction of fish diets and feeding habits also provides the basis for understanding trophic associations in aquatic food network. The details of biology including gut content analysis were studied by various researchers including Goswami, Jayaram, Talwar and Jhingran, Tandon and Pande,. A food habit study is led to focus on the most frequently consumed prey or focus the relative significance of diverse nourishment to fish nutrition and to evaluate the utilization rate of individual prey types. Fish digestive system varies with their feeding habits which include; carnivorous, omnivorous, and herbivorous. Fish

diet has been found to be an important factor governing fish growth, condition factor, fecundity and migration patterns (Rao, Adeyemi).

Condition factor is also a useful index for monitoring feeding intensity, age, and growth rates in fish Ndimele. In fisheries science, it is used to compare the "condition", "fatness" or wellbeing of fishes. It is based on the hypothesis that heavier fish of a particular length are in a better physiological condition Bagenal and Tesch,. 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 Anene and Keke. The dietary habits of fish, based on stomach analyses, is widely used in fish ecology as an important method to investigate trophic relationships in aquatic communities (Fagbenro) [4-7].

The main objective of this study, is to determine the quantity and quality composition of food in the stomachs of Chrysichthys auratus and Notogladinum macrostoma in River Ogbese. The specific objectives are to determine the; abundance and diet composition of the fish species; relationship between diet composition and seasonal variation; and condition factor.

# Materials and Methods

## Study Area

River Ogbese (Figure 1) lies between longitude 5o26'E and latitude 6o43'N The River runs through Ogbese town, a town which 21 kilometres from Akure, in Akure North Local Government Area of Ondo state, Nigeria. River Ogbese is one of the major perennial rivers in South Western Nigeria; it took its source from Awo Ekiti in Ekiti State. It flows for approximately 22km from its source to meet River Ose which is 265km long and discharges into the Atlantic Ocean through an intricate series of creeks and lagoons.

## Samples collection

Samples of Notoglanidium macrostoma and Chrysichthys auratus were obtained from the fishermen fishing at river Ogbese, Ondo State Nigeria. Samples of N.macrostoma and C. auratus were collected randomly, and were grouped into various length ranges.
Fish identification were carried out using field guide of Nigerian freshwater fishes by Olaosebikan and Raji (2013). The specimens were preserved in an ice-chest containing ice cubes in the field and later transported to the Fisheries and Aquaculture Technology Laboratory of the Federal University of Technology Akure for Analysis.

## Stomach Fullness Classification

The stomach condition of N. macrostoma and C. auratus based on degree of fullness were determined according to methods described by Ugwumba and Ugwumba (2007). The condition of the stomach was determined visually and categorized as follows:

- 1 - empty stomach
- 2 - one quarter full stomach
- 3 - half full stomach
- 4 - three quarter full stomach
- 5 - full stomach

## Identification of Stomach Contents

Fish gut were carefully extracted by opening the abdominal portion of the fish with a pair of dissecting scissors. The gut tip i.e. the end of oesophagus to the end of the rectum were carefully removed and weighed using a weighing balance (Toledo PB8001). The gut was preserved in 5% formalin to enhance the coagulation of the diet components for ease of identification (Longhurst; Haroon, Job,. Stomach contents were identified using invertebrate identification guide by William and Mary (2018) and Mellanby, (1975) [8-12].

- Analyses of stomach Content
- The following analysis were determined:
- Numerical method

Frequency of occurrence and dominance method are the numerical methods adopted in evaluating the relative importance of food items.

Frequency of occurrence: This is inferred from the proportion of total guts containing each food item (Baker). Each food item occurring in number of stomachs were recorded and expressed as a percentage of the total number of fish stomachs examined.

Frequency of occurrence was calculated thus

$$Oi = Ni / N \times 100$$

Where: % O is the frequency of occurrence of given food i

Ni is the number of stomachs containing prey i

N is the total number of stomachs with some food

## Dominance of Food

This method gives rough picture of the dietary of a fish and the food items which are less dominant due to environmental reasons that may escape attention. Therefore, the dominance of particular item was calculated according to the equation:

Dominance of food, is calculated thus;

$$D1 = Nd1 / N \times 100$$

Where: Ndi is the number of fish in which food item i dominates

N is the number of fish examined.

