

Full Length Research Paper

The food and feeding habits of the African catfish, *Clarias gariepinus* (Burchell), in Lake Babogaya, Ethiopia

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Abstract

The food and feeding habits of the African catfish, *Clarias gariepinus*, in Lake Babogaya, Ethiopia, were studied from samples caught in each month during September 2005 to August 2006. Analysis of the stomach content (n=340) showed that the fish ingests a variety of items of plant origin, animal origin, detritus and sand grains. The items of plant origin were algae and macrophyte fruits and shoots whereas those of animal origin were crustacean zooplankton, insects, fish, mollusks, nematodes and fish eggs. The insects ingested by the fish were most diverse as they were sub-adult and adult stages belonging to seven taxa such as Hemiptera, Diptera and Odonata. The Nile tilapia, *Oreochromis niloticus*, was the only fish species ingested by the studied *C. gariepinus*. There were differences in the relative importance of the various items ingested by the fish. Thus, the frequency of occurrence of insects was the highest (82%), and this was followed by the frequency of occurrence of macrophytes and of zooplankton (each 60%), fish (26.8%) and fish eggs (16%). The numerically most important food were crustacean zooplankton (92.8%) followed by insects (5.31%), mollusks (0.95%) and *O. niloticus* (0.92%). Based on results from frequency of occurrence and numerical abundance methods, crustacean zooplankton, insects and fish (*O. niloticus*) are considered as the major food of the studied *C. gariepinus*. In contrast, the items of plant origin, detritus and sand grains were believed to be accidentally ingested while the fish was pursuing its prey. Therefore, *C. gariepinus* in Lake Babogaya is considered to have a carnivorous feeding habit. The study also found size-based and seasonal differences in the relative importance of the major food items. Thus, the frequency of occurrence method suggested that the fish feeds progressively less of zooplankton and insects, but more of *O. niloticus* as it grows larger/older. In addition, it feeds relatively more *O. niloticus* than the other major items in September 2005, and during February through to August (mainly in April and July). This is attributed to increased abundance of the prey following intensive breeding in the rainy seasons (February-April and July-September). Likewise, monthly high frequencies of *C. gariepinus* with empty stomach were recorded during the rainy seasons in which time the fish breeds intensively. Thus, at that time the fish could be engaged more in spawning than in feeding activity.

Keywords: *C. gariepinus*, Ethiopia, food, Lake Babogaya

INTRODUCTION

The African catfish, *Clarias gariepinus*, is a widely distributed freshwater fish species in Africa and the

middle-east (Clay, 1979; Viveen *et al.*, 1986; Spataru *et al.*, 1987). It inhabits such varied habitats as natural and man-made lakes, impoundments, small ponds, streams and rivers, and thrives well in deep as well as shallow waters (Clay, 1979; Spataru *et al.*, 1987; Nyamweya *et al.*, 2010). The

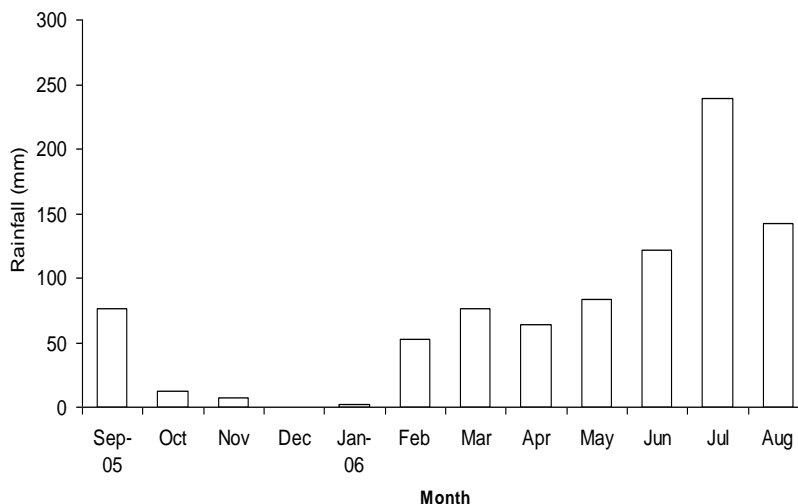


Figure 1. Monthly total rainfall (mm) of Lake Babogaya area during September 2005 to August 2006.

success of the fish could be attributed to its indiscriminate and opportunistic feeding habits, rapid growth rate and its ability to tolerate adverse environmental conditions (Elias Dadebo, 2000 & references therein). Those characteristics of *C. gariepinus* make it one of the species suitable for aquaculture (Viveen *et al.*, 1986). *C. gariepinus* is also one of the most important fish species in many African inland fisheries (Tesfaye Wudneh, 1998; Nyamweya *et al.*, 2010).

