

FECUNDITY, FOOD AND FEEDING HABITS AND GROWTH PATTERN OF GALEOIDES DECADACTYLUS IN NIGERIA COASTAL WATERS

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ABSTRACT

Twenty five (25) *Galeoides decadactylus* bought from Ijora were examined for the growth pattern, food and feeding habit and reproduction biology of the fish. The standard length of the specimen ranged from 17.5 to 21.7. The correlation coefficient was 0.85 which showed a strong correlation between the standard length and weight. Out of the twenty five fish specimens 20% has empty stomach. The condition factor ranged from 2.30 to 2.89 for the combined sexes. The result from chi-square test showed that the number of female is more significant than the number of males.

Keywords: Fecundity, *Galeoides decadactylus*, Ijora, Correlation coefficient, Condition factor, Nigeria.

1. INTRODUCTION

Galeoides decadactylus is one of the three species of the family *polynemidae* found in warm tropical surface water of the Atlantic on the continental shelf of West Africa. It is usually distinguished by its lower portion of the pectoral fin detached to form nine or ten short free rays [1].

Galeoides decadactylus (threadfin) extending only sporadically in to the cool canary and Benguela currents occurs in the warm surface waters of the Guinea current on the West African continental shelf and does not appear to penetrate the thermocline [2].

Despite the importance of this species (*G. decadactylus*) to the fisheries very little information on their biology is available.

Fish is a key ingredient on the global menu, a vital factor the global environment and an important basis for livelihood worldwide [3].

It is valuable to Africans because it forms one of the most important protein source and an essential supplement to the family budget. It can be obtained at cheaper rate compared to some other sources of protein. Fish is also widely acceptable because of its high be palatability, low cholesterol and tender flesh [4].

Fish is one of the most perishable staples. It spoils very quickly because of intrinsic and extrinsic factors. The high ambient temperature in the tropics hastens fish spoilage by accelerating the activities of bacteria, enzymes and chemical oxidation of fat in fresh fish [4].

The main objective of this work was to provide information on *G. decadactylus* in the Nigeria coastal waters with particular references to the growth partner, length – weight relationship, condition factor, food and feeding habit, sex ratio and fecundity of this species.

2. MATERIALS AND METHODS

The specimens used for this study were collected from Ijora on the 2nd of June, 2011 they were caught by artisanal fisher men from Nigerian coastal waters. Specimens were preserved in the freezer pending further analysis at the marine science laboratory to prevent spoilage.

2.1. Laboratory Procedure

At the laboratory the fish samples were thawed in the open air and body wiped dry. Measurements recorded for each of the 25 fish specimen were standard length (SL) , total length (TL) and weight. Sexes and food of the fish were determined.

2.2. Length Measurement

The standard length and the total length was measured using measuring board to the nearest centimetre. This was done for all the specimens by placing the fish on a calibrated measuring board. The standard length was measured from the tip of the snout to the posterior end of the mid lateral portion of the hypural plate. This measurement excludes the length of the caudal fin. While the total length is measured from the tip of the snout to the tip of longer lobe of the caudal fin.

2.3. Weight Measurement

An electric weighing balance (Sartorius) was used in measuring the weight of the samples, as well as the weight of their egg to nearest gram. This is done after draining water from the bucal cavity and blotting and excess water on the fish body [5].

2.4. Growth Pattern

To determine growth pattern in the species length – weight relationship for male, female and both were estimated using the equation.

$$W = aL^b \quad [6]$$

Length – weight relationship

$$W = aL^b = a + bL$$

Where

W = body weight of fish (g)

L = body length of fish (cm)

Q = proportionality constant or intercept.

B = regression coefficient

The corresponding log transformation values of length and weight gives the linear expression $\log_{10} w = \log_{10} a + b \log_{10} L$ via least square linear equation [7].

In general, b less than 3.0 represents fish that become less rotund as length increase and b greater than 3.0, growth is isometric, this means that the shape does not change as fish grow.

