Oceanography & Fisheries
Open access Journal
ISSN: 2476-0536

Juniper Publishers
key to the Researchers

Research Article
Volume 16 Issue 5 - December 2023
DOI: 10.19080/OFOAJ.2023.16.555950

Oceanogr Fish Open Access J

Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – *Pseudotolithus Typus* from Iko River Estuary, South Eastern Nigeria

Abiaobo NO[1], Akpan II[1], Asuquo IE[2]*, Udosen IE[1] and Ekpetor EE[1]

[1]*Department of Zoology, Akwa Ibom State University, Mkpat Enin, Nigeria*

[2]*Department of Fisheries and Aquaculture, Akwa Ibom State University, Mkpat Enin, Nigeria*

Submission: November 16, 2023; **Published**: December 08, 2023

Corresponding author: Asuquo IE, Department of Fisheries and Aquaculture, Akwa Ibom State University, Mkpat Enin, Nigeria

Abstract

The study of the trophic ecology, growth patterns and condition factor of *Pseudolithus typus* from the Iko River Estuary, was carried out between December 2021 and May 2022. A total of 180 specimens were collected and transported in ice-packed container to the Zoology Departmental Laboratory, Akwa Ibom State University for further examination. The diet of *Pseudotolithus typus* was analyzed using frequency of occurrence, numerical abundance, point method and gut repletion index. The major dietary components of the species in order of abundance revealed shrimps, followed by fish remains and less common items. The length-weight relationship and condition factor of *Pseudotolithus typus* were also evaluated. The total weight ranged from 41.10g - 142.10g with a mean value of 71.13g and the total length ranged from 18.00 cm - 28.30cm with a mean value of 22.05cm. *Pseudotolithus typus* in this study exhibited a negative allometric growth ($b < 3$) with a mean b value of 2.37. It has been established that when K value is greater than one, it indicates that the fish species is living well in the concerned habitat. In this research, the K values were generally lower than 1 indicating poor condition of the species in the environment, which suggests that the wellbeing of *Pseudotolithus typus* is poor and the fish was not living well.

Keywords: *Pseudotolithus typus*; Length-weight relationship; Condition factor; Iko River estuary

Introduction

Food is one of the important factors that promotes growth and enriches the biochemical composition of the fish, and any variation in the food items may affect the wellbeing of the fish. Searching, ingestion, digestion and resting comprises the main parts of a fish circadian feeding cycle (Mazzoni and Rezende, 2009). This cycle may be influenced by many factors such as predation risk, prey availability, environmental factors (e.g. temperature and daylight), potential for inter or intraspecific competition and the capabilities of each fish species (e.g. dependence on vision for locating prey) (Gaygusuz et al., 2010). Nevertheless, feeding periodicity may occur at the same time of the day for some species, and may be followed by sampling fish populations at intervals of a few hours throughout the diet cycle [1]. Studies on food consumption, when combined with information on fish diet, may contribute to clarify prey– predator relationships, and to elaborate trophic models for stock assessment (Christensen and Pauly, 1993; Temming et al., 2002). Diets of fishes represent an integration of many important ecological components that include behavior, condition, habitat use, energy intake and intra/inter specific interactions. The feeding habit of different fishes could vary temporarily due to seasonal variation in the availability and composition of food organism (Manon and Hossan, 2011). The study of the food and feeding habits of fish is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management program on fish capture and culture [2].

Length-weight relationship (LWR) is of great importance in fishery assessments [3]. Length and weight measurements in conjunction with age data can give information on the fish stock, age, maturity, life span, mortality, growth and reproduction [4]. Length-weight relationship of fish is widely recognized

as an important tool in fisheries science especially in ecology, population dynamics and stock management [5]. During their development, fish are known to pass through stages in their life history which are defined by different length-weight relationships [6]. In fisheries science, condition factor (K) is used to compare the "condition", i.e., fatness or wellbeing of fish [7]. It is based on the hypothesis that heavier fish of a particular length are in a better physiological condition. The condition factor which is an index reflecting interaction between biotic and abiotic factors in the physiological condition of fishes shows the populations welfare during various stages of its life cycle [8]. Condition index may be used to determine the reproductive time of fish species without sacrificing the organisms, and this could be a valuable tool to develop monitory programs for the species fisheries and culture programs [9]. Condition factor is also a useful index for monitoring of feeding intensity, age, and growth rates in fish [10]. Factors affecting condition factor range from feeding, spawning, food nutrient composition, and fat accumulation [11].

The genus *Pseudotolithus (Family Sciaenidae)* commonly known as Croakers constitute an abundant and commercially important fish in Nigerian inshore waters (Isangedighi, 2001). The most economically important and dominant species in the Nigerian coastal waters are *Pseudotolithus elongatus, P. senegalensis and P. typus,* [12], while the less prominent ones include *P. brachygnatus, P. epiperchus & P. moori* (Isangedighi, 2001).

The Sciaenids constitute a large and varied family of fishes related to snappers but differs in that the spinous dorsal fin is short and the adipose tissue is much longer than the anal fin, which has only one or two spines. The Croakers are commonly found on muddy deposits (Isangedighi, 2001) and are exploited by both industrial and artisanal fisheries. One of the most economically important and dominant species in the Nigerian coastal waters is *Pseudotolithus typus*. *P. typus* possess long head and body, a compressed body with the top of the head slightly concave, supra-lateral eyes and large mouth with lower jaw projecting. *Pseudotolithus typus* utilize various kinds of food resources available in their habitat [13]. P. typus is among the top commercial fish species that is widely consumed locally by Nigerians because of its abundances on the local market [14].