C. gariepinus is an indiscriminate and opportunistic feeder ingesting a wide variety of items including algae, macrophyte tissues, crustaceans (especially zooplankton), insects, other fish, detritus and sand grains (Fryer, 1959; Groenewald, 1964; Willoughby and Tweddle, 1978; Clay, 1979). The same has been reported for some populations of *C. gariepinus* in Ethiopian water bodies (Tesfaye Wudneh, 1998; Elias Dadebo, 2000; Leul Teka, 2001; Daba Tugie & Meseret Taye, 2004). The fish is considered to be an indiscriminate carnivore accidentally ingesting plant materials, detritus and sand grains (Groenewald, 1964; Kirk, 1967). In addition, seasonal as well as size-based differences in the food habit of *C. gariepinus* have also been observed. According to Leul Teka (2001), for instance, in Lake Langeno (Ethiopia) the Nile tilapia, *Oreochromis niloticus*, is an important prey for large-sized *C. gariepinus* and mainly during high water level seasons. However, *C. gariepinus* is considered to be unspecialized piscivore feeding on other fish when these are abundant and where specialized piscivores are rare or absent (Nagelkerke *et al.*, 1994; Tesfaye Wudneh, 1998).

In Ethiopia, *C. gariepinus* is found in almost all water bodies inhabited by fish (Shibru Tedla, 1973). It also contributes significantly to the Ethiopian capture fisheries (Reyntjens and Tesfaye Wudneh, 1998) and it is a

suitable candidate for future aquaculture development in the country (Viveen *et al.*, 1986; Elias Dadebo, 1988 & 2000). Thus, *C. gariepinus* is ecologically as well as economically an important fish species in Ethiopia. Therefore, scientific knowledge about this fish is required for rational exploitation and management of the resource. Nevertheless, very little is known about this fish species in Ethiopia and virtually nothing is known about the population in Lake Babogaya (previously Lake Pawlo). Thus, in an attempt to fill this knowledge gap, a study was conducted on various aspects the biology of *C. gariepinus* in Lake Babogaya (Lemma Abera, 2007), and the length-weight relationship, sex-ratio, maturity and condition factor of the fish have been published earlier (Lemma Abera *et al.*, 2014). The present contribution reports the food and feeding habits of the fish.

Description of the Study Area

Lake Babogaya (9°N latitude and 39°E longitude) is one of a group of crater lakes found in the vicinity of Bishoftu (Debrezeit) town about 45 km east of the capital, Addis Ababa. It is located at an altitude of 1870 m (Prosser *et al.*, 1968; Wood *et al.*, 1984). The lake is 0.58 km² in area and has a mean and a maximum depth of 38 m and 71 m, respectively (Prosser *et al.*, 1968; Zinabu Gebre-Mariam, 1994). The region where the lake is located is generally warm and moderately humid (Rediat *et al.*, 2014). During this study, mean monthly minimum air temperature in the region ranged from 11.2-13.5°C while the maximum ranged from 21.6-31.5°C. Monthly total rainfall in the region ranged from 2.1 mm to 239.5 mm (Figure 1). As reported by others (Rediat *et al.*, 2014) and indicated in Figure 1, the area is characterized by two peak rainy seasons in a year: February to April (little rains) and June to September (heavy rains).

Table 1. Relative importance, of items observed in stomach content samples (n = 340) of *Clarias gariepinus* from L. Babogaya, Ethiopia. % FrO = percentage frequency of occurrence, %Num = percentage numerical abundance, ND = not determined.

Item/Taxon	%FrO	%Num
Algae	ND	ND
- <i>Microcystis</i> sp.		
- Filamentous		
Macrophyta	60.9	ND
- Fruits, pieces of shoots		
Crustacea (Zooplankton)	60.3	92.8
- Copepoda	55.3	77.9
- Cladocera	6.2	14.9
Insecta	81.8	5.31
- Hemiptera adults	73.5	1.04
- Diptera larvae and pupae	61.8	1.08
- Odonata nymphs	13.5	0.23
- Ephemeroptera nymphs	12.4	0.64
- Coleoptera larvae	8.8	0.18
- Trichoptera larvae	1.2	0.03
- Hymenoptera adults (ants)	5.9	0.11
Nematoda	2.7	0.05
Mollusca	2.4	0.95
- Gastropod snails		
Pisces	26.8	0.92
- <i>Oreochromis niloticus</i>	26.8	0.92
- Fish eggs	16.0	ND
Detritus	6.0	ND
Sand grains	14.0	ND

Surface water temperature of Lake Babogaya ranges from 22-27°C whereas dissolved oxygen concentration ranges from 7-14 mg/l (Wood *et al.*, 1984; Yeshimebet Major, 2006). The phytoplankton community of Lake Babogaya is dominated by blue-greens, particularly *Microcystis aeruginosa* (Wood and Talling, 1988) whereas its zooplankton community is mainly composed of cladocerans (*Ceriodaphnia*), copepods (*Afrocyclus gibsoni*, *Lovenula africana*) and rotifers (*Asplanchna sieboldi*, *Brachionus calyciflorus*, *Hexarthra jenkiniae*) (Yeshimebet Major, 2006). In addition to *C. gariepinus*, Lake Babogaya is inhabited by *O. niloticus* and *Tilapia zillii* (personal observation) all of which were introduced into the lake to develop fisheries. There was very little fishing on the lake prior to this study. However, fishing intensified afterwards probably due to learning by local people from this study about fish abundance and fishing gears. *C. gariepinus* and *O. niloticus* were the most abundant fish species in the lake as well as in the catch by fishermen (personal observation).