Food specific index

Food specific index of the volume of specific food item is expressed as the individual food item volume percentage of the total volume of digestive tract contents.

Percentage of volume is calculated thus

$$\%Vi = Vi/Vt \times 100$$

Where: %Vi is the ratio of the food item i

Vi is the volume of food item i

Vt is the total volume of food (gut content).

Index of Preponderance (I)

The index of Preponderance was obtained by using formula:

Index of Preponderance is calculated thus;

$$(I) = (Vi \times Oi) / \sum (Vi \times Oi) \times 100$$

Where, Vi = Percentage volume of food item (i); Oi = Frequency of occurrence of food item (i)

Index of Relative Importance (IRI):

Index of relative importance is calculated thus;

$$IRIi = (\%Ni + \%Vi)\,\%Oi \text{ or } IRIi = (\%Ni + \%Wi)\,\%Oi$$

Where: % Ni is the percentage of specific food category by number

% Vi is the percentage by volume

% Oi is the frequency of occurrence

% Wi is the percentage by weight.

Condition Factor

The condition factor was calculated using the formula:

$$K = [100\,W] / L3$$

Where K = condition factor, L = standard length (cm) and W = weight (g).

## Results

A total of 103 fishes collected and examined, these comprised of 52 pieces of N. macrostoma and 51 pieces of C. auratus. Standard length ranged from 15.9 to 19.5cm and 15.0 to 24.7cm for N. macrostoma and C. auratus respectively while the weight range from 57.04 to 98.67g and 42.65 to 116.60g as shown in Table 1 and 2

Condition Factor (K)

Table 1 and 2 showed that, the K-values for C. auratus ranged from 0.83 to 1.19, while that of N. macrostoma ranged from 1.27 to 1.48. The mean K-value was 1.33 and 1.01 for N. macrostoma and C. auratus respectively [13-17].

**Table 1**: Length range of N macrostoma and frequency of occurrence.

| Length range | Frequency of occurrence of fish | Mean weight Of fish | K |
|---|---|---|---|
| 15.50-16.49 | 6 | 61.34±2.33 | 1.47 |
| 16.50-17.49 | 7 | 65.29±3.67 | 1.37 |
| 17.50-18.49 | 25 | 71.17±4.12 | 1.28 |
| 18.50-19.49 | 8 | 83.80±3.24 | 1.24 |
| 19.50-20.49 | 6 | 94.43±1.21 | 1.27 |

**K = Mean condition factor**

**Table 2:** Length range of C auratus and frequency of occurrence

| Length range | Frequency of occurrence of fish | Mean weight Of fish | K |
|---|---|---|---|
| 15.00-16.99 | 11 | 50.75±3.31 | 1.19 |
| 17.00-18.99 | 12 | 59.84±2.25 | 1.06 |
| 19.00-20.99 | 9 | 82.18±3.10 | 1.08 |
| 21.00-22.99 | 12 | 94.72±3.28 | 0.91 |
| 23.00-24.99 | 7 | 104.34±2.24 | 0.83 |

K= Mean condition factor

Stomach Fullness Classification

The stomach fullness in Table 3, shows that 21.2% of N. macrostoma, had an empty stomach, 19.2% had quarter full stomach, 25% had a half filled stomach, 21.2% and 13.4% had three quarter and full stomachs respectively.

C. auratus had 25.5% empty stomach, 21.5% quarter full stomach, 19.6% half full stomach, 15.7% and 17.7% were three quarter full and full stomachs respectively.

