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Research Article

Feeding Ecology of Juvenile *Chrysichthys nigrodigitatus* (*LACÉPÈDE*, 1803), At the Tombia Mangrove Swamp Creek, Rivers State, Nigeria.

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Abstract

The feeding ecology of Chrysichthys nigrodigitatus juvenile was investigated in a shallow mangrous creek in Rivers State of Nigeria. The frequency of occurrence and the numerical abundance methods were both used to assess the food items found in the stomach of the fish. It was observed that the dominant food items, using the percentage occurrence include filamatous green algae (96%); Detritus sand particles (88%); insect parts (53%); Molluscs (52.00%); Bivalve (49%), cladocera (49%); Megalope larva of crabs (35%). By the numerical abundance method the data analysis also indicated that filamentous green was the most dominant food item (24.67%); molluscs (13.31%) detritus/sand grains (11.51%) cladocera (11.32%) bivalve (10.17%); megalope larva of crabs (8.07%) and insect parts (7.42%). These findings suggest that C. nigrodigitatus is an omnivore but is more favourably disposed to animal sources of food than plant materials judging from the variety of food items of animal origin. It was predicted that the juvenile C. nigrodigitatus of Tombia Creek would likely be a predator in the adult stage. There is need for further investigation.

KEY WORDS: *C. nigrodigitatus*, food materials, feeding habits, Tombia Creek.

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Introduction

Chrysichthys nigrodigitatus of the family claroteidae (Actinopterigii) commonly known as the silver catfish is an economically important catfish in Rivers State in particular and Nigerian in general. It is a demersal protomodromous fish. It is confined to fine sand and bottom in shallow water. They feed on a variety of food items which include seeds, insects, bivalves and detritus, and are reported to be omnivorous (*Reed et al,* 1967).

C. nigrodigitatus has large eyes, large mouth and relatively small barbels on this species which usually relates to the habitat where it resides, being clear water where large barbels for feeling for food is not needed, hence the large eyes for hunting prey (*George and Atokpa* 2015).

The dorsal fin is preceded by a spine. Adipose fin is present and can have a relatively long base in some species. The pectoral fin can be serrated. The body is completely naked (without scales). Fishes of the bagridae family have four pairs of well-developed barbels covered by a layer of taste bud epithelium (*George and Atakpa* 2015). It has a basic grey/silver body colouration and a white underside.

The dorsal fin is quite large and the caudal fin deeply forked. Basically it is a food fish in its native Africa water. Its flesh is also reported to be quite good. The bagrid catfish *C. nigrodigitatus* is consumed for its nutritional value. Worldwide they are important food resources (Uneke 2014). *C. nigrodigitatus* is an important commercial fish because of its high protein content hardy flesh, thus forming a very important component in the diet of many Nigerians.

Food and feeding habits enable the farmer to have a clear understanding of fish dietary requirements with a view to provide feeds for them in aquaculture (*Malami et al* 2004). The richness and variety of various tropical aquatic habitats provide a wide range of possible food organisms for fishes (George and Atakpa 2015). These originate either from within the aquatic ecosystem itself (autochthonous food sources) or from outside (allochthonous food sources). With age and size feeding becomes specialized. Large *Chrysichthys nigrodigitatus* may feed on decapods and fish (Laleye, 1995).

Some works have been done on the food and feeding habits of *C. nigrodigitatus* in Nigeria. They include that of Kusemiju and Olaniyan (1989) in the Lagos Lagoon, Idodo-Umeh (2002) in River Ase; Oronsaye and Nakpodia, (2005) in River Ethiope; *Offem et al* (2008), in Cross River, *Yem et al* (2009) in Kainji Lake; *Lawal et al* (2010) in Epe Lagoon; Atobatele

and Ugwumba (2011) in Aiba Reservoire Iwo; Uneke (2014) in Ebonyi River, *Ekpo et al* (2014) in Qua Iboe River estuary; George and Atakpa (2015) in Cross River estuary.

