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An Investigation into the Food and Feeding Ecology of S*arotherodon Galilaeus* in Oyan Lake, Ogun State, Nigeria

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Target Audience: Fish Farmer, Researcher and Aquaculturist

Abstract

An investigation was conducted on the stomach content of Sarotherodon galilaeus in Oyan Lake. Fish species were procured from fishermen using gillnets, cast nets ,traps, hook and line and gura net. Sixty (60) specimens were used for the study. Diet indices such as percentage composition by number and frequency of occurrence methods used to analyze the stomach contents which showed that the food items covered a wide range of diatoms, desmids, blue green algae, green algae, protozoan, detritus and unidentified plants material suggesting that the fish species feeds on both surface water and bottom sediments. The results showed that S. galilaeus is a euryphagous and therefore exploit a wide range of organisms. This makes it an opportunistic feeder. Nonetheless, detritus constituted the most preferred food item eaten by S. galilaeus. Also, filamentous blue green algae were favoured more than diatoms. The preference of filamentous blue green algae over diatoms was consistent.

Key Words: Fish, Food items, Oyan Lake, *Sarotherodon galilaeus*.

Description of the Problem

Tilapia is a large genus in the cichlid family (Cichlidae). The genus Tilapia, as well as closely related genera like *Oreochromis* and *Sarotherodon*, belongs to the tribe Tilapiine in the subfamily Pseudocrenilabrinae. *Sarotherodon galilaeus* is a tilapia species belonging to the family Cichlidae. It lives in fresh water or brackish water environments at a depth of 5m (1). Climatically, it survives in a subtropical temperature of 22°C-28°C (2 and 3).

Today, tilapia is a popular food fish all over the world and it is also kept in aquariums. Tilapia has been used as biological controls for certain aquatic plant problems. It has a preference for a floating aquatic plant, duckweed (*Lemna* sp.) but also consume some filamentous algae. In Kenya tilapia were introduced to control mosquitoes which were causing malaria, because they consume mosquito larvae, consequently reducing the numbers of adult female mosquitoes, the vector of the disease (4). The study of tilapia feeding ecology and food consumption follow two approaches: stomach content analysis of fishes captured in the field and direct

quantification of algal ingestion by fish in the laboratory (5). Various experiments on stomach content analysis among the Cichlids have shown a diversity of feeding adaptations and behaviour that enable them to utilise virtually different kinds of food items, suggesting a high degree of opportunistic feeding behaviour (6). According to (1), *S. galilaeus* is associated with beds of submerged vegetation and often feed on algae and fine organic debris. Similarly, (6) and (7) found that, algae and algae-derived detritus comprised the bulk of gut content in adult *Sarotherodon*. Therefore, this research is undertaken to determine the stomach content of both juveniles and adults *Sarotherodon galilaeus* in the Oyan Lake which could be helpful to fish farm managers to increase their production in Nigeria.

Materials and Methods

Description of the Study Area

Oyan Lake was constructed in the year 1979. It is an earth filled lake under the management of Ogun-Oshun River Basin and Rural Development Authority (OORBDA), having it headquarters at Alabata, Abeokuta, Ogun State.

The lake is in the Savannah region, with sparse trees and grasses and low fertility. It covers 4000hectares and has a catchment area of 9,000km^2. The dam has a crest length of 1044 m, height 30.4 m and gross storage capacity of 270million m^3. It was designed to supply raw water to Lagos and Abeokuta, and to support the 3,000hectare lower Ogun Irrigation Project. Oyan Lake is man-made lake reservoir in Ogun State. The lake is relatively reach in fish and other wildlife, and has potential for ecotourism. It is the second largest lake in the southern part of Nigeria.

Sampling Techniques and Laboratory Procedure

Fish specimens were collected between June and August 2014 with the help of the fishermen operating on the reservoir. Gears employed included gill nets, cast nets, traps, hooks and lines. Samples were chilled in iced blocks at the point of collection before it was transported to the laboratory for analysis.

Identification of fish species was done using fish identification guide by (8), and (9). The weight of each specimen were taken using a top loading metler balance (model PNI200) to the nearest 0.1 g after draining excess water with a pile of filter paper while standard length was measured in centimeter using a measuring board. Specimens were dissected and the gut taken out to remove the stomach. The contents were emptied into a petri dish for analysis. Gut contents were dispensed in sterile petri-dishes and observation under the microscope. Food items in those guts that could not be identified or analyzed immediately were preserved in a well labelled bottles containing 10% formalin solution for future identification. Large food items were easily recognized with naked eyes, while binocular microscope was used to enhance proper viewing of food organisms with magnification (at X 100) and identification. All recognized food items were identified. Food items were analysed using two methods of gut contents analysis these includes frequency of occurrence and numerical methods.

