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Food and Feeding Habit and Condition Factor of *Tilapia* Species in Ebonyi River, Southeastern Nigeria

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Keywords

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This study examined food, feeding habits and condition factor of *Tilapia zilli* obtained from Ebonyi River in Ebonyi State. Analysis of stomach content revealed varying food items. Out of the 120 species of *T. zilli* that were sampled, 11 had full stomach, 21 had ¾ stomach full, 52 had 2/4 stomach full, 28 had ¼ stomach while 8 had empty stomach. The male fish was 55, while female was 65. The major food items of *T. zilli* from this study were *Spirogyra* spp (17.75%), *Clostridium* spp (13.61%), *Nanicula* spp (11.44%), *Asterionella* spp (80.4%), *Oscillatoria* spp (13.61%). Some other food items that were also recorded include *Piridinium* spp, and *Cosmarium* spp. The length-weight relationship for the samples ranging in size from 5.5cm to 23.7cm TL was estimated and the exponent (b) value indicated negative allometric growth. Overall condition factor value of *T. zilli* was 1.932 which showed that the sampled fishes were in good condition and sustainable management should not be neglected.

Introduction

Food is any substance consumed to provide nutritional support for the body. It is usually of plant or animal origin, and contains essential nutrients such as carbohydrates, fats, proteins, vitamins or minerals. The substance is ingested by an organism's cell to produce energy, maintain life or stimulate growth. Feeding means to give food; supply with nourishment [1]. Food and feeding habit of fish are important biological factors for selecting a group of fish for culture in ponds to avoid competition for food among themselves and live in association and to utilize all the available food [2]. It is virtually impossible to gather sufficient information of food and feeding habit of fish in their natural habitat without studying its gut contents. [2]. A thorough knowledge on the food and feeding habit of fishes provide keys for the selection of culturable species and the importance of much information is necessary for successful fish farming. The food habit of different fish varies from month to month. This variation is due to changes in the composition of food organisms occurring at different seasons of the year [2]. [3] stated that the natural foods of fishes are classified under three groups (i) Main food (ii) Occasional food and (iii) Emergency food. The stimuli to food are of two kinds: factors affecting the internal motivation or drive for feeding, including season, time of day, light intensity, lime and nature of last feeding, temperature and any internal rhythm that may exists; food stimuli perceived by the sense like smell, taste, sight and the lateral line system that release and control the momentary feeding act. The knowledge of food and feeding habit helps to select such species of fish for culture and produce an optimum yield by utilizing all the available potential food of the water bodies without any competition [2]. Thus, this study seeks the different foods, feeding habit and condition factor of *T. zilli*.

Materials and Methods

Study Area

The study was carried out in Ebonyi River in an area covering about 6,421.2 square kilometer of the crystalline complex in

South Eastern Nigeria. It lies at latitude 6°15° North and 8°05 East.

Sample Collection

The fish tilapia species were collected at the Ebonyi River in the morning and in the evening. The fishing gears used include; lift net and drag net. Daily sampling was carried out between 7.30am and 12:00 noon. The fishes were preserved in 10% formalin solution and were transported in a plastic container to the Applied Biology laboratory of the Ebonyi State University, Abakaliki.

Laboratory Analysis

Length -weight relationship

In the laboratory, the length and weigh of each sample was measured using a meter rule and an electronic weighing balance respectively. The total length (TL) of the fish (from the tip of the snout to the tip of the tail fin). The standard length (SL) of the fish (from the tip of the snout to the beginning (caudal fin) and the head length (HL) from the tip of the snout to the end of the operculum region were measured.