Materials and Methods

Study area

Eastern Obolo is an area blessed with many communities with diverse socio-economic activities such as artisanal fishing, timbering and boat transport. The water is fringed with diversity of floral such as *Rhizophora mangle, Avicennia africana, Lancungularia, Raphia hookeri, Nypa fruiticans and Sargassum spp* that is normally found during wet season, with Nypa palm and red mangrove being the most dominant species of flora. Oil palm *(Elaeis guineensis)* and coconut palm *(Cocoa nucifera)* are also widely distributed in the villages. A large sand bar is also found at Etizar during neap low tide. As part of tropics, this area experiences two seasons, the dry (November to March) and wet (April to October) with an annual rainfall averaging about 2500mm (AKUTEC Report, 2006). Coastal water of Eastern Obolo drains into Atlantic Ocean and is connected to Qua Iboe river estuary at the East and Imo River estuary at the west. It is located at 4°33'N-4°50'N; 7°45'E-7°55'E and about 650m above sea level in the tropical mangrove forest belt east of the Niger Delta. The tidal regime here is semidiurnal and has a range of about 0.8m at neap tides and 2.20m during spring tides with little freshwater input joined by numerous tributaries.

Samples collection

Samples of long neck croaker, *Pseudotolithus typus* were randomly obtained from December 2021 to May, 2022 from fishermen catches at Iko landing point. The fish collection was done monthly for six consecutive months. A total of 180 specimens were collected and transported in ice-packed box to Zoology Departmental laboratory, Akwa Ibom State University the same day and preserved in a refrigerator till the next day for analysis. These specimens were usually collected during the early hours of afternoon.

Stomach content analysis

In the laboratory, the fish specimens were treated individually to determine their biometric data. After blotting dry with clean towel, specimens were dissected and the guts were carefully removed with the aid of forceps after dissection. The stomach of the dissected specimens was slit open and the contents poured into a petri dish and smeared with a small drop of distilled water and the food items were examined macroscopically, then under a stereo light microscope (magnification up to 100×) to identify the food items to the nearest taxonomic entity. Information on total length, standard length, weight and identified food items were recorded into a data sheet for data analysis. Analysis was carried out using frequency of occurrence, point method and numerical method respectively.

Point method

Each prey category is allocated points in proportion to its visually estimated contribution to gut volume (Hyslop, 1980).

Frequency of occurrence

Recording the presence or absence of each food item across all individuals is the simplest way to reveal the relative importance of different food items and to judge the dietary composition of a fish population. The importance is inferred from the proportion of total guts containing each food item (Baker et al., 2014) [15-17]. Each food item occurred in number of stomachs is recorded and expressed as a percentage of the total number of fish stomachs examined.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

Frequency of occurrence, $\%O_i = \frac{Ni}{N} \times 100$

Where: % O is the frequency of occurrence of given food i

Ni is the number of stomachs containing prey i

N is the total number of stomachs with some food

Numerical method

This involved counting the number of each food item present in the stomach of the species and summing up these numbers to obtain the grand number of all food items in its guts. The number of each food was expressed as a percentage of the grand total number of food items. Usually expressed as:

$$Percentage\ number\ of\ food = \frac{Total\ number\ of\ particular\ food\ item}{Total\ number\ of\ all\ food\ items} \times 100$$

This method expresses the numerical importance of different food items and gives relative importance of each food item.

Feeding intensity

Feeding intensity was determined using Gut repletion index (GRI) and was calculated by dividing the number of non-empty guts by the total number of guts examined multiplied by 100 (Hyslop, 1980).

Gut repletion index (GRI) is given as:

$$GRI = \frac{Total\ number\ of\ non-empty\ guts}{Total\ number\ of\ guts\ examined} \times 100$$

Determination of Length- Weight Relationship

The relationship between the length (L) and weight (W) of fish was expressed by the equation given by Gayanilo and Pauly [18]

$W = aL^b$

The above equation and data were transformed into logarithms before the calculations were made. Therefore, equation becomes:

$$Log\ W = \log a + b \log L$$

Where: W= Weight of the fish in grams (g)

L= Standard length of the fish in centimeters (cm)

a = the regression constant which is also the intercept

b = an exponent (slope)

Condition Factor (K)

The condition factor which is a measure of the relative wellbeing of the fish was estimated using the Fulton's coefficient formula (Fulton, 1902):

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

Where:

K = Condition factor

L = Total length in centimetre

W = Body weight in grams

Results and Discussion

Results

Food composition

The overall food composition based on stomach content analysis of *P. typus* from Iko River estuary is shown in table 1. The highest food item consumed was crayfish 42.61%, followed by fish remain 22.34%, detritus 17.18%, crab 7.22%, worm 4.81%, sand 4.12 and octopus 1.72% as the least. Monthly diet composition of *P.typus* is shown in table 2. The highest number of food items was recorded in December 2021 and the least was observed in March 2022.

Table 1: Overall food compositions of *Pseudotholithus typus* from Iko River estuary.

S/N	Food items	Number of food items	Number of food items %
1	Crayfish	124	42.61
2	Fish remain	65	22.34
3	Detritus	50	17.18
4	Crab	21	7.22
5	Worm	14	4.81
6	Sand	12	4.12
7	Octopus	5	1.72
	Total	291	

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

Table 2: Monthly diet composition of *Pseudotholithus typus* from Iko River estuary.