2.5. Condition Factor

In fisheries science, the condition factor is (fatness) or well-being of fishes. The condition factor was calculated for the males, females and combined sexes using the condition factor method of Pauly [8].

$$\text{Condition factor } K = \frac{100W}{L^3}$$

Where K = condition factor

W = Weight in gram (g)

L = Length in centimetre (cm)

2.6. Reproductive Biology

The fish samples were dissected by opening the ventral side to the end of the lower jaw to expose its additional cavity. The gonad was used to determine the sex for each specimen. The male are recognised by the testes while female are recognized with sac-like structure called Ovary. The gonad sac for ripe samples was weighed and their fecundity was estimated. The gonadotropic index was estimated as well as sex ratio.

2.7. Gonadotropic index

The Gonadotropic Index (GI) was calculated using the formula:

$$\frac{\text{Ovary weight}}{\text{Fish weight}} \times 100$$

$$\text{G.I} = \frac{\text{Ovary weight}}{\text{Fish weight}} \times 100$$

given by Sturm [9].

A general development stage includes:

Immature – White

Developing – Creasing

Ripening – Pale brown

Ripe – Grown

Ripe running – Brown

Spent – Red

The fecundity was estimated from the ripe ovaries. (Stage IV).

Fecundity – the number of ripe eggs in the female fish prior to the next spawning.

The length – fecundity, weight-fecundity relationship were estimated by plotting the equation in a graph

$$Y = a + bx$$

Where y = Fecundity

a = constant

b = constant

x = length or weight

2.8. Stomach Content Analysis

Stomach content: The stomach contents were analyzed to establish the food habits of the fish. Since the fish were frozen immediately after catching their stomach contents were representative of their last meals. Food items were quantified by two methods, the numerical and frequency of occurrence methods [10, 11].

In the numerical method the number of each food item was expressed as the percentage of the total number of food items found in the stomachs while in the frequency of occurrence method, the occurrence of food items was expressed as the percentage of the total number of stomach containing food.

3. RESULTS

3.1. Size Composition of Galeoides Decadactylus

25 Specimens of Galeoides decadactylus were studied for length-frequency distributions.(Table 1) the standard length ranged from 17.5cm to 21.7cm and has its highest frequency of 8 in the class range of 17.5-18.4 and 19.5-20.4 thus size groups 17.5-18.4 and 19.5-20.4 was most abundant.

Table-1. Standard length-frequecy distribution of galeoides decadactylus in Nigeria coastal water

Standard length Range(g)	Mid class(cm)	Frequency	%Frequency
17.5 – 18.4	17.95	8	32
18.5 – 19.4	18.95	6	24
19.5 – 20.4	19.95	8	32
20.5 – 21.4	20.95	2	8
21.5 – 22.4	21.95	1	4
Total		25	100

Figure-1.