The food organisms of *C.nigrodigitatus* at the Epe Lagoon consisted of phytoplankton, crustaceans, molluscs, plant materials and fish parts (*Lawal et al* 2010). Atobatele and Ugwumba (2011) reported that the major food items included insects, crustaceans, Arachnids, Rotifers and Molluses in the Aiba Reservoire Iwo. Other food items of less importance were fish scales, unidentified green eggs, plant parts detritus and sand. In Ebonyi River, the stomach of the fish examined were found to contain cladocera, copepods, rotifer, diatoms dinoflagellates, clams, worms, insect parts, fish scales, sand grains and detritus (Uneke, 2014). In the Qua Iboe River Estuary, *Ekpo et al* (2014) reported that *C. nigrodigitatus* fed mainly on crustaceans (shrimps and crabs), molluscs, bivalves and other gastropods and was described as non-piscivorous predator. The result of the food and feeding habits of *C. nigrodigitatus* in the Cross River estuary revealed that the species feed on Amphipods, crab / crab particles, mud/sand particles, diatoms, shrimps/shrimp parts, bivalve, mollusc small fish, copepod, fish bones, fish scales, prawns, crustaceans and detritus (George and Atakpa 2015). Fishes are very mobile, and show extensive longitudinal, vertical and horizontal movement. The variety of food items found in the stomach of fishes therefore is a reflection of trophic flexibility or opportunistic feeders (Warren 1993). This is the ability of fishes to switch from one diet to another depending on availability.

The dietary habits of fish based on stomach content analysis is widely used in fish ecology as an important method to investigate trophic relationship in aquatic communities (*Fagbenro et al* 2008).

However, most of the work on *C. nigrodigitatus* have focused on the major rivers, lagoons and estuaries in Nigeria, and little attention to the numerous creeks that dissect a good part of the Niger Delta region. This work is therefore on attempt at studying aspects of the biology of *C. nigrodigitatus* in one of the small creeks of the Niger Delta region (Tombia creek) with a view to giving more information on the biology, to create awareness for managing the fisheries effectively.

Materials and Methods

Study Area

The Tombia Creek is a shallow brackish water creek that adjourns the Tombia community. It is located north of Rumuolumeni and Ogbakiri towns. It is one of the tributaries of the New Calabar River which empties into the Atlantic Ocean. It is located

between latitude $4^{0}31^{1}$N and $4^{0}59^{1}$N and longitude $6^{0}47^{1}$E and $6^{0}59^{1}$E in the southeast of the Niger Delta in the Degema Local Government Area of Rivers State.