MATERIALS AND METHODS

Sampling and measurement

Monthly samples of *C. gariepinus* were caught between September 2005 and August 2006 using gillnets and long-line gear. Pieces of tilapia were used as bait on hooks, and the two gears were set overnight at inshore

and offshore sites. Two sites were sampled to increase sample size and fish length range in the sample. Fishermen's catch were also sampled for the same purpose. Immediately after sampling, total length (TL, nearest 0.1 cm) of each specimen was measured, and the stomach was removed. The occurrence of empty stomach was recorded whereas stomachs containing food were dissected and the contents were preserved in formaldehyde solution.

Stomach content analysis

In the laboratory, the content of each stomach was transferred into a petri-dish to identify food items visually and/or microscopically. Large food items, particularly fish, were identified visually. However, the sample was examined under a microscope (magnifications: 6X to 400X) for smaller food items which were identified to the lowest taxa possible using descriptions in the literature (Mamaril and Fernando, 1978; Pennak, 1978; Edington and Hildrew, 1981; Defaye, 1988). Simultaneously with identification, food items were counted to estimate their numerical contribution to the diet of the fish.

Estimation of Relative Importance of Food Items

The relative importance of food items to the diet of *C. gariepinus* was analyzed using the frequency of occurrence and the numerical abundance methods

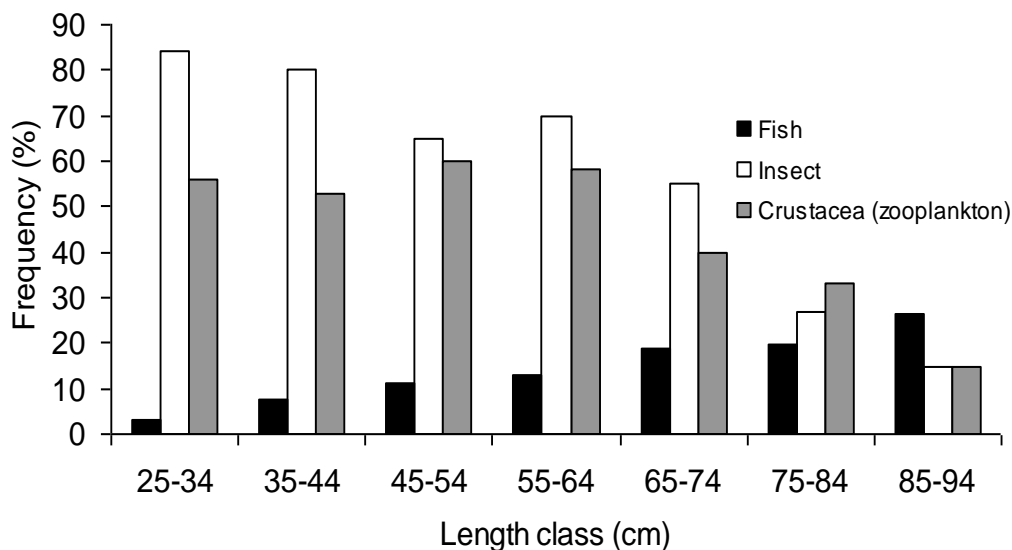


Figure 2. Relationship between the length of *Clarias gariepinus* in Lake Babogaya, Ethiopia, and the frequency of occurrence of its major food items.

(Windell and Bowen, 1978; Hyslop, 1980). Results from those methods served as bases to identify major and minor food items.

Investigation of Size-based and Seasonal Differences in Food Habit

Size-based difference in food habit of the fish was studied by plotting frequency of occurrence of major food items against TL of the fish. Seasonal difference in the food habit was studied by plotting the relative importance (frequency of occurrence and numerical abundance) of major food items as well as the frequency of fish with empty stomachs against sampling month.

RESULTS

Composition of Stomach Content

Stomach content analysis showed that *C. gariepinus* in Lake Babogaya ingested a wide variety of food items. Items of animal origin ingested by the fish included insects, zooplankton, fish, mollusks, nematodes and fish eggs (Table 1). Fruits and pieces of macrophyte tissue, and some algae, were items of plant origin ingested by the fish. Detritus and sand grains were also part of the content of the stomach. The insects ingested by *C. gariepinus* were most varied as they included sub-adult and adult stages of Hemiptera, Diptera, Odonata, Ephemeroptera, Coleoptera, Trichoptera and Hymenoptera (Table 1). The zooplanktonic diet was composed of copepods and cladocerans whereas *O. niloticus* was the only fish species ingested by *C. gariepinus* in Lake Babogaya.

