SOME ASPECTS OF THE BIOLOGY OF TWO MEMBERS OF THE FAMILY CICHLIDAE IN KADUNA RIVER, NIGERIA

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APPROVAL

This thesis entitled "SOME ASPECTS OF THE BIOLOGY OF TWO MEMBERS OF THE FAMILY CICHLIDAE IN KADUNA RIVER, NIGERIA" by Kotos Abdurahaman Abubakar meets the regulations governing the award of the degree of Master of Science in Fisheries (M.Sc Fisheries) of Ahmadu Bello University Zaria and is approved for its contribution to knowledge and literary presentation.

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D E C L A R A T I O N

I declare that this work is wholly that of the author and has not formed part of any presentation for any other qualification.

Signed by the author

K.A.ABUBAKAR

D E D I C A T I O N

TO MY DEAREST FRIEND MAGDALEEN

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A B S T R A C T

Investigation into some aspects of the biology of Oreochromis niloticus (Peters) and Tilapia zillii (Gervais) were conducted between August 1966 and July 1967. Samples were obtained twice monthly during the period of the investigation from River Kaduna.

The standard length of males 0. niloticus ranged from 6.5 to 26.0 cm while that of ferales ranged from 6.6 to 25.7 cm. The weight of the males varied between 11.0 to 592.1g while that of females varied between 29.0 to 593g. In T. zillii the standard length of males ranged from 7.0 to 23.0 cm while that, of females ranged from 9.0 to 21.8 cm. The weight of males varied between 16.0 to 480.5 gm while that of females varied between 13.0 to 240g.

The length-weight regression analysis indicated negative allometric growth for both species. The mean condition factors for both species were found to be good throughout the period of investigation except, in the months of January and February where there were general fall in conditions.

The fishes exhibited diverse feeding habits. 0. niloticus fed more on algae and diatoms than T. zillii which fed almost exclusively on higher aquatic plants.

Chi-square test revealed that the sex ratio of 2- niloticus did not deviate from the expected 1:1 ratio. In T. zillii there were more males than females.

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CHAPTER ONE

INTRODUCTION

In Nigeria, the estimated inland water mass is about 12.5 million hectares(Ita, 1986). These are said to be capable of producing over 512,00 metric tonnes of fish annually, but the inland water bodies are currently producing less than 50% of their estimated fishery potential. Most of the fish consumed in the country is imported. In 1980, Nigeria consumed about 1.5 million metric tonnes of fish, out of which 900,000 metric tonnes were imported, costing about 360 million naira in foreign exchange.

On the other hand however, fish population, recruitment and yield is reducing drastically due to lack of scientific and management knowledge by the local fishermen. Recent findings have shown that Kainji Lake is already overfished(Ita, 1982). Soon after the closure of the dam, the annual commercial landing reached about 30,000 metric tonnes between 1969 and 1971. By 1972, the Commercial landings dropped drastically to about 10,000 metric tonnes and since then the annual fish landings have continued to decline. Presently, the catch landing of 4,000 to 6000 metric tonnes of fish per annum is being recorded and small sizes often form major portion of the landings(Balogun, 1985).

These have called for research into the various aspects of the biology of fishes in order to ensure good management. The present study is concerned with some aspects of the biology of two species of Cichlids in Kaduna river,Northern Nigeria.

In tropical Africa various workers have studied various aspects of fisheries. Babikar and Ibrahim(1979) studied the Biology of reproduction in the Cichlid Tilapia nilotica (L) gonad maturation and fecundity. He revealed that female mature shortly before male and females breed more than once a year. Botros (1970) studied the length-weight relation and coefficients of condition of Tilapia nilotica(Linne) and T.Zillii (Gervais) from Lake Mariut, Egypt. He found that there was a straight line relationship between log weight and log length for both species and the mean condition for T. Zillii proved to be higher than for T. nilotica. Gwahaba (1973) worked on the effects of fishing on T.nilotica populations in Lake George, Uganda over the past 20 years. He found that factors that regulate the population are both artificial and natural. Natural factors include size of nursery zones, strong killing storms, and old age. However, artificial factors like commercial fishing have a stronger controlling influence.

Chilvers and Gee(1974) worked on the food of Bagrus docmac (Forskal) and its relationship with Haplochromis hilgendorf in Lake Victoria, the diets of the Young fish were invertebrates which were generally of little significance in adults. The adults were piscivorous in feeding habits. Bruton and Boltt(1975) studied the aspects of the biology of Tilapia mossambicus in a natural fresh water lake, Lake Sibeya, South Africa. They found that the fry fed on detritus rich in diatoms while the adults fed on periphyton, aquatic macrophytes, insects and the largest specimens fed on other fishes.

Siddiqui(1977) studied the reproductive biology, length-weight relationship and relative condition of Tilapia leucostica (Trewavas) in Lake Naivasha, Kenya and noted that the length-weight regression coefficient is near to the cube and there was little seasonal fluctuation in relative condition of fishes. McKaye(1983) studied ecology and behaviour of a cichlid fish Cytocara eucinostomes in Lake Malawi. He found that this species fed on zooplankton in the Lake in the afternoon to avoid predatory catfish which fed upon them and other cichlids at night. Edwards et al, (1985) investigated the incorporation of composted and dried water hyacinth in pelleted feed for the tilapia, Oreochromis niloticus (peters) and discovered that the fish performed better with diets containing compost than with diets containing dried water hyacinth.

The importance of fish in Nigeria is evident by looking at investigations conducted by some workers.

Purchard(1967) studied the family cichlidae. He noted that the group is highly successful in abundance of individuals and has conquered a variety of habitats and ways of life, from predator to plankton feeder and from pelagic to permantly bottom living forms. They figure importantly in many fisheries, and because of their great adaptability, high fecundity, and rapid growth rate, they are used extensively for fish culture. Cichlids are one of a very few groups which extend parental care to the young for a considerable time. The basic patern of breeding behaviour is one in which male and female join forces to form a stable pair and together defend their brooad of young fish.

Fagade(1971) worked on the food and feeding habits of Tilapia mariae(Boulenger), Tilapia guineensis(Dumeril) and Tilapia melanotheron

melanotheron (Rupell) in Lagos Lagoon. The result of the analysis showed that about 30% of food of T.guineensis was from plant source, 16.6% from animal source, 12.5% from disposed sewage, 40% were sand grain and unidentified organic material. T.m. melanotheron 20% food was from plant source, 10% from animal source, 6.4% from disposed sewage and 73% were sand grains and unidentified food items.

The stomachs of T.mariae contained alga filaments and diatoms which were mainly Conscinodiscus spp.

Fagade and Olaniyan(1973) worked on food and feeding inter-relationship of the fishes in the Lagos Lagoon. Tilapia species were found to be deposit feeders, their principal food items were algal filaments, diatoms and unidentified organic matter. Lewis(1974) while working on the food and feeding habits of Hydrocynus forskahlii (Cuvier) and H.brevis (Gunther) in lake Kainji found out that these species were piscivorous mainly feeding on Tilapia species. Fagade(1978) worked on the biology of T. guineensis (Dumeril) from the Lekki Lagoon, Lagos. He noted that the species fed mainly on diatoms, Cladocera and Copepoda. The length-weight relationship showed that the body length was approximately the cube of the body weight.

Akintunde and Ibevbore(1979) studied aspects of the biology of Cichlid fishes of Lake Kaniji and observed that the main contents in the stomach of most S. niloticus examined were phytoplankton, and followed in order of preference by grasses, plant seeds, debris and plant tissues. T.zillii fed almost exclusively on higher plants tissues, aquatic macrophytes, grass, leaves and stems. Other items occuring in small amount included organic debris, algae and insect larvae, all of which were probably ingested accidently with plant materials.

Sagua(1983) made a preliminary observations on the feeding habits and reproductive biology of Gymnarchus niloticus in Lake Chad and found that the species was exclusively piscivorous, feeding mainly on Tilapia/Sarotherodon and Clarias Nwadairo(1985) looked at the distribution and food habits of the dwarf African Cichlid, Pelvicachromis pulcher in the River Sombreiro, Nigeria. Benthic algae, higher plant remains, detritus and copepods were the main food items.

The aim of this study is to investigate

(a) food and feeding habits

(b) length-weight relationship, and

(c) condition factor of Oreochromis niloticus (Peters) and Tilapia zillii(Gervais) in Kaduna river, Nigeria. Since there is no work done yet on these species in this river, it is hoped that this work will add more light to the biology of these two species.

CHAPTER 2

2.0 MATERIALS AND METHODS

2.1 AREA OF STUDY

Kaduna river originates from the North-Central Plateau and flows south-westward(Iloeje, 1981). It passes along its course through Kaduna(fig.1) town to join the Niger river as a major tributary.

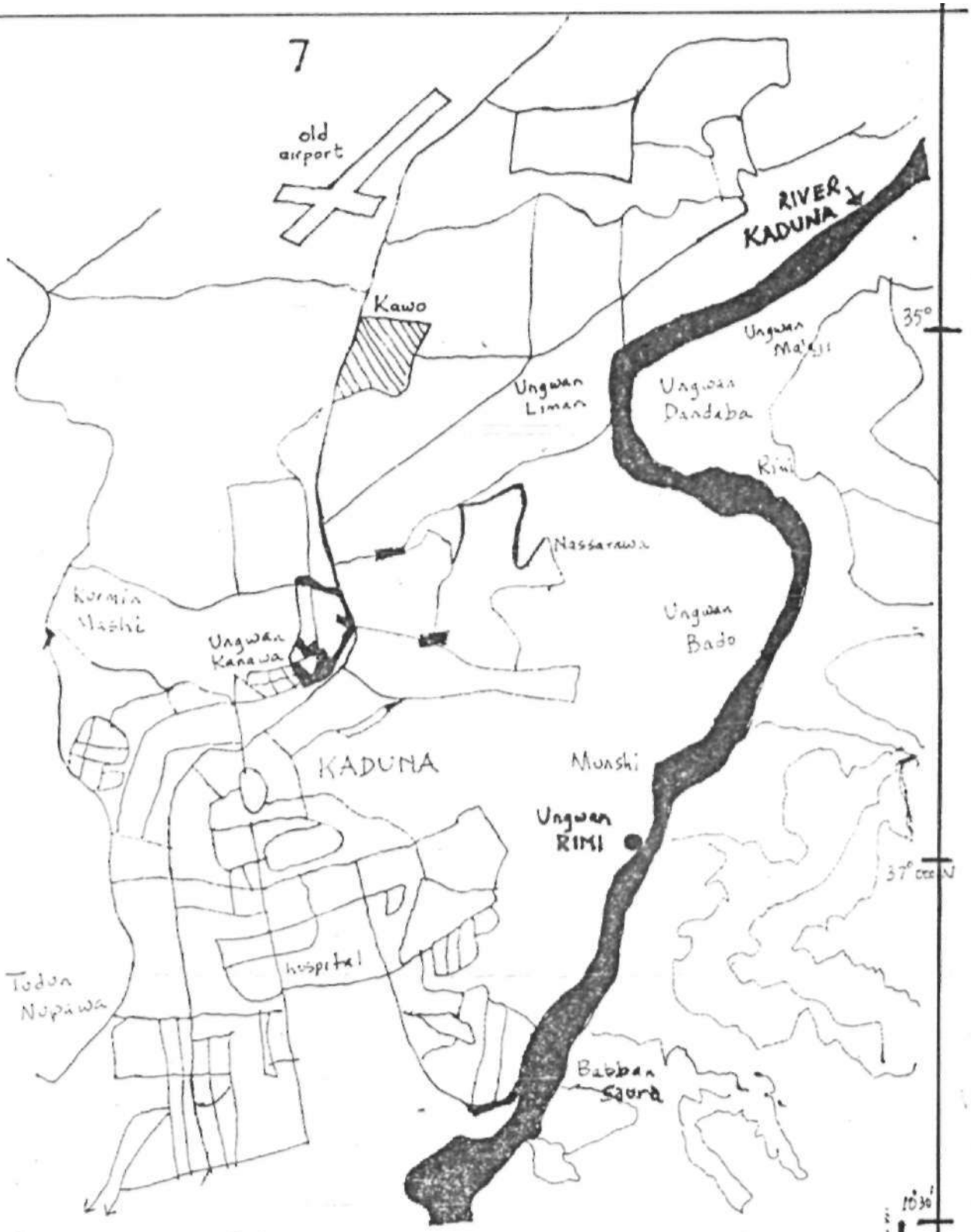
Kaduna town is located between latitude 10.4°N - 10.7°N, and longitude 7.2°E - 7.6°E. Its highest temperature range is 30 - 60° which occurs in April. January is the coldest period with a temperature range of 9 - 14° (Rabiu, 1995).

There are two main seasons, the dry season from November to March and the rainy season from April to October. Rainfall ranges from 1016mm to 1524 mm with a single peak in August/ September(Rabiu, 1995).

2.2 DESCRIPTION OF SPECIES

Two fish species sampled in this study were Oreochromis niloticus (Peters) and Tilapia zillii(Gerv). Brief redescriptions of these species are given below.

Oreochromis niloticus.Dorsalfin with 17 to 18 spines and 12 - 14 rays, analfin with 3 spines and from 8 - 10 rays (D.XVII -VIII 12-14; A-III 8 - 10). White and blue black vertical bars present on the soft part of dorsal and on tail and anal fins, sometimes the bars appear on the body surface. Body colour generally darker, throat and belly usually white, except in the breeding season when belly becomes deep red.



1
8 1°0000E 25'

● Sampling area
Published by Federal Surveys, Nigeria, 1964.
Scale :- 1:50,000

KADUNA S·E.

FIG 1

Tilapia zillii. A distinct tilapia spot at the base of the soft dorsal fin; dorsalfin with 14 to 16 spines and 11 - 13 rays analfin with 3 spines and from 7 - 10 rays(D. XIV -XVIII-13; A.III 7 - 10), dorsal and caudal fins are marked with yellow spots. Body colour olive green with a blue sheen marked with six to seven dark vertical bars, throat generally red, colour deepens during breeding season. Body profile flat ventrally and convex dorsally. Teeth in the jaws stout and sharp.

Buchard(1967) noted that O. niloticus is one of the largest tilapia, reaching 50 cm in lenght while T.zillii can attain the length of 30 cm.(figs. 2 and 3).

2.3 COLLECTION OF SPECIMENS

Fish samples were bought from the Government Garden around Unguwan Rimi in the South-eastern part of Kaduna along the bank of Kaduna river. Fish mongers ascertained that the fish were caught from Kaduna river. Gears used by the fishermen include, gill nets, cast nets, clap nets, traps and hook and line. The stretched mesh sizes of nets were reported to vary from 20mm to50mm. Fish samples were bought twice monthly for a period of twelve months. From August 1986 to July, 1987. Fish were immediately transported to the laboratory for analysis. Those that could not be worked upon immediately were kept in freezers.

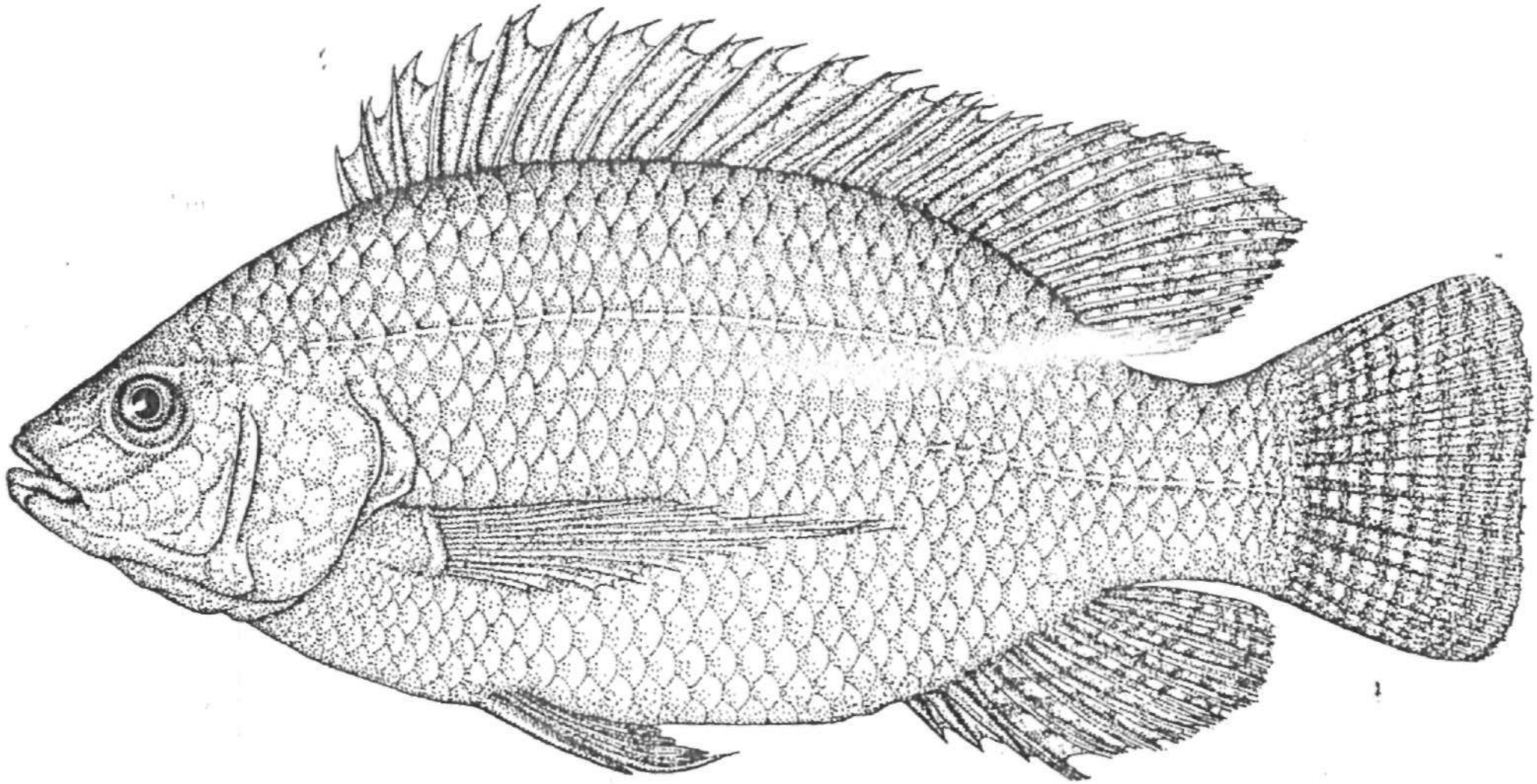
2.4. LABORATORY MEASUREMENT

Fish were identified using the key prepared by Buchard (1967) and Holden and Reed(1972).

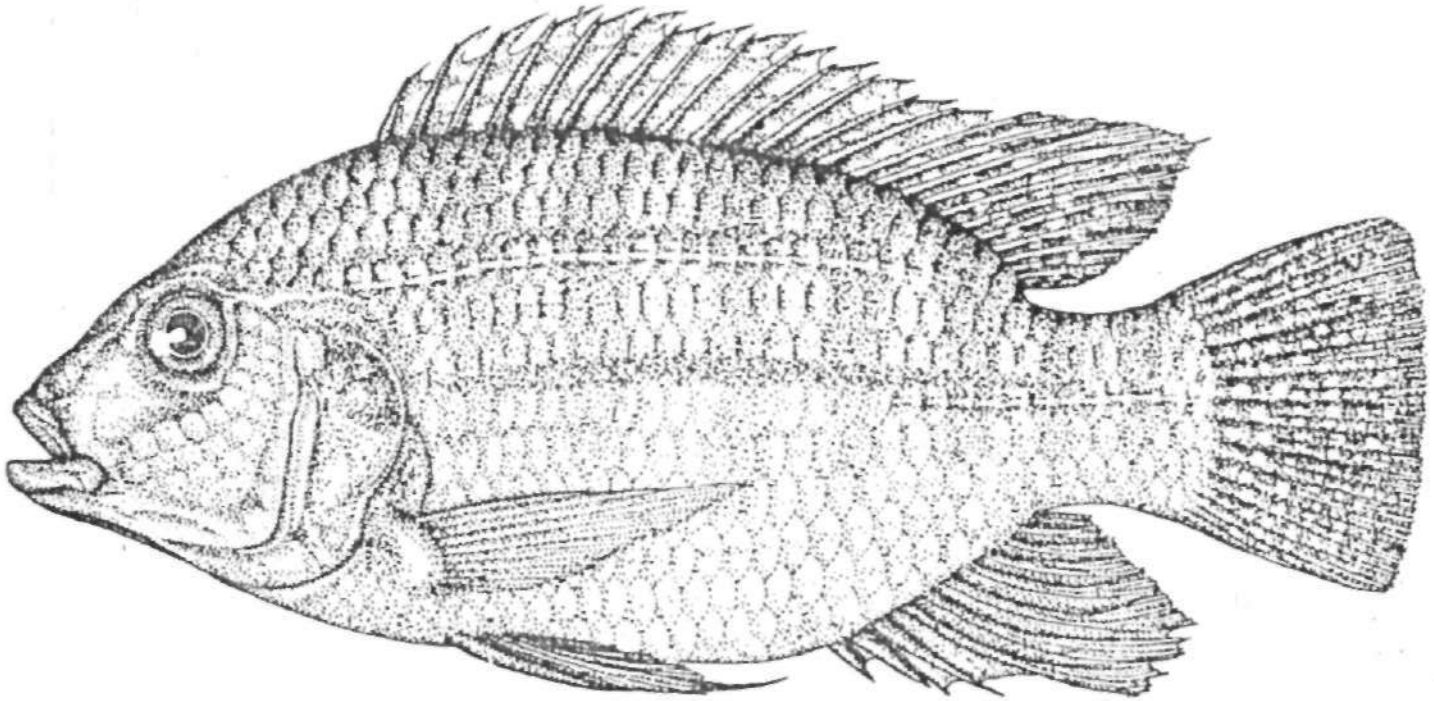
Routine laboratory measurements were carried out as described by Olatunde(1977). These include:

(a) Length

Total length was measured from the tip-most part of the mouth to the tip of the caudal fin. Standard length was



Oreochromis niloticus
(After Lewis 1974)



Tilapia zillii
(After Lewis 1974)

measured from the tip of the mouth to the tip of the hypural bone. All measurements were made to the nearest centimetre.

(b) Weight

Water and other unwanted substances on the fish were removed with filter paper and the fresh weight of the whole fish was determined using electronic mattler balance.

2.5 SEX DETERMINATION AND GONAD CLASSIFICATION

Sexes of samples were determined by the examination of the internal organs. Male and female gonads were classified according to maturity scale modified after Nikolsky(1963) and Olatunde(1978b) (Table 1). Matured eggs were removed and weighed.