Method of stomach content analysis

Analysis was done using frequency of occurrence and numerical methods as described by (9) and (10).

$$\%\ F.C = \frac{\text{Total number of fish with food item}}{\text{Total number of stomachs with food in the sample}} \times 100$$

This is a methods of which content made of individuals of each kind of food present in the stomach is taken and summed up to give the total for each kind of food item in the whole sampled examined as a percentage of the total food type found in all fish examined.

$$\%\text{number of food items} = \frac{\text{Total number of a particular food item}}{\text{Grand total of all food item}} \times 100$$

Results

A total number of 60 specimens of *Sarotherodon galilaeus* were obtained. The total length and standard length ranged between 10.8cm to 19.1cm and 6.3cm to 16.3cm, respectively in *Sarotherodon galilaeus* while the weight ranged between 38g to 125g.

Table 1 shows the summary of stomach contents of *Sarotherodon galilaeus* from Oyan Lake. Detritus formed the most important diet (102.38%) followed by phormidium (78.57%) while volvox species was least observed in frequency of occurrence method. In the numerical method, phormidium (12.88%) was the most important food item observed, followed by polycystis (9.20%) while unidentified plant materials (3.51%) was least observed in numerical method. As shown in Table 2, 18 (30.00%) out of 60 specimens examined had empty stomachs.

Table 1:Summary of the stomach con tents of *Sarotherodon galilaeus* in Oyan Lake, Ogun State, Nigeria.

	Frequency of occurrence method		Numerical method	
Food items	No.	%	No.	%
BLUE-GREEN ALGAE				
Phormidium	33	78.57	77	12.88
Merismopedia	10	23.81	29	4.85
Polycystis	15	35.71	55	9.20
GREEN ALGAE				
Scenedesmus	8	19.05	36	6.02
Protococcus	12	28.57	38	6.35
Characium	9	21.43	62	10.36
Spirogyra	11	26.19	32	5.35
DESMID				
Docidium	5	11.90	37	6.19
Closterium	7	16.67	25	4.18
Desmidium	24	57.14	24	4.01
PROTOZOANS				
Chlamydomonas	14	33.33	33	5.51
Volvox	6	14.29	40	6.69
Insect parts	17	40.48	22	3.68
Detritus	43	102.38	67	11.20
Unidentified plant material	16	38.09	21	3.51

Table 2: Analysis of empty stomach of *S. galilaeus*

Month	No. of stomach examined	No. of empty stomach	% of empty stomach
June	19	6	31.57
July	13	4	30.77
August	28	11	39.29

O % - Percentage of Occurrence
% of empty stomach –30.00%
Total number of stomach examined –60
Total number of empty stomach –18

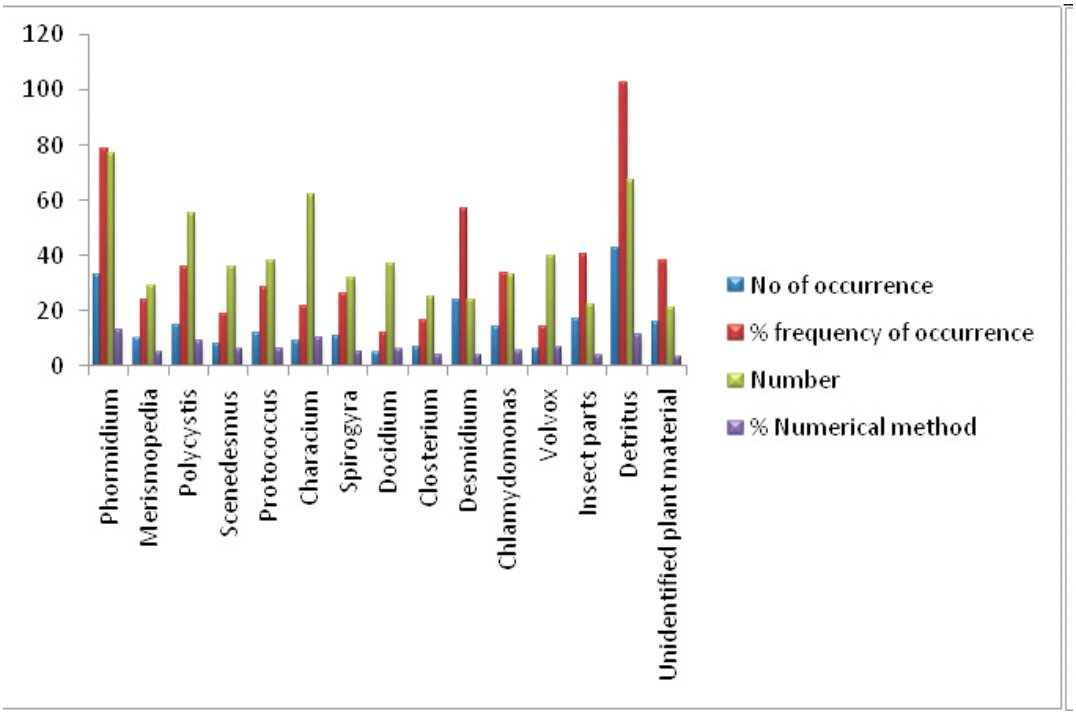

Fig. 1: Bar chart representing the percentage of occurrence of various food items present in *Sarotherodon galilaeus* stomach