	Crayfish (%)	Fish remain (%)	Detritus (%)	Crab (%)	Worm (%)	Sand (%)	Octopus (%)
December	27.39	20.55	16.44	15.07	8.22	5.48	6.85
January	23.81	17.46	17.46	15.87	12.70	12.70	0
February	53.85	46.15	0	0	0	0	0
March	100	0	0	0	0	0	0
April	46.81	21.28	31.91	0	0	0	0
May	50.00	23.91	26.09	0	0	0	0

The overall percentage numerical abundance, frequency of occurrence and point method of food consumed by *P. typus* from Iko River estuary is shown in table 3. In the three methods, crayfish was the most consumed food item while octopus was the least consumed item. In the frequency of occurrence method, the primary food items were crayfish, fish remains, and detritus while crab, worms, sand and octopus constituted the secondary food items. Based on the numerical method, crayfish, fish remains, and detritus made up the primary diets while crab, worms, sand and octopus constituted the secondary food items. Based on the point method crayfish and fish remain made up the primary diets while detritus, crab, worm, sand and octopus constituted the secondary food items. The species was found to be an active feeder based on the gut repletion index of 73.22.

Table 3: Overall Numerical Abundance (%), Frequency of Occurrence (%) and Point Method (%) of diet composition of *Psuedotholithus typus* from Iko River estuary.

Food Items	Number of stomach In Which Food Items Occurred	Frequency Occurrence (%)	Numerical Abundance (%)	Point Method %
Crayfish	124	92.54	42.61	56.11
Fish remain	65	48.51	22.34	29.81
Detritus	50	37.31	17.18	5.05
Crab	21	15.67	7.21	4.02
Worm	14	10.45	4.81	3.50
Sand	12	8.96	4.12	0.76
Octopus	5	3.73	1.71	0.76
Number of specimen with food examined	134			
Total number of specimen examined	180			
Total number of food item	291			

The Index of Relative Importance of Long neck croaker, *Psuedotholithus typus* from Iko River estuary is shown in table 4. Crayfish formed the most important food item with %IRI of 74.40. Fish remain was the 2nd most important composed 20.87% IRI. Detritus ranked third in the importance at IRI 2.92%. Other food items constituted less than 2%.

Growth parameters

The range and mean values of weight and total length of *Pseudotolithus typus* from Iko River Estuary are presented in table 5. Maximum weight was recorded in March with a mean value of 77.24±3.50g while the minimum weight in February with a mean of 64.11±1.57g. The minimum total length was 18.00cm with a mean of 21.48±0.27 recorded in January, while the maximum total length was 28.30cm with a mean of 22.80±0.34 recorded in March. The weight of *Pseudotolithus typus* sampled ranges 41.10g-129.0g (December), 44.40g-95.60g (January), 49.90g-85.50g (February), 48.00g-142.10g (March), 49.80g-92.70g (April) and 49.70-119.80 (May). The highest mean body weight was recorded in March (142.10g) while the lowest mean body weight was obtained in December (41.10g). Table 1 shows total length range from 18.20-26.70, 18.00-23.90, 18.60-24.00,19.70-28.30, 19.20-24.30 and 19.00-26.70 for December, January, February, March, April and May, respectively. The highest mean total length was noted in March (28.30cm) while the lowest mean total length (18.00cm) was recorded in January.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

The length–weight parameters of *P. typus* from Iko River estuary is depicted in table 6 and figures 1-3. Male, female and combined sex samples exhibited negative allometric regression exponent (b-values) except females in May which showed isometric growth pattern. The coefficient of determination "r^2" showed that there was correlation between length and weight in all the months (Figures 4-9).

Table 4: Index of Relative Importance of Long neck croaker, *Psuedotholithus typus* from Iko River estuary.

Food Items	% Cn	% Cp	% Fo	(%Cn + %Cp) %Fo	% IRI
Crayfish	42.61	56.11	92.54	5,235.03	74.40
Fish remain	22.34	29.81	48.51	1,468.42	20.87
Detritus	17.18	5.05	37.31	205.60	2.92
Crab	7.21	4.02	15.67	70.20	1.0
Worm	4.81	3.50	10.45	41.39	0.59
Sand	4.12	0.76	8.96	10.93	0.16
Octopus	1.71	0.76	3.73	4.54	0.06
Total				7,036.11	

Table 5: Size distributions of *P. typus*.