2.6 STOMACH CONTENT ANALYSIS

The stomach of each specimen was removed and kept in labelled specimen bottles containing 5% formalin solution. Points method and frequency of occurence method were used to analyse the dietary items.

2.6a Points Method

The stomach fullness was determined according to classification scheme by Olatunde(1978a). The stomach were slit lengthwise and the contents washed with little quantity of water into petri-dishes. Food items were identified and separated into watch glasses. Smaller food items were further separated under the dissecting microscope. Points were then awarded to food items according to the volume they were judged to have occupied in relation to the total volume of food in the stomaches. Therefore the sum of points awarded to

TABLE 1. GONAD MATURITY STAGES IN FAMILY CICHLIDAE

MATURITY STAGE	CONDITION OF GONAD	DESCRIPTION OF GONADS	
		FEMALE	MALE
I	Virgin	Ovary very small usually colourless	Testes very small not easily identifiable
ii.	Inmature or developing	Gonads visible to the naked eyes. Eggs no yet visible	Testes visible to the naked eye but very thin .
iii.	Matured or developing	Eggs visible to the naked eye. The ovary is yellowish.	Testes are white and slightly swollen
iv.	Fully matured	Ovaries with eggs very large	Testes white and fully swollen.
v.	Running and spawning	As in iv but eggs discharge when abdomen is pressed slightly The genital opening is swollen.	As in iv but milt discharge when abdomen is slightly pressed.
vi.	Spent and recovering	Eggs are shed ovaries are flappy.	Testes usually absent.

individual items was equal to the sum of points awarded for the stomach size. Points were awarded to food items in such a way that many units of small food items were awarded the same points as one large food item. This is to justify the volume the food items were judged to have occupied in relation to the total volume of the stomach. The points gained by each food item were summed and scaled down to percentages to give the percentage composition of the food of all the fish examined.

This technique has been recommended by Hynes(1950). The method analysed dietary items both quantitatively and qualitatively.

2.6b Frequency of Occurence Method

In this method, the occurrence of each food item in each stomach was noted. The total number of fish in which food item appeared were scaled down to the percentage of the total number of fish with food content.

This method considers only the qualitative and not the quantitative aspects of the diets.

2.7 LENGTH-WEIGHT RELATIONSHIP

The length-weight relationship was calculated using the conventional formula described by Le Cren(1951).

$$W = aL^b \quad \ldots\ldots\ldots\ldots\ldots(1)$$

The above equation (1) and the data were changed to logarithms before the calculations were made. Equation (1) was therefore transformed into

$$\text{Log}w = \log a + b \log l \quad \ldots\ldots(2)$$

where w = weight of fish in grams

l = standard length of fish in cm

a = a constant

b = an exponent.

2.8 CONDITION FACTOR

The condition factor "K" were calculated for individual fish for each month using the conventional formula described by Worthington and Richard (1930).

$$K = \frac{W \times 100}{L^3} \quad \ldots\ldots\ldots\ldots (3)$$

where K = condition factor

W = weight in gram

and L = standard length in cm.

2.9 STATISTICAL PROCEDURES

Regression analysis was used to determine the length weight relationship while Chi-square test was used to find out whether ratio of males to females has departed from the expected 1:1 ratio.

CHAPTER 3

3. 0. RESULTS

3.1 SIZE DISTRIBUTION

Number of fish examined each month is shown in Table 2 The total number of Oreochromis niloticus sampled was 449 while that of Tilapia zillii was 383.

3.1.1. O. niloticus

The standard length of males ranged from 6.5 to 26.0cm. That of the females ranged from 8.6 to 25.7 cm. The weight of the males varied from 11.0 to 592.1 g while that of the females varied from 29.0 to 593.0g. (Appendix 2).

The length-frequency histogram were plotted for males (fig.4) females (fig.5) and males and females combined (fig.6). The three histograms showed normal distribution curve with peaks between 12 - 15 cm. This indicated that most of the fish sampled fell within one population group.

TABLE 2: THE NUMBER OF *O. niloticus* and *T. zillii* examined from Kaduna river, August 1986 - July, 1987.

MONTH	*Oreochromis niloticus*	*Tilapia zillii*
AUGUST	27	33
SEPTEMBER	40	25
OCTOBER	46	37
NOVEMBER	48	10
DECEMBER	41	40
JANUARY	31	34
FEBRUARY	41	31
MARCH	45	32
APRIL	24	34
MAY	44	48
JUNE	35	27
JULY	27	32
	449	383

3.1.2 T.zillii

The standard length of males ranged from 7.0 to 23.0 cm. That of the females ranged from 9.0 to 21.8 cm. The weight of males ranged from 16.0 to 480.5g.While that of females varied between 13.0 and 240g. (Appendix 2).

The length-frequency histograms were plotted for males (Fig.7), females (Fig.8) and males and females combined(Fig.9). The males showed peak between 12 - 15 cm, the females between 9 - 12 cm while males and females combined exhibited peaks between 12 - 15 cm. This indicated that most of the fish sampled fell within one population group.

3.2 Length - Weight Relationship

3. 2.1 O.niloticus

The results of the regression analysis and the correlation co-efficients are shown in figures10 - 12. The 'b' values indicated that the growth is allometric since values are below "3". The length-weight regression analysis showed linear relationship. The correlation coefficients were significant (P=0.05)

3.2.2 T. zillii

The results of the regression analysis and the correlation co-efficients are shown in figures 13 - 15. The 'b' values indicated that the growth is allometric since values are below "3". The length-weight regression analysis showed linear relationship. The correlation coefficients were significant (P=0.05)

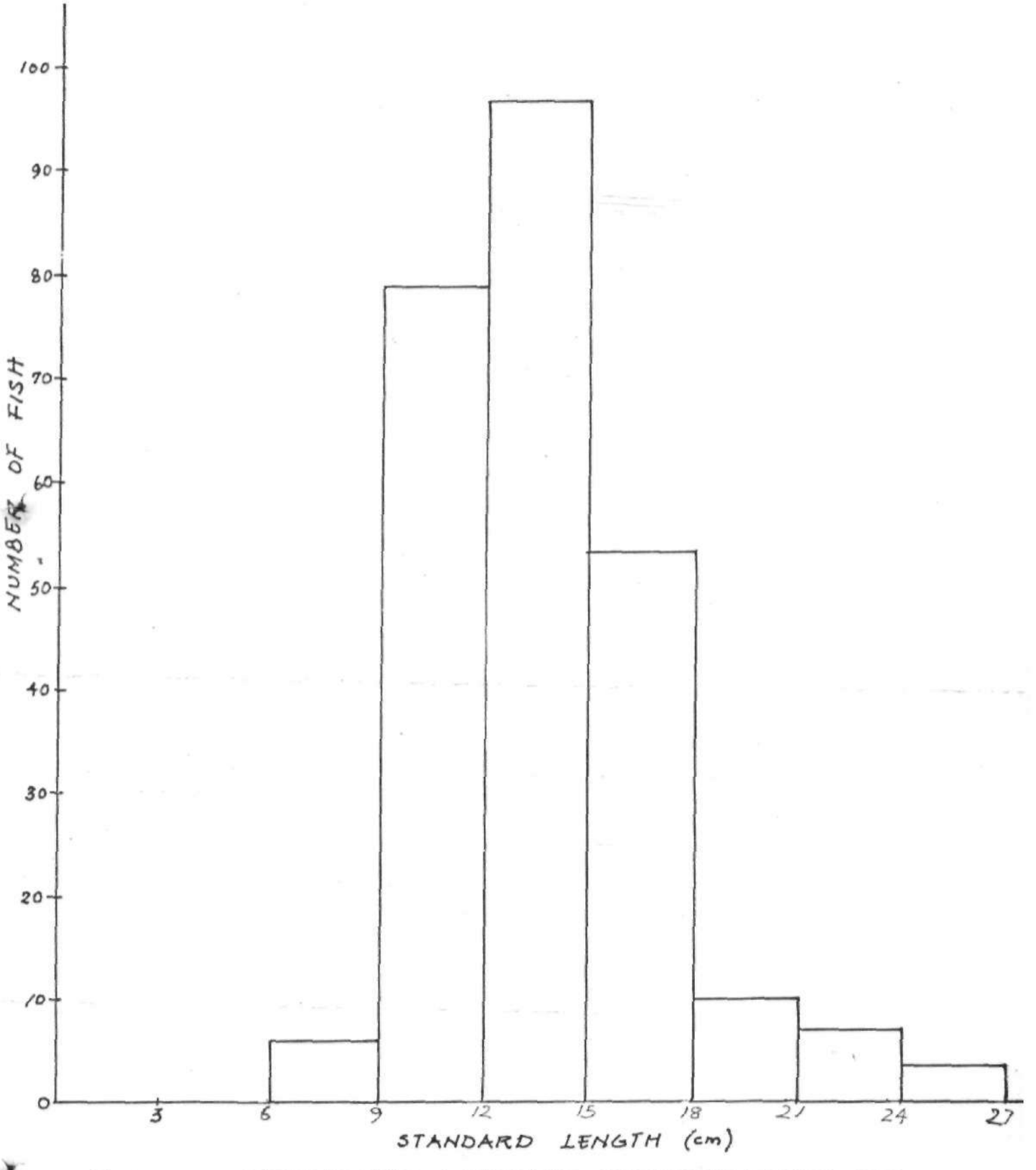


FIG 4 STANDARD LENGTH DISTRIBUTION OF OREOCHROMIS NILOTICUS (MALE)

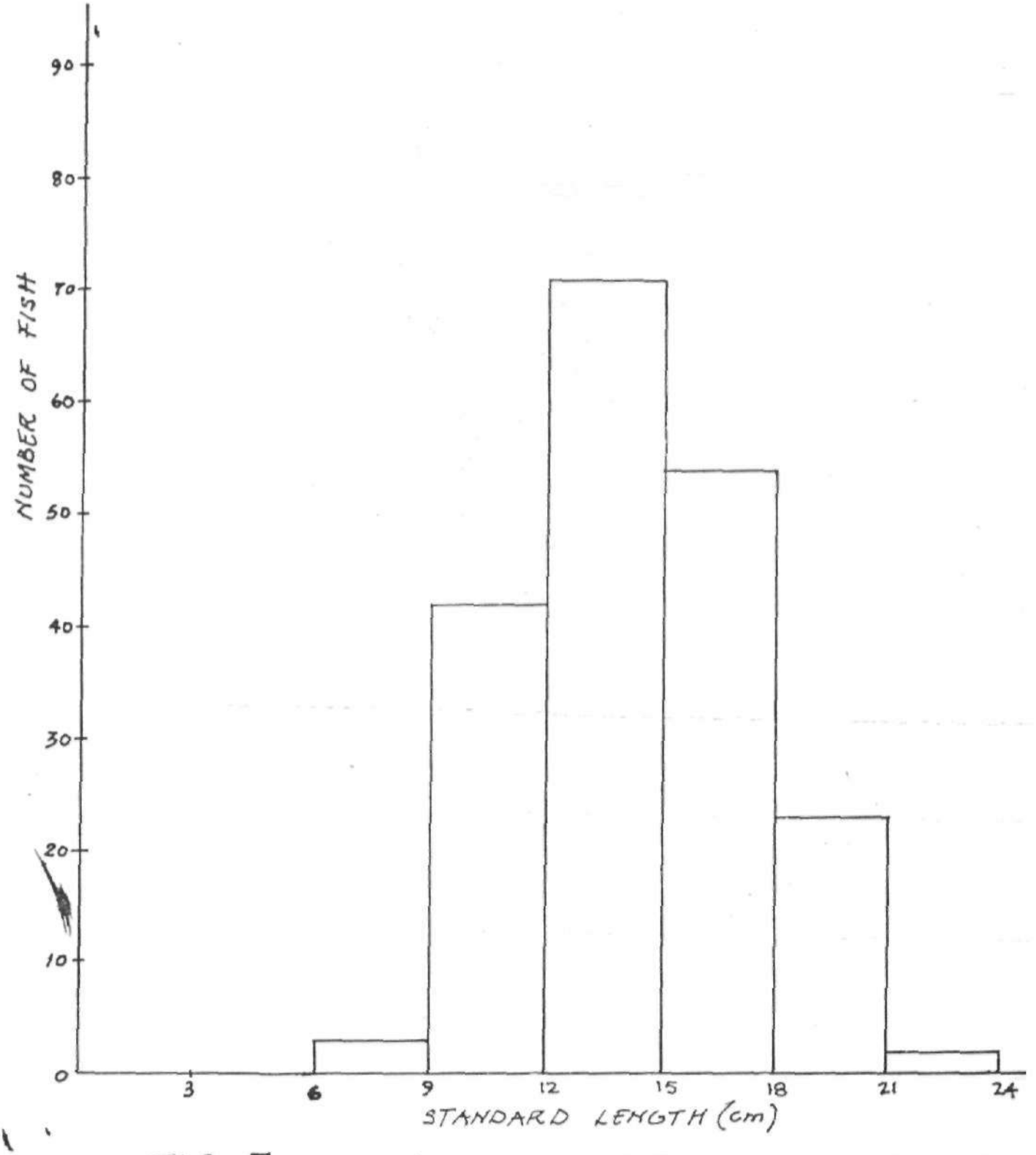


FIG. 5 STANDARD LENGTH DISTRIBUTION OF OREOCHROMIS NILOTICUS (FEMALE)

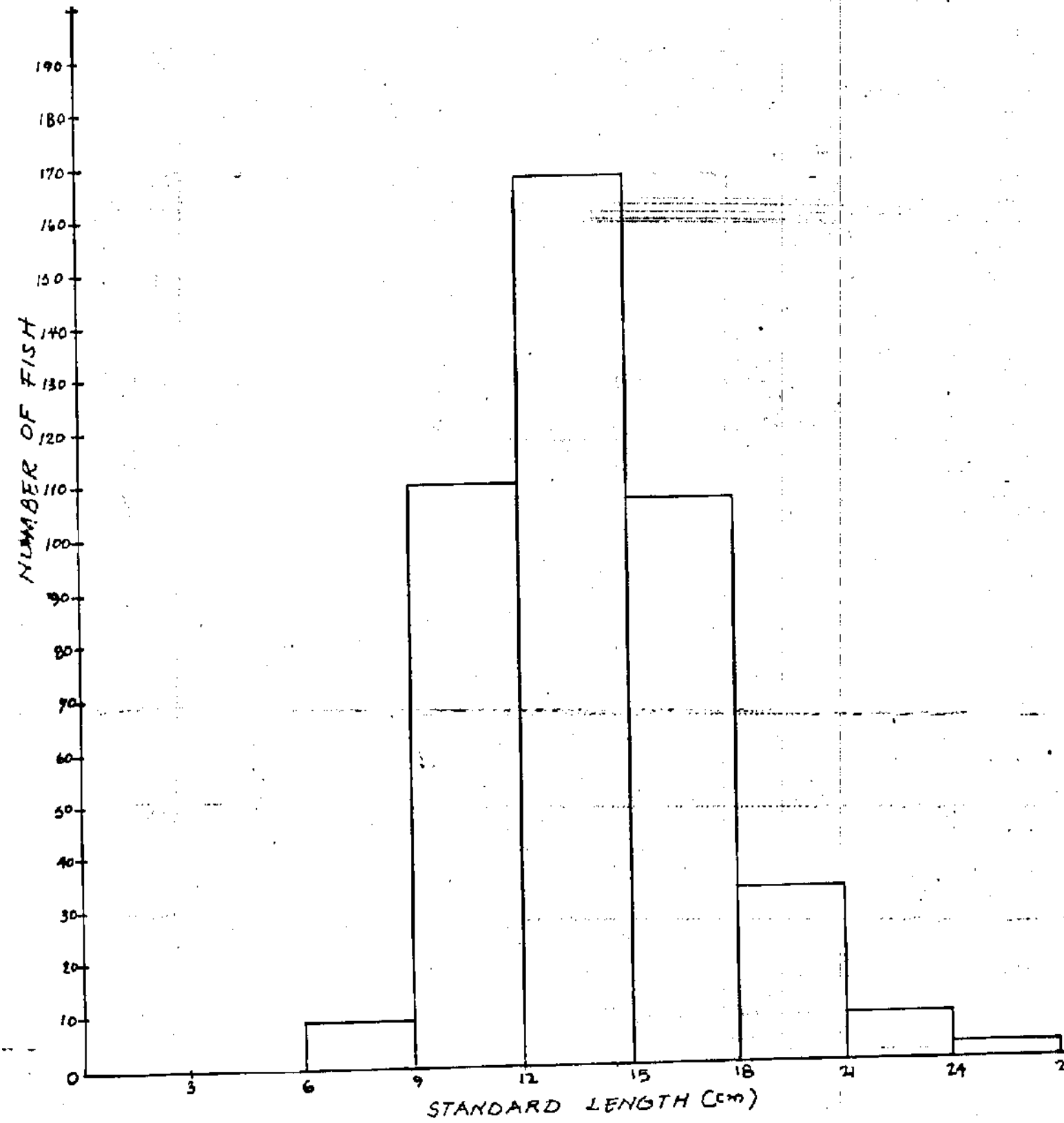


FIG. 6 STANDARD LENGTH DISTRIBUTION OF OREOCHROMIS NILOTICUS (MALE & FEMALE combine

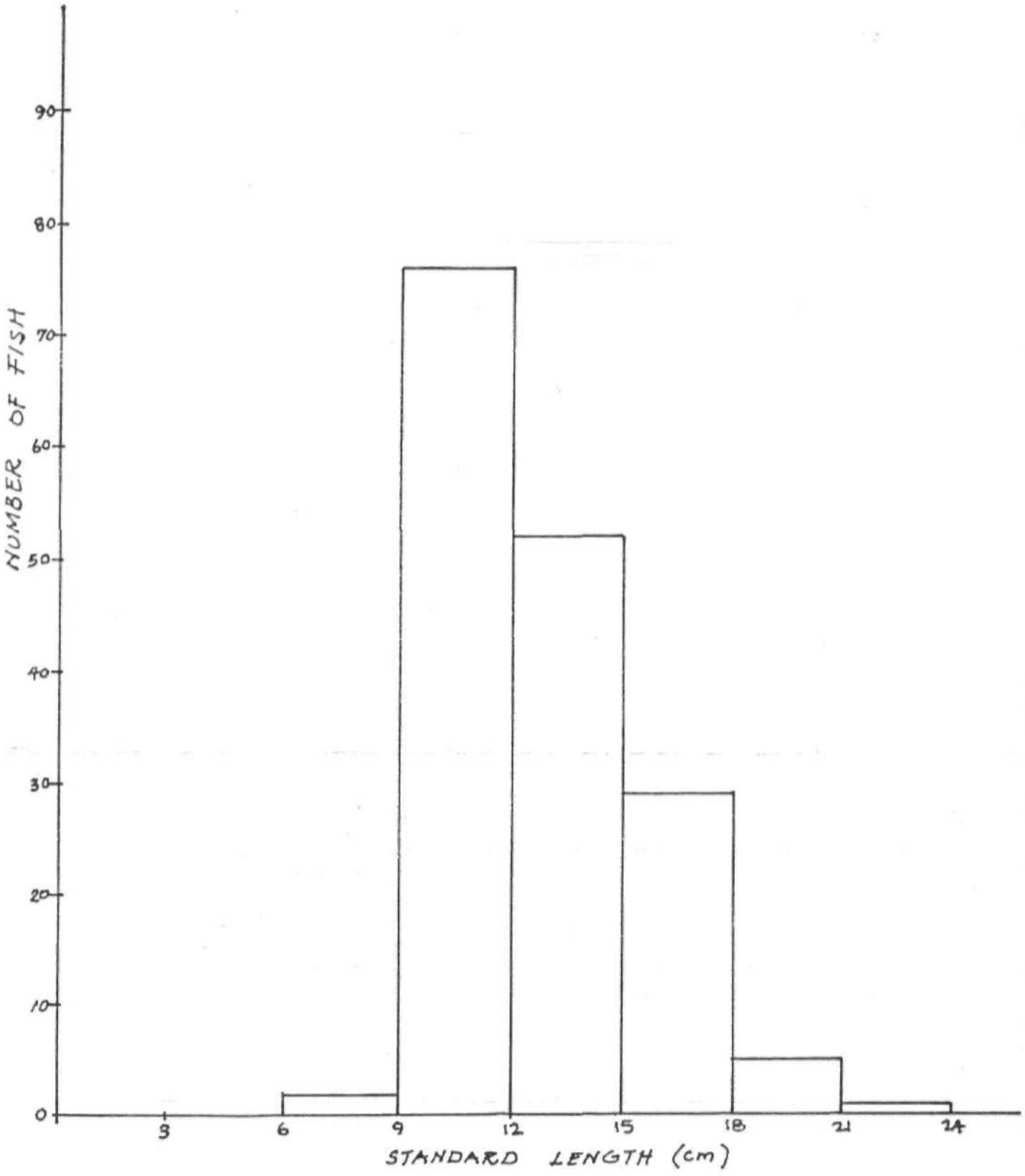


FIG. 8 STANDARD LENGTH DISTRIBUTION OF TILAPIA ZILLII (FEMALE)

