



FOOD AND FEEDING HABITS OF *Clarotes laticeps* (RÜPPEL, 1829) FROM LAKE AKATA, BENUE STATE, NIGERIA

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ABSTRACT

Food and feeding habits of Clarotes laticeps (Rüppel, 1829) were investigated in Lake Akata, Benue State, Nigeria. Samples were collected from May 2008 – April 2009. Eighty nine fish specimens were examined and their stomach contents analyzed. Food and feeding habits were investigated using point and frequency of occurrence methods.

The seasonal variation, changes in the dietary composition with size and monthly feeding index were also noted in the stomach contents of C. laticeps. Close examination of the individual food items showed that insects, crustaceans, fish and molluscs were the most important food that occurred most frequently. The food items suggested that C. laticeps was a predator with preference for insects and crustaceans.

Keywords: food availability, gut content, fisheries management

INTRODUCTION

The family Claroteidae is a group of catfish species of which *Clarotes laticeps* is a prominent member. The family consists of 13 genera and 86 known species. Family Claroteidae was carved out of the traditional Bagridae to reflect a monophyletic group of African catfishes (Berra, 2001). Family Claroteidae are found in Africa (Nelson, 2006). They are extensively distributed in the Nile River basin, mostly in West and Central Africa, south to the tropic of Capricorn, and in the East African lakes. *C. laticeps* is found in the Rivers Nile, Niger, Senegal, Volta and Lake Chad. *C. laticeps* inhabits rivers and swamps. Juveniles of 100-150 mm length were common in commercial catches in November and December (Eccles, 1992). The fish is common, commands high market price and is of considerable commercial importance.

Nature provides variety of organisms that are used as food by fish, which differ in size and taxonomic groups. Various researches have been conducted into the food and feeding habits of fish in order to assess the dietary compositions and food habits of fish aimed at a sound fisheries management programme on fish rearing in captivity (Oronsanye and Nakpodia, 2005).

Data on different food items consumed by fish provides information on the guideline in identifying stable food preference and creation of trophic models aimed at understanding their complex ecosystems (Lopez-Peralta and Arcila, 2002, Bachok *et al.*, 2004).

Arawomo and Fawole (1997) reported that cichlids are among the commercially exploited fishes in Africa Lakes. Cichlids are of high economic importance and serve as food for human

consumption. Researches have been conducted on the diets of cichlids, such scholarly work include those of Durr and Gonzalez (2002) who worked extensively on the food and feeding habits of *Beryx splendens* and *B. decadactylus* (Berycidae) off Canary Islands while Ikomi (1996) examined the food and feeding relationships of *Ethmalosa fimbriata* and *Mugil cephalus* from Kulama Creek, Niger Delta. Komolafe and Aramowo (1998), also worked on the distribution and feeding habits of *Oreochromis niloticus* in Opa reservoir, Ile-Ife; while Arawomo and Fawole (1997), assessed the food and feeding habits of *Sarotherodon galilaeus* in Opa reservoir of Obafemi Awolowo University, Ile-Ife. Ogbe and Fagade (2004), worked on food and feeding habits and trophic inter-relationships of four mormyrid species in Lower River Benue. Ogbe *et al.* (2008), also investigated feeding habits of *Hydrocynus forskalii* and *Brycinus nurse* in River Benue, Nigeria.

However there is no published account of the biology of *C. laticeps* in Lake Akata, despite its economic importance. A thorough knowledge of the biology of the fish is crucial towards planning good, sound management strategies for the species. The objective of this paper therefore aims at providing information on the food and feeding habits of *C. laticeps*.

MATERIALS AND METHODS

Study area

The study area Lake Akata, is an ox-bow lake of the River Katsina-Ala, located in Katsina-Ala local Government Area, Benue State, Nigeria. It lies between longitude 9°16' and 9°17' East, latitude 7°11' and 7°13' North (Fig. 1). River Katsina-Ala is seasonally flooded every year between August–

October, with extensive fadama flood plain used for rice and arable farming. The month of May marks the beginning of the rainy season. During the peak of rainy season the river floods and merges with the

lake. The month of November marks the beginning of the dry season. During the dry season period the lake is cut-off from the river due to reduction in the water level.