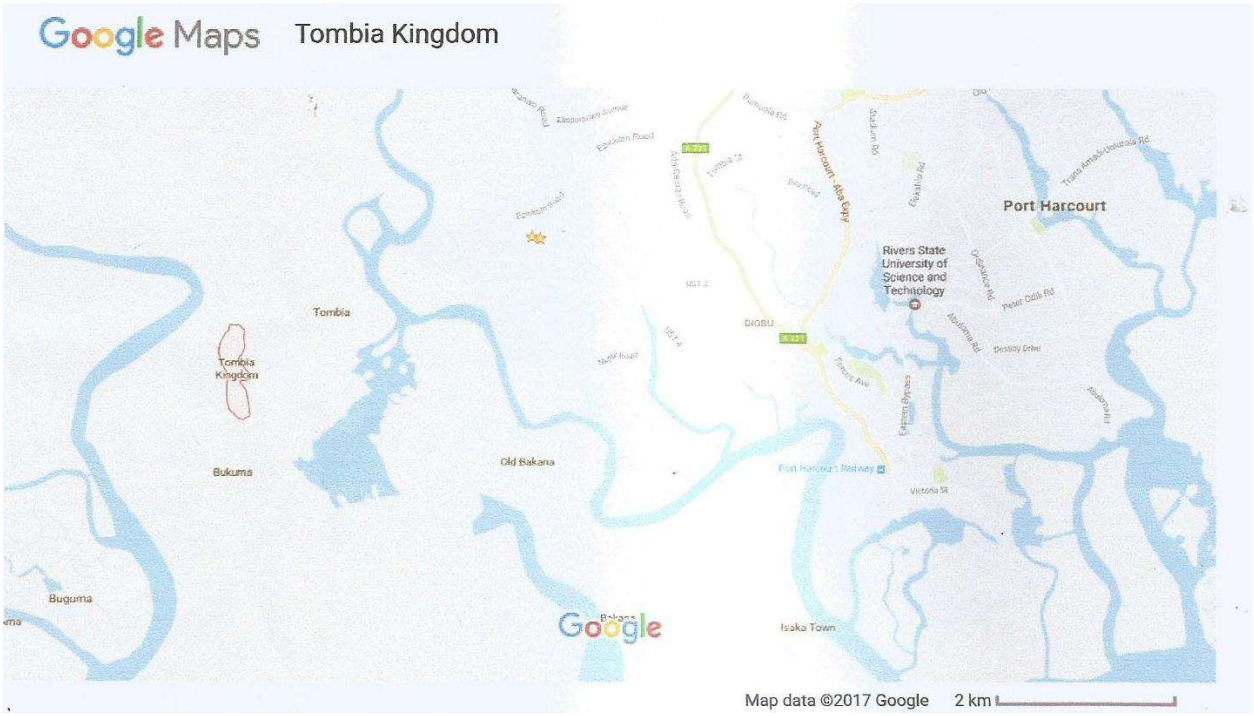

Fig. 1 Map of Tombia Creek

Collection of Specimens

The 200 specimens of *C.nigrodigitatus* Juveniles used for this study were procured from local fisher-folks. The specimens were caught mainly with cast nets and set nets in the creek. The specimens were preserved in an ice-chest containing ice cubes in the field and transferred later into a deep freezer in the Biology laboratory of Ignatius Ajuru University of Education prior to further examination.

Laboratory Procedure

The preserved specimens were allowed to thaw and wiped dried with filter papers before laboratory analysis. The standard lengths (SL) and total lengths (TL) were measured on a measuring board and recorded to the nearest 0.1cm; while the total weight (TW) and gutted weights (GW) were taken with an electronic top load weighing balance (Model XY500CY) and recorded to the nearest 0.1g. Each stomach content was emptied into a

specimen bottle containing 5% formalin after dissection with a stainless steel scissors and forceps; they were then preserved until the contents were needed for analysis.

During the analysis each stomach content was emptied into a petridish and observed under a binocular microscope. Food items were identified to the lowest possible taxon using the guides of Olasebikan and Raji (1998).

Stomach Content Analysis

The methods used here was that adopted by Fagade (1983). It involved the estimation of the degree of fullness of each stomach by visual means. Counting the number of individual food items only in the stomach where they occur. Only the contents of the stomach were examined since food beyond the pyloric region was normally greatly digested. In each case a cut was made across the adjacent cardiac limb of the stomach to give a u-shaped standard stomach.

Data Analysis

Frequency of Occurrence Method (FOM)

This involves counting the number of times a particular food item occurs in the stomach and expressing this as a percentage of the total number of stomachs with food excluding empty, Stomachs (Hynes, 1950; Windel, and Bowen 1978). This is expressed as:

$$\text{Percentage occurrence of a food item} = \frac{\text{Total number of stomach with particular food items}}{\text{Total number of stomachs with food}} \times \frac{100}{1}$$

Numerical Abundance Method (NAM)

This method involves counting the number of each food item present in the stomach of a fish and summing up these numbers to obtain the grand total number of all the food in the stomach. The number of each food item is then expressed as a percentage of the grand total number of all food items (Hynes, 1950 Winded and Bowen, 1978). This is expressed as:

$$\text{Percentage number of a food item} = \frac{\text{Total number of the particular food items}}{\text{Total number of all food items}} \times \frac{100}{1}$$

Results

Table 1: Summary of analysis of food items in the stomach of *Chrysichthys nigrodigitatus* in Tombia creek, Rivers State, Nigeria by the frequency of occurrence method.