Relative Importance of Food Items

The frequency of occurrence method showed that insects as a group were ingested by about 82% of the total *C. gariepinus* sample (Table 1). Macrophyte tissues and zooplankton were ingested by a comparable proportion (about 60%), whereas *O. niloticus* was ingested by about 27%, of the total sample (Table 1). Frequency of occurrence of fish eggs and sand grains was 16% and 14%, respectively. The same for nematodes, mollusks and detritus ranged from 2.4% to 6% (Table 1).

The high frequency of occurrence of insects was mainly due to Hemiptera and Diptera which were ingested by about 73% and 62%, respectively, of the *C. gariepinus* samples. The numerical contribution of zooplankton was mainly due to Copepoda (55.3%). Numerically, the most important food of *C. gariepinus* were crustacean zooplankton (60%) followed by insects, fish, gastropod snails and nematodes (Table 1). The high numerical importance of crustaceans was mainly due to copepods (about 78%), and the numerical importance of cladocerans (about 15%) was also higher than that of all non-crustacean food items combined (Table 1). Among the insects eaten by the studied fish, Hemiptera and Diptera numerically contributed about 1% each of the total food items. The same result for Ephemeroptera was 0.64% whereas it was below 0.25% for the rest of the insects.

Generally, based on the above results, insects, crustacean zooplankton and fish (*O. niloticus*) were considered as the major food items of *C. gariepinus* in Lake Babogaya.

Size-based Difference in Food Habit

The size (TL) of *C. gariepinus* with food in their stomach ranged from 25 cm to 94 cm which were grouped into 7

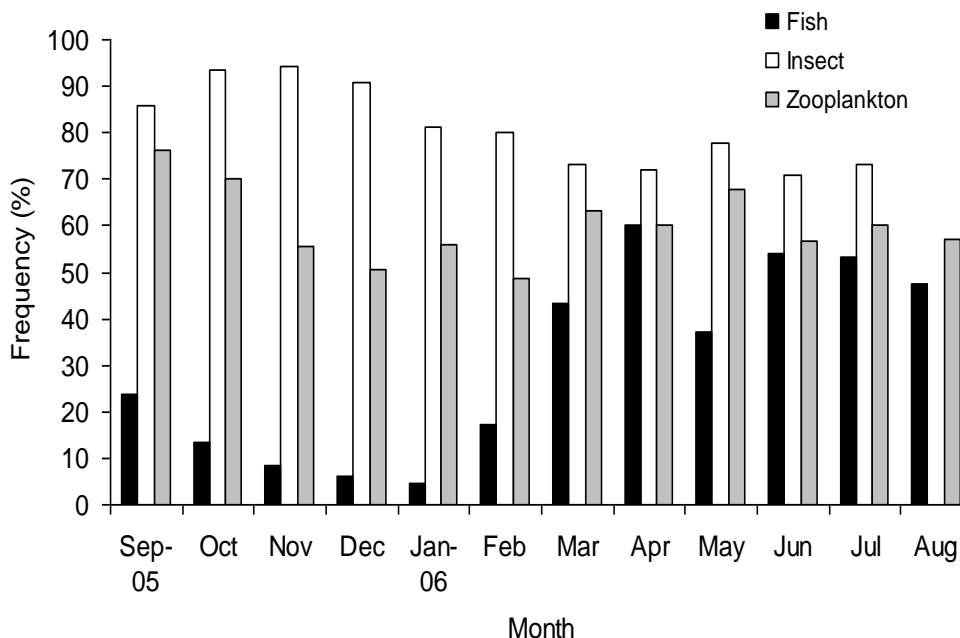


Figure 3. Seasonal fluctuation in the frequency of occurrence of major food items of *Clarias gariepinus* from Lake Babogaya, Ethiopia.

length classes of 9 cm width. The frequency of occurrence method showed that the major food items (i.e., insects, crustaceans and fish) were ingested by *C. gariepinus* belonging to all length groups (Figure 2). However, there was some size-based difference in frequency of occurrence of the three food items. Thus, frequency of occurrence of insects and of crustaceans was higher than that of fish (*O. niloticus*) for *C. gariepinus* below 75 cm TL whereas the three food items occurred at similar frequencies for larger ones (Figure 2). In addition, frequency of occurrence of insects and that of crustaceans tended to decrease whereas that of fish tended to increase with increase in the TL of *C. gariepinus* (Figure 2).

Feeding Seasonality

Each of the major food items were ingested by *C. gariepinus* in each sampling month (Figures 3 & 4). However, their relative contribution, particularly that of fish, varied seasonally. Frequency of occurrence of insects was generally high throughout the sampling year with relatively higher frequencies (>80%) between September 2005 and January 2006 and relatively lower frequencies between March and August (Figure 3). Frequency of occurrence of crustacean zooplankton, which ranged from 50.7% in December 2005 to 76.1% in September 2005, tended to decrease from September towards February, and tended to increase from February towards August (Figure 3). The frequency of occurrence of *O. niloticus* ranged from 4.7% in January to 54.2% in

June with peak frequencies occurring during March-May and June-August (Figure 3).

