

Growth and Stomach Content of *Pellonula leonensis* from New Calabar River, Rivers State, Nigeria

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Abstract

The growth and food of *Pellonula leonensis* from the New Calabar River, Port Harcourt, Nigeria was studied, with the view of developing a proper feed that could meet the fish nutritional needs if reared in captivity. Analysis of growth using the length and weight measurements by applying regression analysis indicated that the fish had an allometric growth (2.6425 ± 0.078), and a condition factor of 0.8731. The fish's food preferences were estimated using the frequency of occurrence and points methods. Analysis of food preferences (index of food significance (IFS)) was categorized in two groups, 5.9–7.5 cm and 8.0–9.0 cm, respectively. *Temora* sp (37.27%) was the most important food for smaller category while *Penilia ovirrostris* 23.09% was consumed most by the bigger group. The least important food for small and bigger groups were *Podon polyphemoides* and *Temora* sp, respectively. *Paracyclops* sp was part of the contents of the fish stomach. The study further revealed the percentage index of food significance for the stomach content as follows; *Evadne nordmanni* recorded a value of 16.38 for the small group and 22, 31 for the big group, while *Penilia ovirrostris* had a value of 25.05 and 23.09 for the small and bi categories, respectively. *Podon polyphemoides* had 7.22 for the small group and 18.90 for the big group. Figures recorded for the copepods showed that *Paracyclops* sp was 14.09 and *Temora* sp 37.26 for the small category while the values were 18.90 and 16.79, respectively, for the big group. In general, all the fish's food was zoo planktons, as a result this fish may require a feed with high protein content if considered for aquaculture.

Keywords: Clupeids, length, weight, foods, feeding

INTRODUCTION

Pellonula leonensis, commonly known as the small tooted pellowula, is mostly found in lakes, lagoons, and most rivers in Africa, both in Senegal and Cameroon, as well as in the Democratic Republic of Congo [1]. *Pellinia leonensis* is an important ichthyofaunal component of freshwater and brackish ecosystems. In addition to their substantial economic worth, they play an important ecological role [2].

Fish have a big influence on a nation's development. It contains other essential components that the body needs in addition to being a cheap and nutrient-dense source of protein. King's research indicates that the world's population depends on both aquaculture and capture fisheries for its food fish [3].

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One of the most used aspects of fisheries analysis is the length-weight relationship, specifically fish length-weight data. They are an essential instrument for collecting information on fish condition, length frequency distribution, and stock appraisal, and they are useful in figuring out the length and age distributions, growth, mortality rate, and overall health of the population [4–6].

Fish food and feeding patterns are frequently studied using stomach content analysis in fish biology and ecology to provide information on the

relative contributions of different prey items to the diet and to illustrate a species' place in a food web. For several purposes, such as building trophic models, determining the level of the trophics, and comprehending predator-prey dynamics in intricate ecosystems, it is crucial to understand fish diet and eating patterns [7].

Fish growth is a crucial tool for managing fisheries, and it is especially significant when determining the average weight of fish in a certain length group. The length-weight relationship is crucial for assessing the overall health of a fish population [8]. Length-weight relationship and condition factor for fish species of the River Okura, Kogi State, Nigeria, are among the earlier research on cichlid length-weight correlations in Nigeria. *Pellonula leonensis* was found to have a growth factor "b" of 1.85–2.92, suggesting that the fish species had negative allometric growth.

It is important to have the necessary data on this species (*Pellonula leonensis*) considering its importance and commercial value. This could serve as a key knowledge for raising it in confinement should it be considered for aquaculture in the future [9].

MATERIALS AND METHODS

The study was carried out at the New Calabar River, situated at coordinates 4.4167° N and 7.0333° E. This brackish water stream supports a diverse range of aquatic organisms, including fish, crabs, shrimp, and aquatic plants, such as nypa palms (*Nypa fruticans*). Over the course of three months, random samples of *Pellonula leonensis* were collected from fishermen along the New Calabar River. After that, they were sent to the lab for examination after being kept in plastic containers with a 10% formaldehyde solution.