**Table 3:** Categorization of stomach fullness of N. macrostoma and C. auratus collected from River Ogbese

| Stomach Fullness (%) | Number of Samples N.m | Number of Samples C.a | Percentage Of N.m | Percentage Of C.a |
|---|---|---|---|---|
| 0 | 11 | 13 | 21.2 | 25.5 |
| 25 | 10 | 11 | 19.2 | 21.5 |
| 50 | 13 | 10 | 25 | 19.6 |
| 75 | 11 | 8 | 21.2 | 15.7 |
| 100 | 7 | 9 | 13.4 | 17.7 |
| Total | 52 | 51 | 100 | 100 |

Frequency of occurrence and food dominance in N.macrostoma

The frequency of occurrence as shown in Table 4, the most frequently occurring food in the stomachs of N. macrostoma include phytoplankon and animal remains i.e. (fish remains, insect remains, gastropods and crustacean.) with 27.24% and 28.78% respectively. Others include, zooplankons and macrophytes with 15.85 and 6.10% respectively [18,19].

Phyoplankotons is the most dominant food with 29.31%, animal remains i.e. (fish remains, insect remains, gastropods and crustacean.) also amount to 25.86%, while zooplankons and detritus has a percentage of 15.52 and 17.24% resepectively.

**Table 4:** Frequency of Food Occurrence and Food Dominance in the Stomach of N macrostoma in River Ogbese

| | | | | | | |
|---|---|---|---|---|---|---|
| **PHYTOPLANKTON** | | | 27.24 | | | 29.31 |
| **Bacillariophyta(Diatoms)** | | | | | | |
| **Cyclotella spp** | 7 | 17.5 | | 2 | 5 | |
| **Cholrophyta(Green algae)** | | | | | | |
| **Pedriasrum spp** | 4 | 10 | | 1 | 2.5 | |
| **Stigeocloniu m** | 7 | 17.5 | | 1 | 2.5 | |
| **Ciliophora** | | | | | | |
| **Spirostoma spp** | 4 | 10 | | 1 | 2.5 | |
| **Vorticella spp** | 8 | 20 | | 2 | 5 | |
| **Charophyta** | | | | | | |
| **Closterium spp** | 9 | 22.5 | | 3 | 7.5 | |
| **Hydrodictyon spp** | 4 | 10 | | 1 | 2.5 | |
| **Zygnema spp** | 2 | 5 | | 1 | 2.5 | |
| **Pedastrum spp** | 8 | 20 | | 1 | 2.5 | |
| **Cyanophyta(Blue green algae)** | | | | | | |
| **Micocystis spp** | 2 | 5 | | 1 | 2.5 | |
| **Phormidium spp** | 7 | 17.5 | | 2 | 5 | |
| **Dignoflagellate** | | | | | | |
| **Gymnodinum** | 5 | 12.5 | | 1 | 2.5 | |
| **ZOOPLANKOON** | | | 15.85 | | | 15.52 |
| **Arthropoda** | | | | | | |
| **Polyphemus spp** | 8 | 20 | | 2 | 5 | |
| **Chironomus spp** | 6 | 15 | | 1 | 2.5 | |
| **Sida spp** | 4 | 10 | | 1 | 2.5 | |
| **Rotifers** | | | | | | |
| **Brachionus spp** | 12 | 30 | | 3 | 7.5 | |
| **Trichocera capucina** | 9 | 22.5 | | 2 | 5 | |
| **MACROPHYTES** | | | 6.1 | | | 6.9 |
| **Plant part** | 15 | 37.5 | | 4 | 10 | |
| **ANIMAL PARTS** | | | 28.78 | | | 25.86 |
| **Fish remains** | 25 | 62.5 | | 9 | 22.5 | |
| **Insect remains** | 34 | 85 | | 1 | 2.5 | |
| **Gastropods** | | | | | | |
| **Snail** | 10 | 25 | | 3 | 7.5 | |
| **Crustacean** | | | | | | |
| **Crab** | 2 | 5 | | 2 | 5 | |
| **DETRITUS** | | | 15.45 | | | 17.24 |
| **Sand particles/Mud** | 38 | 95 | | 10 | 25 | |
| **Unidentified** | 16 | 40 | 6.5 | 3 | 7.5 | 5.17 |

Frequency of occurrence and food dominance in C.auratus

As shown in Table 5 below, animal remains i.e. (fish remains, insect remains, gastropods and crustacean.) is the most frequently occurring food in the guts of C.auratus with a

percentage of 37.72%, phytoplankton and zooplankton had 14.28% each while macrophytes had only 8% occurrence.