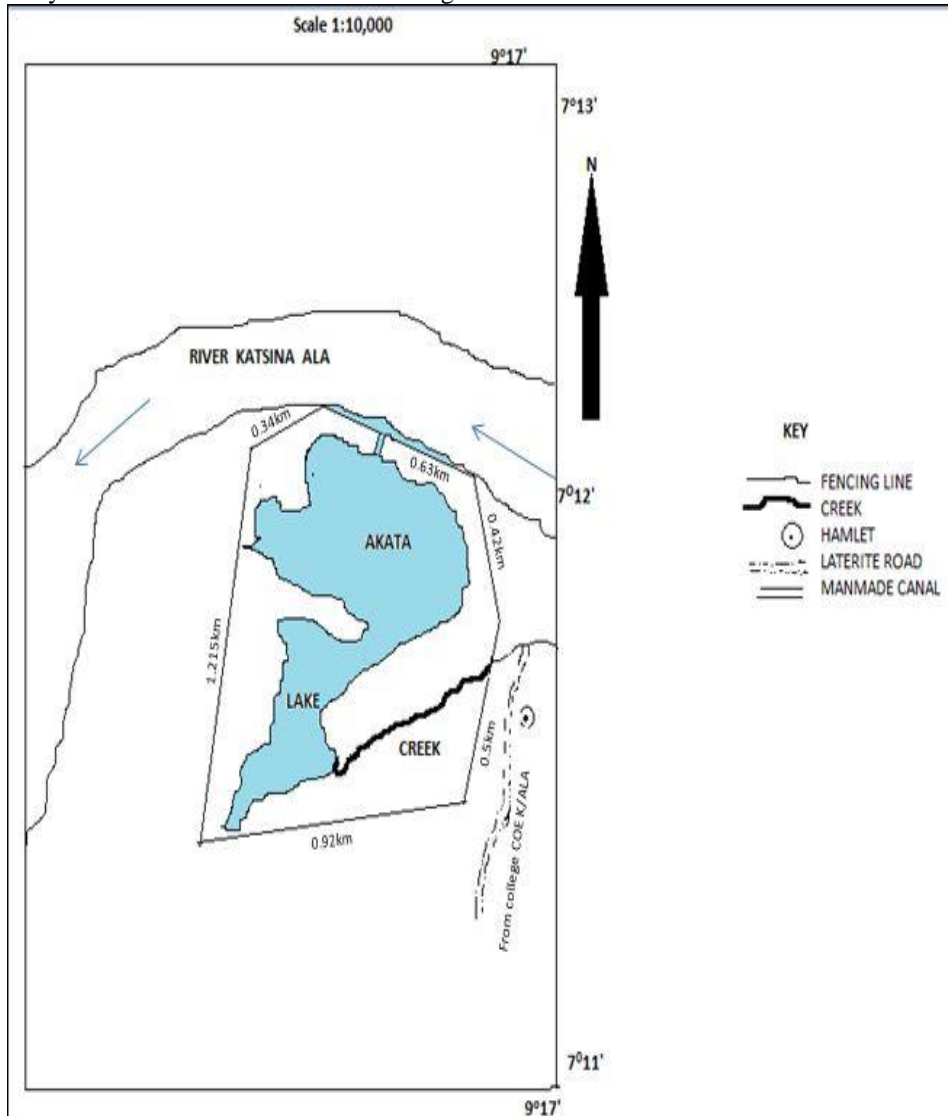


Fig. 1: Map of Lake Akata

Source: Ministry of Agriculture and Natural Resources, Makurdi, Benue State (unpublished)

Sample Collection

A total of 89 individuals of *C. laticeps*, were randomly sampled monthly for one year from May, 2008 - April, 2009. Sampling was done between 7.00 a.m. – 9.00 a.m. in the morning and 4.30 p.m. – 6.30 p.m. in the evening. The fish specimens used for the study were obtained from fishermen operating along Lake Akata. The fish specimens were caught using scoop nets, cast nets, and gill nets of various standard mesh sizes. The fishing craft used was a dugout canoe. Stomach content samples were preserved in

ice chest and taken to the laboratory for identification.