The following techniques were used to evaluate the samples: The following formula was used to calculate the growth coefficients for the length/weight data:

$$W = aL^b \text{ regression} \quad (1)$$

where

W = Weight of the Fish (grams)

A = Intercept of the regression

L = Total length (cm)

B = (Fish Growth coefficient).

The condition factor (K) was estimated using the following relationship:

$$K = \frac{100W}{L^3} \quad [2]$$

where:

W = Weight (grams).

L = Observed Total length (cm).

K = Condition Factor.

The following techniques were used to evaluate the stomach content:

Points Method

Points were awarded to various food items based on their quantity (size) in relation to the other, this was expressed as follows:

$$\text{Percentage by number (\%N)} = \frac{\text{Total Points of the particular food item}}{\text{Total Points of all food items}} \times 100 \quad [10]$$

Frequency of Occurrence Method

Frequency of occurrence of each diet was expressed as:

$$\% \text{ Occurrence of the food item} = \frac{\text{Total Number of stomachs with the particular food item}}{\text{Total number of stomachs with food}} \times 100 \quad [11]$$

Index of Food Significance (IFS)

$$\text{IFS} = \frac{\%F \times \%P}{\sum \%F \times \%P} \times 100 \quad [7, 1]$$

where

IFS = Index of Food Significance.

%F = Percentage frequency of food items.

%P = Percentage Number of food items.

RESULTS

Analysis of observed data from New Calabar River on *Pellonula leonensis* (n = 200) revealed a growth coefficient of 2.6425 ± 0.078 (negative allometric), an intercept of -0.9092 ± 0.0657 and an R square value of 0.5269. The condition factor for the fish was 0.8731, with a peak in May and low in June (Figure 1).

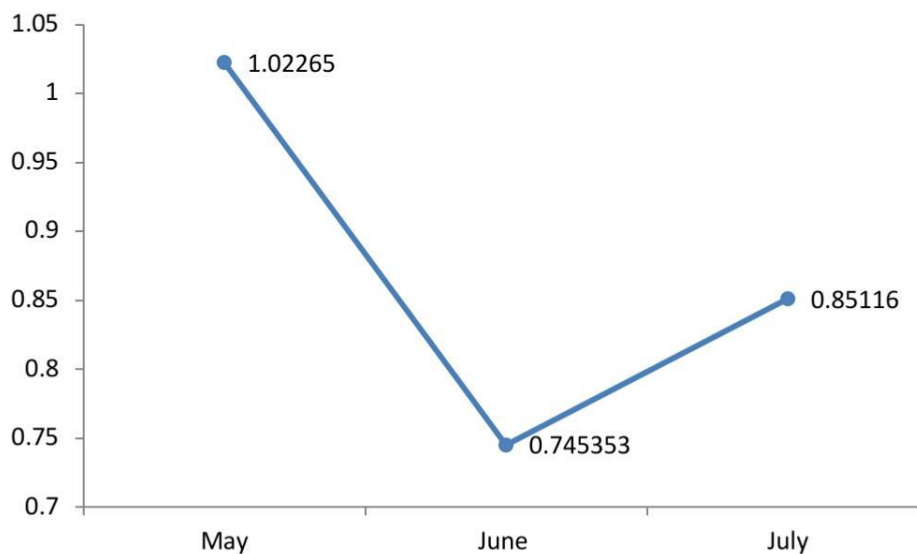


Figure 1. Condition factor of *Pellonula leonensis* from New Calabar River.

Gut analysis of *Pellonula leonensis* showed that the fish fed predominantly on zooplanktons. These included *Evadne nordmanni*, *Penilia ovirrostris*, and *Podon polyphemoides* (Cladocera), others were *Paracyclops sp* and *Temora sp*. *Penilia ovirrostris* was the most important food for the two classes, (5.9 cm–7.5 cm) smaller group and (8.0 cm–9.0 cm) as the bigger group (Tables 1 and 2).