Also in table 5, the most dominant food include Fish remains, insect remains, gastropods and crustacean all making up the animal parts with a percentage dominance of 44.45%, phytoplankton and zooplanktons had 18.52 and 12.96% respectively, while macrophytes had 7.41% dominance [20-24].

**Table 5:** Frequency of Food Occurrence and Food Dominance in the Stomach of C auratus in River Ogbese

| Food items | Frequency of Occurrence | Frequency of Occurrence % | Total% | Dominance of food Item | Dominance food Item% | Total % |
|---|---|---|---|---|---|---|
| PHYTOPLANKTON | | | 14.28 | | | 18.52 |
| Bacillariophyta(Diatoms) | | | | | | |
| Cyclotella | 4 | 10.52 | | 2 | 5.26 | |
| Cholrophyta(Green algae) | | | | | | |
| Pedriastrum spp | 3 | 7.89 | | 2 | 5.26 | |
| Cosmarium spp | 2 | 5.26 | | 1 | 2.63 | |
| Ciliophora | | | | | | |
| Vorticella spp | 4 | 10.52 | | 1 | 2.63 | |
| Charophyta | | | | | | |
| Desmidium spp | 3 | 7.89 | | 1 | 2.63 | |
| Zygnema spp | 2 | 5.26 | | 1 | 2.63 | |
| Cyanophyta(Blue green algae) | | | | | | |
| Micocystis spp | 3 | 7.89 | | 1 | 2.63 | |
| Phormidium spp | 4 | 10.52 | | 1 | 2.63 | |
| ZOOPLANKON | | | 14.28 | | | 12.96 |
| Arthropoda | | | | | | |
| Polyphemus spp | 7 | 18.42 | | 2 | 5.26 | |
| Chironomus spp | 9 | 23.68 | | 2 | 5.26 | |
| Rotifers | | | | | | |
| Branchionus spp | 3 | 7.89 | | 1 | 2.63 | |
| Dipleuchlanis propaula | 6 | 15.78 | | 2 | 5.26 | |
| MACROPHYTES | | | 8 | | | 7.41 |
| Plant part | 14 | 36.84 | | 4 | 10.52 | |
| ANIMAL PART | | | 37.72 | | | 44.45 |
| Fish remains | 23 | 60.52 | | 11 | 28.94 | |
| Insect remains | 31 | 81.57 | | 9 | 23.68 | |
| Gastropods | | | | | | |
| Snail | 11 | 28.94 | | 3 | 7.89 | |
| Crustacean | | | | | | |
| Crab | 1 | 2.63 | | 1 | 2.63 | |
| DETRITUS | | | 16.57 | | | 12.96 |
| Sand particles | 15 | 39.47 | | 4 | 10.52 | |
| Mud | 14 | 36.84 | | 3 | 7.89 | |
| Unidentified | 16 | 42.1 | 9.14 | 2 | 5.26 | 3.7 |

Index of Preponderance of N.malostoma food items

The index of preponderance describes the superiority in power or influence of each food item as shown in Table 6 phytoplankton and zooplanktons has the highest percentage with 32.64 and 31.61% respectively, fish remains and insect remains also have some influence with a percentage of 10.80 and 12.85% respectively [25].