Monthly numerical abundance of zooplankton (range: 87% to 97%) was highest among the major food items throughout the sampling year with no seasonality (Figure 4a). The same for insects ranged from 2.3% (October) to 10.1% (July) with high values in September and in July (Figure 4b). The monthly numerical contribution of *O. niloticus* to the diet of *C. gariepinus* was generally low (range: 0.02% to 2.2%), but showed a clear seasonality. Thus, numerical contribution of *O. niloticus* was relatively low during October 2005 to January 2006 whereas relatively high in September 2005 and during February to May, peaking in April and in July (Figure 4c). In addition, from the total number of *O. niloticus* ingested by *C. gariepinus* during the study, most of them were ingested during March-April (30.4%) and June-August (40.6%) (Figure 5).

C. gariepinus with empty stomach were encountered in each sampling month, but their frequency varied between the months (Figure 6). Thus, their frequency was relatively low between October 2005 and February 2006, but it was relatively high in September 2005, and during March to August peaking in April and again in July (Figure 6).

DISCUSSION

The study showed that *C. gariepinus* in Lake Babogaya ingests a variety of organisms and items. The organisms

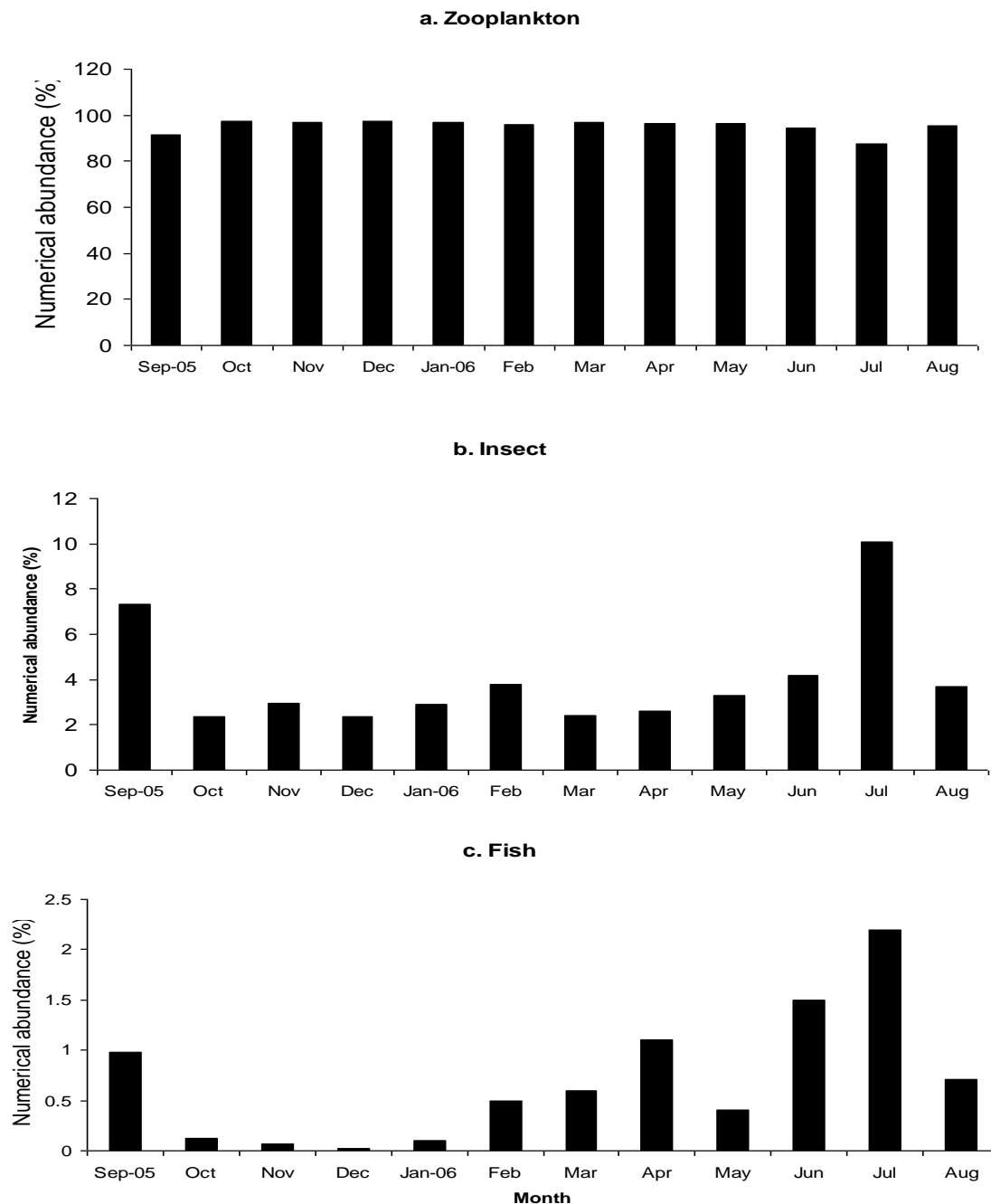


Figure 4. Seasonal fluctuation in the numerical abundance of zooplankton (a), insects (b) and fish, *Oreochromis niloticus*, (c) in the stomach content of *Clarias gariepinus* from Lake Babogaya, Ethiopia.