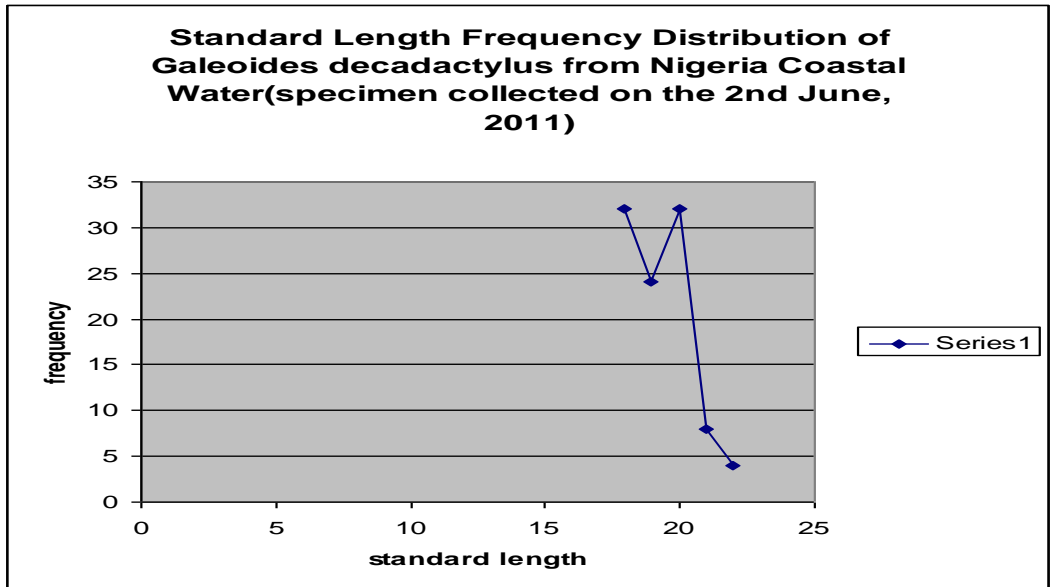
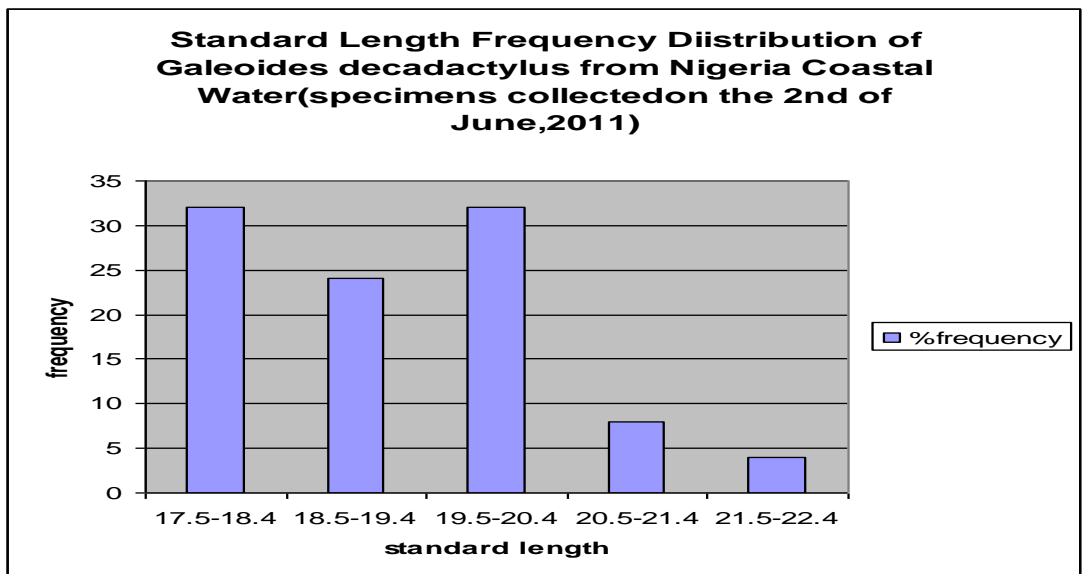


Figure-2. Length – Weight Relationship



3.2. Growth Pattern

The total weight of *Galeoides decadactylus* range from 146.53-254.74. This showed increase in length with increase weight.

The standard length total Weight was transferred into the logarithm form. The log standard length-log weight relationship showed a linear relationship. The scatter diagram showing log length and log weight relationship is illustrated in figure 4.

From the equation

$$\text{Logwt} = \text{Loga} + b\text{LogSL}$$

$$\text{LogWt} = \log - 0.2644 + 1.9729\log\text{SL}$$

$$a = 0.2644$$

$$b = 1.9729$$

$$n = 25$$

$$r = 0.8488$$

The value of 'b' obtained for the fish was less than 3. This indicates that *Galeoides decadactylus* from the Nigerian coastal waters exhibited a negative allometric growth. The correlated coefficient 'r' was 0.85 which shows a very strong correlation between the standard length of *Galeoides decadactylus* and total weight.

