Nigerian Journal of Ecology (2009) 10:16-18.

ISSN: 1116-753X

Aspects of food and feeding habits of dominant fish species in International Institute for Tropical Agriculture (IITA) Lake, Ibadan, Nigeria

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(Accepted 19 June 2009)

ABSTRACT
Aspects of food and feeding habits of dominant fish species captured from International Institute for Tropical Agriculture (IITA) lake, Ibadan, Nigeria were studied using stomach content analysis.Fish species recorded in IITA lake include Oreochromis niloticus, Sarotherodon galilaeus, Lates niloticus, Heterotis niloticus, Labeo senegalensis, Auchenoglanis occidentalis, Gymnarchus niloticus, Hepsetus odoe, Polypterus senegalus, Oreochromis aureus, Tilapia rendallii, Hemichromis fasciatus, Clarias sp., Chromidotilapia guentheri, Barbus calipterus and Schilbe mystus. O. niloticus, S. galilaeus and L. niloticus are dominant species with corresponding 32%, 28% and 11% levels of occurrence by number in the first year and 49 %, 21% and 13% in second year of sampling respectively.
The stomach content analysis of dominant fish species revealed L. niloticus as a carnivore with fish and insect as common food items in the stomach. O. niloticus and S. galilaeus are herbivores feeding mainly on aquatic plants and algae.
Food and feeding habits studies as reported in this study provide biological basis for sustainable fish production both in the capture and culture systems.

Key words: Food/feeding habits, *L. niloticus, O. niloticus, S. galilaeus,* lake ecosystem

INTRODUCTION

According to Lagler *et al*, 1977 feeding habits of fish is the search for and ingesting of food while the food habits and diets imply materials habitually eaten by the fish. Three dietary habits were identified in fish-phytophagous, carnivorous and omnivorous. The carnivorous fish usually possess well-developed jaws armed with strong teeth, well-defined stomach and shorter intestine. On the other hand teeth are absent in phytophagous fish. The number of gill-rakers can also be used as useful tools in predicting food and feeding habits of fish. Reed *et al* (1967) and Holden and Reed (1972) reported that fish with numerous and fine gill-rakers are microphagous or plankton feeders, while those with fewer and bigger gill-rakers feed on larger objects or macrophagous. Food items eaten by fish varied with species and age. In addition, the choice of food by fish depend on seasonal variation, time of the day, light intensity and availability of the food. Therefore, the fish that find food by smell and taste, are predominately night feeders while the predators that depends on sight to locate their prey mostly feed during the day.

According to Okoye *et al*. (1986) a thorough knowledge of the food and feeding habits of fishes is important in all aspects of fish production. It was reported that fishes like other animals require adequate nutrition to grow and survive. The wild aquatic ecosystem offers a great diversity of foods to fishes which include nutrients in solution and hosts of different plants and animal.

The natural foods of fish include phytoplankton and zooplankton. According to Ovie *et al.* (1986) phytoplankton and zooplankton are live foods which are normally present in natural aquatic systems and represent the most valuable food resources for aquatic animals especially fish in the wild. Natural food is nutritious and readily acceptable by fish. Most species of fish solely depend on this natural food during their early stage of life. Zooplankton include different kinds of micro-crustaceans, protozoans and other microscopic invertebrates such as larvae and eggs of mosquito. In addition, information on food and feeding habits of fish species in the wild is important in the development and formulation of diet for them under culture system.

The food and feeding habits of dominant fish species in IITA lake were studied to know the natural diets for their sustainable production. Therefore

MATERIALS AND METHODS

Experimental fishing

Experimental fish samples were collected using two different fishing gears (experimental gill nets and long-lines) for two years.

Fish caught were identified by species and the number recorded. Fish identification was based on morphometric features and meristic counts as described by Holden and Reed (1978) ,Olaosebikan and Raji (1998) and Udodo-Umeh (2003).

Food and feeding habits study

To obtain samples for food and feeding habits study the fish were dissected to remove the stomach contents and stored in 4% formaldehyde prior to examination to prevent post-humus digestion. Each stomach was cut open and the content emptied into the Petri dish and observed under a binocular microscope. The contents of the stomachs were identified and analysed using the Frequency of occurrence and Volumetric methods as described by Hynes (1950). Information on food and feeding habits of the fishes was used to classify them.