		Males					Females					Over all			
	N	XTL ± Std Err	Range	XTW ± std Err	Range	N	XTL± std Err	Range	XTW ± std Err	Range	N	XTL ± std Err	Range	XTW ± Std Err	Range
Dec	16	21.91± 0.57	18.20-26.70	74.62± 5.45	41.10-129.00	14	22.44±0.53	18.60-25.60	73.77±4.42	46.30-109.50	30	22.16±0.39	18.20-26.70	74.23±3.50	41.10-129.00
Jan	13	21.07± 0.48	18.00-23.90	68.51± 2.89	44.40-87.90	17	21.78±0.28	19.70-23.70	70.65±2.23	53.90-95.60	30	21.48±0.27	18.00-23.90	69.72±1.76	44.40-95.60
Feb	13	21.67 ± 0.41	18.90-23.80	65.40±2.36	49.90-81.20	17	21.21±0.34	18.60-24.00	63.12±2.14	50.10-85.50	30	21.41±0.26	18.60-24.00	64.11±1.57	49.90-85.50
Mar	15	22.22±0.36	19.70-25.10	71.94±3.44	48.00-97.00	15	23.38±0.56	20.20-28.30	82.54±5.90	53.00-142.10	30	22.80±0.34	19.70-28.30	77.24±3.50	48.00-142.10
Apr	15	22.13±0.45	19.20-24.20	69.94±4.01	49.80-92.70	15	21.92±0.39	19.80-24.30	68.06±3.58	50.30 90.70	30	22.02±0.29	19.20-24.30	69.00±2.65	49.80-92.70
May	15	21.71±0.48	19.00-24.50	66.74±4.03	49.70-97.30	15	23.05±0.49	19.90-26.70	78.18±5.41	49.90 119.80	30	22.38±0.36	19.00-26.70	72.46±3.48	49.70-119.80

Table 6: Length–weight parameters.

	Sex	N	A	B	R2
December	Male	16	0.03109	2.52	0.8224
	Female	14	0.0179	2.390	0.93692
	Combined sex	30	0.01919	2.430	0.85135
January	Male	13	0.0323	1.602	0.69033
	Female	17	0.0489	1.708	0.73343
	Combined sex	30	0.0236	1.599	0.6208
February	Male	13	0.0294	1.605	0.7260
	Female	17	0.0398	1.598	0.6533
	Combined sex	30	0.0203	1.603	0.6902
March	Male	15	0.04009	2.698	0.7770
	Female	15	0.01437	2.806	0.96702
	Combined sex	30	0.01676	2.746	0.9055
April	Male	15	0.01499	2.773	0.96342
	Female	15	0.01684	2.8462	0.95647

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

	Combined sex	30	0.01077	2.8036	0.96028
May	Male	15	0.01919	2.5089	0.9293
	Female	15	0.01473	3.072	0.97096
	Combined sex	30	0.01227	2.744	0.94733
Overall	Male	87	0.01291	2.281	0.7858
	Female	93	0.0969	2.476	0.87765
	Combined sex	180	0.07959	2.372	0.83309

Figure 1: Samples of Pseudotolithus typus.

Figure 2: Sample of Stomach with food item.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

Figure 3: Showing petri dish with collected food particle.

Table 7: Condition factor (K) of *P. typus*.

	Male			Female			Combined		
	N	Mean±Str	Range	N	Mean±Str	Range	N	Mean±Str	Range
December	16	0.69± 0.02	0.57-0.94	14	0.64± 0.01	0.58-0.73	30	0.67± 0.01	0.57-0.94
January	13	0.73±0.03	0.62-0.96	17	0.68±0.01	0.57-0.83	30	0.70±0.01	0.57-0.96
February	13	0.64±0.02	0.56-0.82	17	0.66±0.01	0.55-0.82	30	0.65±0.01	0.55-0.82
March	15	0.65±0.01	0.54-0.76	15	0.63±0.008	0.58-0.71	30	0.64±0.008	0.54-0.76
April	15	0.63±0.008	0.57-0.71	15	0.63 ±0.007	0.59-0.71	30	0.63±0.005	0.57-0.71
May	15	0.64±0.01	0.57-0.73	15	0.62±0.007	0.59-0.68	30	0.63±0.007	0.57-0.73
Overall	87	0.66	0.54-0.96	93	0.64	0.55-0.83	180	0.65±0.005	0.54-0.96

Figure 4: Showing petri dish with collected food particles.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

Figure 5: Showing petri dish with collected food particle.

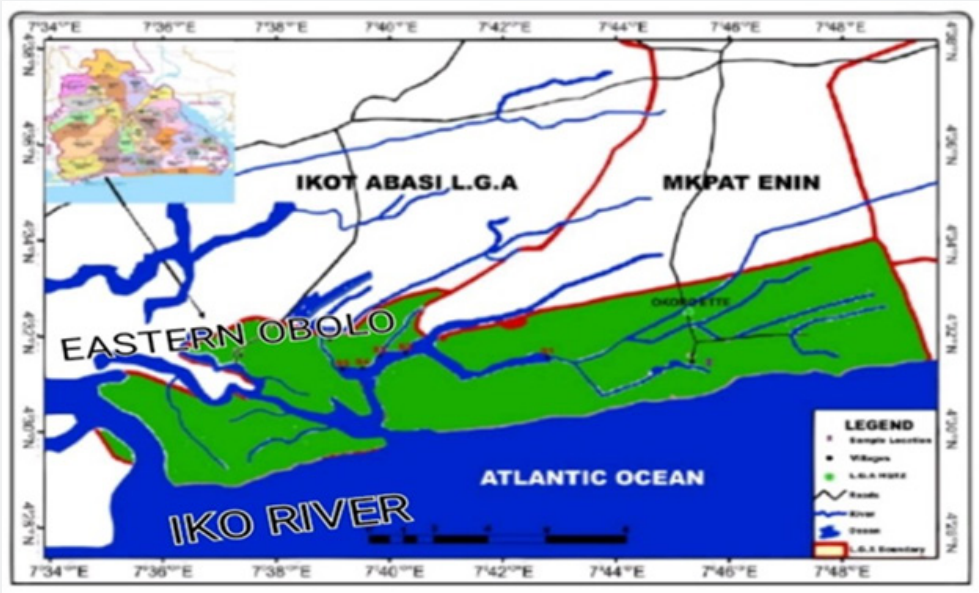

Figure 6: Map of Eastern Obolo L. G. A. Showing Iko River and Its Tributaries.