Figure-3. Scatter diagram of length – weight relationship

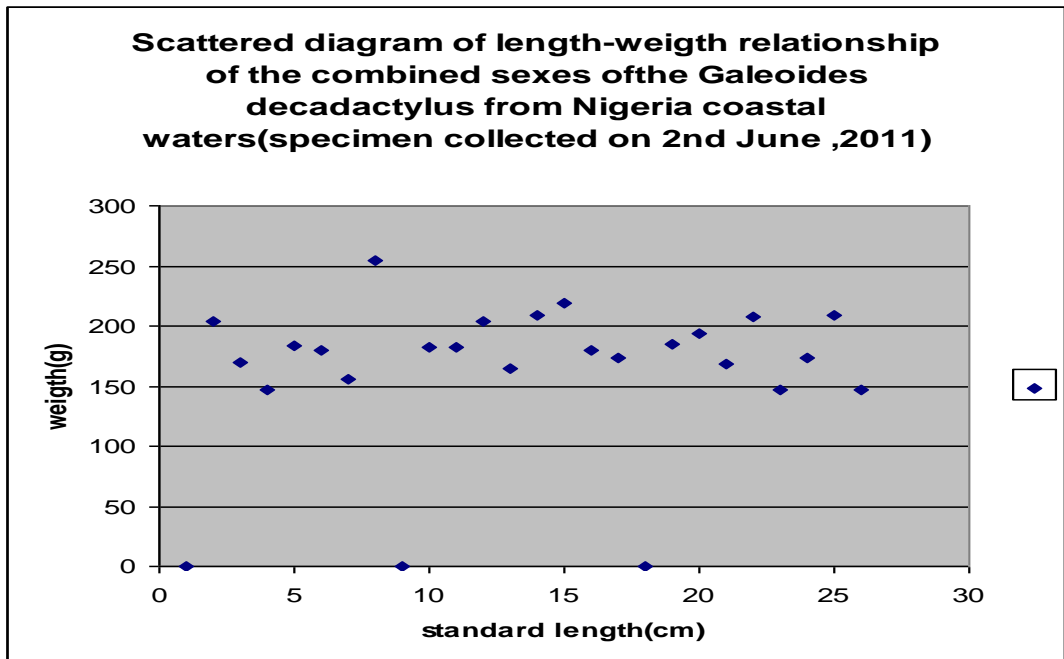
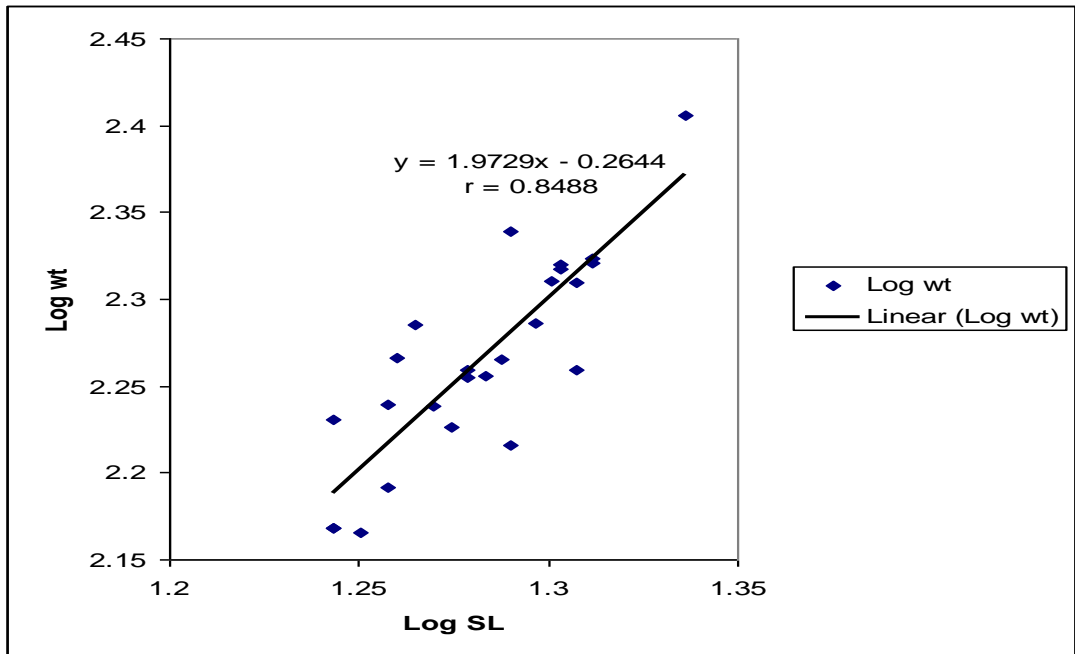