Food items	Frequency of Occurrence	Percentage of Occurrence
Molluscs	103	51.5%
Insect parts	106	53%
Filamentous green algae	192	96%
Prawns/prawn parts	35	17.5%
Bivalve	98	49%
Detritus/sand particles	76	88%
Megalope larva of crab	70	35%
Daphnia (*Acroperus spp*)	4	2%
Unidentified food materials	59	2.95%
Cladocera (*Holo pedium spp*)	97	48.5%
Hermit crab (*Clibanarius africana*)	11	5.5%
Anabaena spp	6	3%
Sequid (Loligo spp)	2	1%
Periwinkle (*Tympanostomus furscatus*)	1	0.5%
Cyclo tella	2	10.5%
Diatoms(*Coscinodiscus spp*)	18	9%
Whelk *(Thai haemastoma)*	3	1.5%
Bloody clam (*Anadara senilis*)	3	1.5%
Empty gut	15	

Discussion

The result of the stomach analysis using the frequency of occurrence method indicated that filamentous algae was the most dominant food item in the stomach of *C. nigrodigitatus* Juveniles at the Tombia creek (96%). This was followed by detritus and sand particles (88%); insect parts constituted 53%; mollusk (51.5%), bivalves (49%); cladocerans (48.5%); megalope larvae of crabs (35%).

The data analysis, from the numerical abundance method also indicated similar trend, with filamentous green algae as the most dominant (24.67%); followed by mollus (13.31%), detritus and sand grains (11.51%), cladocerans (11.32%); bivalves (10.17%), Megalope larvae of crabs (8.07%) and insect parts (7.42%).

Table 2 Summary of analysis of food items in the stomach of *Chrysichthys nigrodigitatus* in Tombia creek Rivers State, Nigeria by the numerical abundance method.

Food items	Number of food items	Numerical Abundance (%)
Molluscs	2,501	13.31
Insect parts	1,394	7.42
Filamentous green algae	4,637	24.67
Prawns/prawn parts	662	3.31
Bivalve	1,911	10.17
Detritus/sand particles	2,163	11.51
Megalope larva of crab	1,517	8.07
Daphnia (*Acroperus spp*)	66	0.35
Unidentified food materials	846	4.50
Cladocera(*Holo pedium spp*)	2,128	11.32
Hermit crab (*Clibanarius africana*)	189	1.01
Anabaena spp	134	0.71
Squid (Loligo spp)	41	0.22
Periwinkle (*Tympanostomus furscatus*)	13	0.07
Cyclo tella	216	1.15
Diatoms (*Coscinodiscus spp*)	243	1.29
Whelk (*Thai haemastoma*)	80	0.43
Bloody clam (*Anadara senilis*)	55	0.29
Total	18,796	100.00
Empty gut	15	

The findings in this research work on the food habits of *C. nigrodigitatus* of the Tombia creek is in consonance with those of *Lawal et al* (2010) at the Epe Lagoon; Atobatele and Ugwumba at the Aiba Reservoire. Uneke (2014) in Ebony River; *Ekpo et al* (2014) in the Qua Iboe River Estuary; as well as George and Atakpa (2015) in the Cross River estuary. The minor differences observed in the food items between this work and those cited above may be attributed to environmental factors and availability of such food items in a given aquatic ecosystem. The high proportion of detritus and sand grains in the stomach of *C. nigrodigitatus* suggests that the fish is a benthic feeder. However, due to trophic flexibility as suggested by Warren (1993), the fish feeds at all levels of the water column both vertical and horizontal. This is evident from the variety of food items in the stomach. From the stomach content analysis it was observed that *C. nigrodigitatus* Juveniles feeding habits has a bias for animal materials. It is likely that as they grow to adulthood their predatory tendency will be more pronounced. This is supported by Laleye (1995) who

reported that feeding may become specialized with age and size and that large *C. nigrodigitatus* may feed on decapods and fish.

From this investigation although the feeding habit of *C. nigrodigitatus* Juveniles included both algae and plankton it is tilted more to animal materials and so could be described as an "opportunistic predator". Further research is needed to unveil the food and feeding habits of the adult *C. nigrodigitatus* in this creek.

Conclusion

The relevance of this work is to enable the fish farmer, the fish nutritionist and the feed technologist understand the nutritional requirement of this fish in its natural habitat so that in culture systems adequate provision would be made to meet the nutritional needs for optimum growth and productivity.

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