Frequency of occurrence

In the frequency of occurrence method, the number of stomach content method containing each food item is expressed as a percentage of all non-empty stomachs. Though this method is quick and requires minimal apparatus, it gives little indication of the relative quantities of each food categories present in the stomach. Therefore, frequency of occurrence method (% frequency) is:

$$\% \text{ F } = \frac{\text{Number of stomach content in which a particular food item}}{\text{Total number of stomach examined}} \times \frac{100}{1}$$

Dissection: each fish sample was placed in a clear dissecting board using dissecting kit, during the dissection a mild ventral cut was made on each fish from the anal aperture to the base of the operculum. The body wall was cut open at both sides enabling a thorough exposure of alimentary canals, each stomach was slit open. The content poured into a Petri dish and observation of the food items was carried out with the aid of a light microscope.

Statistical analysis: There exist several indices for expressing the quantitative importance of the different food items in the diet of fish. Frequency of occurrence of each food object was obtained by expressing the number of stomach each food item occurred as percentage of total number of stomach. Numerical method, food items were counted directly.

Results

This study examined the length-weight relationship, condition factor, food and feeding habits of *T. zilli* obtained from Ebonyi River. The length-weight relationship for the samples ranging in size from 5.5 cm to 23.7cm TL was estimated. The exponential form of equation obtained was $W = 0.812\ TL^{2.270}$ (Figure 1). The value of the co-efficient of correlation (r = 0.932) estimated was high. The exponent (b) value indicated negative allometric growth. Total length-Standard length relationship was estimated for the samples ranging in size from 3.8 cm to 16.8cm TL. The exponential form of equation obtained was $SL = 0.147\ TL^{1.046}$ (Figure 2). The value of the co-efficient of correlation (r = 0.963) estimated was high. The exponent (b) value indicated negative allometric growth.

Table 1. *Analysis of stomach fullness of T. zilli in Ebonyi River.*

Stomach fullness	No. of fish sample	% occurence
Full stomach	11	9.2
¾ stomach	21	17.5
½ stomach	52	43.3
¼ stomach	28	23.3
Empty stomach	8	6.7
Total	120	

Table 2. *Composition of food items of T. zilli in Ebonyi River.*

Food items	No. of food sample	% Occurrence
Microcysticspp	800	3.9
Closteriumspp	2801	13.6
Eudermaspp	68	0.3
Spirogyra spp	3653	17.8
Nostocspp	760	3.7
Oscillatoriaspp	2800	13.6
Spiruliumsp	415	2.0
Cosmariumsp	1832	8.9
Naniculaspp	2354	11.4
Asterionellaspp	1654	8.0
Ceratiuilssp	305	1.5
Piridiniumsp	700	3.4
Diffulgiasp	258	1.3
Chlamydomonassp	197	1.0
Penicumsp	650	3.1
Conscriodiscussp	781	3.8
Arcellasp	553	2.7
Total	20, 581	