**Table 6:** Gut contents and Index of Preponderance of various food items of N macrostoma.

| Food items | V1 | O1 | V1×O1 | IP |
|---|---|---|---|---|
| Phytoplankton | 15.61 | 27.24 | 425.22 | 32.64 |

| | | | | |
|---|---|---|---|---|
| Total | 100 | 100 | 100 | 2843.37 | 100 |
| | | | | |
| Macrophytes | 9.52 | 6.1 | 58.07 | 4.45 |
| Fish remains | 13.85 | 10.16 | 140.72 | 10.8 |
| Insect remains | 12.12 | 13.81 | 167.38 | 12.85 |
| Snail | 11.69 | 4.07 | 47.58 | 3.65 |
| Crab remains | 7.8 | 0.81 | 6.32 | 0.48 |
| Detritus | 2.6 | 15.45 | 40.17 | 3.08 |
| Unidentified | 0.87 | 6.5 | 5.66 | 0.43 |
| Total | 100 | 100 | 1302.9 | 100 |

Index of Preponderance of C.auratus food items

This index gives a summary picture of frequency of occurrence as well as bulk of various food items. It provides a definite and measurable basis of grading the various food elements. As shown in Table 7, phytoplankton and zooplanktons has the highest percentage of 23.24% and 18.23% respectively. Insect and fish remains had 16.46 and 10.69% respectively, while macrophytes had 11.18%.

**TABLE 7:** Gut contents and Index of Preponderance of various food items of C auratus

| Food items | V1 | O1 | V1×O1 | IP |
|---|---|---|---|---|
| Phytoplankton | 20 | 14.28 | 285.6 | 23.24 |
| Zooplanktons | 15.73 | 14.24 | 224 | 18.23 |
| Macrophytes | 17.14 | 8 | 137.36 | 11.18 |
| Fish remains | 10 | 13.14 | 131.4 | 10.69 |
| Insect remains | 11.42 | 17.71 | 202.25 | 16.46 |
| Snail | 8.57 | 6.29 | 53.91 | 4.39 |
| Crab remains | 4.28 | 0.57 | 2.44 | 0.2 |
| Detritus | 10 | 16.57 | 165.7 | 13.48 |
| Unidentified | 2.86 | 9.14 | 26.14 | 2.13 |
| Total | 100 | 100 | 1228.8 | 100 |

Index of Relative Importance (IRI) of C.auratus food items

The Index of Relative Importance shown in Table 8, phytoplankton's composed bulk of the diet, with 31.95% making them the most important prey. Zooplanktons are the second most important prey to this specie with 18.25%. fish remains, Insect remains and macrophytes all have 9.17%,13.99%, and 8.98% respectively.

**Table 8:** Food items and their relative importance index in the diet composition of C auratus

| Food items | V1 | N | O1 | IRI | %IRI |
|---|---|---|---|---|---|
| Phytoplanktons | 20 | 36.82 | 14.28 | 811.4 | 31.95 (i) |
| Zooplanktons | 15.73 | 16.82 | 14.24 | 463.51 | 18.25 (ii) |
| Macrophytes | 17.14 | 11.36 | 8 | 228 | 8.98 (vi) |
| Fish remains | 10 | 7.73 | 13.14 | 232.97 | 9.17 (v) |
| Insect remains | 11.42 | 8.64 | 17.71 | 355.26 | 13.99 (iii) |
| Snail | 8.57 | 5.91 | 6.29 | 91.08 | 3.59 (vii) |
| Crab remains | 4.28 | 0.45 | 0.57 | 2.69 | 0.11 (ix) |
| Detritus | 10 | 6.82 | 16.57 | 278.71 | 10.97 (iv) |
| Unidentified | 2.86 | 5.45 | 9.14 | 75.95 | 3.00 (iix) |
| Total | 100 | 100 | 100 | 2539.57 | 100 |

## Index of Relative Importance (IRI) of N.macrostoma food items

IRI is a composite index employed to describe fish diets and ascertain the relative importance of common food categories (Pinkas; Prince). According to the index of relative importance in Table 9 below, phytoplankton's form the bulk of the diet with 43.31%, followed by the zooplanktons and insects with 20.27 and 10.55% respectively. Crab rank he lowest with just 0.31% in the dies of N.macrostoma.