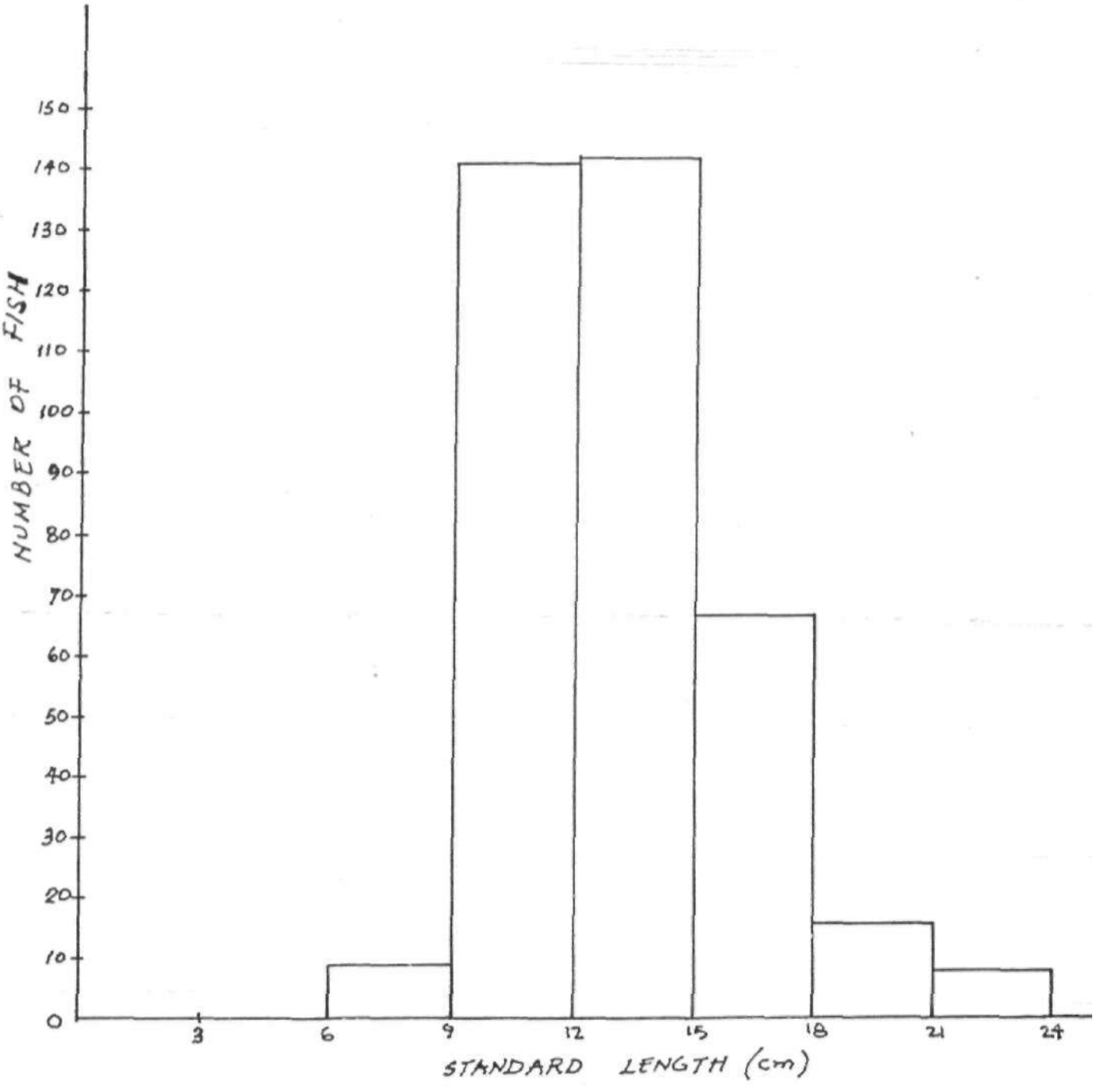
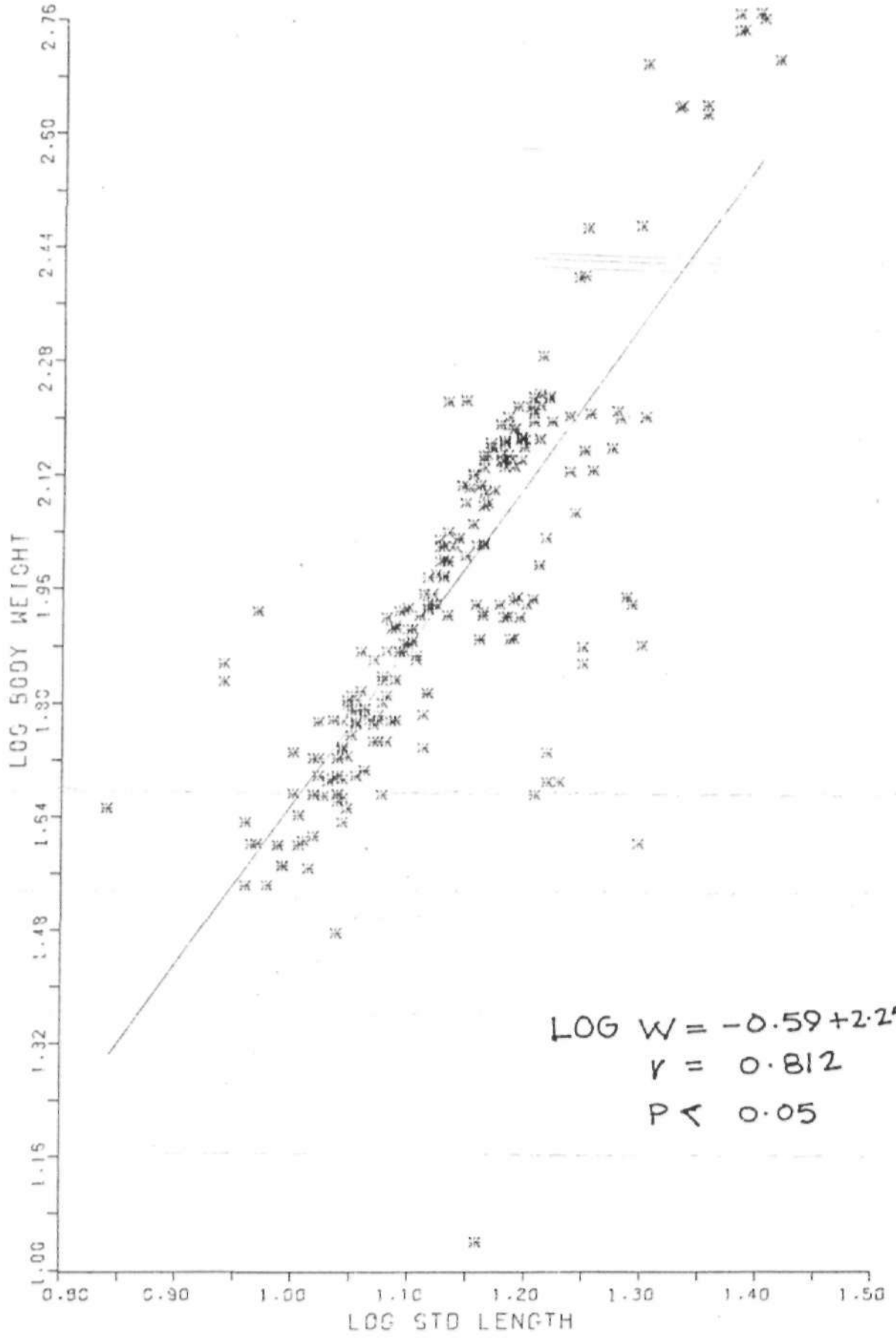


FIG. 9 STANDARD LENGTH DISTRIBUTION OF TILAPIA ZILLII (MALE & FEMALE combined)