Laboratory Analysis

The Point Method

In the laboratory, each specimen was dissected to remove the gut. The entire stomach of the fishes were removed and graded according to fullness. The graded stomach of each specimen was dissected length wise and emptied into a Petri-dish for examination and identification. Each stomach content was dispersed with small amount of distilled water;

sub-samples were taken from the stock and observed under a stereo zoom binocular dissecting microscope.

The degree of fullness (volume) of the stomach and point allotted to each stomach was

based on a table previously described by Olatunde (1978), as in Table 1.

Table 1: Classification of stomach size

Stomach Size	Description	Points
Full stomach	The stomach bulges considerably with food, stomach wall very thin and transparent.	100
¾ full stomach	The stomach is almost full, does not bulge.	75
½ full stomach	Food occupied about 50% of the stomach	50
¼ full stomach	The stomach was very flabby, sometimes looked as if emptied.	25
Empty stomach	No visible food in the stomach when dissected and examined under the microscope.	0

Source: Olatunde (1978)

Frequency of Occurrence Method

Food items occurring in each of the stomachs were examined. The food organisms were identified using keys by (Yoloye, 1994; Wiafe and Frid, 2001). The frequency of occurrence of each food item in all stomachs was expressed as a percentage of all the stomachs that contained food.

The merit of this method is that, it will give good information on the various types of organisms fed upon, while the demerits was that it does not give information on the quantities or number of food items. It also does not give consideration to the accumulation of food organisms, which were resistant to digestion. These two methods were employed to enable a rapid analysis of the data also provide useful information on the feeding habit of each fish species within the population.

RESULTS

Food and Feeding Habits

Table 2 shows the list of food items found in the stomach of *C. laticeps*. 89 stomachs were examined, out of which 63(70.8%) were found to contain food; insects formed the main diet with total points of 55.3% and a frequency of occurrence of 57.3%. Crustaceans were secondary in importance with a total point of 23.2%, and a frequency of occurrence of 31.5%. The other food items collectively formed less than 20% of the total food items. These food items include fish, 15.0% and molluscs, 8.4%.

Close examination of the individual food items showed that insects, crustaceans, fish, and molluscs were the most important food that occurred most frequently. The food items suggested that *C. laticeps* was a predator, although insects and crustaceans predominated in its food.

Table 2: Frequency of occurrence and total point gained of dietary items in the stomach of *Clarotes laticeps* in Lake Akata, Benue State, Nigeria

Dietary items	Frequency of occurrence	% Total point gained
Insects:		
Adult insects:		
Coleopteran	3.38	4.08
Orthoptera	20.05	21.58
Diptera	16.54	17.46
Odonata	7.22	8.02
Immature insect:		
Chironomid larvae	10.11	3.94
Total insects	57.30	55.08
Molluscs	19.10	8.36
Fish and fish parts:		
Whole fish	18.47	9.03
Fish scale	4.35	1.46
Fish skeleton	5.27	3.06
Total fish	28.09	13.55
Crustacean:		
Cladoceran	17.83	13.28
Copepod	13.63	9.73
Total crustaceans	31.46	23.01
Empty stomach	29.21	-
Digested food	8.99	-
Unidentified food	-	-
Total		100.00

No. of stomachs examined = 89 No. of stomach with food = 63 % of stomachs with food = 70.8%
 No. of empty stomach = 26 % of empty stomach = 29.2%

Seasonal Variations in the Dietary Composition

Seasonal variation in diet was investigated by comparing the food items found in the stomach of the fish for the wet season period (May-October) and dry (November-April). Figures 2 and 3 showed the dietary variation in both dry and wet seasons.

During the dry season, insects contributed most to the diet of the fish both in the total point gained 52.09%, and the number of stomach they were found 41.0%. This was closely followed by fish

which gained a total point of 20.5% and a frequency of occurrence of 17.9%.

In the rainy season, insects was the most important food item seen forming 61.95% by point and 72.0% by frequency of occurrence. Contribution by crustaceans was second with total points of 27.7% and frequency of occurrence of 31.5%. Most of the stomachs in this season contained insects. The contribution by digested material was not much compared with the dry months.