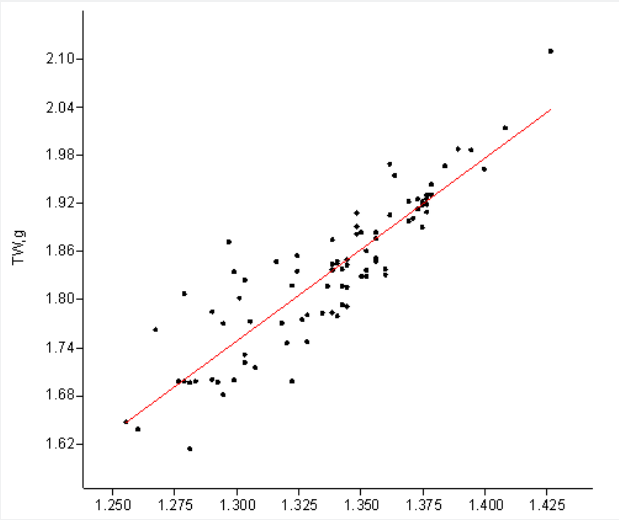

Figure 7: LW graph for male (log transformed), N = 87, a = 0.01291, b = 2.281 (negative allometric growth), r2 = 0.94733.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

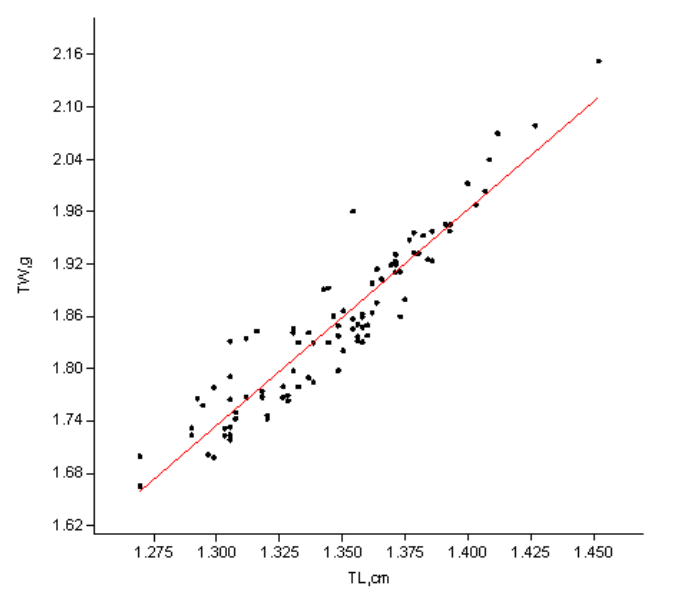

Figure 8: LW graph for female (log transformed), N = 83, a = 0.0969, b = 2.476 (negative allomatric growth), r2 = 0.87765.

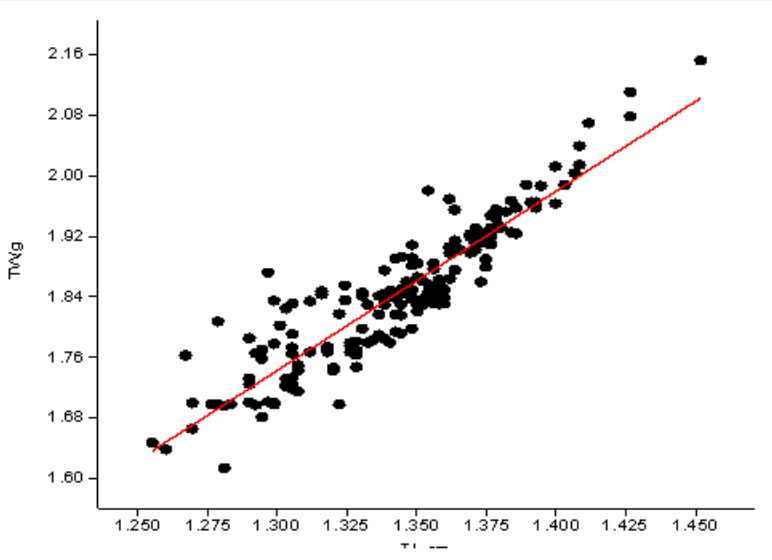

Figure 9: LW graph for Male +female (log transformed), N =180, a = 0.07957, b = 2.372 (negative allomatric growth), r2 = 0.83309.

