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Some Aspects of the Biology of *Tilapia zilli* in Kanye Dam, Kabo Local Government, Kano State, Nigeria

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Abstract

Some aspects of the biology of *Tilapia zilli* were studied using a total of 420 males and females fish specimens caught in Kanye dam, Kano State Nigeria, from May to August, 2014. The fish mean length ranged from 8.4 -14.2 cm while mean weight ranged from 32.4 -89.3g. The fish indicated positive isometric growth pattern with a 'b' value of 3. Analysis of the stomach contents showed that the fish consumed algae (32.28%), insects (25.37%), fish parts (17.66%), decayed food particles (16.91%) and unidentifiable materials (7.14%). The physicochemical parameters were favourable and condition factor (k) obtained signifies that *Tilapia zilli* species were living in a good condition in Kanye Dam.

Keywords

Dam, Length-weight, Physico-chemical, Stomach content, *Tilapia zilli*

1. Introduction

Tilapia is the common name for nearly a hundred species of Cichlids from the *Tilapine cichlid* tribe. Tilapia inhabits a variety of fresh water habitats including shallow streams, ponds, rivers and lakes. Historically they have been of major importance in artisan fishing in Africa and are of increasing importance in aquaculture (Afamdi and Okories, 2008).

Tilapia fish is expanding worldwide in both developed and developing countries because this group of fishes can be cultured under basic condition and so are ideal for rural subsistence farming (Imam *et al*., 2010). Tilapia fish have high reproductive and growth rates and are relatively disease free and hardy in nature (Komolafe, 2008). The members of this species has tolerances to environmental conditions and accepts compounded and natural feeds this make them economically culturable and viable (Imam *et al*., 2010).

In Africa the distribution of Tilapia zillii extends from Morocco and Egypt in North, Cote d'ivore and Nigeria in the west to Democratic Republic of Congo in central Africa (Dadebo *et al*., 2014). Length-weight relationships can be used to predict weight from length measurements made in the yield assessment (Nehemia *et al*., 2012). Fish can attain either isometric growth, negative allometric growth or positive allometric growth. Isometric growth is associated with no change of body shape as an organism grows. Negative allometric growth implies the fish becomes more slender as it increase in weight while positive allometric growth implies the fish becomes relatively stouter or deeper-bodied as it increases in length (Nehemia *et al*., 2012). The condition Factor of fish can be affected by a number of factors such as stress, sex, season, availability of feeds and

other water quality parameters (Nehemia *et al*., 2012).

In its native, tropical range, *Tilapia zilli* is important as a food fish as well as for aquaculture (Ikomi, 1996). *Tilapia zilli* provides 70% of African fish production, however, outside its native range, this fresh water fish has the ability to establish itself even in highly salinated water, only being held back by a low tolerance to cold weather (Anene, 2005), often introduced for use in aquatic weed control. *Tilapia zilli* can alter native benthic communities through the elimination of macrophytes, and exhibits aggressive behavior towards other fish species (Agboola and Anetekhai, 2008).

This research was therefore, carried out to determine the length-weight relationship, food and feeding habits and the physico-chemical parameters required for assisting and managing of *Tilapia zilli* stock at Kanye Dam.

2. Methodology

2.1. Study Area

The study was carried out at Kanye dam, Kabo local government area, Kano state, which is located in the Sudan Savannah of the Northern Nigeria on latitude 11° 97 N and longitude 8° 1 E with two distinct seasons (dry and wet). The rainy season lasts from May to October, while the dry season lasts from November to April yearly.

Kanye dam is approximately 50km away from Kano, along Kano-Gwarzo road, in Kabo Local Government Area of Kano State, Nigeria, about 11.25 km from Kabo Town, it has an area of 11.31 km^2. The dam was impounded and commissioned in 1970. It has two major sources, River Guzu-Guzu and River Kanyan Maja.

2.2. Collection of Samples

Live samples of *Tilapia zilli* were randomly collected twice every month (biweekly) from May to August, 2014. The Koma net (10-32mm mesh size) and Mari net (0.5 - 2.5 inches) were the fishing gears used in the fish collection (Afamdi and Okorie, 2008).