ingested by the fish were of plant and animal origins. The plants varied from algae to higher plants (macrophytes) whereas the items of animal origin varied from micro-invertebrates (crustacean zooplankton) and insects to a higher vertebrate (fish) (Table 1). In addition, the studied *C. gariepinus* ingests detritus and sand grains as well. The organisms and the items ingested by the Lake Babogaya population of *C. gariepinus* were also ingested by other populations of *Clarias* in Ethiopia (Tesfaye

Wudneh, 1998; Elias Dadebo, 2000; Leul Teka, 2001; Daba Tugie and Meseret Taye, 2004) and elsewhere (Bruton, 1979; Spataru *et al.*, 1987). Leul Teka (2001), for instance, reported that *C. gariepinus* in Lake Langeno ingests a wide variety of plants, animals, detritus and sand grains.

As explained below, algae, macrophytes, detritus and nematodes are not considered to be food items of *C. gariepinus* in Lake Babogaya. On the other hand, crustacean

zooplankton, insects, fish (*O. niloticus*), mollusks, fish eggs and nematodes are important food of the fish. In addition, according to their frequency and numerical contribution, insects, zooplankton and *O. niloticus* are considered as major food items whereas the rest are considered as minor food items. The same has been variously reported for other populations of *C. gariepinus* in Ethiopia (Tsfaye Wudneh, 1998; Elias Dadebo, 2000; Leul Teka, 2001; Daba Tugie and Meseret Taye, 2004) and elsewhere (Bruton, 1979; Spataru et al., 1987). Leul Teka (2001), for instance, reported that Crustacea (zooplankton), insects and fish are important food for the Lake Langeno population of *C. gariepinus*. Likewise, according to Daba Tugie and Meseret Taye (2004) zooplankton and insects are the most important food of the fish in Lake Zwai. Nevertheless, there are some differences between populations of *Clarias* concerning some food items. Mollusks, for instance, are ingested by the fish in this study as well as by *Clarias* in lakes Sibaya (Bruton, 1979) and Kinneret (Spataru et al., 1987). In contrast, mollusks are not ingested by *C. gariepinus* in lakes Awassa (Elias Dadebo, 1988) and Langeno (Leul Teka, 2001). In addition, we did not encounter oligochaetes in our samples. Similarly, oligochaetes are not ingested by *C. gariepinus* in lakes Awassa (Elias Dadebo, 1988) and Langeno (Leul Teka, 2001). However, oligochaetes are important food of *Clarias* in lakes Sibaya (Bruton, 1979) and Kinneret (Spataru et al., 1987). Such differences could be attributed to habitat differences as well as to errors introduced due to regurgitation and/or digestion before sampling (Kirk, 1967; Windell and Bowen, 1978).

The Nile tilapia, *O. niloticus*, was the only fish species consumed by *C. gariepinus* in Lake Babogaya. On the other hand, insects ingested by the catfish were most diverse as they included adult and sub-adult stages belonging seven taxa (Table 1). The same is also true for populations of *C. gariepinus* in lakes Awassa (Elias Dadebo, 2000) and Langeno (Leul Teka, 2001).

Macrophytes, algae, detritus and sand grains are not believed to be food items of *C. gariepinus* in this study. Instead, those items were accidentally ingested while the fish was pursuing its prey organisms which are associated with the macrophyte vegetation and the bottom sediment. The high frequency of sand grains in the stomach content, for instance, indicates that the fish has ingested these items accidentally together with the benthic macro-invertebrates which are important food of the fish. Thus, *C. gariepinus* in Lake Babogaya was considered as an indiscriminate carnivorous fish accidentally ingesting plant material. A similar conclusion has been made by several other workers (Groenewald 1964; Thomas, 1966; Kirk, 1967; Spataru et al., 1987; Elias Dadebo, 2000; Leul Teka, 2001). Groenewald (1964) and Kirk (1967), for instance, reported that *C. gariepinus* is a carnivorous predator which accidentally ingests algal filaments, macrophyte fragments and

detritus together with larvae/pupae of benthic organisms. Likewise, Thomas (1966) made a similar conclusion for the related species, *C. senegalensis*, in a man-made lake in Ghana. *C. gariepinus* in lakes Awassa (Elias Dadebo, 2000) and Langeno (Leul Teka, 2001) has also been considered as a carnivorous fish accidentally ingesting plant tissues, detritus and sand grains. In contrast, however, some workers (e.g., Jubb, 1967; Willoughby and Tweddle, 1978) considered *C. gariepinus* to be an omnivore which, in addition to animals, feeds also on humus, plants, detritus and filamentous algae.