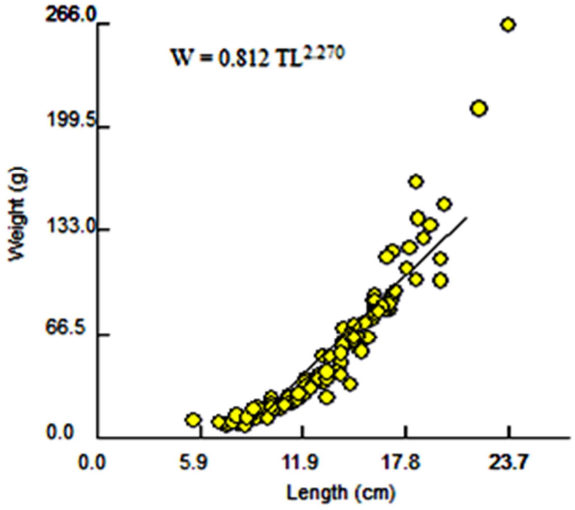

Figure 1. *Length-weight relationship of T. zilli.*

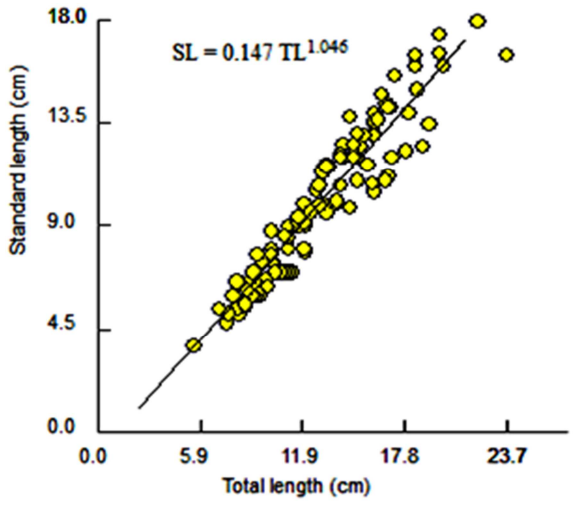

Figure 2. *Total length-Standard length relationship of T. zilli.*

Overall condition factor value of *T. zilli* was 1.932.

Analysis of stomach content revealed varying food items. Out of the 120 species of *T. zilli* that were sampled, 11 had full stomach, 21 had ¾ stomach full, 52 had 2/4 stomach full, 28 had ¼ stomach while 8 had empty stomach. The major food items of *T. zilli* from this study were *Spirogyra* spp (17.75%), *Clostridium* spp (13.61%), *Nanicula* spp (11.44%), *Asterionella* spp (80.4%), *Oscillatoria* spp (13.61%). Some other food items that were also recorded include *Piridinium* spp, and *Cosmarium* spp.

Discussion

Length-weight relationship 'b' value of this study indicate a negative allometric growth pattern (1.586), an indication that fish are lighter than their body lengths [4] which implies poor growths of length and weight respectively. Correlation coefficient 'r' (0.930) was positive and highly significant (p = 0.05) which implies that the sampled specie's lengths and weights were growing proportionally. 'b' value in fish can be affected by many factors such as gonad maturity, sex, food availability, health, seasonal variability of the environment, sample size, habitat suitability, growth increment, temperature and salinity of the environment, fishing activities, individual metabolism, age and maturity [4], [5], [6] and [7]. Marked variability in estimates of b is usually observed among different populations of the same species, or within the same population at different times. On the one hand, this may reflect changes in the condition of individuals related to feeding, reproductive or migratory activities [8].

According to [9] Study on the condition factor for four species of Tilapia, *Tilapia zilli, Oreochromis niloticus, Oreochromis mossabicus* and *Oreochromis aureus* from Ebonyi River was conducted between (January - March, 2011) using mathematical and statistical analysis. Overall mean condition factor (K) value for *T. zilli* was 2.1. The highest K and lowest K values were 5.0 and 0.2 respectively. Overall mean K value for *O. niloticus* was 1.9 with highest and lowest K values as 4.5 and 0.2 respectively. Overall mean K value of *O. aureus* was 2.0. Highest K value was 4.8 while lowest K value obtained was 0.8. Overall mean K value for *O. mossabicus* was 1.9. Highest K value was 4.6 while lowest K value obtained was 0.5. The mean K values recorded for males from the four species were higher than the females indicating that males were in a better state of wellbeing than the females. From the result of this study, the general observation of the condition of the fisheswas that the sampled fishes were in good condition and sustainable management should not be neglected.

It is virtually impossible to gather sufficient information of food and feeding habit of fish in their natural habitat without studying its gut contents. A thorough knowledge on the food and feeding habit of fishes provide keys for the selection of culturable species and the importance of much information is necessary for successful fish farming. The food habit of different fish varies from month to month. This variation is due to changes in the composition of food organisms occurring at different seasons of the year.