Frequency of occurrence method

The identified food items and the number of stomachs in which each food occurred were expressed as a percentage of stomachs containing food using the formula: O = b/a 100

where: a = total number of fish examined with food in the stomach

b = number of fish containing food item

O = percentage of occurrence of each food item

Volumetric method

The volume of each food item was expressed as a percentage of the total volume.

$$V = q/p\ 100$$

where: p = total food volume for the food items

q = volume of individual food items

V = percentage of volume for individual food items

The prominence of each food item was determined using Ranking Index (I).

$$I = (\%\ \text{Occurrence} \times \%\ \text{Volume}).\ 10^{-2}$$

RESULTS

Fish species recorded in IITA lake include *Oreochromis niloticus, Sarotherodon galilaeus, Lates niloticus, Heterotis niloticus, Labeo senegalensis, Auchenoglanis occidentalis, Gymnarchus niloticus, Hepsetus odoe, Polypterus senegalus, Oreochromis aureus, Tilapia rendallii, Hemichromis fasciatus, Clarias sp., Chromidotilapia guentheri, Barbus calipterus* and *Schilbe mystus*. *O. niloticus*, *S. galilaeus* and *L. niloticus* are dominant species with corresponding 32%, 28% and 11% levels of occurrence by number in the first year and 49 %, 21% and 13% in second year of sampling respectively.

The results of stomach contents analysis for *O. niloticus* , *S. galilaeus* and *L. niloticus* are presented in Tables 1, 2and 3 respectively

Table 1: Food Items in the stomach of Tilapia (*O. niloticus*) in IITA Lake

Food Items	F	%	V	%	I
Plant parts	24	28.6	12.0	15.4	13.35
Planktons (algae)	18	21.4	1.6	2.1	1.35
Insect nymph	6	7.1	2.0	2.6	0.27
Insect Parts	6	7.1	1.5	1.9	0.27
Detritus	18	21.4	20.0	25.7	8.32
Sand grains	12	14.3	40.8	52.4	10.77

F= Frequency of occurrence of food item in the stomach
V= Volume of individual food item
I= Ranking Index of food item

Table 2: Food Items in the stomach of *S. galilaeus* in IITA Lake

Food Items	F	%	V	%	I
Plant parts	16	32.0	10.0	26.7	6.60
Planktons (algae)	12	24.0	1.2	3.6	0.50
Insect nymph	1	2.0	0.5	0.9	0.02
Insect Parts	1	2.0	0.5	0.9	0.02
Detritus	12	24.0	15.0	26.2	6.29
Sand grains	8	16.0	30.0	52.4	8.38

Table 3: Food Items in the stomach of *L. niloticus* in IITA Lake

Food Items	F	%	V	%	I
Adult Insects	12	20.0	12.0	4.2	0.84
Insect Larvae	4	6.7	2.0	0.7	0.05
Insect Parts	8	13.3	6.0	2.1	0.28
Whole Fish	16	26.7	180.0	63.6	16.98
Fish Parts	16	26.7	81.6	28.8	7.69
Sand grains	4	6.7	1.6	0.6	0.04

F= Frequency of occurrence of food item in the stomach
V= Volume of individual food item
I= Ranking Index of food item

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V= Volume of individual food item
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DISCUSSION

The fish species composition in the lake from this study revealed *O. niloticus* and *S. galilaeus* (Cichlidae) as the most abundant fish stock in the lake, followed by *L. niloticus* (Centropomidae). The dominance of Family Cichlidae in IITA lake was probably due to the ability of these fish species to utilize a wide range of foods in the lower trophic

level (primary and secondary), as well as their high fecundity and prolific nature.

The stomach content analysis of dominant fish species revealed *L. niloticus* as a carnivore with fish and insects as common food items in the stomach. *O. niloticus* and *S. galilaeus* are herbivores feeding mainly on aquatic plants and algae.

The high percentage of empty stomach recorded in the food and feeding habits study was probably due to the type of fishing gear used and time of collecting the catch. Fish caught in the gill nets will struggle to escape hence, food items might have digested or regurgitated.

Fish species in terms of feeding ecology were classified into 3 trophic levels -primary consumers, secondary consumers and tertiary consumers. The primary consumers feed on filamentous algae, higher plants and bottom deposits. The secondary consumers feed on insects, insect larvae, molluscs and crustaceans. The tertiary consumers feed mainly on fish (piscivores). According to Akinyemi (1987) forage species are the primary and secondary consumers while carnivorous species are the tertiary consumers.

The various food composition based on the stomach content analysis showed Tilapia (*O. niloticus* and *S. galilaeus*) in IITA lake as euryphagous (feeding on wide range of food items). This mode of feeding is possibly responsible, among other reasons for their success in natural environment. According to Lowe-MacConnel (1975) and Welcome (1979) cited by Fagbenro *et al.* (1991), euryphagy is an important feature of ubiquitous fish species thereby having better chance than stenophagous (narrow food choice) species of becoming widely distributed.

Food and feeding habits studies as reported in this study provide biological basis for sustainable fisheries management both in the capture and culture systems. The knowledge of food and feeding habits in the wild forms basis for the formulation of diets for the fish under culture system and can be used to select types of fish that can be combined in polyculture system. In addition, information on food and feeding habits of fish species serves as important management tool in capture fisheries through regulation of carnivore to herbivore population ratio to balance ecological relationship among various fish stocks in a water body.

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