Condition factor (K)

The range and mean monthly condition factor (K) is presented in table 7. Maximum condition factor obtained for P. typus was 0.96 in January with a mean of 0.70 ± 0.01while the minimum condition of 0.54 was recorded in March with a mean of 0.64±0.008. Condition factor of *Pseudotolithus typus* range from mean 0.67 ± 0.01, 0.70 ± 0.01, 0.65 ± 0.01, 0.64 ± 0.008, 0.63 ± 0.005, 0.63 ± 0.007, for December, January, February, March, April and May respectively. Males had higher mean value of K than females, however, the K values were generally lower than 1 indicating poor condition of the species in the environment.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

Discussion

Food items and feeding habit of *Pseudotolithus typus*

The different food items in the gut of the long neck croaker from Iko River Estuary constitutes one of the most important aspects of this study, which included shrimps, octopus, crab, juvenile fish remains, worms, detritus and sand. The major food item found in this current research study were shrimps and these results agreed to that of Fagade and Olaniyan, (1973) who worked on the Lagos Lagoon and reported that crab and fish were the main food items of croaker. Also, Nunoo et al. [19] who worked on Benin (West Africa) near shore waters, reported that food items of P. typus constituted mainly of shrimps and fishes including crabs and cephalopods. Awotunji [20] who worked on the Lagos Lagoon reported also that the main food item of P. typus is shrimps *(crustaceans)*. It also align with Edah [21] who worked on Lagos Lagoon and reported that shrimps made up the main food item of *P. typus*. The observed mean gut repletion index of 73.22% is an indication of high feeding intensity. The present information is in agreement with reports of Olatunji [22] who worked on the stomach and gut content of Long Neck Croaker – *Pseudotolithus typus* [20] from Lagos Lagoon recorded %GRI of 75.18%.

Length and Weight Relationship of *Pseudotolithus typus*

A length-weight relationship (LWR) provides information on growth patterns and growth of animals. In this study, growth of *Pseudotolithus typus* samples from Iko River estuary showed negative allometry. It was observed that if fish must maintain its shape as it grows, their b-values must be equal to 3, but there is no existing theory that says the b-value must be negatively or positively allometric. Allometric growth is negative (b<3) if the fish gets relatively thinner as it grows bigger (growth in age with reduction in size) and positive (b>3) if it gets plumper as it increases in age. It was reported that various factors, including seasons, environmental parameters, and the presence of food, feeding ratio, habitat, sex and physiological conditions of fish may be responsible for differences in the observed b value. The strong relationship between length and weight in the coefficient of determination (r^2) values agrees with previous studies on different fish species from various water bodies. Nunoo et al. [19] reported a negative allometric growth pattern in *P. typus* nearshore waters in Benin. Awotunji [20] reported that the growth pattern of P. typus in Lekki Lagoon showed a negative allometry. Unlike the result of this study, Ndiaye [23] observed a positive allometric growth pattern for *P. typus* in an evaluation of length-weight relationship of some fish species from the Bandiala River in Saloum Delta, Senegal. Olapade and Tarawallie (2014) also reported positive allometric growth pattern for *P. senegalensis* in Tombo, western rural district of Sierra Leone.

According to Abiaobo et al. [24], a negative allometric growth signifies that the rate of weight gained is less than the increase in length, and this can be caused by environmental factors such as temperature, dissolved oxygen, pH, pollution, overfishing, food competition and trophic potentials of the rivers. Moreover, the growth exponent was not within the limit or range of 2 and 4 as reported for most fish [23] as observed in months of January and February in the present study. LWR is important in fisheries management for comparative growth studies (Mendes et al., 2004); it provides valuable information on the aquatic habitat and in aquatic ecosystem modelling (Pauly, 1993; Kulbick et al., 2006).

Condition Factor of *Pseudotolithus typus*

Condition factor is a morphometric index used to evaluate physiological status of fish based on the principle that those individual of a given length which have a higher mass are in better 'condition' (Udoh and Abiaobo, 2024) [20]. The condition factor could be influenced by differences in size or age [25]. Ndiaye [23] stated that when condition factor value is higher, it means that the fish has attained a better condition. The range of condition factor (K) obtained in this study is 0.54-0.96 which was less than one and showed poor condition of the species in the environment. This agreed with Abowei [26] who reported the mean condition factor ranging from 0.94-0.99 in Nkoro River, Niger-Delta, Nigeria. Olapade and Tarawallie (2014) also reported mean condition factor ranging from 0.66-0.99 for *P. senegalensis* in Tombo Western rural district of Sierra Leone. However, Bagenal and Tesch, (1978) opined that a fish living in a favourable environment in terms of amount of food available and good environmental conditions grow faster with condition factor of one or more. Certain factors are known to affect the wellbeing of fish including data pulling, sorting into classes, sex, stages of maturity and state of the stomach [18]. It has been found that the value of K is not constant for individuals, species or populations but is subject to wide variations for fish of average natural condition [20]. Generally, variations in the K values of these fish species could be a reflection of the state of sexual maturity, degree of nourishment, age of the fish and in some species sex of the fish [27].

Conclusion

In conclusion, this study showed that *Pseudotolithus typus* is a predator that feeds on a wide range of food items with a greater preference for a carnivorous lifestyle. Its major food items are shrimps, fish remains, crab, octopus, worms, detritus and sands. The length-weight relationship showed a negative allometric growth as the regression co-efficient value was less than 3 and condition factor was lower than 1, indicating poor condition of the species in the environment. It is hoped that the imminent coastal development and pollution that is bound to accompany the establishment of an oil company in the study area will be such that will not constitute a threat to the shrimp fishery as this will negatively affect the croakers and other species of fish dependent on them for food [28-51].