The fish specimens were transported in iced box to the laboratory (aquarium) of the Department of Biological Sciences, Bayero University, Kano. The total length of each fish (distance from the tip of the snout to the distal end of the caudal fin or tail fin) and the standard length (the distance from the tip of the snout to the end of the caudal peduncle) were measured using a meter rule to the nearest centimeter. Weight of each specimen was also measured to the nearest gram using top loading balance (model-L420) (Oniye *et al.,* 2006).

2.3. Length -Weight Relationship

The Length Weight relationship of each fish was determined by using the expression.

$W = aL^b$ (Thomas *et al,* 2003)

Where:

W= Weight of each fish specimen (g)

L = Total length of each fish,

a= regression intercept

b= regression coefficient

This expression was transformed into logarithmic form as:-

LogW = loga + b (logL) (Afamdi and Okorie, 2008).

2.4. Condition Factor

The condition factor (K) was calculated using the following formula

$$\text{Condition (K)} = \frac{100w}{l^3}$$

Where

K= condition factor

W= Weight of each specimen (g)

L— total length of each specimen (cm) (Khaironizam and Norma Rashid 2002)

2.5. Determination of Relative Importance of Food

The relative importance and contribution of each food item to the diet of *Tilapia zilli* was determined using the frequency of occurrence method (El.sayed and Maharram, 2007). The number of stomach samples in which one or more of a given type of food item was expressed as a percentage of all non-empty stomachs examined. This was considered as the proportion of the population that feeds on that particular food and is referred as frequency of occurrence.

$$\text{Percentage occurrence (\%)} = \frac{\text{Total number of stomach with the particular food item} \times 100}{\text{Total number of stomach with food}}$$

2.6. Determination of Physico-Chemical Parameters

pH: The pH of the water was determined by using Jenway pH digital meter (model - 3150), by dipping the electrode inside the sample bottle, after 2 seconds the readings was displayed and recorded accordingly.

Temperature- Mercury in bulb thermometer was used to obtain the temperature by dipping it inside the water sample.

Electrical Conductivity: Electrical conductivity of the water was measured by using Digital conductivity meter (model - star 6) by dipping the electrode inside the water sample, and after 2 seconds the reading was displayed on the screen and consequently recorded.

Dissolved oxygen: Dissolved oxygen and biochemical oxygen demand were measured by using portable digital dissolved oxygen meter (model - HI -9146). The machine was switched on, and calibrated by dipping the electrode into the water sample, while the measurement was achieved by manual stirring of the water from left to right. The D.O. reading was automatically displayed on the screen. In the case of biochemical oxygen demand value, the meter was adjusted to BOD position and readings were displayed on the screen which was recorded accordingly.

2.7. Transparency

Transparency was measured by using Secchi disk, which was dipped at 3 points from 2-3m deep till it disappeared and re appeared and the difference was recorded.

2.8. Statistical Analysis

Data obtained were subjected to Analysis of Variance (ANOVA) test and the means from the various treatments were compared for significant difference (P<0.05), (Hadi, 2008).

3. Result

3.1. Length-Weight Relationship

A total of 420 homogeneous *Tilapia zilli* (218 males and 202 females) were analysed during the study period. The total length of *Tilapia zilli* ranged from 6.9 – 30cm. (Table 1). The females had the highest total length value of 30 cm and the lowest value of 7.5cm, while the males had the highest total length value[1] of 29.4cm and the lowest value of 6.9cm. The females had the highest standard length of 27.6cm and the lowest value of 5.6cm while the males had the highest standard length of 27.0cm and the lowest value of 5.0cm the weight of *Tilapia zilli* obtained in this study ranged from 12g to 186g. The females had the highest weight of 186g and the lowest value of 13g, while the male had the highest weight of 180g and the lowest value of 12g. The mean standard length of *Tilapia zilli* ranged from 8.44cm to 19.71cm. The mean weight obtained in this study ranged from 32.4g to 133.14g. The female had the highest mean standard length value of 19.71cm and the lowest value of 8.90cm. While the males had the highest value of mean standard length of 17.75cm and the lowest value of 8.44cm The female and the highest mean weight value of 133.14g and the lowest value of 35.4g. While the males had the highest mean weight value of 117.0g and the lowest value of 32.4g (Table I).