Although *C. gariepinus* in Lake Babogaya is considered to be an indiscriminate carnivore, there are differences in the relative importance of its major food items. Generally, insects, crustacean zooplankton and fish (*O. niloticus*) are the major food items of the fish based on the frequency of occurrence as well as the numerical abundance methods. However, in frequency of occurrence, insects, and numerically crustaceans, are the most important food of *C. gariepinus* in Lake Babogaya (Table 1). On the other hand, among the three major food items, *O. niloticus* is the least important food of the fish based on both methods. Our finding agrees with several other studies on *C. gariepinus* populations in Ethiopia (Nagelkerke et al., 1994; Tsfaye Wudneh, 1998; Leul Teka, 2001; Daba Tugie and Meseret Taye, 2004) and elsewhere (Bruton, 1979; Spataru et al., 1987). According to Leul Teka (2001), insects, followed by crustaceans are the most important, whereas fish (*O. niloticus*) are the least important, food of *C. gariepinus* in Lake Langeno. The same has been reported by Daba Tugie and Meseret Taye (2004) for the Lake Zwai population of *C. gariepinus*. Likewise, Elias Dadebo (unpublished data) found that zooplankters (crustaceans) are more important than fish in the diet of *C. gariepinus* in Lake Chamo, Ethiopia. In contrast, fish are the most important food of some other populations of *Clarias*. Thus, Elias Dadebo (2000) reported that fish, particularly the cichlid *O. niloticus*, is the most important food of *C. gariepinus* in Lake Awassa as are cichlid fishes to the closely related *C. senegalensis* in a man-made lake in Ghana (Thomas, 1966).

The relative importance of *O. niloticus* to the diet of *C. gariepinus* should also be viewed in light of seasonal and size-based differences in the food habit of the predator. For instance, the frequency of occurrence of *O. niloticus* was comparable to that of crustaceans in April and during June to August (Figure 3). Likewise, the frequency of occurrence of *O. niloticus* was also at least comparable to that of insects and of crustaceans for large-sized (>75 cm TL) *C. gariepinus* (Figure 2). Therefore, *O. niloticus* is as important as the other major food items for large-sized *C. gariepinus* and at certain times of the year (see more below). The same has also been reported (Leul Teka, 2001) for the Lake Langeno *C. gariepinus*.

The relative importance of *O. niloticus* was higher in September 2005, April and during July-August than

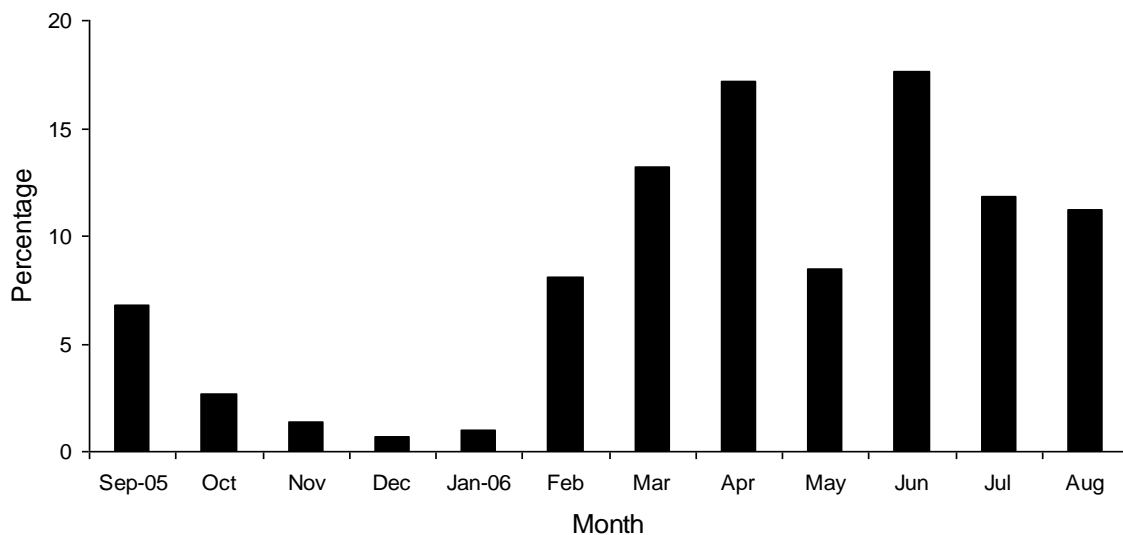


Figure 5. Monthly proportion of fish (*O. niloticus*), from the annual total, ingested by *Clarias gariepinus* in Lake Babogaya, Ethiopia.