Changes in Composition of Diet with Size

The fish were grouped into 1-15 cm, 16-25 cm. and 26-35 cm, range of standard length for the purpose of the analysis, Fig.4. Fish ranging from 1-15 cm fed on crustaceans, while fish ranging from 16-25 cm fed on mollusc and 26-35 cm fed on Insects and other food items like fish scale, and cladocerans were found but were not of importance. The general trend observed show that *C. laticeps* is a predator.

Monthly Feeding Index

The percentage of the fish with food in their stomach and those without is shown in Fig.5. In May, June, August, September, October, and November over 60% of the fish were feeding; whereas in other months most of the fish feeding were below 60%.

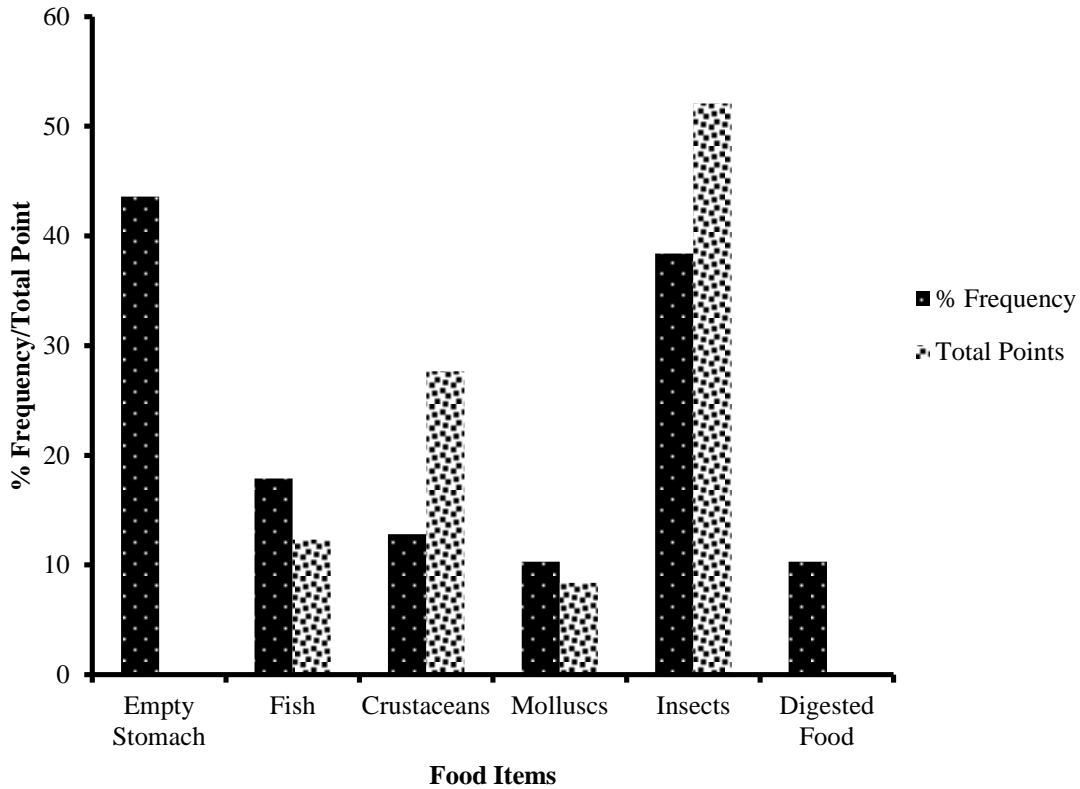


Fig. 2: Food Items in Stomach of *Clarotes laticeps* from Lake Akata, Benue State, Nigeria, during the dry Season.