Table 1. *Length - Weight Relationship of Males and Females Tilapia zilli from Kanye Dam*

Parameters	Months							
	May		June		July		August	
Males mean	32.4	56.7	69	77	55	68.8	78.4	80
Weight (g)	61.8	57.3	70	68	72.6	76.3	87.8	117
Male mean	8.4	11.4	11.8	12.1	12.5	12.7	13.9	14.2
Standard length (cm)	11.4	11.7	12.2	12.2	12.8	13.8	14.7	17.75
Female mean	35.4	52.8	67.0	63.0	75.6	67.0	80.0	89.3
Weight (g)	60.0	62.0	70.0	86.4	79.8	68.4	102.7	101
Female mean	8.9	10.1	12.1	12.2	13.2	13.3	13.6	14.4
Standard length (cm)	12.0	12.0	12.4	13.1	13.3	13.6	16.5	15.2

The regression analysis of weight on length gave the following relationship W = a L b

$W= 0.4L^{30}$(r-0.89; P<0.05; n=218) and

$W = 0.3\ L^{20}$ (r = 0.96; P< 0.05; n -202) for male and female *Tilapia zilli* respectively.

Log w = log a+ blog L

A plot of log w against log L gives a straight line graph with an intercept ' Log a and a gradient equal to b.

3.2. Stomach Content Analysis

Table 2. *Stomach Content Analysis of Tilapia zilli in Kanye Dam*

Occurrence Stomach	Occurrence	
	Number	%
No. of fish examined	420	-----
No. of identifiable food items	402	95.71
No. with empty stomachs	18	4.28
Insect parts	102	25.37
Fish parts	71	17.66
Algae	132	32.28
Decayed food particles	68	16.91
No. of unidentifiable materials	29	7.14

Table 2 shows the stomach content analysis of *Tilapia zilli.* Algae had the highest percentage of occurrence of 32.28%, followed by insect parts (25.37%), then fish parts (17.66%), decayed food particles (16.91%), and lowest percentage of occurrence was obtained with unidentifiable materials (7.14%).

There was significant difference (P<0.05) between the algae and other food materials examined.

3.3. Physico-Chemical Parameters

Table 3. *Physicochemical Parameters Obtained In Kanye Dam During The Study Period*

Parameters	May	June	July	August
Water Tempt (°C)	25	26	26,40	27
Transparency (cm)	142	540	528	137
PH	7	7.12	8.2	8.25
Conductivity (µs/cm)	576	576	378	428
Dissolved oxygen (mg/1)	18	20	21	21.5
BOD (mg/1)	8.4	8.5	10	10

Table 3 shows the physico-chemical parameters obtained in Kanye dam from May to August, 2011.

The highest temperature value of 27°C was recorded in August and the lowest value of 25°C in May. The highest pH value of 8.25 was recorded in August, and the lowest value of 7.0 in May. The highest transparency value of 540 cm was recorded in June and the lowest value of 137cm in August. The highest electrical conductivity 576 µs/cm was recorded in both May and June respectively, and the lowest value 378 µs/cm was recorded in July. The highest dissolved oxygen value of 21.5 mg/1 was recorded in August and the lowest value of 18mg/l in May. The highest 5 day Biochemical Oxygen Demand (BOD) value of 10 mg/1 was recorded in

both July and August respectively, and the lowest value of 8.4 mg/1 was recorded in May (Table 3).

3.4. Condition Factor (K)

The condition factor (K) obtained in this study ranged from 1.84-1.92. The highest condition factor was obtained from females (1.84) and the lowest value (1.92) was obtained from the males (Table 4).