Figure-4. Diagram of Log length – Log weight relationship of the combined sexes of the *Galeoides decadactylus*



LogSL- Log standard length

Logwt- Log weight

4. CONDITION FACTOR

The summary of condition factor by size of *Galeoides decadactylus* is presented in Table 2. The k-values ranged from 2.22 to 2.78, 2.5-3.0 and 2.30-2.89 for males, females and combined sexes respectively.

Table-2. Condition factor(k) of *galeoides decadactylus* from nigeria coastal waters

Size group Standard Length(cm)	Male				Female				Combined sexes			
	F	SL	WT	K	F	SL	WT	K	F	SL	WT	K
17.5- 18.4	3	18.0	162.26	2.78	5	17.94	173.32	3.0	8	17.97	167.79	2.89
18.5-19.4	1	19.0	179.68	2.62	5	19.0	177.47	2.6	6	19.0	178.58	2.60
19.5- 20.4	1	19.5	164.24	2.22	7	20.0	190.0	2.37	8	19.75	177.12	2.30
20.5- 21.4	-	-	-	-	2	20.63	209.75	2.38	2	20.63	209.75	2.39
21.5- 22.4	-	-	-	-	1	21.70	254.74	2.5	1	21.7	254.74	2.49

Where

F- Frequency

SL- standard length (cm)

Wt -mean weight-condition factor

Table-3. Stomach condition

Stomach Condition	Frequency	% Frequency
0/4	5	20
1/4	7	28
2/4	7	28
3/4	4	16
4/4	2	8

5. FOOD AND FEEDING HABITS

5.1. Stomach Analysis

The stomach content of 25 specimen of *Galeoides decadactylus* were examined for food. 5(20%) of the fish had empty stomachs.

6. FOOD ITEM OF GALEOIDES DECACTYLUS

The summary of stomach contents of *Galeoides decadactylus* is represented in Table 4 and figure 5. The food items were found mostly to include fish, crab and shrimp, where shrimp constituted the most important both by occurrence method 56.25% and numerical method 84.16%.

Table- 4. Summary of the stomach content of *galeoides decadactylus* in nigeria coastal water

Food items	Numerical Method		Occurrence Method	
	Numerical Value	Percentage (%)	Frequency	Percentage (%)
Crab	11	10.89	5	31.25
Fish	5	4.95	2	12.5
Shrimp	85	84.16	9	56.25
	101	100	16	100