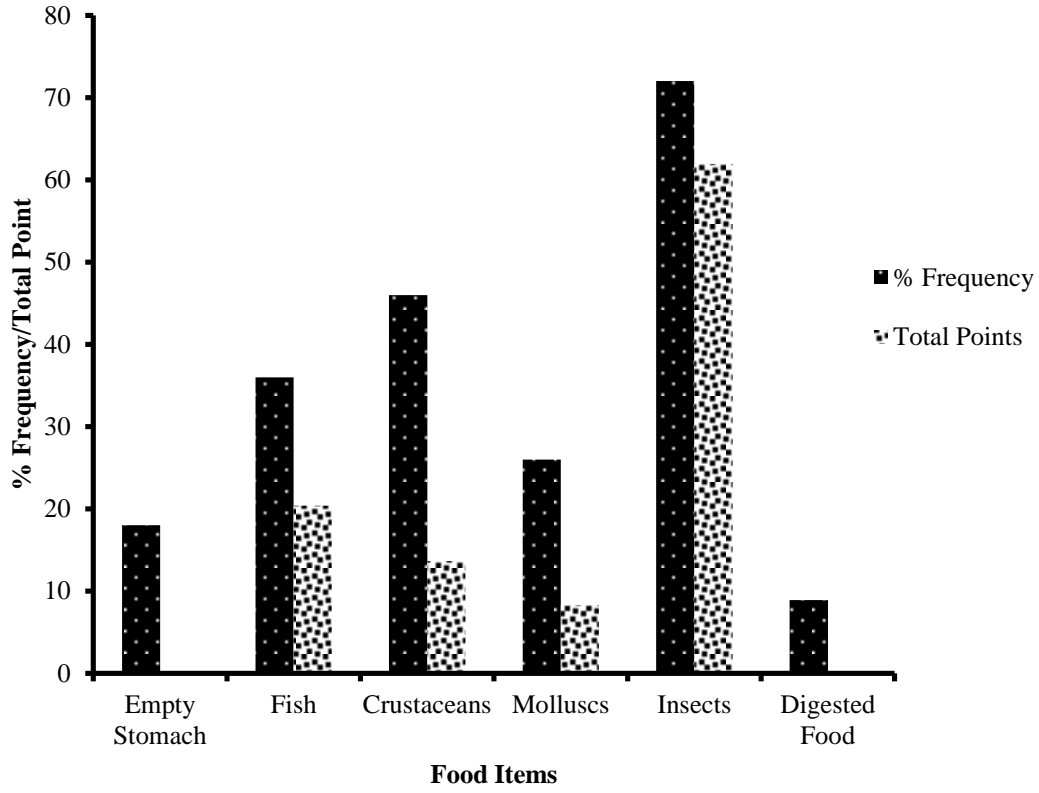


Fig. 3: Food items in stomachs of *Clarotes laticeps* from Lake Akata, Benue State, Nigeria, during the wet season.