This study is also comparable to earlier reports by [10] whose study investigated the food and feeding habit of a brackish water fish *Tilapia guineenisis* in the Rumuolumeni Creek of the Niger Delta, Nigeria. His findings indicated that the juveniles of *T. guineensis* feed mainly on zooplankton while theadult fish depend more on aquatic plants and invertebrates. It is opined that this mode of feeding could give an insight in feed formulation for intensive culture of *T. guineensis.* In the case of the adult *T. guineensis* his findings also suggest the mostdominant food items from both the 'point' and frequency of occurrence methods as decayingaquatic leaves, invertebrates, sand grains anddetritus/mud. This agrees with this present finding. The findingin this work is further corroborated by thatof [11] and [12]. Generally, one can only infer that *T. zilli* in Ebonyi River are opportunistic feeders that are able to consume and digest quite a variety of food items available in the environment, switching from mainly zooplankton diets at the juvenile stage to aquatic macrophytes and invertebrates in adulthood.

This study is comparable with the reports by [12] who studied dietary habits of *T. zilli* in River Otamiri, Imo State, Nigeria. Data collected from his studies showed that *T. zilli* is an omnivorous fish with dietary preference for Algae, vegetative matter, detritus and aquatic invertebrates' larvae such as *Chaoborus larvae and Chironomid larvae*. The presence of detritus and sand in few of the guts examined confirms the reports that Tilapia seldom browses on live benthic invertebrates and bacteria-laden detritus [13], [14] and [15]. Tilapia preference for algae and vegetative matter may be attributed to its ability to secrete mucus from the gills that traps plankton; however, their ability to digest filamentous algae and aquatic macrophytes is through the mechanism of physical grinding of vegetative matter between the two pharyngeal plates of fine teeth and acidic nature (pH < 2) of the stomach which raptures the cell walls of algae and bacteria [15].

Over the years aquaculture had gained a rapid interest due to the importance of fish as a cheap source of animal protein. Fish, like any animal require adequate nutrition for proper growth and survival. In the wild, nature offers a great diversity of

food including a host of animals and plants. However, in ponds natural food is not sufficient to sustain the fish especially in high density ponds. Therefore, for efficient and cost effective fish farm management, there is need for effective nutritional strategies, which can only be achieved via proper understanding of the food and feeding habits of the fish to be cultured.

The decline in the abundance of fresh water fish resources is always an issue in the fishing industries in Nigeria. The declining trend is thought to prevail due to either over-exploitation of the fish resources with bad fishing methods like explosives and poisoning or factors relating to availability of food in the area [16]. Analysis of the stomach content of fish could provide information about the niche of the particular fish in its ecosystem. It contributes a better understanding of the trophic dynamics and food webs, which is essential for appropriate fisheries management. Studies on food and feeding habits gives information on seasonal changes of fish because the type and magnitude of food available as well as the season it occurs plays important role in the history of the fish [17].

Conclusion

In summary, analysis of the stomach content of Tilapia species has provided information about the niche of the particular fish in its ecosystem. It has also contributed a better understanding of the trophic dynamics and food webs, which is essential for appropriate fisheries management. The food and feeding habits of fish should continue to be studied because it forms the basis of a good aquaculture management system. Since feeding constitutes 60 to 65% of the aquaculture business, any species being considered for culture, must be evaluated for its food and feeding habit with a view to determining the kinds of natural food to be encouraged to grow or artificial feed to be given in the pond or culture medium. Fishes as all other animals require adequate nutrition in order to grow and survive. Through observations in the field and the examination of the contents of digestive tracts, a lot has been learnt concerning the feeding behaviour and the kinds of organisms that are eaten by fish. Due to natural fluctuations in abundance, any one-food organism is not of constant numerical availability to fishes. Such fluctuation of forage organisms are often cyclic and due to environmental factors, life histories or climatic. Abundance of a potential feed species often determine whether or not it will be eaten by fishes in the wild, for indeed availability is a factor in determining what a fish will eat. Most fishes are highly adaptable in their feeding habits and utilize the most readily available foods. The type of food a fish feeds on in the wild is an indicator to its feeding habits and this gives an insight in aquaculture to the type of feed formulated. It is hoped that the findings in this work will give fish culturist, fish nutritionists and feed technologists an insight in the choice of feed ingredients to use in compounding artificial diets for the juvenile and adult *Tilapia* species respectively under intensive culture system.■

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References

[1] Food. Encyclopedia Britannica. Retrieved 29 May 2015.