Table 1. Stomach content of *P. leonensis* (5.9 cm–7.5 cm).

Food Item	% RF	% Point	IFS	% IFS
Cladocera				
<i>Evadne nordmanni</i>	20.51	18.48	379.02	16.38
<i>Penilia ovirrostris</i>	20.51	28.26	579.61	25.05
<i>Podon polyphemoides</i>	15.38	10.87	167.18	7.22
Copepodes				
<i>Paracyclops sp</i>	23.07	14.13	325.98	14.09
<i>Temora sp</i>	30.51	28.26	862.21	37.26

Table 2. Stomach content of *P. leonensis* (8.0 cm–9.0 cm).

Food Item	% RF	% Point	IFS	% IFS
Cladocera				
<i>Evadne nordmanni</i>	23.81	18.48	444.77	22.31
<i>Penilia ovirrostris</i>	19.05	24.17	460.44	23.09
<i>Podon polyphemoides</i>	19.05	19.78	376.81	18.90
Copepodes				
<i>Paracyclops sp</i>	19.05	19.78	376.81	18.90
<i>Temora sp</i>	19.05	17.58	334.89	16.79

DISCUSSION

The growth of *P. leonensis* from New Calabar River (2.6425 ± 0.078) was negative allometric, which described a fish that got slender as it increases in weight. This agrees with results obtained from Okura River [12] which reported a growth coefficient of 1.85 for *P. leonensis*. Similar results (negative allometry) were also obtained by [6, 10], Studies by [13] for *Pellonula leonensis* in Qua Iboe Estuary, Nigeria. The length-weight relationship of *Pellonula leonensis* was assessed, and it was found that the length exponent for the pooled sexes was 3, suggesting that as the length increases, so does the weight. Other studies on the diet and growth of *Pellonula leonensis* outside Nigeria include the work by, who examined the diet of *P. leonensis* in the Buyo reservoir lake in Ivory Coast. Using the index of relative importance (IRI) to analyze food items, they found that *P. leonensis* consumes a variety of food, including insects (both aquatic and terrestrial), crustaceans, arachnids, and fruits.

A condition factor of 0.8731 suggests that the fish was not in optimal health. Additionally, a study by [12] reported that the condition factors for *H. bimaculatus* ranged from 1.14 to 3.13 ± 1.79 , for *S. melanotheron* the values ranged from 1.40 to 3.60 ± 2.79 , and for *C. guentheri*, it ranged from 1.13 to 2.24 ± 1.67 . In all three species, the condition factor (K) values were greater than one and varied based on size and season.

The study of [13] on Nkoro River, Niger Delta, Nigeria recorded condition factor values of 0.95 (*Ethmalosa fimbriata*), 0.92 (*Ilisha Africana*), 0.95 (*Sardinella maderensis*), 0.99 (*Cynoglossus senegalensis*), and 0.94 (*E. senegalensis*). All species studied were in good condition.

Examination of the stomach of *P. leonensis* revealed that it fed mainly on zooplankton in the New Calabar River. With *Temora sp* constituting the most important food item for the small group and *Penilia ovirrostris* for the bigger fishes. This finding is consistent with the research of Eric et al. [5], who found that *P. leonensis* mostly consumed two types of crustaceans, namely cladocerans, and copepods. The findings are also consistent with the findings of Kouamé et al. (2006) [10], who found that *P. leonensis* consumes four types of tropical foods: fruits, crustaceans, arachnids, and insects. The behavior of this was quite different for observed feeding mode in *B. africanus* as reported by [3] being species that are found in similar environment (Brackish water).

CONCLUSIONS

The content of the fish's stomach and its feeding behavior depicts a species that hunts for various species of zoo plankton, as a result this fish may require a feed with high protein content if considered for aquaculture.

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