Discussion

The result from the frequency of occurrence and numerical methods showed that *S. galilaeus* fed mostly on detritus, blue-green algae, green algae, insect parts, diatoms, protozoans and some unidentified plant material indicating that it is omnivorous fish species. A similar study shows that *S. galilaeus* fed on varieties of food items. The knowledge of the diet of a species in nature is important for the establishment of its nutritional needs and of its interaction with other organisms. Most aquatic animals appear to be opportunistic feeders, consuming a large diversity of prey (11), and results from this study indicates that *Sarotherodon galilaeus* is a non-selective opportunistic feeder and its diet include a diverse spectrum of plankton, but with phormidium, insect part and detritus

being the dominant food items. (12) reported that unspecialized feeders eat insects, plankton, and detritus and plant matter according to their abundance while (13) stated that teleost including cichlids were able to exploit more than one food source. This ability to exploit different varieties of food makes *Sarotherodon galilaeus* to be omnivorous. Examination of the diet also showed that there was some percentage of detritus in its stomach (both adults and juveniles) and this indicates that the species could be a bottom grazer (14). The result obtained in this study showed that about 30.00 had empty stomach. The reason for this may be due to the fact that the food items in their stomach may have been regurgitated or digested as the fish struggled for escape in the traps and gill nets.Total number of 60 specimens were examined, 42 specimens has food present in it while total number of 18 specimens were empty. There was also a high degree of feeding intensity during the study period since percentage of full stomachs in both adults and juveniles was higher than that of empty stomachs and this also indicates that food was abundant in the lake during the study period. The ability of *Sarotherodon galilaeus* to feed on a wide range of food items makes it possess a high aquaculture potential. This is particularly important for the culture of this species since it is possible to formulate artificial diets necessary for its mass production but this is yet to be realized in Nigeria.

Conclusions and Application

Sarotherodon galilaeus fed on a wide range of food items.

1. It may be considered as euryphagous. This is particularly important for the culture of this species since it is possible to formulate artificial diets necessary for its mass production in Nigeria.
2. Oyan dam, though primarily constructed to provide portable water for some neighbouring towns and villages, can support a very good fish production with proper management approach put in place.

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References

1. Bailey R.G. (1994). Guide to the fishes of the River Nile in the Republic of the Sudan. *J. Nat. Hist*. 28: 937-970.
2. Baensch H. A. and Riehl R. (1991). *Aquarien atlas*. Bd. 3. Melle: Mergus, Verlag für Natur-und Heimtierkunde, Germany.
4. Petr, T. (1968). Distribution, abundance and food of commercial fish in the Black Volta and the Volta man-made lakes in Ghana during its period of filling (1964-1968). I. Mormyridae. *Hydrobilogia*, 32:417-485
5. Hartnel R. M. (1996). Laboratory and field investigation into performance of Lake Malawi Oreochromis. PhD. Thesis, University of Wales, Cardiff, U.K.
6. Lever C. (1996). *Naturalist fishes of the world*. Academic Press,

London, U.K.

7. Christian L. (1997). Biodiversity dynamics and conservation: The freshwater fish of Tropical Africa. http://books.googles.com/books.
8. Olaosebikan, B.D. and Raji, A. (1998): *Field guide to Nigerian fresh waters fishes.* Decency Printers and stationary Ltd, Ilorin, Nigeria. 105pp.

http://www.uaex.edu/wneal/pond_management/pdf/FSA-9090.pdf.

9. Hyslop, E.J. (1980). Stomach content analysis - a review of methods and their application. *Journal of Fish Biology*, 17: 411-429.
10. Costal, J. L.; Almeida, P.R.: Moreira, F.M and Costal, M.L. (1992): On the food of the European eel, *Anguilla Anguilla* (L.) in the upper zone of the Tagus estuary, Portugal. *Journal of Fish Biology*, 41: 841-850.
11. Cortes, E. (1999). Standardized diet compositions and trophic levels of sharks. ICES *Journal of Marine Science*, 56: 707-717.
12. Welcomme, R.L., (2001). *Inland Fisheries. Ecology and Management.* Blackwell Science Press, England.
13. Liem, K., (1984). Functional versatility, speculation niches-overlap: are fish different? In: Tropic interactions within aquatic ecosystems. *Rev. Zool. Bot. Afri.,* 57: 180-193