[2] Manon, M. R. and Hossain, M. D. (2011). Food and feeding habit of *Cyprinus carpio* var. *specularis*. *J. Sci. Foundation,* 9(2):163-181.

[3] Jhingran, V. G. (1983). Fish and Fisheries of India (Revised and enlarged 2nded). Hindustan Publishing Corporation (India) Delhi. Pp. 645.

[4] Wootton, R. J. (1998). Ecology of Teleost Fishes. 2ndEdn., Kluwer Academic Publishers, Dordrecht, Netherlands, ISBN-13:9780412317200, Pages: 404.

[5] Franco-Lopez, J., C. B. Sanchez, H. B. Escorcia, L. G. Abarca-Arena, T. C. Ferreira and Vazquez-Lopez, H. (2010). Biological and Ecological aspects regarding *Cynoscion nothus* Holbrook, 1855 (Perciforms: Sciaenidae). *R.J. Fish*. *Hydrobiol*., 5(2): 66-75.

[6] Lawson, E. O. (2010). Morphometric measurements and meristic counts in mudskipper (*Periophthalmus papilio*) from mangrove swamps of Lagos Lagoon, Nigeria. *J. Appl. Biosci*., 34: 2166-2172.

[7] Uneke, B. I. (2015a). Length-weight relationship and condition factor of *Chrysichthys nigrodigitatus* of the Ebonyi river, South eastern, Nigeria. *American Journal of AgriculturalSciences*2 (2): 70-74.

[8] King, E. P. (1996). Length Weight Relationship of Nigerian Coastal Water Fishes. *Fishbyte.*19: 53-58.

[9] Uneke B. I. (2015b). Condition factor of Tilapia species in Ebonyi River, South eastern Nigeria. *International Journal of Biological Sciences and Applications* 2(4): 33-36.

[10] Fayeofori, G. F. (2013). Food and Feeding Habits of *Tilapia guineensis* (1862) in Rumuolumeni Creek, Niger Delta: Implications for Pisciculture. *J. Life Sci.*, 5(1): 41-45.

[11] Oribhabor, B. F. and Adisa-Balanta, A. S. (2009). Aspects of the Biology of *Sarotherodon melanotheron* and *Tilapia guineensis* (Perciformes: Cichlidae) in Buguma Creek, RiversState, Nigeria. *Nigeria Journal of Agriculture, Food and Environment* 5(2): 5-9.

[12] Agbabiaka, L. A. (2012). Food and feeding habits of *Tilapia zilli*: (Pisces: Cichlidae) in River Otamiri South-Eastern Nigeria. *Bioscience Discovery* 3(2): 146-148.

[13] Kuton, M. P. and Ikusemiju, K. (2000). The Feeding Interrelationship of four Cichlids in the Lekki Lagoon, Nigeria. *Journal Sci. Res. Dev*. 5: 169-176.

[14] Olufeagba, S. O., Aluko, P. O. and Eyo, A. A. (2002). Dietary protein requirements of triploid *Heterobranchus*. *J. Aquat Sci*. 17: 1- 4.

[15] Osho, J. A., Ayodele, I. A. and Fagbuaro, O. (2006). Food and Feeding Habits of *Oreochromis niloticus (L)* and *Sarotherodon galilaeus (L)* in a Tropical Reservoir. *World ournal of Zoology* 1(2):118–121.

[16] Khan, A. M., Shakir, H. A., Khan, M. N., Abid, M. and Mirza, M. R. (2008). Ichthyofauna lsurvey of some fresh water reservoirs in Punjab. *The J. Anim. Plant Sci.* 18(4): 155-157.

[17] Akpan, A. W. and Isangedihi, A. I. (2005). Dynamics in the Length-Weight relationship and condition index of three species of *Pseudotolithus* (Pisces: Sciaenidae) in three tropical river estuaries. *Liv. Sys.sus. Dev*. 5: 33-43.