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

References

1. Richter H, Luckstadt C, Focken U, Becker K (2004) Some mathematical considerations in estimating daily ration in fish using food consumption models. Ecol Model 171(4): 381-393.
2. Oronsaye CG, Nakpodia FA (2005) A Comparative Study of the Food and Feeding Habit of *Chrysicthys nigrodigitatus* and brycinus nurse in a tropical river. Pkistan J Sci indust Res 48(2): 118-121.
3. Ayoade AA, Ikulala AO (2007) Length weight relationship, condition factor and stomach contents of Hemichromis bimaculatus, Serotherodon melanotheron and Tilapia getheri *(perciformes: Cichilidae)* in Eleiyele Lake, Southwestern Nigeria. Int Journal of Tropical Biology 55(3-4): 969-977.
4. Kumar DB, Singh NR, Bink D, Devashish K (2014) Length weight relationship of *Labeorohita and Labeogonius (Hamilton-Buchanan)* from SoneBeel, the biggest wetland of Assam. Indian Journal of Environmental Research and Development 8(3).
5. Abdoli A, Rasooli P (2008) Length-weight relationship of 10 Species of fishes collected from Iranian freshwaters. Journal of Applied Itchyology 22: 156-157.
6. Ighwela KA, Ahmed A, Abol MAB (2011) Condition Factor as an Indicator of Growth and Feeding Intensity of Nile Tilapia Fingerlings *(Oreochromis niloticus)* Feed on Different Levels of Maltose. American-Eurasian Journal of Agriculture & Environmental Science 11(4): 559-563.
7. Seher DD, Suleyman CI (2012) Condition factors of seven cyprinid fish species from Çamligöze Dam Lake on central Anatolia, Turkey. African Journal of Agricultural Research 7(31): 4460-4464.
8. Anene A (2005) Condition factor of four Chichild species of a man–made lake in Imo State South Eastern Nigeria. Turkish Journal of fisheries and Aquatic sciences 5(1): 43-47.
9. Udo MT (2002) Intersexual plasticity in aspects of the biology of the mudskipper, swamps of Imo Estuary, Nigeria). Environ Sci (China) 14 (1): 95-101.
10. Kumolu JCA, Ndimele PE (2010) Length-weight relationships and condition factors of twenty-one fish species in Ologe lagoon, Lagos, Nigeria. Asian Journal of Agricultural Science 2: 174-179.
11. Lizama M, De Los AP, Ambrosio MA (2002) Condition Factor in nine Species of the Characidae Family in the upper parana River Floodplain Brazil. Brazilian Journal of Biology 62 (1): 113-124.
12. Anyanwu AO, Kusemiju KI (1990) Food of the croakers *Pseudotolithus senegalensis* (C.V.) and *Pseudotolithus typus* (Bleeker) off the coast of Lagos, Nigeria. J Fish Biol 37(5): 823-.825.
13. Bachok Z, Mansor MI, Noordin RM (2004) Diet composition and food habits of demersal and pelagic marine fishes from Terengganu waters, east coast of Peninsular, Malaysia. NAGA WorldFish Center Quarterly 27: 41-43.
14. Fagade S, Olaniyan C (1972) The biology of the West African shad *Ethmalosa fimbriata* (Bowditch) in the Lagos lagoon, Nigeria. J Fish Biol 4: 519-533.
15. Udo MT, Abiaobo NO, Asuquo IE (2016) Aspects of the reproductive biology in mudskippers *Periophthalmus barbarus* (Gobiidae) (Linneaus 1766) in mangrove swamps of Iko Estuary, Southeast, Nigeria. International Journal of Fisheries and Aquatic Studies 4(3): 27-32.
16. Udoh JP, Abiaobo NO (2014) Condition Index, Meat Yield and Population Structure of The Marine Gastropod, Thais coronata, off Cross River Estuary. Advances in Life Sciences and Technology (23): 24-31.
17. Abiaobo NO, Asuquo IE, Ejiogu IN, Umoren UJ (2020) Diets and Trophic Niches of an Amphibious Fish From Jaja Creek South Eastern, Nigeria. American journal of Biology and Life Sciences 8(2): 8-13.
18. Gayanilo FC, Pauly D (1997) FAO ICLARM stock assessment tools (FISAT): Reference Manual, FAO, Computerized Information Series. Fisheries 8: 262.
19. Nunoo FKE, Sossoukpe E, Adite A, Fiogbe ED (2013) Food habits of two species of *Pseudotolithus* (Sciaenidae) off Benin (West Africa) nearshore waters and implications for management International. Journal of Fisheries and Aquaculture 5(6): 142-151.
20. Awotunde OM (2021) Stomach and gut content of Long Neck Croacker-*Pseudotolithus typus* (Bleeker,1863) from Lagos Lagoon, Nigera. Ann Mar Sci 5(1): 1-6.
21. Edah Bernard (2016) Biometric Characteristics, Food and Feeding Habit and Sex Dimorphism of the Long Neck Croaker *(Pseudotolithus typus)* from Lagos Lagoon. International Journal of l Modern Plant & Animal Sciences 4(1): 1-9.
22. Olatunji AM (2021) Length–weight relationship and condition factor of long neck croaker –*Pseudotolithus typus* (Bleeker, 1863) from Lagos Lagoon, Nigeria. International Journal of Fisheries and Aquatic Studies 9(2): 9-13.
23. Ndiaye W, Diouf K, Samba O, Ndiaye P, Panfili J (2015) The Length-Weight, Relationship and Condition Factor of white grouper (*Epinephelus aeneus*, Geoffroy Saint Hilaire, 1817) at the south-west coast of Senegal, West Africa. International Journal of Advanced Research 3(3): 145-153.
24. Abiaobo NO, Asuquo IE, Ejiogu IN, Etimfon JJ (2021) Aspect of the biology of *Periophthalmus barbarous* (mudskipper) from Jaja creek, Niger Delta, Nigeria. Ecology and Evolutionary Biology 6(1): 15-22.
25. Anwa UEP, Pepple PCG (2011) Length-Weight relationship and Condition factor of Brackish Tilapia *(Sarotherodon melanotheron)* cultured in sheltered outer tanks. Proceedings of the 26th Annual Conference of the Fisheries Society of Nigeria, Minna, Nigeria pp. 98-102.
26. Abowei JFN, Davies OA, Eli A (2009) Physicochemistry, morphology and abundance of fin fish of Nkoro River, Niger Delta, Nigeria. International Journal of Pharma and Bio Sciences 6(2).
27. Ndome CB, Muabe T (2009) The feeding behavior and condition index of *Heterobranchus bidorsalis* in southeastern Nigeria. Journal Sustainable Tropical Agriculture Res. 29:18.
28. Baran E (1995) Spatio-temporal dynamics of estuarine poison populations in Guinea – relationship with the abiotic environment. Doctoral thesis, University of Western Brittany, Brest. France 242.
29. Chao LN, Trewavas E (1990) Sciaenidae. p. 813-826.
30. Dewan S (1979) Food and feeding habits of *Tilapia nilotica (L.) (Perciformes: Cichlidae)*, 2: Diet and seasonal patterns of feeding. Bangladesh Journal of Zoology (Bangladesh) 7: 75-80.
31. Sossoukpe FKE, Adite EA, Fiogbe ED (2013) Aquaculture Food habits of two species of *Pseudotolithus (Sciaenidae)* off Benin (West Africa) nearshore waters and implications for management. International Journal of Fisheries and Aquaculture 5(6): 142-151.
32. Fafioye OO, Oluajo OA (2005) Length-weight relationships of five fish species in Epe Lagoon, Nigeria. African journal of Biotechnology 4(7): 749-751.