$\log W = -0.59 + 2.25 \log L$

$r = 0.812$

$P < 0.05$

FIG 10 LENGTH-WEIGHT RELATIONSHIP OF MALE O. NILOTICUS

$Y = 2.258X - 0.595$

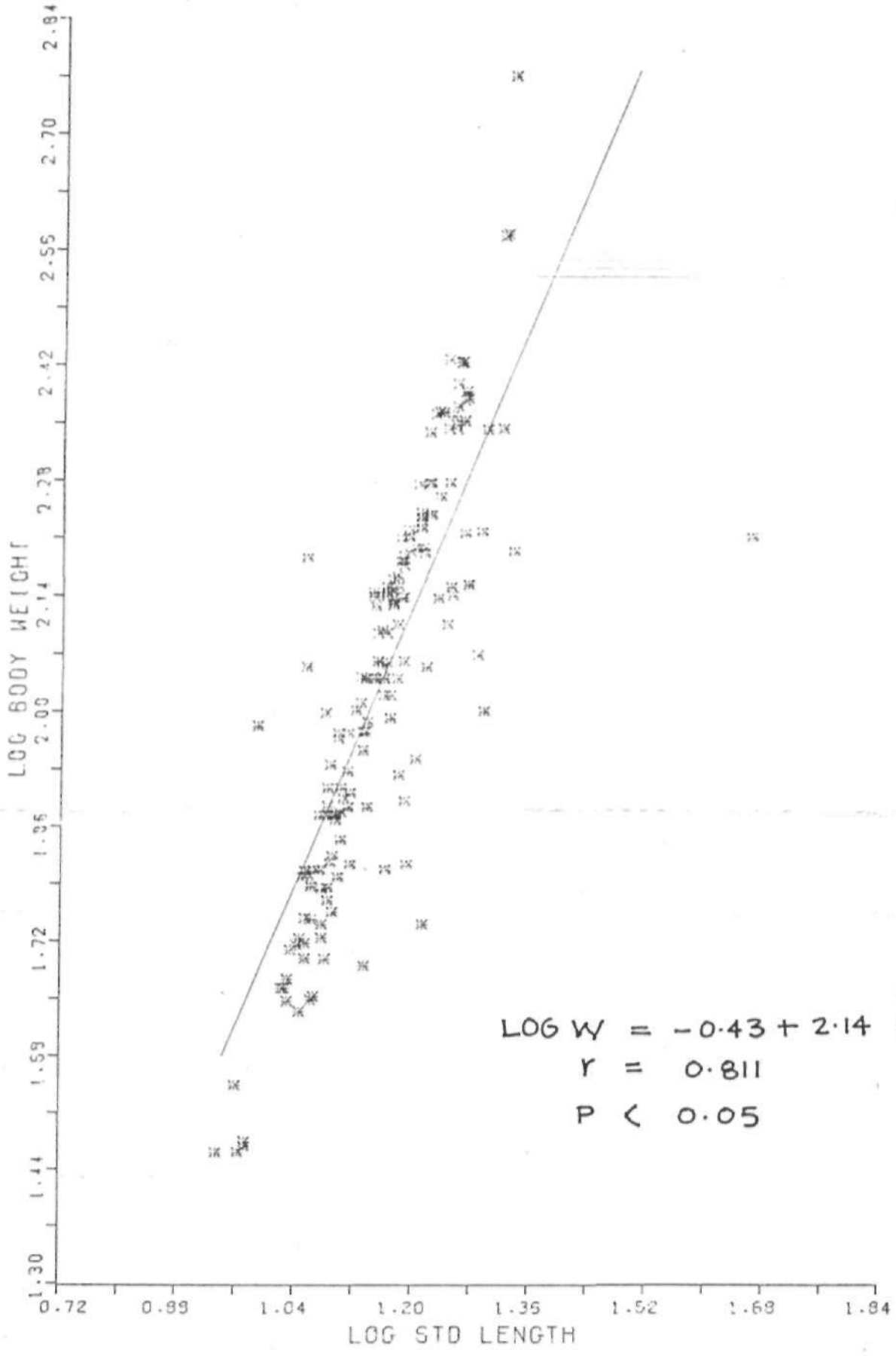


FIG II LENGTH-WEIGHT RELATIONSHIP OF FEMALE O. NILOTICUS

Y = 2.145X - 0.438

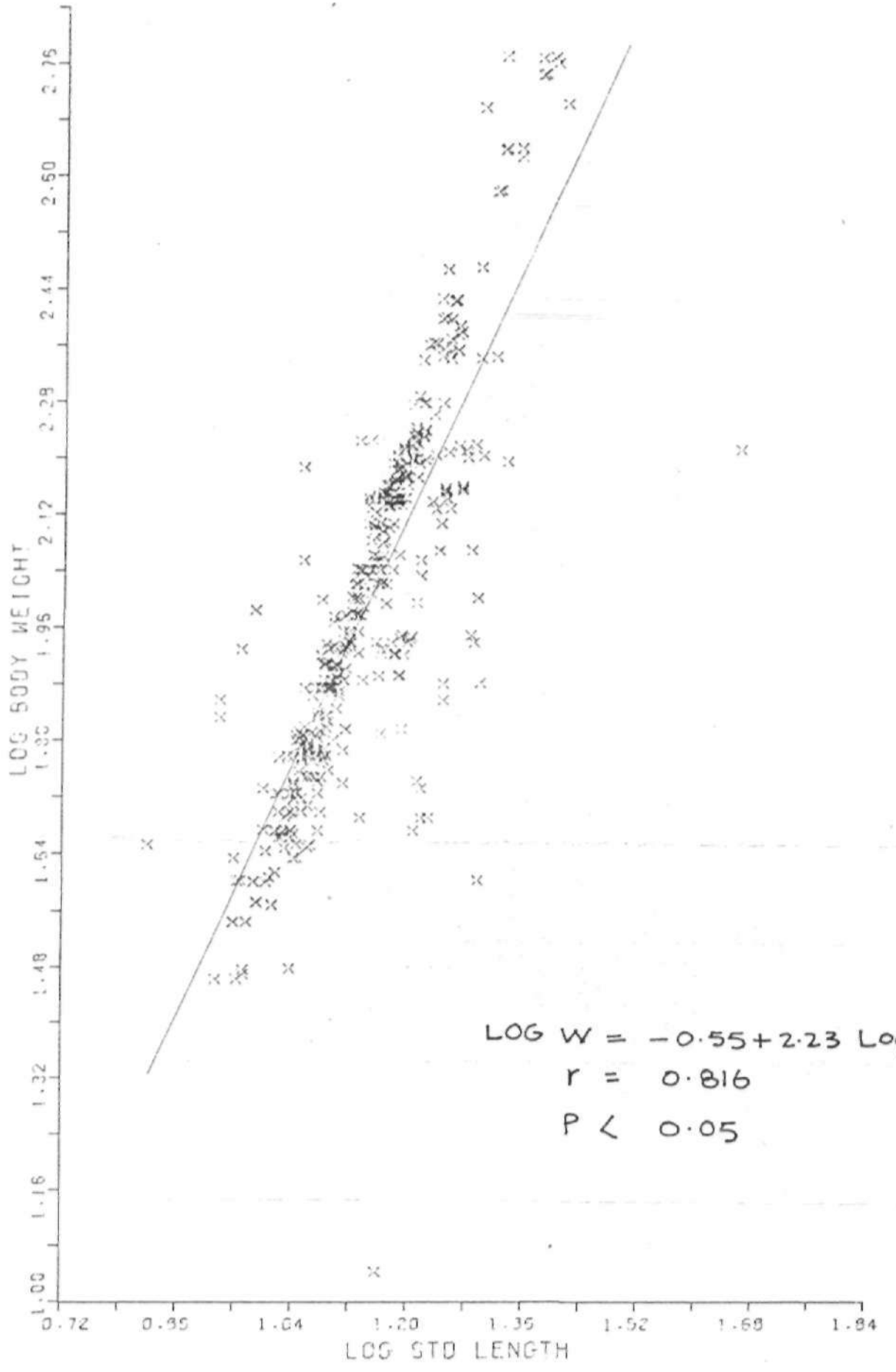


FIG 12 LENGTH-WEIGHT RELATIONSHIP OF OREOCHROMIS NILOTIEUS

$Y = 2.232X - 0.554$

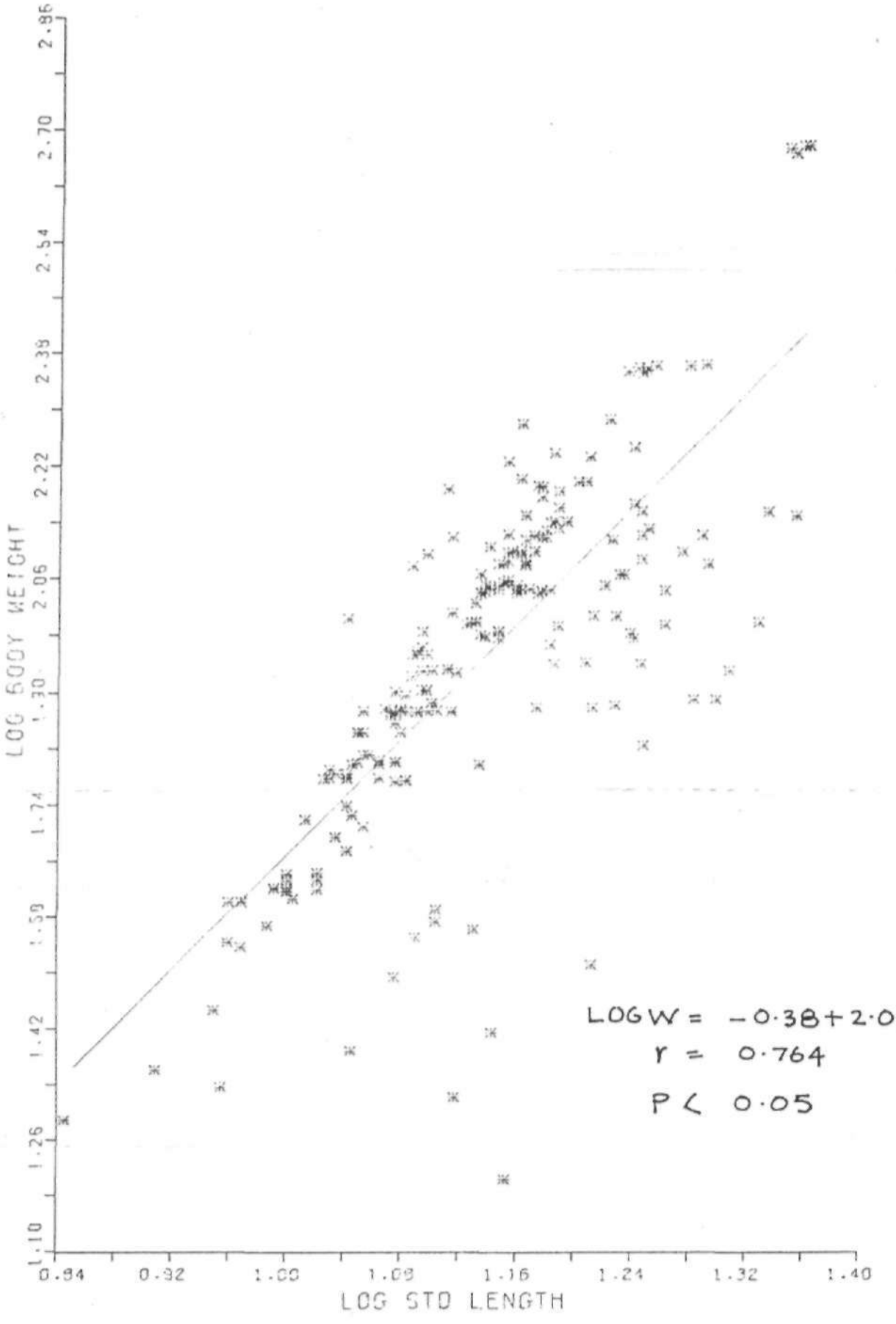


FIG 13 LENGTH-WEIGHT RELATIONSHIP OF MALE TILAPIA ZILLII

$Y = 2.059X - 0.387$

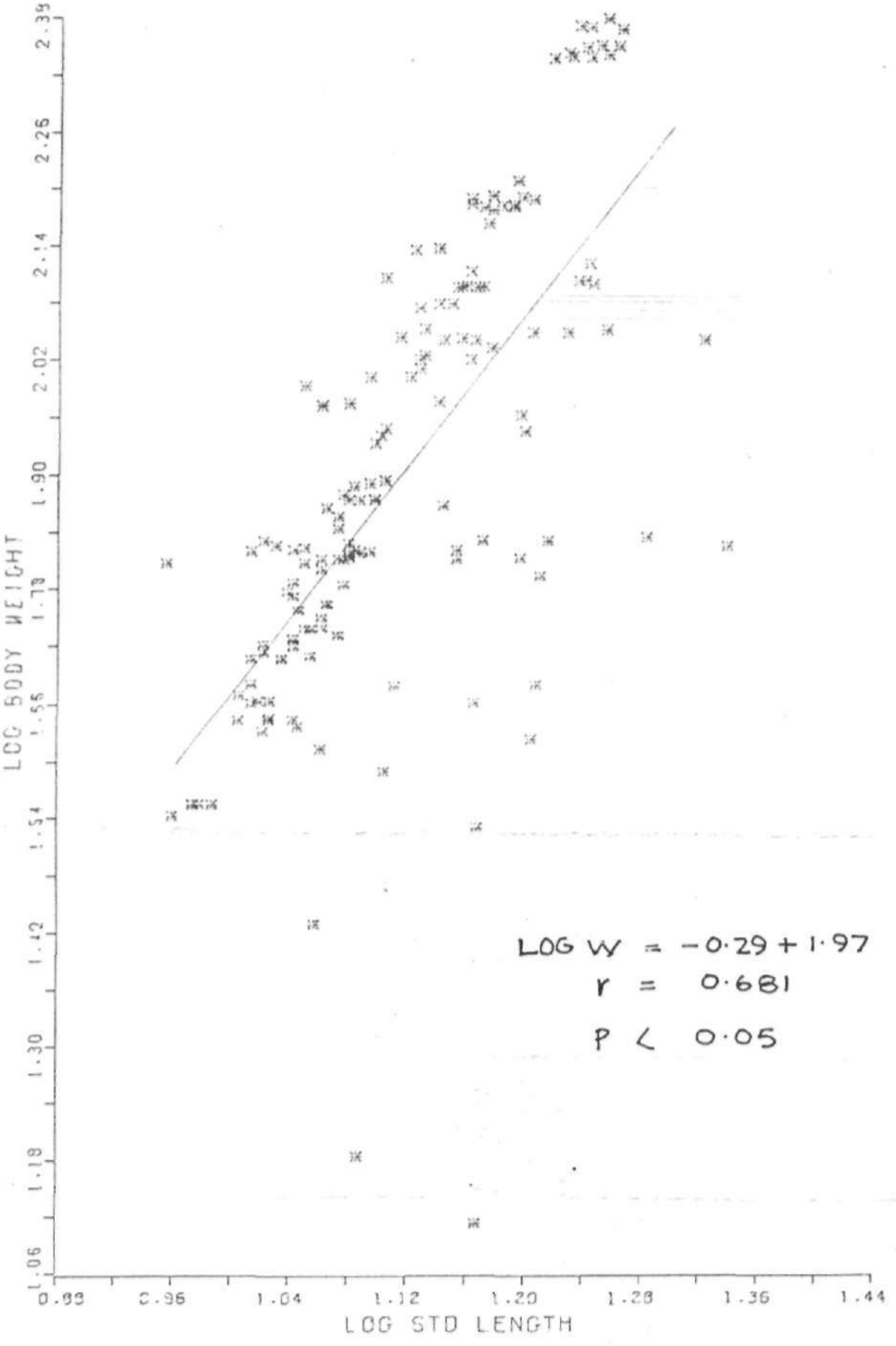


FIG. 14 LENGTH-WEIGHT RELATIONSHIP OF FEMALE TILAPIA ZILLII

Y = 1.972X - 0.236

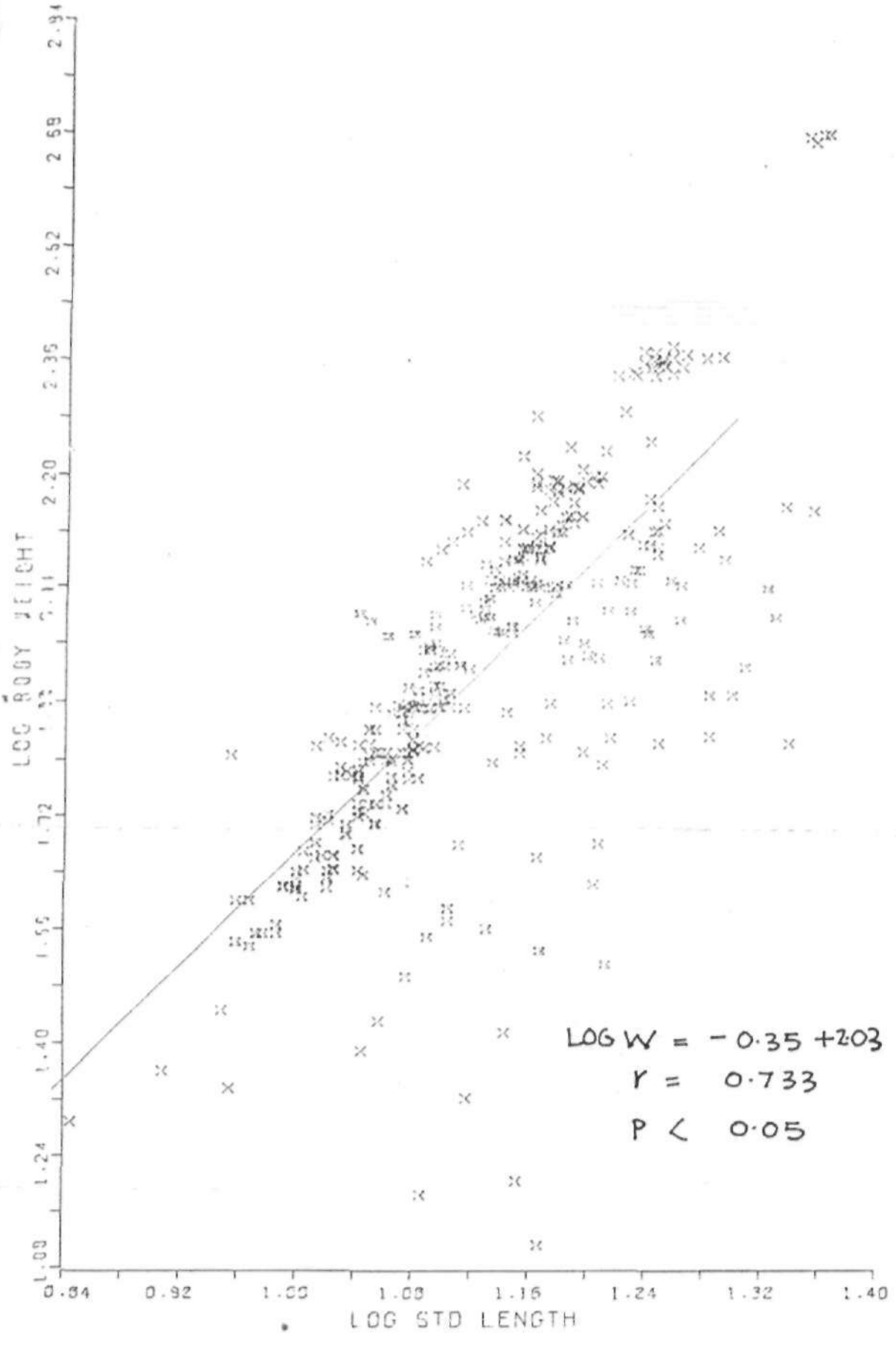


FIG 15 LENGTH-WEIGHT RELATIONSHIP OF TILAPIA ZILLII

$Y = 2.031X - 0.358$

Condition Factor

3.3. 1 O. niloticus

Monthly mean condition factor and their standard deviations are shown in figures 16 and 17. In the male(figure 17) the condition range from 2.36 to 4.35 while in the female(fig.17) the condition range from 3.35 to 4.35. (Appendix 3 and 4).

3.3.2. T.zillii

Monthly mean condition factor and their standard deviations are shown in figures 18 and 19. In the male(fig.18) the condition range from 1.38 to 4.67 while in the female(fig. 19). The condition range from 1.26 to 5.53. (Appendix 5 and 6).

3.4 FOOD AND FEEDING HABITS

3.4.1. Composition of the Stomach Contents

The types of diets found in the stomachs examined are as follows:-

(a) Higher plants

These were made up of dry bark of trees, plant twigs, fruits and seeds, most of which appeared in bits and pieces.

(b) Algae

These were made up of unicellular and filamentous green algae and blue-green algae. Examples are Anabaena sp, Ulothrix sp. and Spirogyra sp.

(c) Diatoms

Some species of diatoms were also identified in the diets. Examples are Pinnularia sp and Bacillaria sp.

(d) Insect remains

These included various parts of undigested insects parts such as legs, wings, head and antenna.

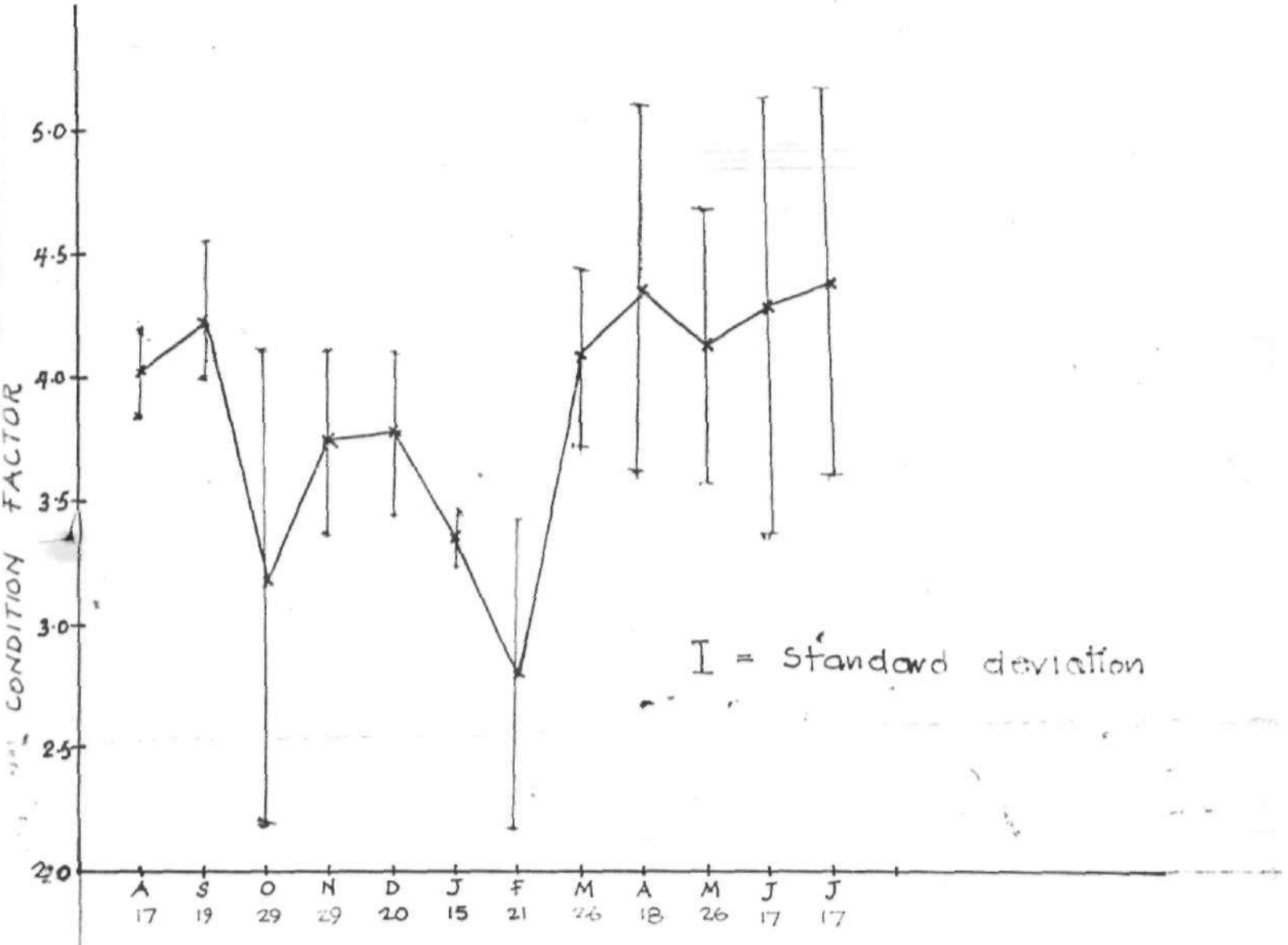


FIG. 16 MONTHLY MEAN CONDITION FACTOR OF OREOCHROMIS NILOTICUS (MALE)

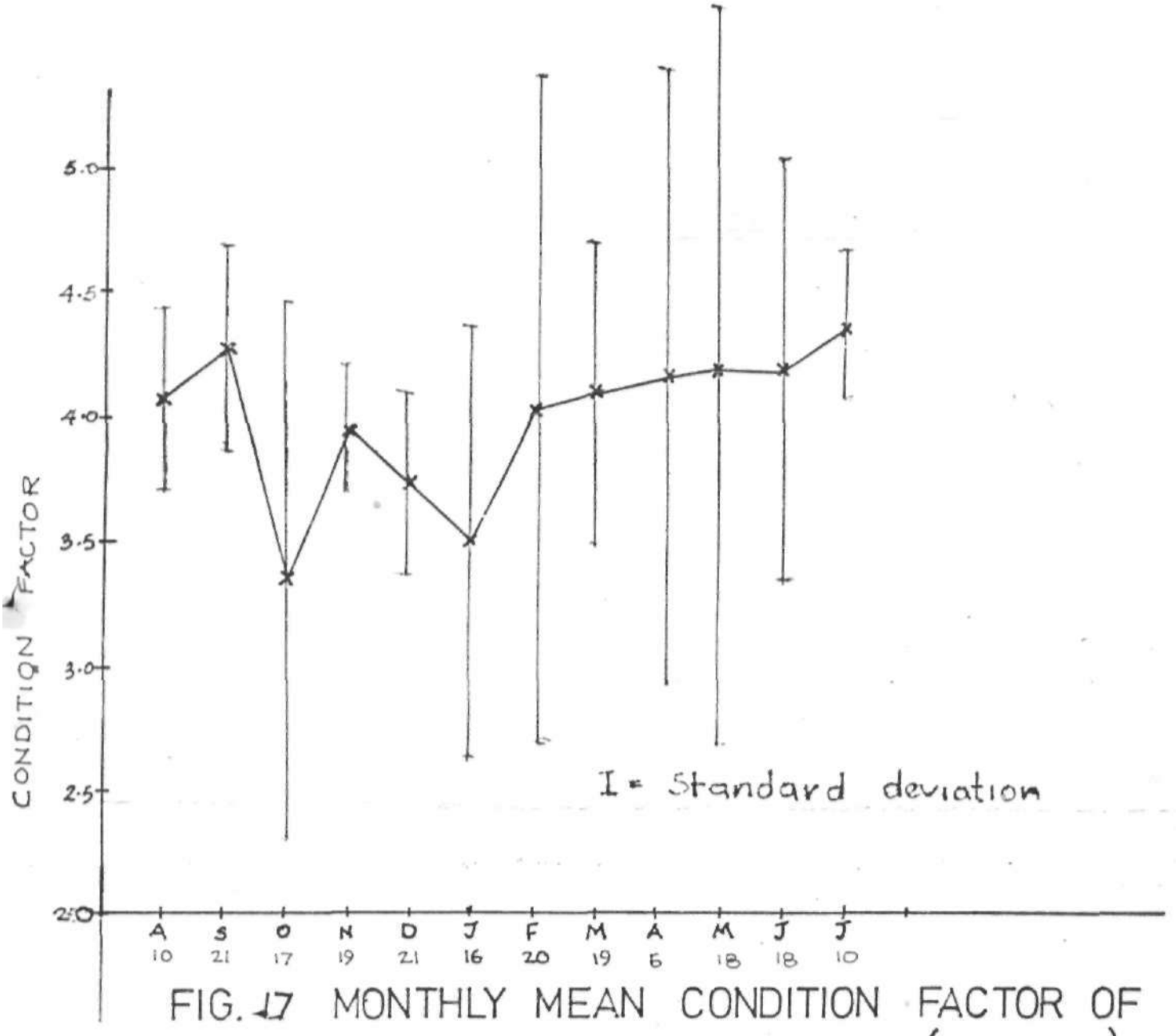


FIG. 17 MONTHLY MEAN CONDITION FACTOR OF OREOCHROMIS NILOTICUS (FEMALE)

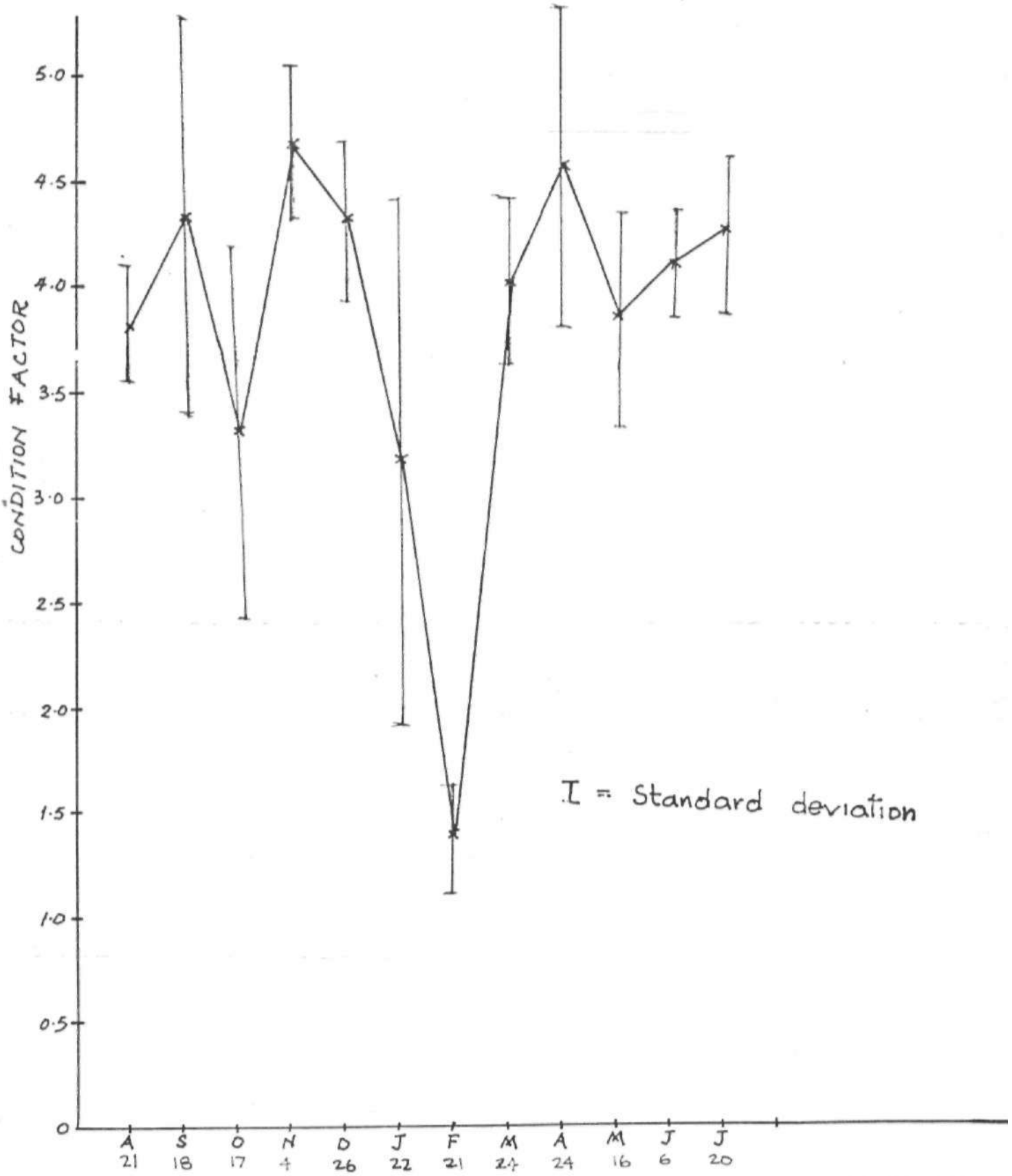


FIG. 18 MONTHLY MEAN CONDITION FACTOR OF TILAPIA ZILLI (MALE)

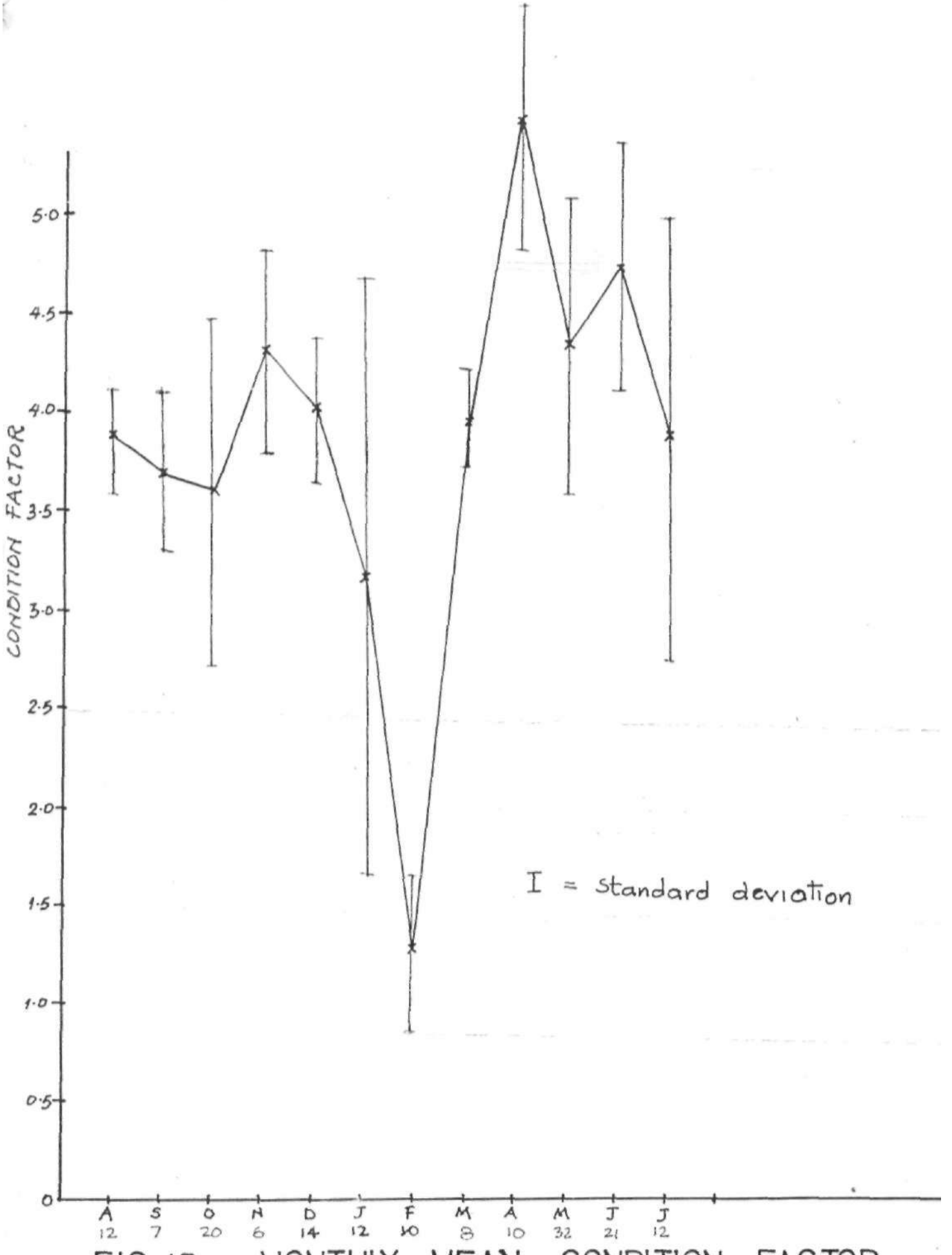


FIG. 19 MONTHLY MEAN CONDITION FACTOR FOR TILAPIA ZILLII (FEMALE)

(e) Inorganic matters

Some shiny inorganic matter also used to occur from time to time in the stomachs.

(f) Unidentified organic matter

Stomachs of some samples composed of materials digested beyond identification.

3.4.2 O.niloticus

(a) Food Composition

Food composition of O.niloticus is shown in Table 3. Plant materials dominated the dietary items with a percentage frequency of occurrence of about 97% and 64% of total points. Algae had 35% frequency of occurrence and 18% of total points. Diatoms had 6% frequency of occurrence and 2% of total points. Unidentified organic matter had 59% frequency of occurrence and 12% of total points.

(b) Monthly feeding index

The percentage number of species feeding each month were calculated for the period of study. The graph was plotted as shown in Figure 20. The results showed that the lowest feeding was recorded in January. At least 50% of the fish examined each month fed in the months of April to December with highest feeding recorded in September. A look at the feeding index generally showed that there was a continuous fall of feeding from September to January. It however started increasing from February to July.