Figure- 5. Major food items in the stomach of *Galeoides decadactylus*

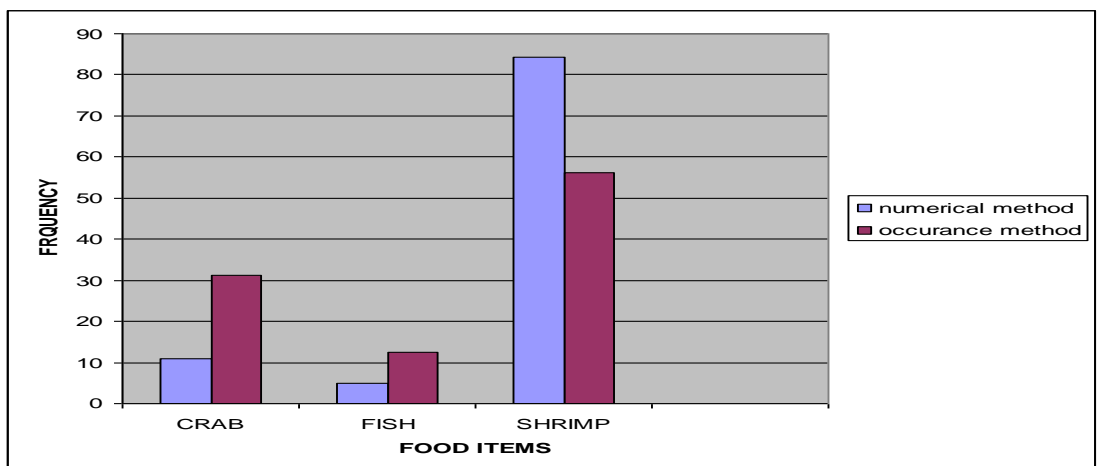
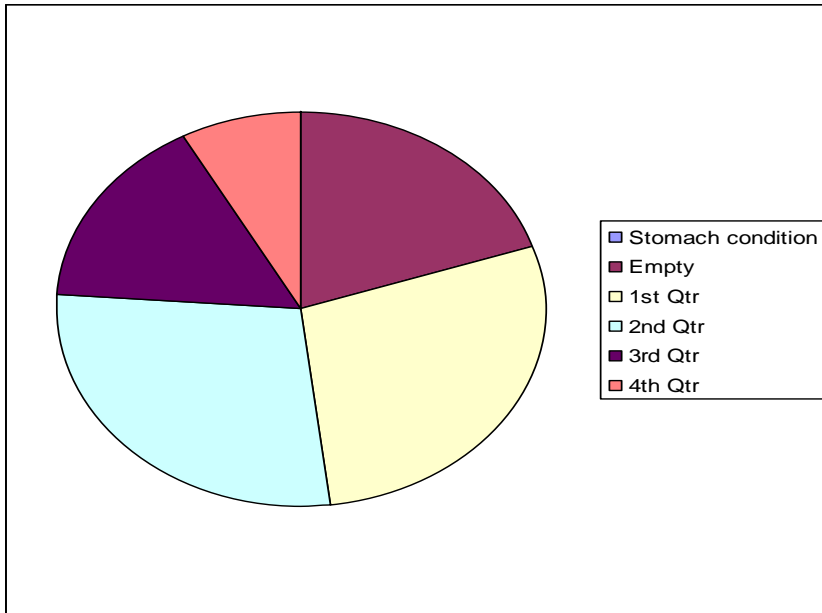


Figure- 6. Chart of major food items in the stomach of *Galeoides decadactylus*.



7. SEX RATIO

Out of the 25 specimens of *Galeoides decadactylus* studied, only 5 males were found. The result of chi-square test showed that the number of female *Galeoides decadactylus* is more significance than the number of males. Table-5 giving rise to the ratio of 1:0.2

Table- 5. Test calculation on sex ratio of *galeoides decadactylus*

Expected	Sex	observed
13	Male	5
25	Female	20
25	Total	25

$$X^2 = \frac{(\text{observed} - \text{expected})^2}{\text{Expected}}$$

$$\frac{(5-13)^2}{13} + \frac{(20-12)^2}{12}$$

$$\frac{(-8)^2}{13} + \frac{(8)^2}{12}$$

$$\frac{64}{13} + \frac{64}{12}$$

$$4.92 + 5.33 = 10.25^*$$

$$\text{Tab } X^2 \text{ 1df at 5\%} = 3.84$$

Hence calculated $X^2 > 3.84$

* Significance

Therefore the number of female was more significant than the number of male.