Table 4. *Condition Factor (K) Values of Males and Females Tilapia zilli in Kanye dam.*

Sex	No	Condition Factor (K)
Male	218	1.92
Female	202	1.84
Total	420	3.76

4. Discussion

The length weight relationship of *Tilapia zilli* studied in Kanye dam showed positive isometric growth (b=3), which indicates an increase in weight as length increases, for both sexes, an evidence that the fish becomes " heavier for its length as it grows (Ikomi, 1996 and Oniye *et al.,* 2006). Thomas *et al.,* (2003), stated that the isometric value of b=3 is for an ideal fish that maintains three dimensional equality, when b- value is <3, the fish has a negative allometric growth and b- value >3 is positive allometric growth (Oniye *et al.,* 2006). If fish have to maintain their shape as they grow, their b-values must be equal to 3, but there is no existing theory that says the b-value must be negatively or positively allometric (Agboola and Anetekhai, 2008).

The various food material identified in the fish is similar to those reported by Abdallah and Tala'at (2000) and Oniye *et al.,* (2006), that the diet of *Tilapia* Specie consists of fish parts, algae, insect part, decayed food particles and unidentifiable materials, except that molluscs were completely absent in this study. This is in contrast with the work of El- Sayed and Moharram (2007) who reported that molluscs form a very high proportion of the food of *Tilapia zilli* specie. The differences may be related to faunal dissimilarities of the aquatic environments where these studies were conducted (Anene, 2005).

The highest temperature value recorded in this study (27°C) and the lowest value of 25°C, this was in conformity with the values of 27°C- 24°C reported by Anene and Nwachukwu, (2001), of flood plain pond in the Niger Delta. The highest pH recorded in this study (8.5) and the lowest recorded (7.0) agrees with the findings of Negassa and Padanillay, (2008). The pH in this study is favourable and falls within the pH range of most natural waters (6.0- 8.5) and is capable of supporting aquatic life, and could therefore be regarded as normal when related to fish ecology.

The transparency recorded in this study ranges from 540cm- 137cm. This was in agreement with the work of Shallof (2009). The conductivity values recorded in this study ranges from 378-576 µs/cm. This value was in agreement with Mahmoud *et al*., (2011) in Lake Timsah (Egypt). The Dissolved oxygen values recorded in this study ranges from 18-21.5 mg/1. This was in agreement with the work of Hadi, (2008), but was in contract with the study conducted by AbdAllah and Talaat, (2000) in Lake Edku which reported that, the growth rate of fish is affected by low dissolved oxygen.

The Biochemical oxygen demand recorded in this study ranges from 8.4-10mg/l. This is similar to that obtained by Negassa and Padanillay (2003) in Lake Zwai (Ethiopia) with the value ranges of 7.9-10.5 mg/1. The condition factor (K) obtained in this study ranges from 1.84-1.92. This is in agreement with the work Shallot, (2009), in Lake Qarum, (Egypt). The values falls within the normal range, this signifies that *Tilapia zilli* species were living in a good condition in Kanye Dam.

5. Conclusions

This study revealed that *Tilapia zilli* has positive isometric growth pattern and the fish has omnivorous feeding habit. The fish lived within the normal physicochemical parameter in Kanye dam.

Recommendation

The government should provide good management of Kanye dam by prohibiting overfishing, and more study should be undertaken on fish's biology in Kanye dam.

Tiapia zilli must be protected in Kanye Dam till their third year of life, when they have a good marketable size, this can be attained by increase in the length at first capture by selecting the optimum mesh size which release small fish and allow each fish to produced eggs at least once in its life.

References

[1] Abdallah, A. and Talaat, K. M. (2000). Growth and Dynamics of Tilapias in Edku Lake, Egypt. Bulletin of National Institute of Oceanography and Fisheries. *World J. Fish Marine Sci,* 1 (I):20-28.

[2] Afami, A. and Okorie, P. U (2008). Some Aspect of the Reproductive Biology of Tilapiamariae (Boulenger 1901 in a Small Lake in South Eastern Nigeria Afri J. of Biotech. Vol7 (14) PP 2478-2482.