(c) Monthly variations in the food items consumed

The monthly variations in the food items consumed by Oreochromis niloticus was shown in Figure 21. The Table 3:

TABLE 3: STOMACH CONTENTS OF *O. niloticus*

NUMBER WITH FOOD 240 (53.5%)

NUMBER WITHOUT FOOD 209(46.4%)

FOOD ITEMS	PERCENTAGE FREQUENCY OF OCCURRENCE	PERCENTAGE TOTAL POINTS
PLANT TWINGS	97.0	45.0
FRUITS AND SEEDS	48.0	19.4
GREEN ALGAE		
Pandorina sp	6.2	1.4
Synura sp	3.7	0.4
Cosmarium sp	3.7	0.5
Closterium sp	16.2	2.9
Oedogonium sp	3.7	0.6
Ulothrix sp	35.0	8.0
Spirogyra sp	15.0	3.2
BLUE GREEN ALGAE		
Anabaena sp	7.5	1.2
DIATOMS		
Pinnularia sp	6.2	1.1
Bacillaria sp	5.4	1.0
Synedra sp	0.4	0.02
Melosira sp	0.4	0.02
OTHERS		
Unidentified organic matters	58.7	12.3
INSECT REMAINS	10.8	2.2
INORGANIC MATTER	1.2	0.4
		100

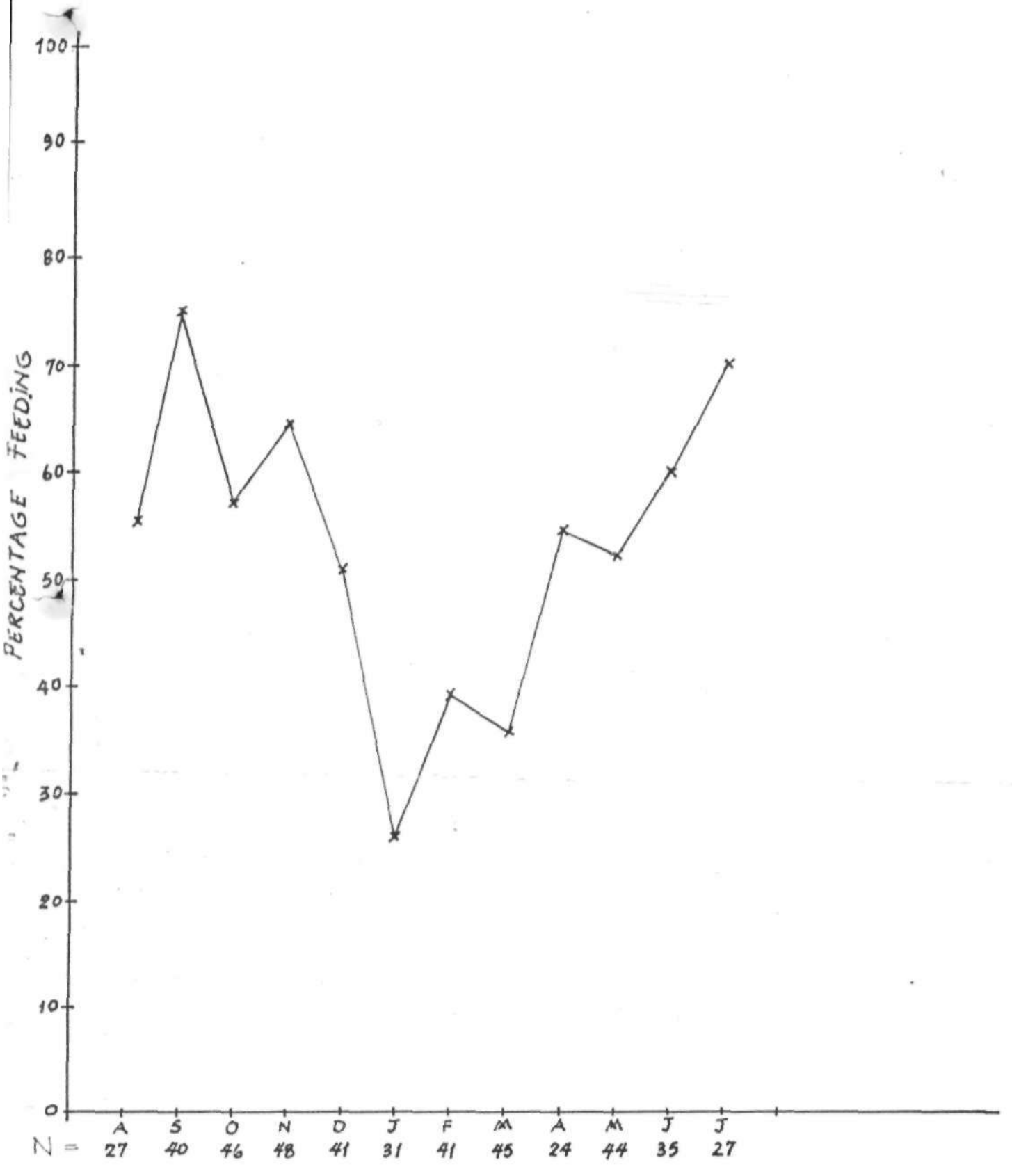


FIG. 20 MONTHLY FEEDING INDEX OF OREOCHROMIS NILOTICUS (N = number of fish examined

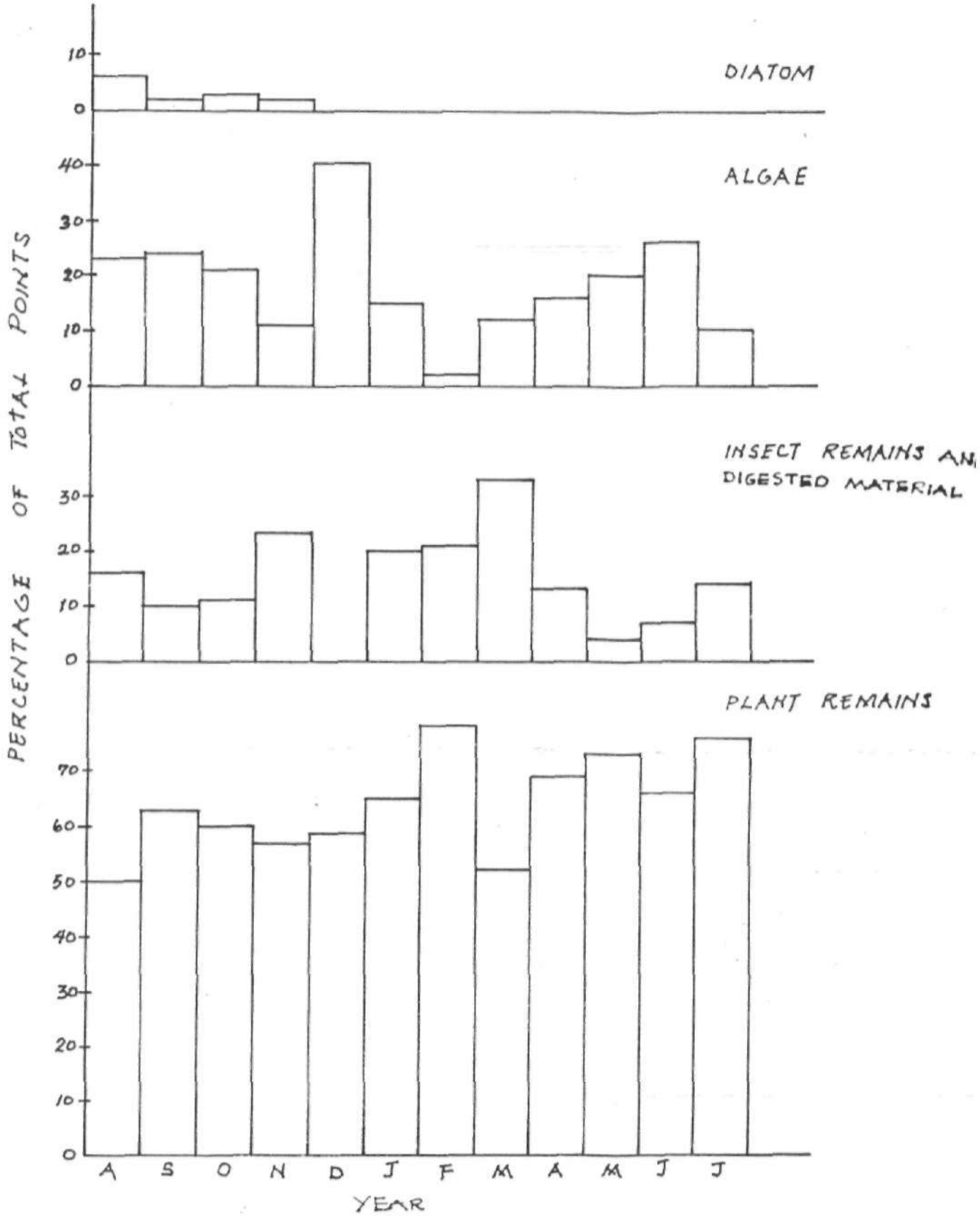


FIG. 21 MONTHLY VARIATIONS IN DIETARY COMPOSITION OF OREOCHROMIS NILOTICUS

results showed that the plant remains dominated the dietary items throughout the months of investigation. The lowest percentage total points scored by plant remains in the dietary items each month was 50% while the highest was 78%. These were followed by algae unidentified organic matter and insect remains. Diatoms appeared not only in small quantity(less than 10.) but also only during four months of the period of investigation,(August to November)

3.4.3 T.zillii

(a) Food composition

Food composition of T.zillii is shown in table 4. Plant remains dominated the dietary items with a frequency of occurrence of about 84% and 76% of total points. Algae came second with a frequency of occurrence of about 16% and 9% of total points. Other dietary items included diatoms: 6.8% by frequency and 2% by total points and insect remains: 5.8 by frequency and 1.3% by total points. Unidentified organic matter had 59.3% frequency of occurrence and 8.2% of total points.

(b) Monthly feeding index

The percentage number of species feeding each month were calculated for the period of the study. The results(Fig. 22) showed that the lowest feeding was recorded in February (22.5%).Feeding above.

TABLE 4: STOMACH CONTENTS OF *Tilapia zillii*

NUMBER WITH FOOD 187 (49%)

NUMBER WITHOUT FOOD 196(51%)

FOOD ITEMS	PERCENTAGE FREQUENCY OF OCCURRENCE	PERCENTAGE TOTAL POINTS
DEA WOOD	4.2	0.7
PLANT TWIGS	84.5	52.6
FRUITS AND SEEDS	51.3	23.3
BLUE GREEN ALGAE		
Anabaena sp	6.4	1.3
GREEN ALGAE		
Pandorina sp	10.1	1.0
Synura sp	1.0	0.1
Cosmarium sp	2.6	0.4
Closterium sp	8.0	0.9
Spirogyra sp	9.6	3.0
Cladophora sp	8.5	1.8
Oedogonium sp	2.6	0.2
Ulothrix sp	15.6	1.0
DIATOMS		
Pinnularia sp	1.0	0.07
Bacillaria sp	5.8	1.2
OTHERS		
Unidentified organic matter	59.3	8.2
INSECT REMAINS	5.8	1.3
INORGANIC MATTER	8.0	2.7
		99.97

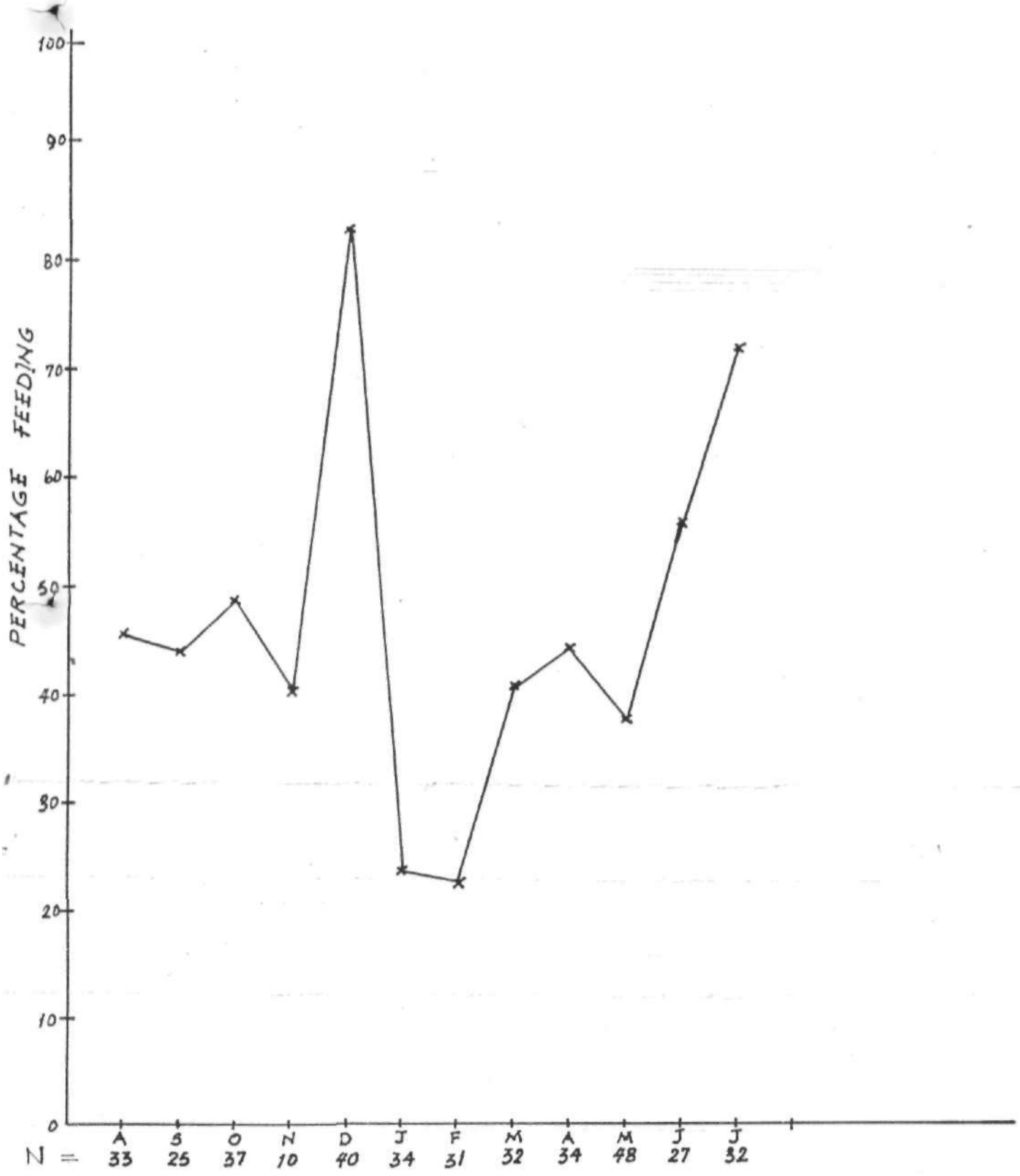


FIG 22 MONTHLY FEEDING INDEX OF TILAPIA ZILLII (N = number of fish examined)

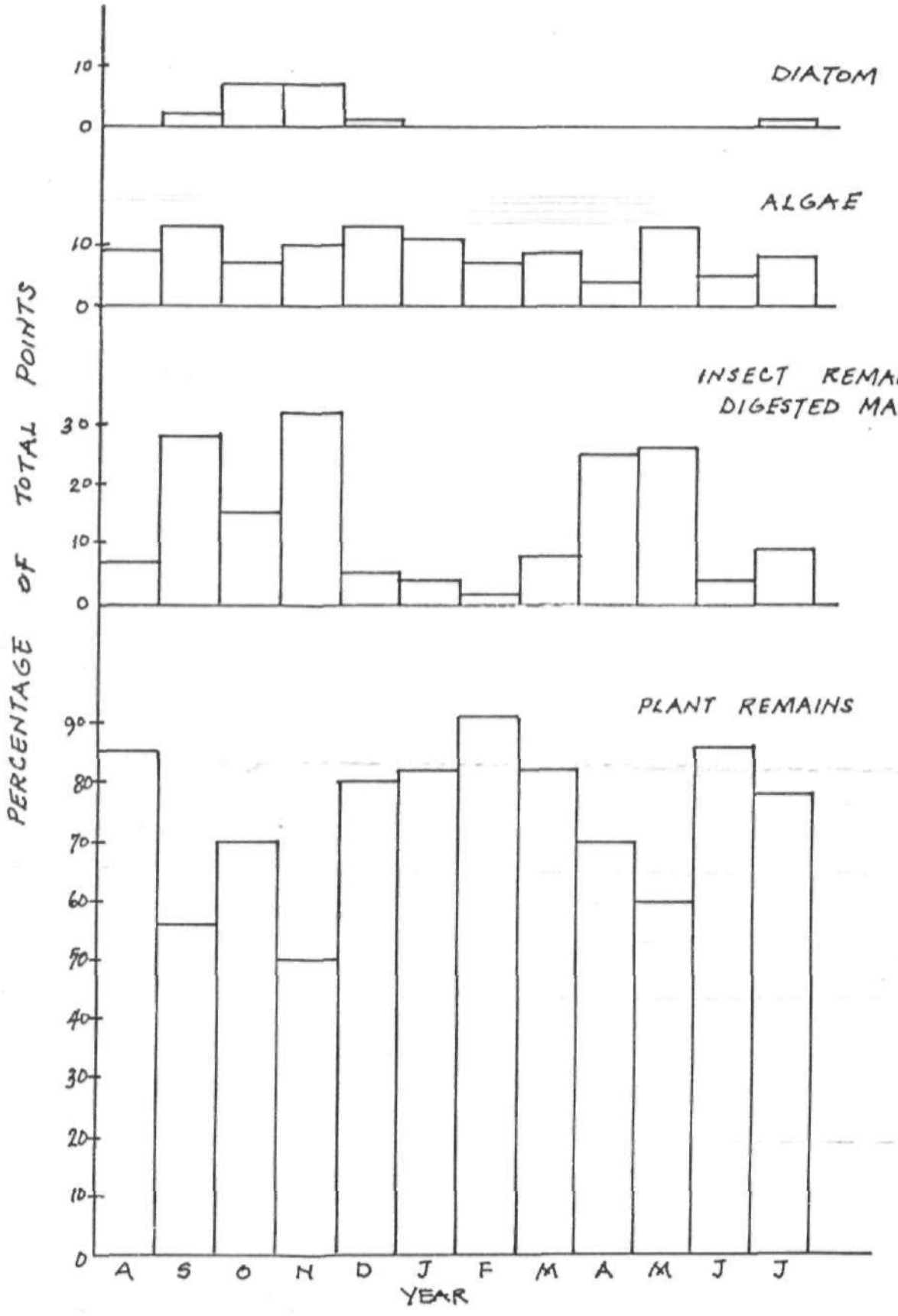


FIG. 23 MONTHLY VARIATION IN DIETARY COMPOSITION OF TILAPIA ZILLII

50% was reoorded only in the months of December, June and July, with the highest in December.

(c) Monthly variations in the food consumed

The monthly variations in the food items selected by T.zillii is shown in figure 23. The results showed that plant remains dominated the dietary items throughout the period of the investigation. These were followed by algae which also occurred throughout the months of investigation, percentage of total points was however less than 20%. Insect remains, unidentified organic matter, and inorganic matter were also noticed throughout the period of the investigation. Diatoms appeared in the dietary items only during five months of the study period(September to December and July).

3.5 SEX RATIO AND GONADAL STAGES

3.5.1. O.niloticus

The sex ratio of O. niloticus(Table 5) showed that out of the total number of 449 fish examined, 254 were males while 195 were females. This gave a ratio of 1 male to 0.78 females. Seasonal variation in the sex ratio showed that females dominated in the months of September, December, January and June only. The result of the months were dominated by males.

Monthly occurrence of different stages of gonads (Table 6) however showed that there were more mature

TABLE 5: SEASONAL VARIATION IN THE SEX RATIO OF *O. niloticus*

MONTHS:	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	TOTAL
MALES	17	19	29	29	20	15	21	26	18	26	17	17	254
FEMALES	10	21	17	19	21	16	20	19	6	18	18	10	195
TOTAL NO EXAMINED	27	40	46	40	41	31	41	45	24	44	35	27	449
RATIO M.F	1:0.59	1:1.1	1:0.59	1:0.90	1:1.05	1:1.06	1:1.04	1:0.76	1:3	1:0.71	1:1.05	1:0.59	1:0.78

TABLE 6: MONTHLY OCCURRENCE OF DIFFERENT STAGES OF GONADS IN O.niloticus

MONTHS	SEX	II	III	IV	TOTAL EXAMINED
AUGUST	M	16	1	0	17
	F	6	4	0	10
SEPTEMBER	M	15	4	0	19
	F	3	16	2	21
OCTOBER	M	23	6	0	29
	F	5	12	0	17
NOVEMBER	M	27	2	0	29
	F	7	12	0	19
DECEMBER	M	16	4	0	20
	F	16	5	0	21
JANUARY	M	7	8	0	15
	F	2	9	5	16
FEBRUARY	M	10	11	0	21
	F	2	12	6	20
MARCH	M	20	6	0	26
	F	3	14	2	19
APRIL	M	12	6	0	18
	F	1	3	2	6
MAY	M	22	4	0	26
	F	17	1	0	18
JUNE	M	16	1	0	17
	F	17	1	0	18
JULY	M	16	1	0	17
	F	6	4	0	10

females than males throughout the period of investigation except in May and June. Fully matured females were recorded in the months of January, February, March, April and September. Most of the fish examined in this study are those on gonadal stages II and III.

3.5.2 T.zillii

The sex ratio of Tilapia zillii (Table 7) showed that out of the total number of 383 fish examined, 219 were males while 164 were females. This gave a ratio of 1 male to 0.78 female. Seasonal variations in the sex ratio showed that females were more in May, June, October and November. The rest of the months were dominated by the males.

Monthly occurrence of different stages of gonads (Table 8) showed that there were more matured males than females in the months of August, September, October, January, February, March, April and July. Fully mature males were recorded in only September and December while fully matured females were not recorded in November, December, March and April. Most of the fish examined in this study are those on gonadal stages II and III.

TABLE 7: SEASONAL VARIATION IN THE SEX RATIO OF T zillii

MONTHS	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	TOTAL
MALES	21	18	17	4	26	2[illegible]	21	24	24	16	6	20	219
FEMALES	12	7	20	6	14	12	10	8	10	32	21	12	164
TOTAL NO OF FISH EXAMINED	33	25	37	10	40	34	31	32	34	48	27	32	383
RATIO M:F	1:0.59	1:0.4	1:1.1	1:1.5	1:0.56	1:0.65	1:0.47	1:0.33	1:0.41	1:2	1:35	1:0.62	1:0.78

TABLE 8: MONTHLY OCCURRENCE OF DIFFERENT STAGES OF GONADS IN *T.zillii*

MONTHS	SEX	II	III	IV	TOTAL EXAMINED
AUGUST	M	15	6	0	21
	F	9	1	2	12
SEPTEMBER	M	8	8	2	18
	F	0	5	2	7
OCTOBER	M	7	10	0	17
	F	3	6	11	20
NOVEMBER	M	3	1	0	4
	F	4	2	0	6
DECEMBER	M	18	7	1	26
	F	2	12	0	14
JANUARY	M	9	13	0	22
	F	5	5	2	12
FEBRUARY	M	7	14	0	21
	F	4	4	2	10
MARCH	M	16	8	0	24
	F	4	4	0	8
APRIL	M	12	12	0	24
	F	0	10	0	10
MAY	M	8	8	0	16
	F	13	13	6	32
JUNE	M	1	5	0	6
	F	8	9	4	21
JULY	M	15	5	0	20
	F	9	1	2	12

CHAPTER 4

4.0 DISCUSSION

The analysis of the size ranges of Orechromis niloticus showed that the standard length of males ranged from 6.5 to 26.0 cm while that of females ranged from 8.6 to 25.7cm. The weight of males varied from 11,0 to 592.1g while that of females varied from 29.0 to 593.0g.