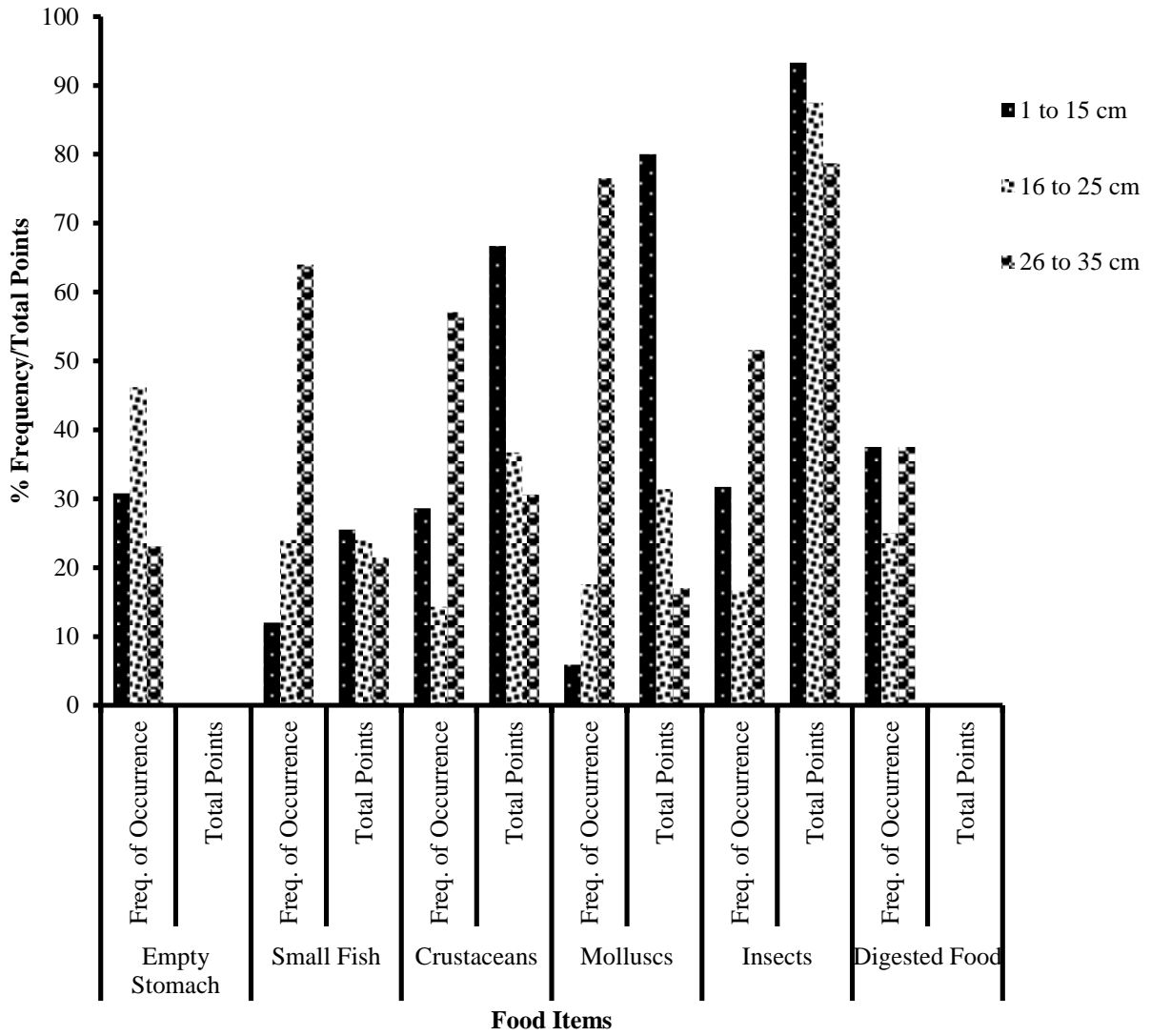


Fig. 4: Changes in the dietary composition with standard length of *Clarotes laticeps* from Lake Akata, Benue State, Nigeria

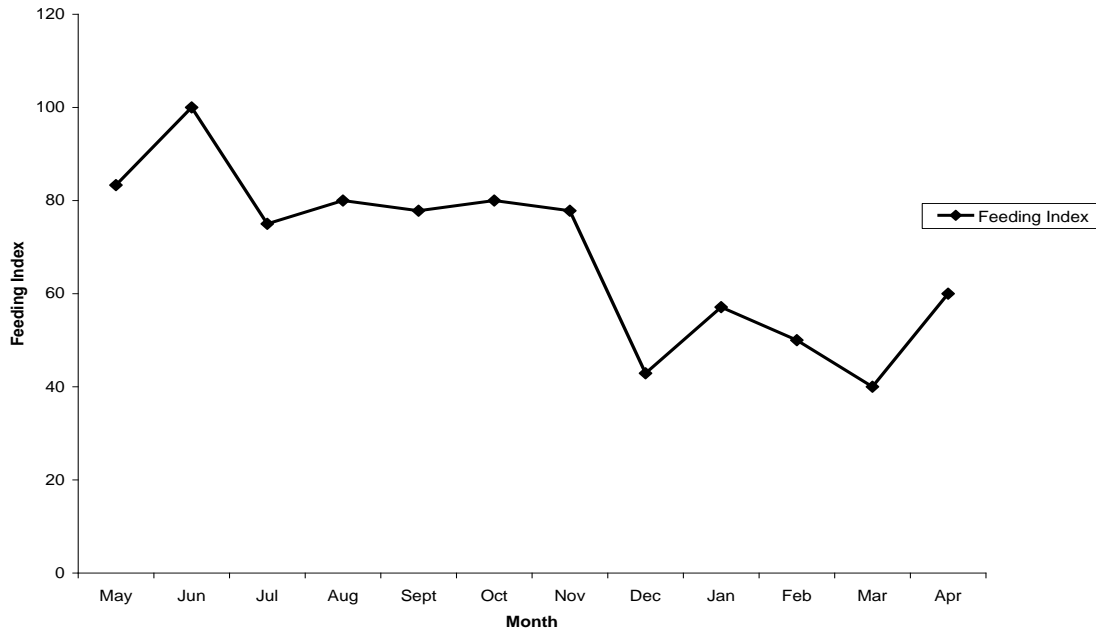


Fig. 5: Monthly feeding index for *Clarotes laticeps* from Lake Akata, Benue State, Nigeria