[3] Agboola J.I and Anetekhai M.A. (2008). Length Weight Relationships of Some Fresh and Brackish Water Fishes in Badagry Creek, Nigeria. *J. Appl Ichthyol.* (24). 623-625

[4] Anene A. (2005). Condition Factors of Four Cichlids Species of a Man-Made Lake in Imo State, Southeast, Nigeria. *Turk. J. Fish Aquat. Sci.* (5) 43-47

[5] Anene, A. and Nwachukwu V.N. (2001). Physicochemical Characteristics of Flood plain pond in the Niger Delta J. Agric. Biotechnol. Environ 3(l/2): 5-9.

[6] Dadebo, E., kebtineh, N., Sorsa, S., and Balkew, K. (2014). Food and Feeding habits of the red-belly Tilapia (*Tilapia zilli*, Gervais, 1848) (Pisces: Cichlidae) in lake Ziway, Ethiopia. Agriculture, Forestry and Fisheries, 3(1):17-23.

[7] El-sayed, H.K. and Moharram, S.G (2007). Reproductive Biology of *Tilapia zilli* (Gerv. 1848) from Abu Qirbay, Egypt, of Aqua res vol. 33, No 1PP 379-394.

[8] Hadi, A.A. (2008). Some Observation on the Age and Growth of *Tilapia zilli* (Gervais 1848) in Uminfein lake (Libya), J.Sc Appl. (2); 724-747.

[9] Imam, T. S., Bala, U., Balarabe, M. L., and Oyeyi,T. I. (2010). Length-weigth relationship and condition factor of four fish species from Wasai Reservoir in Kano, Nigeria. *Afri. J. Gen. Agric. 6(3):125-130.*

[10] Ikomi, R. B. (1996). Studies on Growth Pattern, Feeding Habits and Reproductive Characteristics of the Mormyrid *Brienomyrus longianalis* (Boulenger 1901) in the Upper Warn river, Nigeria J. Fish Res. 26. 187-198.

[11] Khaironizam, M.Z. and Norma-Rashid, Y. (2002). Length-Weight Relationship of Mudskippers Gobilldae. Oxudercinae) in the Coastal Area of Selanquor, Malaysia JV/lG World -Fish Centre Quarterly 25, 20-22.

[12] Komolafe, O. O. (2008). Some Aspects of the Biology of Tilapia *zilli* (GERVAIS) PISCES: CICHLIDAE) in Opa Reservoir*, Ile-Ife,* Nigeria. *Journal of Science and Technology,* 28(1):49-56.

[13] Mahmoud, W. F. Mal, M. M. A. Kamal, F. E. Amal, M. R. and El-Halfawy, M. K. O. (2011). Reproductive Biology and Some Observation on the Agem Growth, and Management of *Tilapia zilli* (Gervus, 1848) from Lake Timsah*, Egypt J. Fish and Aqua* (6): 32-38.

[14] Negassa, A. and Padanillay, C.P (2008). Abundance, Food Habits and Breeding Season of Exotic Tilapia zilli and native *Oreochromis niloticus* L. fish Species in Lake Zwai, Ethiopia M, Int. J. Sci. Tech. (2): 345-350.

[15] Nehemia, A., Maganira, J.D. and Rumisha, C.(2012). Length-Weight relationship and condition factor of Tilapia species grown in Marine and Freshwater Ponds. *Agriculture and Biology Journal of North America,* 3(3): 117-124.

[16] Oniye, SJ. Adebote, D.A., Usman, S. K. and Makpo, J.K. (2006). Some Aspect of the Biology of Protopterus annectens (owen) in Jachi Dam Near Katsina, Katsina State, Nigeria, *Journal of fisheries and Aquatic Science* 1(2:136-141.

[17] Shallof, K.A. (2009). Some Observations on Fisheries Biology of Tilapia zilli (Gervais, 18480 and Solea Vulgaris (Quensel 1806) in lake Qarum, Egypt World J. Fish Marine Sci. 1(1): 20-29

[18] Thomas, J. Venu, S. and Kuruo, B.M. (2003). Length Weight Relationships of Some Deep-sea Fish Inhabiting the Continental Slope Beyond 250m depth Along the West Coast of India. NAGA World Fish Centre.