7.1. Gonadal stages of Galeoides Decadactylus

The gonad development stage ranged from stage 1 (immature), stage 11 (developing), stage 111 (mature or ripe), stage IV (ripe –running) in developing stage, 10 (40%) in ripe stage and 7 (28%) in ripe running.

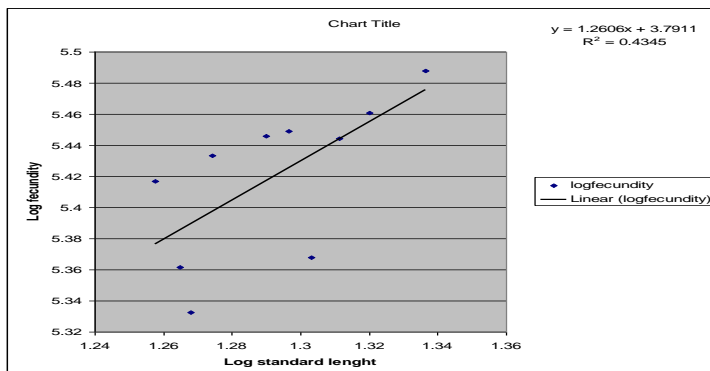
Table- 6. Gonadal development of *Galeoides decadactylus*

Stage	Number	%
Stage I	3	12
Stage II	5	20
Stage III	10	40
Stage IV	7	28
Total	25	100

Table-7. Fecundity

SPECIMEN	SL(cm)	WT	Log SL	Log WT	FECUNDITY	Log fecundity
4	19.4	184.09	1.287802	2.26503	214956.6	5.332351
7	21.7	254.74	1.33646	2.406097	307391.4	5.487692
13	20.5	209.47	1.311754	2.321122	278279.5	5.444481
14	19.5	218.46	1.290035	2.339372	279270	5.446024
17	18.4	193.01	1.264818	2.28558	229954.5	5.361642
19	19.8	193.32	1.296665	2.286277	281179.7	5.448984
20	18.8	168.36	1.274158	2.226239	271228.5	5.433335
21	20.1	207.66	1.303196	2.317353	233221.4	5.367768
23	18.1	171.5	1.257679	2.234264	261134.5	5.416864
24	20.9	209.1	1.320146	2.320354	288956.6	5.460833

Figure-7. Log standard length – Log Fecundity relationship *G. decadactylus* in Nigeria coastal waters