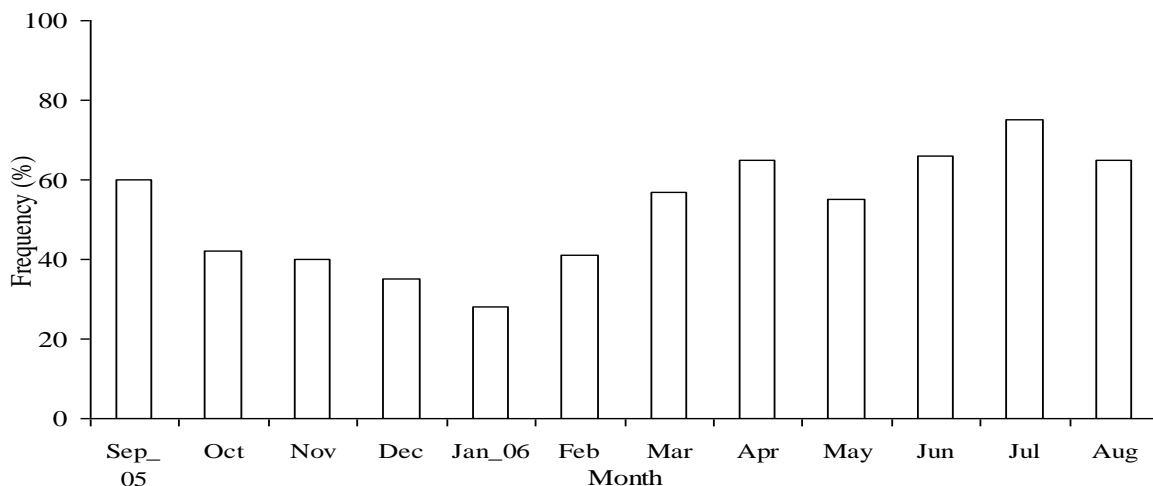


Figure 6. Monthly frequency of *Clarias gariepinus* with empty stomach caught from Lake Babogaya, Ethiopia.

during the rest of the sampling year (Figures 3, 4 & 5). This could be attributed to increased abundance of juvenile *O. niloticus* in those seasons following intensive breeding activity. The peak breeding season of *O. niloticus* in Lake Babogaya is not studied. However, several other populations of *O. niloticus* breed intensively during the rainy seasons and at times of high lake water level (e.g., Zenebe Tadesse, 1988; Demeke Admassu 1996 & 1998; Yirgaw Teferi, 1997). The increase in the importance of *O. niloticus* in the diet of *C. gariepinus* in the lake is also coincident with the rainy seasons (February-April and June-September) (Figure 1). Therefore, the increased importance of *O. niloticus* as food of the catfish during that time could be due to increased abundance of the prey following breeding. A

similar conclusion has been made by Leul Teka (2001) who found increased importance of *O. niloticus* to the diet of *C. gariepinus* in Lake Langeno at times of high lake water level. In addition, that the food habit of *C. gariepinus* varies seasonally suggests that the fish is opportunistic feeder capable of shifting from one diet to another depending on variations in availability of the diets in the habitat (Fryer and Iles, 1972; Matipe and De Silva, 1985). The same has also been concluded for the species in lakes Awassa (Elias Dadebo, 2000), Langeno (Leul Teka, 2001) and Zwai (Daba Tugie and Meseret Taye, 2004).

There was also sized-based difference in the food habit of *C. gariepinus* in this study (Figure 2). Evidently, most of the small sized *C. gariepinus* feed mainly on insects and

crustaceans whereas larger ones included more *O. niloticus* in their diet. In addition, as *C. gariepinus* grows in size it feeds less and less of insects and crustaceans whereas progressively more and more of *O. niloticus* (Figure 2). Such an ontogenetic shift in feeding habit of *Clarias* has also been reported by Elias Dadebo (2000) and Leul Tekla (2001) who reported that juvenile *C. gariepinus* feed more on insects than the adults. Likewise, Munro (1967) reported that insects are more important in the diet of small-sized *C. gariepinus*. Furthermore, Corbet (1961) also found that young *Clarias* in Lake Victoria feed mainly on ostracods and insects, but they feed progressively more fishes as they grow older. The observed size-based difference in food habit could be attributed to habitat difference such that small/young *C. gariepinus* inhabit shallow waters among macrophytes where the density of benthic organisms is usually high whereas large/old ones inhabit mainly deeper waters (Bruton, 1979; Elias Dadebo, 2000; Leul Tekla, 2001).

High incidence of *C. gariepinus* with empty stomach was coincident with the rainy seasons during which time the fish breeds intensively (Lemma Abera, 2007). Therefore, the high incidence of fish with empty stomach at that time may be because the fish was engaged more in spawning activity than in hunting for prey. In addition, the effect of regurgitation and/or digestion before sampling cannot be ruled out (Kirk, 1967). Similarly, Leul Tekla (2001) has reported a high incidence of *C. gariepinus* with empty stomach at times of high water level of Lake Langeno and attributed it to intensive spawning activity.

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