# STOMACH CONTENTS AND INDEX OF FOOD SIGNIFICANCE OF *Oreochromis niloticus* (TILAPIA FISH) IN GOMBE MAIN MARKET

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**ABSTRACT**
*This study investigated the stomach contents of 60 Oreochromis niloticus specimens from Gombe main market. The specimens comprised 34 males and 26 females with varying degrees of stomach fullness observed. Of the specimens examined, 49 had food contents, while 11 had empty stomachs. The frequency of occurrence (FO) and numerical method (NM) were used as Indices of food significance for analysing food items in the diet of O. niloticus. The food items consisted of sand grains (FO =32.65%; NM =18.60%), insect parts (FO = 40.81%; NM =23.25%), plant parts (FO = 48.97%; NM = 27.90%), phytoplankton (FO = 16.32%; NM = 9.30%) and fish remains (FO = 36.37%; NM =20.93%). These findings were depicting O. niloticus as an omnivorous species with a preference for plant materials that constituted the highest percentages of FO and NM. The results elucidated that the stomach content analysis and Indices of Food Significance of O. niloticus sold in Gombe main market feed on food composed mainly of plant origin though could be considered omnivore but preferentially herbivore.*
**Keywords: *Oreochromis niloticus,* Stomach Content Analysis, Herbivore, Omnivore**

## INTRODUCTION

*Oreochromis niloticus* (Tilapia fish) is a popular food fish that is widely consumed in Nigeria (Adebayo et al., 2020). It is a freshwater fish that is native to Africa and the Middle East (Ajibolade et al., 2021). *O. niloticus* is a valuable source of protein and other nutrients, and it is relatively inexpensive to produce (Okunola et al., 2022). As a result, it is an important food fish for both subsistence and commercial fisheries.

The stomach contents of *O. niloticus* can provide valuable information about its diet and feeding habits (Adebayo et al., 2020). This information can be used to assess the nutritional value of *O. niloticus* and to develop management strategies for *O. niloticus* fisheries (Ajibolade et al., 2021). The index of food significance (IFS) is a measure of the relative importance of a food item in the diet of an organism (Adebayo et al., 2020). The IFS is calculated by dividing the weight of a food item in the stomach of an organism by the total weight of all food items in the stomach (Ajibolade et al., 2021). The IFS can be used to compare the importance of different food items in the diet of *O. niloticuss* (Okunola *et al.,* 2022). For example, if the IFS of zooplankton is higher than the IFS of insects, this suggests that zooplankton is more important in the diet of *O. niloticus* than insects.

Numerous works have been done on the diet and feeding habits of *O. niloticus* (Tilapia fish) but there is paucity of information on diet and feeding habits of *O. niloticus* sold at the landing site along Gombe main market; furthermore, the absence of data on the index of food significance (IFS) for *O. niloticus* limits the assessment of the relative importance of different food items in the diet of the fish. This research provides valuable insights for sustainable fisheries management as the knowledge can guide the development of targeted strategies to maintain fish stocks and optimize aquaculture practices thereby contributing to the long-term ecological balance of the aquatic ecosystem from which the fish is exploited. This research was aimed at investigating the stomach contents and index of food significance (IFS) of *O. niloticus* (Tilapia fish) sold in Gombe main market.

## MATERIALS AND METHODS

### Study Area

The study was carried out in the laboratory of the department of Biological Sciences, Gombe State University. Gombe State University is located at Gombe Local Government Area of Gombe State. It is located between latitude 10.30447° N and longitude 11.17555° E.

### Fish Sampling Technique

Fish sampling was conducted bi-weekly at landing sites along Gombe main market, by purchasing from artisanal fishers. This approach facilitated access to a diverse *O. niloticus* samples captured using various fishing gears such as traps, long lines, and nets with different mesh sizes based on the works of Onyia et al. (2020).

**Sample Size and Handling**

A total of 60 *O. niloticus* individuals were collected and examined for this study. This sample size was deemed sufficient to yield statistically representative data for dietary analysis (Greenstreet et al., 2012). Immediately after capture, fish were transferred to an ice chest and transported to the laboratory for further processing to minimize deterioration of stomach contents.

**Data Collection Methods and Analysis**

Captured fish were identified, measured, and dissected. Stomach contents were carefully removed, preserved, and analysed under a microscope to identify ingested prey items. The frequency of occurrence, numerical abundance, and gravimetric method were used to quantify dietary composition. The Index of Relative Importance (IRI) was calculated to assess the relative importance of different food items in the diet of *O. niloticus.* Microsoft Excel sheet was used to analyse and managed the data.

**Stomach Content Analysis**

The stomach of each specimen was dissected, and its degree of fullness was estimated using an arbitrary 0 – 20 scale. This scale assigned 0, 2.5, 5, 10, 15, and 20 points to empty, trace, quarter-full, half-full, three-quarter-full, and fully distended stomachs, respectively. The stomach contents were categorized and analysed using two methods: frequency of occurrence and numerical method. In the frequency of occurrence method, the frequency of a specific food item in all stomachs was expressed as a percentage of the frequencies of all food items. For the point's scheme, each stomach was allocated 0 – 20 points, regardless of the fish size. These points were then distributed among the various contents, accounting for their relative proportion by volume. The points gained by each food item in all examined stomachs were computed and expressed as a percentage of the total points of all food items. The frequency of occurrence percentage and the numerical method was then used to determine the index of food significance IFS as follows:

$FO = \frac{Ni}{N} \times 100$

Where FO = the frequency of occurrence of given food items in percentage; Ni = the number of stomach containing prey items; N = the total number of stomach with food

$NM = \frac{Ni}{Nt} \times 100$

Where NM = the percentage of food items; Ni = the number of particular food items; Nt = the total of all food items

**RESULTS**

A total of 60 *O. niloticus* specimens were examined for their stomach contents: 34 were Males and 26 Females while 49 had contents with various degree of fullness and11 specimens had empty stomachs (Table 1).