In the case of Tilapia zillii, the standard length of males ranged from 7.0 to 23.0 cm while that of females ranged from 9.0 to 21.8cm. The weight of the males varied from 16.0 to 480.5g while that of females varied from 13.0 to 240g. Fagade(1978) noted in Lekki Lagoon that the largest specimens of T.guineensis were females. Holden and Reed(1972), however, stated that male Tilapia grew to a larger size than the female. Olatunde(1983) gave various reasons which may affect the size and sex distribution of captured fish as follows:

(i) the type of gears used for fishing,
(ii) seasons of the year and time of the day of capture,
(iii) structural and physiological adaptatio s which make one fish more vulnerable to catch than others and
(iv) analysis based on market samples which might not give a true picture of the size ranges present in wild populations.

The length frequency distribution showed normal distribution curve and both species showed highest peaks between 12 - 15 centimetres. This showed that most of the fish sampled fell within one population group.

The regression analysis showed that the 'b' values of the males and females of both O. niloticus and T.zillii exhibited allometric growth. It has been observed that certain factors such as an increase in weight due to intake of water or food and gonads; seasons of the year, and the time of the day when the fish was captured, loss of weight due to food regurgiation and spawning can among other things affect the 'b' values (Lagler, 1952).

The length-weight relationship, when transformed to logarithmic scale showed linear relationship. Botros(1970) obtained a straight linear relationship between log length and log weight for T.nilotica (O. niloticus) and Tilapia zillii. Fagade and Olaniyan(1972) noticed that there was an increase in weight with increase in length to a certain point in Ethmalosa fimbriata. Siddiqui(1977)., Fagade(1978) and Landau(1979) worked on the length-weight relationship of various species of Tilapia and found that the body length was approximately cube of the body weight. Certain other factors were also found to affect the length-weight relationship. Treasurer(1976) observed that gill nets can select the fatter of short fish and thinner of long fish, thereby affecting the length-weight relationship. Sturm (1978) observed that difference in length-weight relationship may occur as a result of gear selectivity, sex and different seasons and time of the year.

The mean condition factor indicated that the fish species were in good condition throughout the period of investigation except in January and February(dry season) when there was a general fall of values in all species. Olatunde(1983) noted that there was fall in condition factor of Clarias lazera in Zaria from October to February during the dry season. Fagade and

Olaniyan (1972) observed that E.fimbriata in Lagos Lagoon have higher condition factor during the period of January to May.

The mean condition of females in the two species studied was higher than that of males. This agreed with the work of Hodgkiss and Mann (1977) who noticed that mean values for the body condition of females Sarotherodon mossambicus were in general higher than those of males in Plover Cove reservoir, Hong Kong, suggesting that females were more robust than males. Sexual differences, age, changes in seasons, gonadal maturity levels, length and weight, nutritional level or stomach fullness and the maturity level of the fish can influence the values of the condition factor "K"(Lagler, 1952).

Hynes(1950) reviewed the methods used in the studied of the food of fishes. The advantages of the "points" methods are as follows:

i. it is rapid and easy,
ii there is no special apparatus needed for measurements.
iii. it is neither influenced by frequent occurrence of a small organism in small numbers nor of heavy bodies,
iv. it does not involve trying to count large number of small and broken organisms.

Frequency of occurrence method was used to indicate the proportion of fish eating a particular food item. This method is often biased by accumulation within individual fish of remains of certain food organisms which are resistant to digestion.

The cichlids exhibit a great diversity of feeding habits. Gwahaba(1973) working in Lake George, Uganda noted that T. nilotica (O. niloticus) is a phytoplankton feeder. Fagade

and Olaniyan(1973) observed that Tilapia species of Lagos Lagoon were deposit feeders. Their principal food items were algal filaments, diatoms and unidentified organic matter. Fragments of higher plants, arthropods appendages and some animal species were also included.

Akintunde(1976) observed that Sarotherodon galileous and S. niloticus(O.niloticus)in Lake Kainji fed intensively on organic matter, plankton and occasionally worms and insects. Akintunde and Imevbore(1979) in Lake Kainji noted that the main contents in the stomachs of most S.niloticus(O.niloticus) examined were phytoplankton, and followed in order of preference by grasses, plant seeds, debris and plant tissues. Tilapia zillii fed almost exclusively on higher plant tissues, aquatic macrophytes, grass, leaves and stems. Other items occurring in small amount included organic debris, algae and insect larvae, all of which were probably ingested accidentally with plant materials.

Burchard(1976) observed that T.zillii feed on insect larvae and coarse plant material and therefore has the heaviest pharyngeal teeth and coarsest gill rakers among Nigerian Tilapia. Holden and Reed(1972) also observed that T.nilotica (O.niloticus) fed on both plants and predominately phytoplankton while T.zilliii fed on plants.

Bruton and Boltt(1975) worked on Tilapia mossambica in Lake Sibeya and found that the fry fed on detritus rich in diatoms. Landau(1979) studied Tilapia galilaea in Lake Kinneret, food particles found included algal materials, phytoplankton, diatoms and green algae. Nwadairo(1985) studied the dwarf African cichlid Pelvicachromis pulcher in river Sombreiro and found that benthic algae, higher plant remains, detritus and

copepods were the main food items.

All the work done by authors cited above agreed with the types of food items indentified and located in the stomachs of cichlid species sampled from the Kaduna. Plant twigs, fruits and seeds were noted more in the stomachs of Tilapia zillii. Whereas there was relatively more Algae and diatoms in the stomachs of Oreochromis niloticus.This was based on the fact that many algal filaments and diatoms were grouped and awarded the same points as few fragments of higher plants.

Most of the higher plants, fruits and seeds that serve as food for fish find their way into the river from plants and trees bordering the river. This was also observed by Vaas (1954) who noted that fallen fruits and leaves are food for certain fish species and that in the flood, the leaves of trees and shrubs may also be eaten.

Hickling(1961) observed that an important part of the food of fish may not be derived from the water at all but from the land when the river rises in the flood and overspreads the flood-plains or valleys so that the fish has an access to a vast store of food of all kinds.

The seasonal fluctuations in dietary composition of the species may be probably due to actual variations in the numbers of the various food items in the habitat or partly due to varying relative availability. The feeding intensity of both species is low during the dry season when the water level is low and is high during the rainy season when the water level is high.

Higher rate of empty stomachs were recorded during the course of investigation. These might be attributed to some factors ranging from the types of nets used for capture to the condition of the fish during capture. Munro(1967) recorded 50% empty stomach for Tilapia melanopleura in Lake Mcllwaine in East Africa. He attributed the high percentage of empty stomach to the long hours during which the fish have been in the gill nets before being removed for examination. Arowomo(1976) noted that majority of speciemens caught by gill netting have empty stomachs. Olatunde(1977) attributed the causes of occurrence of empty stomach to the following reasons;

i. recent digestion of the food by the fish,
ii. fish caught between their meal times,
iii. regurgitation of stomach content, particularly when gill nets are used,
iv. fish capture long time before they are removed,
v. scarcity of food,
vi. Due to certain conditions, when fish do not feed at all, as in the case of mouth brooding, fish with gonads pressing the stomach, and sickness.

One or more of the reasons mentioned above by various workers might have been the cause of the high occurrence of empty stomachs during this study.

The raw data of seasonal variation in the sex ratio of both species showed that it is in favour of males. Statistical analysis using chi-square however showed that at 5% level of signifance, there was no significant difference between the ratio of males to female in O.niloticus while there was in T.zillii. Variations in sex ratio might be due to genetic factors, seasonal and breeding migrations and vulnerability of a particular sex to

capture. Fagade(1978) in his studies on the biology of T.guineensis in Lekki Lagoon found that the sex ratio of the population was slightly in favour of males. He also noted that sex ratio is not static and may vary from year to year.

In both species, fishes on stages I, V and Vi were completely not sampled throughout the period of study. More numbers of matured females were sampled than matured males. Absence of fishes on stages I, V and VI is attributed to the fact that while those on stage I were too small and therefore pass through the nets without being trapped during capture, those on stages V and VI were in their breeding seasons. When cichlids are breeding, they form nests in calm regions of water far way from the activities of the fishermen(Burchard 1967). Lowe McConnell(1975) observed that cichlids appear to breed throughout the year in equatorial waters.

CHAPTER 5

5.0 SUMMARY AND CONCLUSION

Studies were carried out on some aspects of the biology of Oreochromis niloticus and Tilapia zillii in the Kaduna river from August 1986 to July, 1987.

The standard length of males O.niloticus ranged from 6.5 to 26.0 cm while that of females ranged from 8.6 to 25.7cm. The weight of the males varied between 11.0 to 592.1g while that of females varied between 29.0 to 593g. In T.zillii, the standard length of males ranged from 7.0 to 23.0cm while that of females ranged from 9.0 to 21.8cm. The weight of males ranged from 16.0 to 480.5g while that of females ranged from 13.0 to 240g.

Majority of the samples fell within the length group of 12 - 15cm. The length-weight relationship showed that the weight of fish increased with the length of fish in the two species. The length weight regression analysis showed that both species exhibited negative allometric pattern of growth.

The fish were generally in good condition with slight variations during the sampling period. The species exhibited diversity in feeding habits. They were mainly herbivorous. Main diets were bits of higher plants and phytoplankton. Diatoms and insect parts also occurred in little quantities. The feeding intensity varried from season to season. The instensity was high in the rainy season while it was low in the dry season.

Chi-square test revealed that the sex ration of O. niloticus did not deviate from the expected 1:1 ratio. In T. zillii there were more males than females.

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APPENDIX

DATA OF SAMPLES COLLECTED

MONTH: AUGUST, 1986 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
1	21.1	16.6	173.9	F	II	-	Empty stomach
2	20.6	16.1	167.4	F	II	-	Full stomach
3	19.5	15.2	137.9	F	II	-	" "
4	24.0	16.0	170.2	M	II	-	" "
5	23.6	18.4	226.2	F	III	400	½ Full stomach
6	18.0	13.8	107.8	M	II	-	Empty stomach
7	19.5	15.0	141.3	M	II	-	" "
8	19.7	15.1	147.3	M	II	-	½ Full stomach
9	21.5	16.5	189.9	F	II	-	Empty stomach
10	20.5	15.6	148.7	M	II	-	" "
11	19.4	15.0	138.4	M	II	-	" "
12	20.4	15.6	149.4	M	II	-	" "
13	20.9	15.7	163.6	F	III	3.0	½ Full stomach
14	16.5	12.4	76.9	M	II	-	Empty stomach
15	18.5	14.3	105.4	M	II	-	" "
16	16.7	12.9	76.8	F	II	-	" "
17	12.4	9.7	39.9	M	II	-	" "
18	21.5	17.2	231.3	F	III	1.0	½ Full stomach
19.	23.3	18.3	266.5	F	III	-	Full stomach
20	18.3	14.4	128.2	M	II	-	Empty stomach
21	14.5	11.3	59.7	M	III	-	½ Full stomach
22	13.7	10.9	53.0	M	II	-	Full stomach
23	15.5	12.2	68.4	M	II	-	" "

MONTH: AUGUST 1986 SPECIES: Oreochromis niloticus Con'D

NO	TL	SL	WT	SEX	CC	WT OF EGGS	REMARKS
24	15.0	11.8	64.3	F	II	-	Full stomach
25	14.0	10.9	47.1	M	II	-	" "
26	13.2	10.4	41.1	M	II	-	Full stomach
27	12.4	9.3	37.3	M	II	-	" "

MONTH: AUGUST 1986 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	NO OF EGGS	REMARKS
28	17.5	14.2	112.9	M	III	-	½ Full stomach
29	20.7	17.1	158.5	M	III	-	" "
30	19.5	15.0	155.8	M	II	-	Empty stomach
31	19.8	15.4	153.5	M	II	-	" "
32	19.5	15.2	152.4	F	II	-	" "
33	18.8	14.6	120.7	M	II	-	" "
34	15.2	12.1	66.5	F	II	-	½ Full stomach
35	16.5	12.9	65.9	M	II	-	Empty stomach
36	16.0	12.6	77.2	M	II	-	½ Full stomach
37	17.9	14.0	97.1	M	II	-	Empty stomach
38	15.4	12.0	65.6	F	II	-	" "
39	15.0	11.8	54.1	F	IV	6.0	" "
40	13.8	10.6	46.3	F	II	-	¼ Full stomach
41	14.2	11.0	52.7	F	II	-	" "
42	13.9	10.6	44.2	F	II	-	Empty stomach
43	14.0	11.0	47.3	M	II	-	" "
44	18.8	14.4	110.0	M	II	-	" "
45	19.5	14.9	110.0	M	II	-	" "
46	16.1	12.2	75.0	F	II	-	" "
47	15.9	12.2	66.0	F	III	2.5	" "
48	13.0	10.3	46.0	F	II	-	" "
49	18.6	14.5	111.0	M	III	-	" "
50	18.7	14.4	113.0	M	II	-	" "
51	19.7	15.6	139.0	M	III	-	Full stomach
52	16.2	12.5	80.3	M	III	-	½ Full stomach
53	16.2	12.3	74.8	M	II	-	" "

MONTH: AUGUST 1986 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
54	15.6	12.8	126.2	M	III	-	½ Full stomach
55	16.3	12.7	78.6	F	IV	5.0	Empty stomach
56	13.0	10.0	41.5	M	II	-	Full stomach
57	14.0	10.8	51.2	F	II	-	" "
58	14.0	10.6	49.6	M	II	-	" "
59	15.4	12.1	59.7	M	II	-	" "
60	15.3	11.9	63.4	M	II	-	" "

MONTH: SEPTEMBER 1986 SPECIES Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF ECGS	REMARKS
61	19.5	17.6	156.0	F	III	2.0	Full stomach
62	11.2	11.1	63.0	M	II	-	" "
63	18.5	14.5	125.0	F	IV	1.0	" "
64	17.1	13.4	95.0	M	II	-	Full stomach
65	18.3	14.1	125.0	F	III	2.0	" "
66	11.3	11.2	65.0	M	II	-	Empty stomach
67	15.2	12.0	75.0	F	II	-	Full stomach
68	17.0	13.6	145.0	F	III	-	Empty stomach
69	13.6	11.0	55.0	M	II	-	" "
70	18.5	14.4	110.0	F	III	3.0	Full stomach
71	16.5	14.4	110.0	F	III	-	" "
72	15.1	11.8	75.0	F	III	-	Empty stomach
73	17.3	13.3	100.0	M	II	-	Full stomach
74	17.4	13.5	95.0	F	III	2.5	" "
75	17.3	13.5	100.0	M	III	-	" "
76	17.9	14.2	110.0	F	III	-	" "
77	11.8	9.1	35.0	F	II	-	" "
78	15.8	12.4	75.0	F	III	-	" "
79	18.3	14.4	105.0	F	III	-	" "
80	16.0	12.9	90.0	M	II	-	" "
81	15.5	12.0	75.0	M	III	-	" "
82	15.0	11.6	60.0	M	II	-	Full stomach
83	15.5	12.3	75.0	M	II	-	" "
84	11.8	9.1	35.0	M	II	-	Empty stomach
85	12.1	9.5	35.0	M	III	-	" "
86	19.7	15.9	158.0	F	III	2.0	Full stomach

MONTH: SEPTEMBER 1986 SPECIES: Oreochromis niloticus

NO	TI	SL	WT	SEX	GC	WT OF EGGS	REMARKS
87	14.4	11.3	64.0	M	II	-	Full stomach
88	19.0	15.0	128.0	F	IV	5.3	" "
89	17.1	13.4	95.0	M	II	-	" "
90	16.8	14.3	126.0	F	III	-	Full stomach
91	14.5	11.4	66.0	M	II	-	Empty stomach
92	15.4	12.1	75.0	F	II	-	Full stomach
93	19.2	15.0	146.0	F	III	-	Empty stomach
94	14.0	11.2	57.0	M	II	-	" "
95	18.6	14.4	110.0	F	III	2.5	Full stomach
96	18.5	14.5	125.0	M	II	-	Full stomach
97	15.3	12.1	97.0	F	III	1.3	Empty stomach
98	17.3	13.4	101.0	M	II	-	Full stomach
99	17.5	13.6	95.0	F	III	-	" "
100	17.3	13.5	100.0	M	III	-	" "

MONTH: SEPTEMBER 1986 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
101	15.8	12.2	90.0	M	III	-	Full stomach
102	17.4	13.6	110.0	M	IV	-	" "
103	15.5	11.8	65.0	F	III	2.0	Empty stomach
104	13.8	10.6	60.0	M	III	-	" "
105	14.2	11.0	60.0	M	II	-	" "
106	14.5	11.2	55.0	F	IV	4.5	" "
107	14.3	11.2	70.0	M	III	-	" "
108	12.7	9.8	42.0	M	II	-	" "
109	12.7	9.4	36.0	F	III	-	" "
110	12.0	9.1	40.0	M	II	-	" "
111	15.8	12.3	91.0	M	III	-	Full stomach
112	17.6	13.8	112.0	M	IV	-	" "
113	15.7	12.0	66.0	F	III	-	" "
114	14.0	10.8	61.0	M	III	-	Full stomach
115	14.2	11.0	61.0	M	II	-	" "
116	14.7	11.5	55.0	F	IV	3.5	Empty stomach
117	14.3	11.2	70.0	M	II	-	" "
118	13.0	10.0	42.0	M	II	-	" "
119	12.7	9.5	36.0	F	III	-	" "
120	12.2	9.3	40.0	M	II	-	" "
121	18.8	15.2	93.0	M	III	-	Full stomach
122	20.4	16.6	113.0	M	III	-	" "
123	18.5	14.8	68.0	F	III	-	" "
124	16.8	13.6	63.0	M	III	-	" "
125	17.2	14.0	16.0	M	II	-	½ Full stomach

MONTH: OCTOBER 1986 SPECIES: Creochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
126	15.9	12.4	75.0	M	II	-	Empty stomach
127	16.3	12.6	80.5	M	II	-	" "
128	17.6	13.4	105.1	M	II	-	" "
129	16.1	12.4	85.3	M	III	-	" "
130	15.5	12.3	74.9	M	II	-	¾ full stomach
131	17.9	13.4	110.5	F	II	-	Full stomach
132	18.4	14.0	134.5	F	III	1.5	" "
133	15.8	12.2	80.6	M	II	-	" "
134	17.6	13.9	110.2	F	II	-	" "
135	19.0	14.8	135.5	F	II	-	" "
136	15.3	12.1	81.0	F	III	-	Full stomach
137	18.8	14.5	125.0	F	III	2.0	" "
138	15.9	12.1	80.5	M	II	-	" "
139	16.9	13.0	85.5	M	II	-	½ full stomach
140	15.9	12.4	75.2	F	III	-	" "
141	17.1	13.2	96.0	M	III	-	" "
142	16.4	12.8	84.0	M	III	-	Full stomach
143	13.8	10.6	46.0	F	III	1.5	Empty stomach
144	16.7	12.9	84.9	F	III	1.5	" "
145	15.0	11.4	74.9	M	II	-	Empty stomach
146	16.2	12.5	86.0	M	II	-	" "
147	16.9	13.4	78.0	M	II	-	" "
148	19.3	15.6	83.5	M	II	-	" "
149	20.6	16.4	108.1	M	II	-	" "
150	19.1	15.4	88.3	M	III	-	" "
151	18.5	15.3	77.9	M	II	-	¼ full stomach

MONTH: OCTOBER 1986 SPECIES: Creochromis niloticus Con'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
152	20.9	16.4	113.5	F	II	-	½ full stomach
153	21.4	17.0	137.5	F	III	-	Full stomach
154	18.7	15.2	83.6	M	II	-	" "
155	20.8	15.2	83.6	M	II	-	" "
156	22.0	17.8	138.8	F	II	-	" "
157	18.3	15.1	84.0	F	III	-	" "
158	21.8	17.5	128.0	F	III	1.3	¼ full stomach
159	18.9	15.1	83.5	M	II	-	½ full stomach
160	19.1	16.0	88.5	M	II	-	" "
161	18.9	15.4	78.2	F	III	-	Full stomach
162	20.1	16.2	99.0	M	III	-	" "
163	19.4	15.8	87.0	M	III	-	" "
164	16.8	13.6	49.0	F	III	-	Empty stomach
165	19.7	15.9	87.9	F	III	1.5	" "
166	18.0	14.4	77.9	M	II	-	" "
167	18.0	14.4	77.9	M	II	-	" "
168	19.2	15.5	89.0	M	II	-	" "
169	15.6	12.4	75.0	M	II	-	" "
170	16.3	12.6	80.5	M	II	-	" "
171	17.6	13.4	105.1	M	II	-	" "

MONTH: OCTOBER 1986 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
172	18.8	14.8	133.0	M	II	-	Empty stomach
173	18.5	14.6	124.9	F	III	-	" "
174	18.5	14.4	125.5	F	III	1.6	" "
175	19.9	15.4	145.5	M	III	-	" "
176	18.5	14.1	114.0	M	III	-	" "
177	17.7	13.9	110.0	F	III	3.0	" "
178	16.0	12.5	86.0	F	IV	4.5	" "
179	18.2	14.5	125.0	F	IV	6.5	" "
180	18.4	14.0	114.9	M	III	-	" "
181	18.5	14.5	130.0	F	IV	4.3	½ full stomach
182	16.8	13.1	84.9	M	II	-	" "
183	17.9	14.6	131.0	M	III	-	¾ full stomach
184	17.7	14.6	122.0	M	III	-	Full stomach
185	16.2	12.7	89.0	F	IV	6.3	Empty stomach
186	15.1	11.8	72.0	F	II	-	¼ full stomach
187	15.2	11.8	70.0	F	IV	5.0	Empty stomach
188	16.0	12.6	87.5	F	IV	3.5	¼ full stomach
189	15.4	12.1	77.5	F	IV	2.5	Empty stomach
190	15.0	11.9	72.0	M	II	-	" "
191	14.7	11.6	63.8	M	II	-	" "
192	13.5	10.5	43.0	F	II	-	¼ full stomach
193	16.2	13.0	74.9	M	II	-	Empty stomach
194	21.8	17.8	136.0	M	II	-	" "
195	21.5	17.6	126.0	F	III	-	Full stomach
196	21.5	17.4	127.0	F	III	-	" "
197	22.9	17.4	147.5	M	III	-	" "