Table 9: Food items and their relative importance index in the diet composition of N macrostoma

| Food items | V1 | N | O1 | IRI | %IRI |
|---|---|---|---|---|---|
| Phytoplanktons | 15.61 | 29.6 | 27.24 | 1231.52 | 43.31 (i) |
| Zooplanktons | 25.98 | 10.4 | 15.85 | 576.62 | 20.27 (ii) |
| Macrophytes | 9.52 | 10.4 | 6.1 | 121.51 | 4.27 (vi) |
| Fish remains | 13.85 | 12.8 | 10.16 | 270.76 | 9.52 (iv) |
| Insect remains | 12.12 | 9.6 | 13.81 | 299.95 | 10.55 (iii) |
| Snail | 11.69 | 6.4 | 4.07 | 73.63 | 2.60 (vii) |
| Crab remains | 7.8 | 3.2 | 0.81 | 8.91 | 0.31 (ix) |
| Detritus | 2.6 | 11.2 | 15.45 | 213.21 | 7.50 (v) |
| Unidentified | 0.87 | 6.4 | 6.5 | 47.26 | 1.66 (iix) |
| Total | 100 | 100 | 100 | 2843.37 | 100 |

## Discussion

The morphology of N macrostoma and C auratus are adapted for bottom-feeding although stomach contents may prove otherwise as to the variety of food items contained in the stomach of fishes often reflect the ability of the fishes to obtain food from different locations (Atobatele and Ugwumba). Therefore, morphological features cannot limit these species as exclusive bottom feeders (Idodo–Umeh) as stomach content indicates food items from different locations. The wide food spectrum of N macrostoma and C auratus is an indication of flexibility in trophic level, which gives these fishes ecological advantage to feed effectively on different categories of diets based on the availability of the food items Udo (2004); Udo; Warren; Offem,.

The result of this study shows that N macrostoma and C auratus from River Ogbese fed on a wide range of food items from plants (plant materials), animals (insect parts, fish parts, crab, and river snail), and non-living matter (sand grains). Feeding on food items comprising of both plants and animals possibly qualifies these species as omnivores. The wide variety of items occurring in the stomach of this fish species show that they are non-selective in feeding and it appears that the fishes are capable of utilizing many sources of food. Also, feeding on a wide range of food organisms could make N macrostoma and C auratus to be described as euryphagous. This is in agreement with the studies by Fagbenro et al., 2001 and Shep. However, Ekpo et al. 2014 also reported that the index of food dominance enables these fishes to be categorized into 4 broad groups: planktonophagous, herbivorous, predators, and detritivores.

The inclusion of sand grains in the stomach of N macrostoma and C auratus could be attributed to accidental ingestion and other food items. This is in agreement with studies by Fagbenro; Idodo–Umeh, and Atobatele. The presence of insect parts could result from the consumption of aquatic insects by N macrostoma and C auratus. This was probably due not only to its food preference but also to the high availability of insects in the aquatic ecosystem. Indeed, in River Ogbese, the presence of marginal wetland associated with aquatic vegetation could have boosted the proliferation of aquatic insects that were available for these species [26,27].

The relatively high percentage of almost empty stomachs suggests low quantity of food during the period of this study, it might also be as a result of the time when the research was carried out (dry season).

Also, there was general decrease in condition factor with the increasing length of the fish species. However, the mean condition factor of 1.33 and 1.01 for N. macrostoma and C. auratus respectively in River Ogbese is quite high, this is an indication of the good condition of the species (Bannister, 1976), therefore, N. macrostoma and C. auratus population from River Ogbese could provide excellent broodstocks for aquaculture elsewhere.

## Conclusion And Recommendation

C auraus and N macrostoma from River Ogbese fed on wide range of food items from plant to animal materials and can therefore be said to be omnivorous.

However, culture trial is recommended to sustain its demand as source of protein requirement. It is hoped that the present data will complement the limited information on the food, feeding habit of C auraus and N macrostoma in River Ogbese, and prove useful in the management and conservation of this important commercial fish species.

Further research should be done to ascertain the food preference of these species over a longer period of time covering both wet and dry season. This will enable definite conclusion on its food preference for domestication and cultivability.

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