DISCUSSION

The stomach content analysis of *Clarotes laticeps* indicated that out of 89 stomach examined, 63 (70.8%) contained food items, whereas 26 (29.2%) were empty stomach. The most important food items were insects, fish, Insect larvae and Crustacean. That means they are piscivore but had a tendency to predate more on insects, Insects formed the main diet with total point of 55.1% and a frequency of occurrence of 57.3%. This observation agrees with that of Bailey (1994), who found small fish, crustaceans, insects and molluscs in the stomach of *C. laticeps*. The food and feeding habits of many predatory species have also been reported. The species *Hydrocynus forskalii* (tiger fish), *Hepsetus odoe* (African pike), *Parachanna obscura* (African snake head) and *Lates niloticus* (Nile perch) and *Schilbe mystus* were found to be principally piscivorous in all studied habits (Holden, 1970; Aramowo, 1976; Adebisi, 1981; Ogbe, 2004), suggesting they are obligate piscivores, feeding mainly on cichlid fish. Piscivorous fish species prefer long bodied fish as they are easier to swallow as well as insects, grass and snails (Bell-cross and Minshall, 1988).

Findings of other previous workers, suggested that largemouth bass in Lake Naivasha, Kenya feed throughout the year. In general, adult, *Micropterus salmoides* eat fish, crayfish and insects: however according to Hodgson and Kitchell (1987), it is an

opportunistic forager and its diet includes prey ranging greatly in size from zooplankton to vertebrates (fishes, amphibians, reptile, and small mammals). Mhlanga (2003) reported that *Hydrocynus vittatus* in Lake Kariba are predominantly piscivorous on the families Clupeidae and Characidae and sometimes on Clariidae, with invertebrates constituting a very small part of the diet. Seasonal variation influences abundance and diversity in the diet of most fish species because in most tropical waters feeding by fish is highly seasonal. Ugwumba (1992) and Ekpo (1993), reported that natural food of fish tends to differ both in quantity and quality with seasons of the year.

The seasonal variation of *C. laticeps* food revealed that they fed more on insects than on fish in the both seasons. This could mean that they were the most dominant food item in both seasons at that particular time. This preference is probably due to the seasonal predominance of these food items in the environment. When the diet was related with standard lengths of *C. laticeps*, the importance of insects in the diet increased with size, while contribution by fish decreased with increased in size. Fish ranging in size from 1-15 cm fed on crustaceans, while fish ranging from 16-25cm fed on mollusc and 26-35cm fed on Insects and other food items like fish scale and cladocerans were found but were not of importance. Olatunde (1979) reported that the increased ability to consume larger prey is as a result

of increase in mouth gap and strong jaws. Changes in fish diet associated with size and in relation to seasonal availability have been reported by several scientists (Arawomo, 1976; Ugwumba and Adebisi, 1992; Odum and Anuta, 2001; Saliu, 2002). Victor and Brown (1990), reported changes in diet in relation to size in *Brycinus nurse* and *B. longipinnis* in a perturbed river in Benin City. The high percentage of digested materials encountered in *C. laticeps* is due to the fact that the foods taken were soft and were easily digested. Arawomo (1976) also explained that fishes differed in their reactions to capture in gill nets, that some species captured early in the evening digested a considerable part of their food before being removed from the gill net the following morning. Digested materials were most encountered in *C. laticeps* during the rainy season. Idodo-Umeh (1987), reported that feeding intensity is influenced by season and food availability. The monthly feeding index of *C. laticeps* revealed that more than 60% of the stomach with food were observed in the months of May, June, August, September, October, and November, whereas less than this value were observed in the other months which is an indication that allochthonous food washed by flood from the surrounding vegetation into the lake might have been responsible for the high incidence of each of these diets during the rainy season.

CONCLUSION

The most important food items were insects, fish, insect larvae and crustacean. The food items suggested that *C. laticeps* was a predator, with insects and crustaceans predominating its food. The seasonal variation of *C. laticeps* food revealed that they fed more on insects than on fish and crustacean in both rainy and dry seasons.

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