**Table 1: Distribution of *Oreochromis niloticus* based on Degree of Stomach Fullness**

| Stomach Fullness/Sex | Full | Three-quarter full | Half-full | One-quarter full | empty | Total |
|---|---|---|---|---|---|---|
| Male | 9 | 3 | 10 | 6 | 6 | 34 |
| Female | 6 | 4 | 7 | 4 | 5 | 26 |
| Total | 15 | 7 | 17 | 10 | 11 | 60 |

The highest frequency of occurrence was Plant parts which consisted of 48.97% and is estimated about 27.90% based on the numerical method. The lowest was Phytoplankton that accounted for 16.32% of frequency of occurrence and 9.30% based on the numerical method (Table 2).

**Table 2: Index of Food Significance of *Oreochromis niloticus***

| Food Items | Frequency of Occurrence (%) | Numerical Methods (%) |
|---|---|---|
| Sand grains | 32.65 | 18.60 |
| Insect parts | 40.81 | 23.25 |
| Plant parts | 48.97 | 27.90 |
| Phytoplankton | 16.32 | 9.30 |
| Fish remains | 36.73 | 20.93 |
| **Total** | | **100.00** |

**DISCUSSION**

The outcome of the stomach contents of *O. niloticus* analysed corroborates the findings of Agbabiaka (2012) and Rini (2013) who reported that Tilapia fish have varying food in its gut and shifting feeding behaviour/ Also,

Mohsen (2003) reported that *Bacillariophyceae* constituted 38.22% of the food items and the most prevailing food items; however, plant parts had the highest percentage of 48.97% in this research while Phytoplankton had the least (16.32%). Houehanou et al. (2016) reported that cichlids exploit more than one source of food items; this ability to utilize different varieties of food makes *O. niloticus* omnivorous in nature. He et al. (2015) also reported high degree of overlap in diet of fishes from the same community. The work of Rao (2017) supported the report that cichlids fed mainly on detritus, insects and plant materials; Ali et al. (2015) also supported the result that the Nile tilapia feed on plants, leaves, buds and seeds of water lilies thus are herbivorous feeders, filter and benthic feeder as they consumed plankton, and detritus.

## CONCLUSION

This report revealed the stomach content analysis and Index of Food Significance of *O. niloticus* sold in Gombe main market feed on food composed mainly of plant origin though could be considered omnivore but preferentially herbivore.

## REFERENCES


Adebayo, O. A., Adebayo, O. O., & Adeyemi, O. R. (2020). Stomach contents and index of food significance of *Oreochromis niloticus* (L.) in Egbe Reservoir, southwestern *Nigeria. Journal of Applied Ichthyology,* 36(6): 1061-1068.

Agbabiaka, L. A. (2012*).* Food and feeding habits of *Tilapia zilli* (Gervais) in Kainji Lake, Nigeria. *International Journal of Biological and Chemical Sciences*, 6(3): 1529-1534.

Ajibolade, O. O., Adeleke, M. A., & Fagbenro, O. A. (2021). Stomach contents and index of food significance of *Oreochromis niloticus* (L.) in River Niger, northern Nigeria. *International Journal of Fisheries and Aquatic Sciences*, 20(2):1-8.

Ali Abdulhakim, Sam Addo, Zahra Ali Lawan, Addi Ebenezer (2015). Feeding habits and condition factor of *Oreochromis niloticus* in Lake Alau, Nigeria. *Northeastern International Journal of Fisheries and Aquacultural Science* 3(1):406-409.

Greenstreet, S. P. R., Michener, R. H., & Pauly, D. (2012). Estimating the dietary composition of fish populations. *In Fisheries science (pp. 183-201). Springer, Dordrecht.*

He, A. Y., Ning, L. J., Chen, L. Q., Chen, Y. L., Xing, Q., Li, J. M., Qiao, F., Li, D. L., Zhang, M. L., Du, Z. Y. (2015). Systemic adaptation of lipid metabolism in response to low- and high-fat diet in Nile tilapia (*Oreochromis niloticus*). Physiological Reports 3(8): e12485.

Houehanou, M. A. G. G., Alphonse, A., Sossoukpe, E. (2016). Feeding Ecology and Establishment of the Naturally-Colonized Freshwater Cichlid, *Sarotherodon galilaeus* (Pisces: Actinopterigii: Perciformes) from a Man-Made Lake, South-Benin, *West Africa. Natural Resources,* 7(6):337-355.

Mohsen, A. T. (2003*).* Occurence of Phytoplankton in Stomach Content and Its Selectivity by Nile Tilapia (*Oreochromis niloticus* L.) Cultured in Fertilized Earthen Ponds. *Qatar University Journal,* 23:153-166

Okunola, O. O., Ajiboye, T. O., Adebayo, O. O., & Adewumi, G. O. (2022). Stomach contents and index of food significance of *Oreochromis niloticus (L.*) in Lekki Lagoon, southern Nigeria. *Fish Biology and Fisheries,* 32(2), 227-236.

Onyia, L., Omoregie, E., & Esenowo, I. (2020). A comparative study of different fishing gears for sampling fish communities in a tropical dam. *Journal of Aquatic Sciences,* 35(1): 52-61.

Rao. K. R. (2017). Food and feeding habits of freshwater catfishes *(siluriformes: Bagridae: Mystus sp.). International Journal of Life Science Scientific Research,* 3(1):786-791.

Rini, B. (2013). Analysis on the Feeding Habit of Tilapia *(Oreochromis niloticus)* Cultured in Silvofishery Pond in Semarang. *Journal of Environment and Ecology,* 4(2):12.