MONTH: OCTOBER 1986 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
198	21.5	17.1	117.0	M	III	-	Full stomach
199	20.7	16.9	112.0	F	III	1.2	" "
200	19.0	15.5	88.5	F	IV	4.6	Empty stomach
201	20.2	17.2	127.0	F	IV	4.3	" "
202	21.4	17.0	116.9	M	III	-	½ full stomach
203	21.5	17.5	132.5	F	IV	3.0	Empty stomach
204	19.8	16.1	97.9	M	II	-	Full stomach
205	21.9	17.6	133.0	M	III	-	" "
206	21.7	17.6	123.0	M	III	-	" "
207	19.2	15.7	92.0	F	IV	3.0	½ full stomach
208	18.1	13.9	73.9	F	II	-	Empty stomach

MONTH: NOVEMBER 1986 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
209	17.3	13.5	84.0	M	II	-	Empty stomach
210	18.3	14.3	114.9	F	III	-	" "
211	15.5	12.5	50.0	M	II	-	¼ full stomach
212	13.3	10.1	44.0	M	II	-	Full stomach
213	15.5	11.7	73.0	M	II	-	½ full stomach
214	14.3	10.9	46.0	M	II	-	" "
215	19.0	15.3	155.0	F	III	-	" "
216	17.7	13.7	97.5	F	III	-	Full stomach
217	16.3	12.3	85.0	M	II	-	" "
218	18.8	14.5	140.0	F	III	1.2	" "
219	16.0	12.6	75.5	F	III	2.0	Empty stomach
220	17.4	14.5	115.0	F	III	-	" "
221	15.5	11.8	61.0	M	II	-	Full stomach
222	15.5	12.0	56.0	M	II	-	¼ full stomach
223	15.5	11.8	60.0	M	II	-	" "
224	19.9	15.3	150.0	F	II	-	Empty stomach
225	16.0	12.6	81.0	F	II	-	" "
226	14.1	11.0	46.5	M	II	-	" "
227	18.6	14.7	105.0	F	II	-	½ full stomach
228	18.0	14.0	110.0	F	II	-	" "
229	15.5	11.7	59.0	M	II	-	" "
230	17.3	13.5	110.0	M	II	-	Empty stomach
231	18.0	13.6	110.0	F	II	-	" "
232	15.4	11.7	56.0	M	II	-	¼ full stomach
233	19.9	15.3	153.0	F	III	-	Empty stomach
234	17.0	13.1	90.0	M	II	-	" "

MONTH: NOVEMBER 1986 SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
235	15.7	12.1	59.0	F	II	-	Empty stomach
236	21.7	16.1	175.0	F	III	2.3	" "
237	18.4	14.5	120.0	M	III	-	" "
238	15.7	12.2	60.0	M	II	-	½ full stomach
239	20.7	16.1	175.0	F	III	-	Empty stomach
240	18.5	14.5	120.0	M	III	-	" "
241	15.7	12.2	60.0	M	II	-	½ full stomach
242	16.3	12.6	70.0	F	II	-	Full stomach
243	17.5	13.5	90.0	F	III	-	" "
244	15.0	11.1	64.0	M	II	-	" "
245	17.5	13.6	110.0	F	III	-	" "
246	16.8	13.0	94.9	M	II	-	Full stomach
247	16.9	13.1	87.0	M	II	-	Empty stomach
248	15.3	12.0	65.0	M	II	-	Full stomach
249	14.6	11.3	50.0	M	II	-	" "
250	14.2	10.9	50.0	M	II	-	" "
251	15.3	11.8	56.0	M	II	-	" "
252	14.7	11.3	50.0	F	III	-	Full stomach
253	13.9	10.9	30.0	M	II	-	½ full stomach
254	15.9	12.9	54.9	M	II	-	Full stomach
255	14.5	11.0	43.0	M	II	-	" "
256	13.4	10.3	37.0	M	II	-	½ full stomach

MONTH: NOVEMBER 1986 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GS	WT OF EGGS	REMARKS
257	19.5	15.0	108.0	F	II	-	Empty stomach
258	17.8	13.8	120.0	F	III	-	" "
259	17.6	13.5	113.0	F	II	-	½ full stomach
260	17.1	13.5	106.0	F	III	-	" "
261	17.5	13.4	105.0	F	II	-	Empty stomach
262	17.5	13.4	119.0	F	II	-	" "
263	15.5	12.0	75.0	M	II	-	½ full stomach
264	15.2	11.8	75.0	M	III	-	Empty stomach
265	14.8	11.3	75.0	M	II	-	½ full stomach
266	15.7	12.2	84.0	M	II	-	Empty stomach
267	19.6	14.9	105.0	F	II	-	" "

MONTH: DECEMBER 1986 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
268	21.1	16.6	173.9	F	II	-	Empty stomach
269	20.6	16.1	167.4	F	II	-	Full stomach
270	19.6	15.3	138.0	F	II	-	" "
271	24.1	18.5	171.0	M	II	-	" "
272	24.0	18.4	226.2	F	III	3.6	¾ full stomach
273	18.2	14.0	101.5	M	III	-	Empty stomach
274	19.5	14.8	142.0	M	II	-	" "
275	19.7	15.1	147.3	M	II	-	¼ full stomach
276	21.7	16.6	189.8	F	II	-	½ full stomach
277	21.0	15.7	148.7	M	II	-	Full stomach
278	19.5	15.0	139.0	M	II	-	" "
279	20.5	15.6	150.0	M	II	-	½ full stomach
280	21.0	16.0	164.0	M	III	-	" "
281	16.6	12.5	76.5	M	II	-	" "
282	18.7	14.5	106.0	M	II	-	½ full stomach
283	16.8	12.7	76.8	F	II	-	½ full stomach
284	12.6	19.8	40.0	M	II	-	" "
285	17.9	13.3	113.0	F	III	-	" "
286	20.8	16.2	158.5	F	II	-	Empty stomach
287	19.9	15.2	155.8	M	II	-	" "
288	19.9	15.4	154.0	M	II	-	" "
289	19.5	15.2	152.5	F	II	-	" "
290	18.8	14.6	120.8	M	II	-	½ full stomach
291	15.3	12.2	86.5	F	II	-	Empty stomach
292	16.5	13.0	85.9	M	II	-	" "
293	16.0	12.6	77.3	M	II	-	¾ full stomach

MONTH: DECEMBER 1986 SPECIES: Oreochromis niloticus Cont'd

NO	TL	SL	WT	SEX	WT OF EGGS		REMARKS
294	16.0	12.6	77.4	M	II	-	½ full stomach
295	15.5	12.2	65.7	F	II	-	Empty stomach
296	15.3	11.9	55.2	F	III	-	" "
297	13.4	10.7	47.2	F	II	-	" "
298	14.4	11.9	53.1	F	II	-	" "
299	14.0	11.9	53.0	F	II	-	Empty stomach
300	14.0	10.7	44.4	F	II	-	" "
301	14.2	11.0	49.5	M	II	-	Full stomach
302	18.8	14.4	110.0	M	III	-	½ full stomach
303	19.8	15.0	110.0	F	II	-	" "
304	16.2	12.3	75.2	F	II	-	Empty stomach
305	15.9	12.3	67.0	F	III	-	" "
306	15.0	11.5	56.0	F	II	-	" "
307	13.5	10.5	46.0	F	III	-	" "

MONTH: DECEMBER 1986 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
308	16.6	15.7	156.0	F	III	1.3	Full stomach
309	18.5	14.5	125.0	F	III	-	" "
310	14.2	11.1	63.0	M	II	-	" "
311	17.2	13.6	96.0	M	II	-	" "
312	16.5	14.2	125.0	F	III	-	" "
313	15.6	12.0	70.0	M	II	-	Empty stomach
314	14.5	11.3	65.0	M	II	-	Full stomach
315	15.3	12.0	75.0	F	II	-	" "
316	19.2	14.9	146.0	F	III	-	Empty stomach
317	13.8	11.0	55.0	M	II	-	" "
318	18.6	14.6	110.0	F	III	2.0	Full stomach
319	18.6	14.5	125.0	M	II	-	" "
320	15.2	11.9	76.0	F	III	1.5	Empty stomach
321	17.4	13.4	100.0	M	II	-	Full stomach
322	17.5	13.8	95.0	F	III	-	" "
323	17.3	13.5	100.0	M	III	-	" "
324	18.0	14.3	110.5	F	III	-	Full stomach
325	11.9	9.1	35.0	F	II	-	" "
326	15.2	12.5	75.0	F	III	-	" "
327	18.4	14.5	105.0	F	III	2.0	" "
328	16.0	12.5	90.0	M	II	-	Full stomach
329	15.6	12.1	75.0	M	III	-	" "
330	15.1	11.6	63.0	M	II	-	" "
331	15.5	12.7	75.2	M	II	-	" "
332	11.8	9.1	35.0	M	II	-	Empty stomach
333	12.2	9.7	37.0	M	III	-	" "

MONTH: DECEMBER 1986 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
334	16.0	12.3	90.0	M	III	-	Full stomach
335	17.4	13.5	110.0	M	IV	-	" "
336	14.5	12.0	65.2	F	III	-	Empty stomach
337	13.8	10.7	60.2	M	III	-	Full stomach
338	14.3	11.0	60.1	M	II	-	" "
339	14.6	11.3	70.0	M	III	-	" "
340	14.3	11.2	70.0	M	III	-	" "
341	12.7	10.0	43.0	M	II	-	" "
342	12.7	9.4	36.0	F	III	-	" "
343	13.0	10.1	40.5	M	II	-	Full stomach
344	15.8	12.5	75.0	M	II	-	" "
345	16.4	12.4	80.5	M	II	-	" "
346	17.4	13.5	106.2	M	II	-	" "
347	16.2	12.4	85.3	M	II	-	" "

MONTH: JANUARY 1987 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
348	19.5	14.7	141.0	F	IV	5.6	Full stomach
349	20.0	15.5	163.0	F	III	-	Empty stomach
350	18.5	14.7	140.0	F	II	-	½ full stomach
351	21.0	16.0	157.5	M	III	-	Empty stomach
352	19.5	15.2	160.0	M	III	-	" "
353	21.0	16.5	219.0	F	IV	5.0	" "
354	14.5	11.5	61.5	F	III	-	" "
355	18.9	14.2	132.5	M	II	-	" "
356	18.9	14.7	144.8	M	II	-	" "
357	14.5	11.3	56.2	F	IV	3.5	½ full stomach
358	22.5	17.7	183.0	F	III	-	Full stomach
359	23.0	18.5	165.0	F	III	-	Empty stomach
360	21.0	17.7	142.0	F	II	-	½ full stomach
361	24.0	19.0	159.0	M	III	-	Empty stomach
362	22.5	17.9	161.9	M	III	-	" "
363	24.0	19.8	220.5	F	IV	3.7	" "
364	17.5	14.5	64.5	F	III	-	" "
365	21.9	17.2	134.0	M	II	-	" "
366	21.5	17.7	143.5	M	II	-	" "
367	14.5	11.3	52.2	F	IV	4.5	½ full stomach
368	18.3	14.5	85.0	M	III	-	Empty stomach
369	19.3	15.3	115.5	F	III	-	Empty stomach
370	16.5	11.5	51.0	M	III	-	" "
371	14.3	11.1	45.0	M	III	-	" "
372	16.5	12.7	73.0	M	III	-	½ full stomach
373	15.3	11.9	47.0	M	II	-	Empty stomach

MONTH: JANUARY 1987 SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
374	16.5	13.7	74.0	M	II	-	Empty stomach
375	20.0	16.3	156.0	F	III	-	½ full stomach
376	18.7	15.7	98.5	F	III	2.5	Empty stomach
377	17.3	14.7	98.5	F	III	-	" "
378	18.3	14.3	87.0	M	II	-	" "

MONTH: JANUARY 1987 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
379	16.5	12.6	85.5	M	III	-	Empty stomach
380	18.8	14.6	141.8	M	III	-	Full stomach
381	17.1	13.0	110.9	F	IV	4.2	½ full stomach
382	17.0	13.3	99.2	M	III	-	¾ full stomach
383	17.7	13.3	113.0	M	III	-	½ full stomach
384	15.2	11.9	74.5	M	III	-	Empty stomach
385	14.0	10.7	67.2	F	II	-	" "
386	14.8	11.2	64.5	F	II	-	" "
387	10.0	13.8	128.0	M	III	-	" "
388	16.0	12.4	97.0	M	III	-	" "
389	12.0	11.0	44.2	F	II	-	" "
390	10.5	8.1	23.0	M	II	-	" "
391	12.1	9.3	34.5	M	II	-	" "
392	11.5	8.9	28.0	M	II	-	" "
393	12.2	9.7	36.0	F	III	-	" "
394	19.5	15.3	97.5	M	III	-	Empty stomach
395	21.8	17.6	144.0	M	III	-	Full stomach
396	20.1	16.0	112.0	F	IV	3.5	¾ full stomach
397	20.0	16.3	102.7	M	III	-	¾ full stomach
398	20.7	16.3	76.0	M	III	-	Empty stomach
399	18.2	14.9	76.0	M	III	-	" "
400	17.0	14.2	66.5	F	III	-	" "
401	17.8	14.2	65.0	F	III	-	Empty stomach
402	21.0	16.8	131.0	M	III	-	" "
403	19.0	15.4	99.0	M	III	-	" "
404	16.0	14.6	46.1	F	II	-	" "

MONTH: JANUARY 1987 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
405	13.5	11.1	24.5	M	II	-	Empty stomach
406	12.1	12.3	35.6	M	II	-	" "
407	12.5	11.9	31.2	M	II	-	Empty stomach
408	13.2	12.7	39.0	F	III	-	" "
409	12.9	11.4	27.0	F	II	-	" "
410	15.5	12.7	37.5	M	II	-	" "
411	15.8	12.5	48.0	F	III	-	½ full stomach
412	14.2	13.5	36.5	M	II	-	Empty stomach

MONTH: FEBRUARY SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
413	20.0	15.0	142.0	F	IV	4.5	Full stomach
414	20.5	15.5	163.5	F	III	-	Empty stomach
415	18.0	13.9	138.5	F	II	-	½ full stomach
416	21.0	16.6	157.5	M	III	-	Empty stomach
417	20.0	16.0	162.0	M	III	-	" "
418	14.5	11.5	61.5	F	III	-	" "
419	21.5	17.5	221.5	F	IV	5.6	" "
420	18.9	14.2	132.8	M	II	-	" "
421	18.9	14.7	144.8	M	II	-	" "
422	15.5	12.3	57.2	F	IV	3.2	½ full stomach
423	23.5	18.7	143.0	F	III	3.2	Full stomach
424	24.0	19,5	166.0	F	III	-	Empty stomach
425	22.0	18.7	143.0	F	II	-	½ full stomach
426	25.0	20.0	160.0	M	III	-	" "
427	22.5	18.9	162.9	M	III	-	Empty stomach
428	25.0	20.6	221.5	F	IV	4.7	" "
429	18.5	15.5	65.5	F	III	-	" "
430	22.9	18.0	134.5	M	II	-	Empty stomach
431	22.5	18.7	144.5	M	II	-	" "
432	19.5	16.3	55.2	F	IV	6.5	½ full stomach
433	23.3	19.5	87.0	M	III	-	Empty stomach
434	24.3	19.3	117.5	F	III	-	" "
435	20.5	16.5	54.0	M	III	-	" "
436	19.3	16.1	47.0	M	III	-	" "
437	21.5	17.7	72.0	M	III	-	½ full stomach

MONTH: FEBRUARY SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
438	20.3	16.9	49.0	M	II	-	Empty stomach
439	21.5	17.7	76.0	M	II	-	" "
440	25.5	21.6	157.0	F	III	-	½ full stomach
441	23.7	19.7	100.5	F	III	2.5	Empty stomach
442	22.3	19.7	100.5	F	III	-	" "
443	23.3	19.3	89.0	M	II	-	" "
444	14.3	11.3	113.5	F	III	-	" "
445	11.5	6.5	49.0	M	IIII	-	" "
446	11.3	9.1	43.0	M	II	-	" "
447	11.5	9.7	68.0	M	III	-	½ full stomach
448	10.3	8.9	45.0	M	II	-	Full stomach
449	11.5	8.7	72.0	M	II		" "
450	15.5	11.3	114.0	F	III	-	" "
451	12.7	9.7	96.5	F	III	2.5	" "
452	12.3	9.7	96.5	F	III	-	" "
453	15.3	9.3	85.0	M	II	-	Full stomach

MONTH: FEBRUARY 1987 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
454	21.5	17.6	87.5	M	III	-	Empty stomach
455	23.5	21.6	143.8	M	III	-	Full stomach
456	21.1	18.0	112.9	F	IV	3.9	½ full stomach
457	22.0	18.3	99.2	M	III	-	½ full stomach
458	22.7	18.3	111.0	M	III	-	½ full stomach
459	20.2	16.9	76.5	M	III	-	Empty stomach
460	19.0	15.7	65.2	F	II	-	Empty stomach
461	19.8	16.2	62.5	F	II	-	" "
462	23.0	19.6	106.0	M	III	-	" "
463	21.0	17.4	95.0	M	III	-	" "
464	19.0	16.0	42.2	F	II	-	" "
465	17.5	15.1	21.0	M	II	-	" "
466	17.1	15.3	32.5	M	II	-	" "
467	16.1	13.9	26.0	M	II	-	" "
468	15.2	14.7	34.0	F	III	-	" "
469	24.5	20.3	85.5	M	III	-	" "
470	26.8	22.6	142.0	M	III	-	Full stomach
471	25.7	21.0	110.0	F	IV	3.5	½ full stomach
472	25.0	21.3	100.3	M	III	-	½ full stomach
473	25.7	19.9	78.2	M	III	-	Empty stomach
474	23.2	19.2	78.2	M	III	-	" "
475	22.0	19.2	68.5	F	III	-	" "
476	26.0	21.8	67.0	F	III	-	" "
477	22.8	19.4	133.0	M	III	-	Empty stomach
478	24.0	19.6	121.0	M	III	-	" "

MONTH: FEBRUARY 1987 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF ECGS	REMARKS
479	21.0	16.1	48.1	F	II	-	Empty stomach
480	18.5	17.3	96.5	M	II	-	" "
481	18.1	17.9	102.0	M	II	-	" "
482	19.5	17.7	67.0	M	II	-	Empty stomach
483	20.2	16.2	68.0	F	III	-	" "
484	17.9	12.7	39.0	M	II	-	" "

MONTH: MARCH 1987 SPECIES: Oreochromis niliticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
485	21.5	17.2	231.2	F	III	1.0	½ full stomach
486	23.?	1?.3	266.5	F	III	-	Full stomach
487	1?.3	14.4	128.2	M	II	-	Empty stomach
488	14.5	11.3	59.7	M	III	-	½ full stomach
489	13.7	1?.9	53.0	M	II	-	Empty stomach
490	13.2	10.4	47.1	M	II	-	Empty stomach
491	13.0	9.8	37.3	M	II		" "
492	13.2	10.7	49.1	M	II	-	" "
493	14.6	11.5	62.2	M	II	-	" "
494	1?.0	14.1	127.0	M	III	-	" "
495	14.1	11.3	51.2	M	II	-	" "
496	13.7	10.9	53.0	M	II	-	" "
497	15.1	11.9	68.2	M	II	-	" "
498	13.7	10.6	46.8	M	III	-	" "
499	13.0	10.2	46.5	M	II	-	" "
500	15.5	12.2	68.4	M	II	-	Empty stomach
501	15.0	11.3	64.3	F	II	-	" "
502	14.0	10.9	47.1	M	II	-	" "
503	13.2	10.4	47.1	M	II	-	" "
504	13.0	9.8	37.3	M	II	-	" "
505	13.2	10.7	49.1	M	II	-	" "
506	14.6	11.5	62.2	M	II	-	" "
507	21.2	16.8	230.0	F	III	2.5	Full stomach
508	23.0	18.2	266.0	F	III	-	" "
509	18.0	14.1	127.0	M	II	-	" "

MONTH: MARCH 1987 SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
510	14.1	11.3	59.2	M	III	-	½ full stomach
511	13.7	10.9	53.0	M	II	-	" "
512	15.1	11.9	68.2	M	II	-	Empty stomach
513	15.0	11.4	63.3	F	III	-	" "
514	13.7	10.6	46.8	M	II	-	" "
515	13.0	10.2	40.5	M	II	-	" "
516	12.0	9.8	37.3	M	II	-	" "
517	12.9	10.0	47.2	M	II	-	" "
518	14.6	11.5	62.2	M	II	-	" "
519	19.7	15.6	159.0	M	III	-	" "
520	16.2	12.5	80.3	M	III	-	" "
521	16.2	12.3	74.8	M	II	-	" "
522	19.6	14.8	126.2	M	III	-	½ full stomach
523	16.3	12.7	78.6	F	III	5.0	" "
524	14.0	10.8	51.2	F	III	-	Full stomach
525	14.0	10.8	49.6	M	II	-	" "
526	15.4	12.1	59.7	M	II	-	½ full stomach
527	15.3	11.9	63.4	M	II	-	" "
528	15.3	11.9	61.1	F	III	1.0	Empty stomach
529	14.3	11.1	53.3	M	III	-	" "

MONTH: MARCH 1987 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
530	19.4	15.2	138.5	M	III	-	Empty stomach
531	15.6	11.9	80.0	M	III	-	¼ full stomach
532	15.8	11.8	74.0	M	II	-	Empty stomach
533	19.0	14.2	125.5	M	III	-	¼ full stomach
534	16.0	12.4	78.0	F	III	5.0	Empty stomach
535	12.8	9.8	41.8	M	II	-	" "
536	14.6	11.3	51.5	F	II	-	" "
537	14.5	11.3	51.3	M	II	-	" "
538	15.2	11.9	59.5	M	II	-	" "
539	15.0	10.7	62.0	M	II	-	" "
540	14.3	10.9	60.1	F	III	1.0	" "
541	14.3	11.1	53.3	M	III	-	" "
542	13.5	10.5	44.1	M	II	-	" "
543	13.5	10.5	43.1	M	II	-	" "
544	13.0	10.0	41.5	M	II	-	" "
545	13.5	10.4	46.3	F	II	-	" "
546	19.7	15.6	139.0	M	III	-	Full stomach
547	16.2	12.5	80.3	M	III	-	" "
548	19.6	14.8	126.2	M	III	-	½ full stomach
549	16.3	12.7	78.6	F	III	4.5	" "
550	13.0	10.0	41.5	M	II	-	" "
551	14.0	10.8	51.2	F	II	-	" "
552	14.0	10.8	49.6	M	II	-	" "
553	15.4	12.1	59.7	M	II	-	½ full stomach
554	15.3	11.9	63.4	M	II	-	½ full stomach