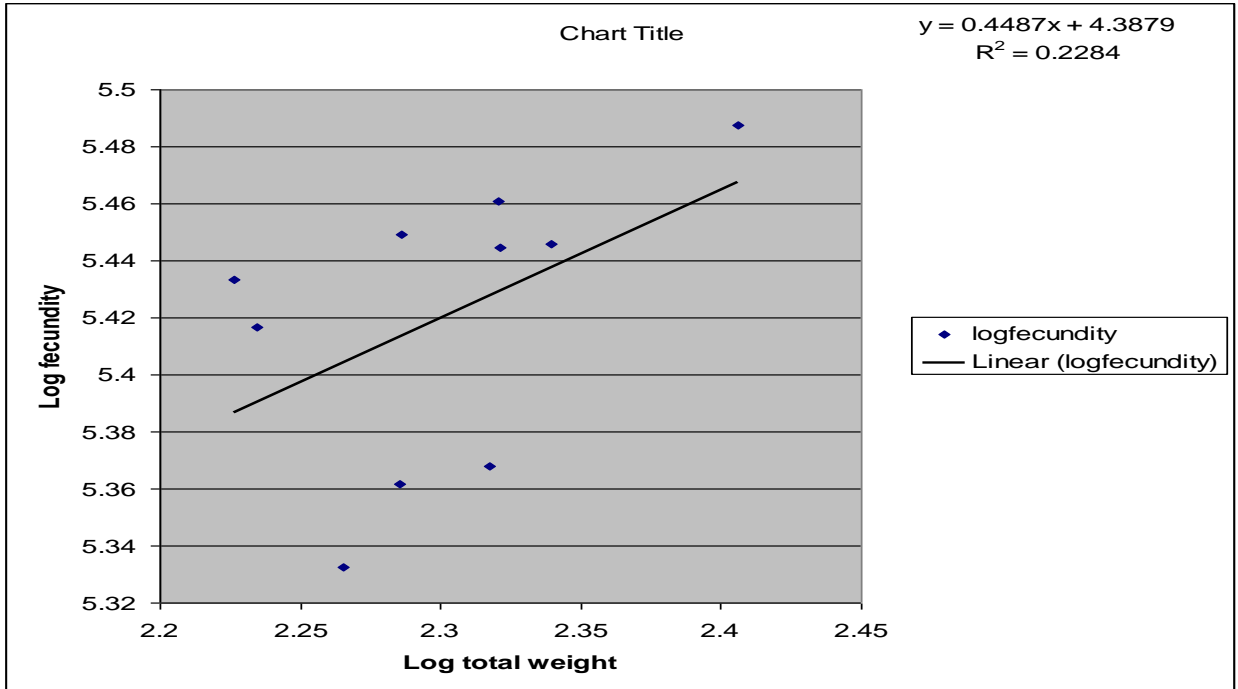


a=3.7911

b=1.2606

r=0.659

Figure-8. Log weight –Log Fecundity relationship



a=4.3879

b=0.4487

r=0.4779

8. GONADOTROPIC INDEX (G I)

Table- 8. Gonadotropic index of g.decadactylus

Specimen	Fish weight(g)	Ovary weight(g)	G I
4	184.09	5.01	2.72
7	254.74	10.29	4.04
13	209.47	5.82	2.78
14	218.46	9.91	4.50
17	193.01	4.9	2.54
19	193.32	5.3	2.74
20	168.36	4.5	2.67
21	207.66	5.61	2.7
23	171.50	4.07	2.37
24	209.10	5.8	2.77

9. DISCUSSION

9.1. Size Composition

The data collected on 25 samples of Galeoides decadactylus showed that there were several size groups in fish community represented in the length-frequency distribution bar chart. The size group 17.5-18.4, and 19.5-20.4 were predominant.

The length weight relationship exhibited a cluster pattern which indicated that the species were from the same age rank within the coastal waters.

9.2. Growth Pattern

The length-weight relationship of *Galeoides decadactylus* from Nigerian coastal water showed negative allometric growth. This was in line with the findings of Emmanuel, et al. [12]. The correlation coefficient was very high, corresponding to the work by Emma et al.

9.3. Condition Factor

The mean condition factor ranges from 2.30-2.890. It changes with increase in length from the result conclusion can be drawn that k-condition factor decreases as the fish becomes large and increases in smaller fish, as well as increase in larger fish. This is contrary to Kusemiju and Osibona [13], and Emmanuel, et al. [12].

9.4. Food and Feeding Habit

Stomach analysis carried out on *Galeoides decadactylus* indicated that the fishes are scavengers, and carnivores. The diet constituted mainly crayfish, fish and crab. These are active sedentary benthic organisms showing that the species is a bottom feeder besides its inferior mouth location [14].

9.5. Sex Ratio

This study showed that number of female *Galeoides decadactylus* were significantly more than the number of males from the expected 1:1 ratio. The fish samples with the same length or weight had variable fecundity also in line with Kusemiju and Osibona [13].

10. CONCLUSION

This study showed that this fish species is a bottom feeder and Carnivore. Its major food items are fish, crab and shrimp. The number of female were significantly more than the number of males. The length-weight relationship showed a negative allometric growth which corresponds with Emmanuel, et al. [12], while the condition factor is contrary to his.

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