MONTH: MARCH 1987 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
555	13.3	11.9	61.1	F	III	1.0	½ full stomach
556	13.3	11.1	53.3	M	III	-	" "
557	13.0	10.0	43.9	M	II	-	Empty stomach
558	13.0	10.0	42.0	M	II	-	" "
559	13.3	10.5	41.7	M	II	-	" "
560	13.6	10.6	44.4	F	II	-	" "
561	13.5	10.4	46.3	F	II	-	" "

MONTH: APRIL, 1987 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
562	26.3	21.0	381.1	F	IV	3.5	Empty stomach
563	22.2	17.7	252.0	M	II	-	" "
564	18.7	19.8	297.0	M	II	-	" "
565	21.5	16.5	169.7	M	III	-	" "
566	19.0	14.1	115.5	F	II	-	¼ full stomach
567	14.5	11.5	61.1	M	II	-	Empty stomach
568	15.0	11.3	62.0	M	II	-	½ full stomach
569	15.6	12.0	83.4	M	II	-	¼ full stomach
570	26.0	20.8	379.2	F	IV	5.0	Empty stomach
571	21.1	17.5	250.8	M	II	-	¾ full stomach
572	21.5	17.8	295.0	M	II	-	Empty stomach
573	20.5	13.5	167.9	M	III	-	" "
574	19.0	14.1	115.5	F	III	-	¼ full stomach
575	14.0	11.0	59.8	M	II	-	Empty stomach
576	14.5	12.9	61.0	M	II	-	¼ full stomach
577	15.6	12.2	81.4	M	II	-	½ full stomach
578	21.2	16.3	194.5	M	III	-	" "
579	22.7	17.4	117.2	M	III	-	Full stomach
580	20.2	15.4	136.0	M	II	-	¼ full stomach
581	18.5	14.0	121.0	M	III	-	" "
582	19.8	15.3	139.3	M	II	-	Full stomach
583	17.4	13.4	102.7	F	III	3.0	Empty stomach
584	21.2	16.2	171.9	M	III	-	" "
585	17.5	13.2	100.7	F	III	2.3	" "

MONTH: APRIL, 1987 SPECIES: Tilapia zillii

NO	TI	SI	WT	SEX	GC	WT OF EGGS	REMARKS
586	19.8	14.5	191.5	M	III	-	Full stomach
587	20.7	15.3	174.1	M	III	-	" "
588	20.1	15.0	132.0	M	II	-	½ full stomach
589	18.1	13.6	117.0	M	III	-	" "
590	19.2	14.2	133.2	M	II	-	½ full stomach
591	16.4	12.4	100.7	F	III	3.0	" "
592	19.2	14.2	169.9	M	III	-	" "
593	15.5	11.2	98.7	F	III	2.3	Full stomach
594	17.1	13.0	132.0	M	II	-	Empty stomach
595	17.6	12.7	128.0	F	III	3.5	" "
596	17.0	12.9	154.6	M	III	-	" "
597	17.1	13.5	124.7	M	II	-	" "
598	17.3	12.2	120.0	M	III	-	" "
599	14.7	11.0	101.2	M	II	-	" "
600	12.7	9.0	64.5	F	III	3.0	" "
601	12.3	11.0	59.4	F	III	1.5	" "
602	9.5	7.0	19.5	M	II	-	" "
603	21.2	16.7	194.5	M	III	-	" "
604	22.7	17.4	177.5	M	III	-	Full stomach
605	20.2	15.4	136.0	M	II	-	½ full stomach
606	18.5	14.0	121.0	M	III	-	Empty stomach
607	19.8	15.3	139.3	M	II	-	" "
608	17.4	13.4	102.7	F	III	-	½ full stomach
609	21.2	16.2	171.9	M	III	-	Empty stomach
610	17.5	13.2	100.7	F	III	2.4	" "
611	19.1	15.1	135.0	M	II	-	" "

MONTH: APRIL, 1987 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
612	19.6	15.7	13.0	F	III	3.0	½ full stomach
613	19.0	14.9	156.6	M	III	"	"
614	19.1	15.5	126.7	M	II	-	" "
615	19.3	14.2	122.0	M	III	-	" "
616	16.7	13.0	103.0	M	II	-	Empty stomach
617	15.7	12.0	67.5	F	III	5.0	" "
618	14.3	11.0	61.4	F	III	1.5	" "
619	10.5	9.0	21.7	M	II	-	Empty stomach

MONTH: MAY, 1987 SPECIES: Oreochromis niliticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
620	27.5	21.4	438.2	M	II	-	Empty stomach
621	30.0	24.0	589.1	M	II	-	" "
622	31.0	24.0	557.9	M	II	-	" "
623	18.3	14.1	138.2	F	II	-	" "
624	23.9	18.6	240.5	F	II	-	¾ full stomach
625	16.0	12.5	94.7	F	II	-	Empty stomach
626	16.0	13.0	65.5	M	II	-	¼ full stomach
627	14.5	11.5	44.6	F	II	-	" "
628	17.0	13.0	87.0	M	II	-	" "
629	14.5	11.0	54.5	M	II	-	Empty stomach
630	12.0	9.4	29.9	F	II	-	" "
631	27.9	21.3	436.0	M	II	-	½ full stomach
632	30.2	25.0	592.0	M	II	-	" "
633	29.0	26.0	508.7	M	II	-	" "
634	20.3	14.5	142.0	F	II	-	Full stomach
635	23.9	18.6	240.5	F	II	-	¾ full stomach
636	16.5	12.9	94.7	F	II	-	Empty stomach
637	16.0	13.0	65.5	F	II	-	¼ full stomach
638	15.0	11.6	45.0	F	II	-	Empty stomach
639	19.0	15.0	87.0	M	II	-	½ full stomach
640	15.6	11.2	62.0	M	II	-	Empty stomach
641	11.5	9.2	29.0	F	II	-	" "
642	21.1	16.6	173.9	F	II	-	" "
643	20.6	16.1	167.4	F	II	-	Full stomach
644	19.5	15.2	137.9	F	II	-	" "

MONTH: MAY, 1987 SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
645	24.0	18.0	170.2	M	II	-	Full stomach
646	23.6	18.4	226.2	F	III	-	½ full stomach
647	18.0	13.8	107.8	M	II	-	Empty stomach
648	19.7	15.2	141.5	M	II	-	" "
649	20.1	16.2	149.0	M	II	-	½ full stomach
650	21.7	17.6	190.2	F	II	-	Empty stomach
651	20.5	15.6	148.7	M	II	-	" "
652	19.4	15.1	138.5	M	II	-	" "
653	20.4	15.6	149.4	M	II	-	" "
654	30.2	15.9	165.0	M	III	2.1	" "
655	16.5	12.4	76.9	M	II	-	" "
656	18.7	14.5	105.4	M	III	-	½ full stomach
657	16.7	12.9	76.8	F	II	-	" "
658	12.4	9.7	39.9	M	II	-	" "
659	17.8	14.2	112.9	M	III	-	" "
660	20.7	17.2	160.2	M	III	-	" "
661	19.8	15.0	155.6	M	II	-	Empty stomach
662	19.8	15.4	153.5	M	II	-	Full stomach
663	19.5	15.2	152.4	F	II	-	" "

MONTH: MAY, 1987 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
664	2 .7	22.6	479.3	M	III	-	Empty stomach
665	22.2	17.4	223.9	F	III	3.0	" "
666	22.5	17.7	227.3	M	III	-	½ full stomach
667	20.0	16.0	154.9	F	III	2.5	Empty stomach
668	22.0	17.2	235.8	F	IV	5.2	" "
669	23.0	18.0	231.1	M	III	-	" "
670	19.0	15.0	156.1	F	III	1.2	" "
671	21.5	17.0	218.9	F	IV	8.6	" "
672	19.0	13.8	137.5	F	III	-	" "
673	14.9	11.6	58.3	F	III	-	" "
674	14.5	11.0	66.6	F	II	-	" "
675	12.5	11.0	53.7	F	II	-	" "
676	13.5	12.0	94.0	F	II	-	" "
677	30.2	23.0	460.5	M	III	-	½ full stomach
678	22.4	18.3	224.5	F	III	2.6	" "
679	22.5	17.7	230.0	M	III	-	½ full stomach
680	23.5	19.6	232.0	M	III	-	" "
681	19.5	15.5	152.0	F	III	2.5	" "
682	22.5	18.0	240.0	F	IV	5.2	" "
683	19.0	15.0	156.1	F	III	1.2	" "
684	21.7	18.0	220.0	F	IV	8.5	" "
685	19.0	13.8	137.5	F	III	-	Full stomach
686	14.9	11.6	58.3	F	III	-	" "
687	14.7	11.2	66.8	F	II	-	Empty stomach
688	12.5	11.0	53.7	F	II	-	" "

MONTH: MAY, 1967 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
689	13.5	12.0	94.6	F	II	-	Empty stomach
690	15.3	13.6	120.7	M	II	-	½ full stomach
691	13.0	12.1	66.5	F	II	-	Empty stomach
692	14.5	12.9	85.9	M	II	-	" "
693	16.0	12.6	77.2	M	II	-	¾ full stomach
694	17.9	14.0	97.1	M	II	-	Empty stomach
695	15.4	12.0	65.6	F	II	-	" "
696	15.0	11.8	54.1	F	IV	6.0	" "
697	13.8	10.6	46.3	F	II	-	¾ full stomach
698	14.2	11.0	52.7	F	II	-	Empty stomach
699	13.4	10.6	44.2	F	II	-	" "
700	14.0	11.0	47.3	M	II	-	" "
701	20.0	15.0	110.9	M	III	-	" "
702	19.7	15.2	111.2	M	II	-	" "
703	16.3	12.5	75.2	F	II	-	" "
704	16.0	12.4	66.2	F	III	-	" "
705	14.9	11.5	56.5	F	II	-	" "
706	13.0	10.3	48.2	F	III	-	" "
707	18.6	14.7	111.6	M	III	-	Empty stomach
708	19.5	15.6	162.0	F	III	-	Full stomach
709	14.4	11.2	63.2	M	II	-	" "
710	18.7	14.8	125.2	F	IV	4.3	" "
711	17.3	13.7	95.4	M	II	-	Full stomach

MONTH: JUNE, 1987 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
712	30.0	22.5	439.0	M	II	-	Empty stomach
713	27.8	21.4	593.0	F	II	-	" "
714	31.1	24.2	569.0	M	II	-	" "
715	17.5	13.9	140.0	F	II	-	" "
716	24.0	18.0	235.0	F	II	-	¼ full stomach
717	16.5	12.0	100.0	F	II	-	Empty stomach
718	16.0	13.0	65.5	M	II	-	½ full stomach
719	15.0	12.0	50.0	F	II	-	" "
720	17.2	13.2	87.0	M	II	-	" "
721	13.5	10.0	54.0	M	II	-	Empty stomach
722	12.0	9.4	29.5	F	II	-	" "
723	30.0	22.5	425.9	M	II	-	½ full stomach
724	29.5	25.2	580.5	M	II	-	" "
725	25.0	20.0	501.6	M	II	-	" "
726	20.3	14.5	139.0	F	II	-	Full stomach
727	23.5	18.4	238.6	F	II	-	¼ full stomach
728	16.0	12.4	93.0	F	II	-	Empty stomach
729	15.5	12.5	63.2	F	II	-	¼ full stomach
730	14.5	11.1	43.2	F	II	-	Empty stomach
731	18.5	14.5	83.9	M	II	-	½ full stomach
732	15.1	10.8	60.0	M	II	-	Empty stomach
733	11.0	8.6	29.0	F	II	-	" "
734	20.7	16.1	172.5	F	II	-	" "
735	19.0	14.8	135.0	F	II	-	Full stomach
736	20.8	16.1	170.0	F	II	-	" "
737	19.0	14.8	136.0	F	II	-	" "

MONTH: JUNE, 1987 SPECIES: Oreochromis niloticus Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
738	20.0	14.0	168.3	M	III	-	Full stomach
739	19.5	18.0	220.5	F	III	-	½ full stomach
740	17.5	13.3	104.9	M	II	-	Empty stomach
741	16.2	12.6	141.5	M	II	-	" "
742	16.5	15.7	145.0	M	II	-	½ full stomach
743	19.5	17.1	183.0	F	II	-	Full stomach
744	20.0	15.1	146.5	M	II	-	" "
745	16.9	14.5	135.6	M	II	-	" "
746	20.0	15.1	136.0	M	II	-	Full stomach

MONTH: JUNE, 1967 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
747	23.2	18.3	476.0	M	III	-	Empty stomach
748	19.5	16.9	220.9	F	III	3.0	" "
749	22.1	17.2	226.0	M	III	-	½ full stomach
750	22.5	17.5	230.0	M	III	-	Empty stomach
751	19.5	15.5	153.0	F	III	2.5	" "
752	19.5	16.4	233.6	F	IV	5.0	" "
753	16.5	14.5	155.1	F	III	2.0	" "
754	21.0	16.5	218.0	F	IV	9.5	" "
755	16.5	13.3	137.0	F	III	-	" "
756	14.4	11.1	57.5	F	II	-	Empty stomach
757	14.0	10.5	68.0	F	II	-	Empty stomach
758	12.5	11.0	53.7	F	II	-	" "
759	13.0	11.5	93.9	F	II	-	" "
760	25.5	22.5	468.2	M	II	-	½ full stomach
761	21.9	17.2	224.9	F	III	3.0	" "
762	22.4	17.6	225.8	M	III	-	" "
763	23.0	19.0	231.2	M	III	-	" "
764	19.0	15.0	150.8	F	III	3.2	" "
765	22.5	17.5	235.0	F	IV	6.0	" "
766	19.5	14.5	153.0	F	III	3.0	" "
767	21.2	17.5	218.5	F	IV	9.2	" "
768	14.4	11.1	57.5	F	III	-	Full stomach
769	14.5	11.1	43.5	F	III	-	" "
770	14.2	10.3	66.3	F	II	-	" "
771	12.0	10.5	53.0	F	II	-	" "
772	13.0	11.5	94.1	F	II	-	" "
773	17.7	14.1	120.0	F	II	-	Full stomach

MONTH: JULY, 1987 SPECIES: Oreochromis niloticus

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
774	20.5	16.1	173.0	F	II	-	Empty stomach
775	20.1	15.5	167.0	F	II	-	Full stomach
776	19.6	14.7	137.0	F	II	-	" "
777	20.5	15.5	165.5	M	II	-	" "
778	23.1	17.9	228.0	F	III	4.0	½ full stomach
779	17.5	13.3	107.2	M	II	-	Empty stomach
780	19.0	14.5	140.8	M	II	-	" "
781	19.2	14.7	M	II	-	½ full stomach	
782	21.7	16.0	169.0	F	II	-	Empty stomach
783	20.0	15.1	148.0	M	II	-	" "
784	19.9	14.5	139.0	M	II	-	" "
785	19.9	15.1	148.0	M	II	-	" "
786	20.4	15.2	163.0	F	II	3.0	½ full stomach
787	16.4	10.9	76.3	M	II	-	" "
788	18.0	13.7	105.1	M	II	-	" "
789	16.2	12.4	74.0	F	II	-	½ full stomach
790	11.0	8.2	40.0	M	II	-	" "
791	21.5	17.7	229.0	F	III	1.5	Full stomach
792	21.8	17.5	268.0	F	III	-	" "
793	17.8	13.9	128.0	M	II	-	Empty stomach
794	14.0	10.5	59.7	M	III	-	½ full stomach
795	13.2	10.4	53.0	M	II	-	Full stomach
796	15.0	11.9	69.2	M	II	-	" "
797	14.5	11.3	64.3	F	II	-	" "
798	13.5	10.4	47.0	M	II	-	" "
799	12.9	10.1	39.9	M	II	-	" "
800	12.0	9.3	40.1	M	II	-	Full stomach

MONTH: JULY, 1967 SPECIES: Tilapia zillii

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
801	[illegible]	13.7	110.5	M	III	-	½ full stomach
802	[illegible]	[illegible]	[illegible]	M	III	-	" "
803	[illegible]	14.5	100.0	M	II	-	Empty stomach
804	19.3	15.0	150.9	M	II	-	" "
805	[illegible]	14.8	152.0	F	II	-	" "
806	18.3	14.1	121.0	M	II	-	" "
807	[illegible]	11.9	65.0	F	II	-	½ full stomach
808	[illegible]	12.4	92.0	M	II	-	Empty stomach
809	[illegible]	12.1	79.2	M	II	-	½ full stomach
810	17.4	13.5	100.0	M	II	-	Empty stomach
811	14.9	11.5	65.1	F	II	-	" "
812	14.5	11.3	55.0	F	IV	6.0	" "
813	13.3	10.1	47.0	F	II	-	½ full stomach
814	13.7	10.5	52.0	F	II	-	" "
815	13.5	10.1	44.2	F	II	-	Full stomach
816	16.3	14.0	95.0	M	II	-	" "
817	19.6	14.4	111.2	M	II	-	" "
818	15.6	11.6	73.5	F	II	-	Full stomach
819	15.4	11.9	63.5	F	III	3.2	Full stomach
820	12.5	11.5	41.2	F	II	-	" "
821	19.1	14.0	111.2	M	III	-	" "
822	19.2	14.0	112.8	M	II	-	" "
823	19.2	15.1	132.0	M	III	-	" "
824	15.7	12.0	75.6	M	III	-	½ full stomach
825	15.8	11.7	75.6	M	II	-	" "
826	19.1	14.3	126.0	M	II	-	" "

MONTH: JULY, 1987 SPECIES: Tilapia zillii Cont'd.

NO	TL	SL	WT	SEX	GC	WT OF EGGS	REMARKS
627	14.1	12.2	75.3	F	IV	5.2	Empty stomach
628	13.1	11.2	71.5	F	II	-	Full stomach
629	13.5	11.3	61.2	F	II	-	" "
630	13.5	10.3	51.5	F	II	-	Full stomach
631	15.0	11.4	65.0	F	II	-	" "
632	14.7	11.4	65.0	F	II	-	Full stomach

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APPENDIX 2

LENGTH AND WEIGHT MEASUREMENTS OF Creochromis niloticus and Tilapia zillii

FISH SPECIES		SEX	NUMBER EXAMINED	MINIMUM	MAXIMUM	MEAN ± SD	STANDARD DEVIATION
Creochromis niloticus	Standard Length (cm)	M	254	6.5	26.0	13.9±	3.17
		F	195	8.6	25.7	14.7±	3.5
	Weight (gm)	M	254	11.0	592.1	113.7±	97.24
		F	195	29.0	593.0	129.6±	73.28
Tilapia zillii	Standard Length (cm)	M	219	7.0	23.0	13.8±	2.99
		F	164	9.0	21.8	13.2±	2.53
	Weight (gm)	M	219	16.0	480.5	102.9±	68.89
		F	164	13.0	140.0	91.9±	51.28

APPENDIX 3

MONTHLY MEAN CONDITION FACTOR OF MALE

Oreochromis niloticus

		TOTAL FISH EXAMINED	CONDITION FACTOR		
			RANGE	MEAN	STANDARD DEVIATION
AUGUST	1986	17	3.60-4.57	4.03	0.22
SEPTEMBER	"	19	3.84-4.85	4.24	0.27
OCTOBER	"	29	2.13-5.85	3.18	1.0
NOVEMBER	"	29	2.31-46.0	3.74	0.35
DECEMBER	"	20	3.47-4.43	3.76	0.31
JANUARY	1987	15	2.31-4.62	3.34	0.70
FEBRUARY	"	21	1.01-5.20	2.76	2.25
MARCH	"	26	3.36-4.88	4.09	0.34
APRIL	"	18	2.22-6.82	4.34	0.93
MAY	"	26	2.57-4.61	4.12	0.54
JUNE	"	17	2.75-6.27	4.27	0.92
JULY	"	17	3.87-5.15	4.35	0.82

APPENDIX 4

MONTHLY MEAN CONDITION FACTOR OF FEMALE

Creochromis niloticus

		TOTAL FISH EXAMINED	CONDITION FACTOR		
			RANGE	MEAN	STANDARD DEVIATION
AUGUST	1986	10	3.63-4.82	4.07	0.39
SEPTEMBER	"	21	3.51-4.64	4.28	0.38
OCTOBER	"	17	1.94-4.96	3.35	1.00
NOVEMBER	"	19	3.30-4.59	3.94	0.43
DECEMBER	"	21	2.98-4.76	3.74	0.47
JANUARY	1987	16	2.11-4.67	3.50	0.85
FEBRUARY	"	20	1.27-7.86	4.03	1.81
MARCH	"	19	3.46-4.85	4.09	0.38
APRIL	"	6	4.12-4.37	4.16	1.44
MAY	"	18	2.88-4.93	4.19	0.80
JUNE	"	18	3.15-6.05	4.19	0.35
JULY	"	10	3.88-5.00	4.35	0.41

APPENDIX 5

MONTHLY MEAN CONDITION FACTOR OF MALE

Tilapia zillii

		TOTAL FISH EXAMINED	CONDITION FACTOR		
			RANGE	MEAN	STANDARD DEVIATION
AUGUST	1986	21	3.32-4.61	3.83	0.29
SEPTEMBER	"	18	2.47-5.30	4.34	0.89
OCTOBER	"	17	2.10-4.27	3.32	0.81
NOVEMBER	"	4	4.34-5.91	4.67	0.35
DECEMBER	"	26	3.67-4.96	4.34	0.35
JANUARY	1987	22	1.48-5.08	3.19	1.22
FEBRUARY	"	21	0.75-2.11	1.38	0.39
MARCH	"	24	3.36-5.06	4.02	0.36
APRIL	"	24	2.97-7.60	4.57	1.27
MAY	"	16	3.12-4.49	3.86	0.51
JUNE	"	6	3.37-4.45	4.10	0.19
JULY	"	20	3.46-5.24	4.26	0.34

APPENDIX 6

MONTHLY MEAN CONDITION FACTOR OF FEMALE

Tilapia zillii

		TOTAL FISH EXAMINED	CONDITION FACTOR		
			RANGE	MEAN	STANDARD DEVIATION
AUGUST	1986	12	3.29-4.33	3.87	0.28
SEPTEMBER	"	7	2.89-4.19	3.69	0.44
OCTOBER	"	20	2.02-4.40	3.60	0.83
NOVEMBER	"	6	3.20-4.90	4.32	0.54
DECEMBER	"	14	3.44-4.64	4.03	0.37
JANUARY	1987	12	1.48-5.84	3.16	1.41
FEBRUARY	"	10	0.64-1.93	1.26	0.36
MARCH	"	8	3.56-4.64	3.95	0.32
APRIL	"	10	3.90-8.84	5.53	1.64
MAY	"	32	3.29-5.47	4.35	0.58
JUNE	"	21	3.18-6.18	4.74	0.89
JULY	"	12	3.46-5.24	3.88	1.12