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950

33. Fulton TW (1902) The rate of growth of fishes. 20th Annual Report of the Fishery Board of Scotland (3): 141-241.

34. Ibrahim BU, Auta J, Balogun JK, Bolorunduro PI, Dankishiya AS (2012) Length-weight relationship and condition factor of *Barilius niloticus (Family: Cyprinidae)* in Kontagora Reservoir, Niger State, Nigeria. Biological and Environmental Sciences Journal for the Tropics 9(2): 155-158.

35. Ikongbeh OA, Ogbe FG, Solomon SG (2012) Length-Weight relationship and Condition factor of *Citharinus citharius* (Geoffroy Saint-hillaine, 1809) from Lake Akata, Benue state, Nigeria. Proceedings of the 27th annual Conference of the Fisheries society of Nigeria 2012, Yenagua, Nigeria pp. 374-378.

36. Joseph YT, Theodore D (1994) Food and feeding habits of two Sciaenid fish species (*Pseudotolithus typus* and *Pseudotolithus senegalensis*) off Cameroon. Naya, the Iclarm quarterly p. 40-41.

37. Kareem OK, Ajani EK, Orisasona O, Olanrewaju AN (2015) The Sex Ratio, Gonadosomatic Index, Diet Composition and Fecundity of African Pike, Hepsetus odoe (Bloch, 1794) in Eleyele Lake, Nigeria. Journal of Fisheries and Livestock Production 3: 139.

38. Kumar R, Sharma BK, Sharma LL (2007) Food and feeding habits of *Catla catla (Hamilton-Buchanan)* from Daya Reservoir, Udaipur, Rajasthan. Indian J Anim Res 41(4): 266-269.

39. Kumolu JCA, Ndimele PE (2011) Length-weight relationships of nine fish species from Ologe Lagoon, Lagos, Nigeria. African Journal of Biotechnology 10(2): 241-243.

40. Lagler KF, Bardack JE, Miller RR, Passino DRM (1977) Ichthyology. John Wiley Inc, New York USA p. 50.

41. Longhurst AR (1964) Synopsis of biological data on West African croakers *(P. typus, P. senegalensis and P. elongatus)*. FAO Fish. Synopsis p. 35.

42. Mahesh V, Ambarish P, Gop, Rekha JN (2018) Stomach content analysis techniques in fishes. Recent advances in fishery biology techniques for biodiversity evaluation and conservation. pp. 104-115

43. Nsikak OA, Idopise AEA, Ifeanyi NE, Etimfon JJ (2021) Aspects of the Biology of *Periophthalmus barbarus* (Mudskipper), from Jaja Creek, Niger Delta, Nigeria. Ecology and Evolutionary Biology 6(1): 15-22.

44. Offem BO, Samsons YA, Omoniyi IT (2009) Length-weight Relationship, Condition Factor and Sex Ratio of Forty-Six Important Fishes in a Tropical Flood River. Research Journal of Fisheries and Hydrobiology 4(2): 65-72.

45. Opadokun IO, Ajani EK (2014) Some aspects of the reproductive biology of *Gymnarchusniloticus Cuvier*, 1829 (Knife fish) in Lekki Lagoon, Nigeria. International Journal of Fisheries and Aquatic studies 2(3): 166-170.

46. Sidibé A (2003) The coastal demersal fishery resources of Guinea. Exploitation, biology and dynamics of the main species of the Sciaenidae community. Thesis Doct. Ensar. Rennes France 320.

47. Tientcheu JY, Djama T (1994) Food habits of two Sciaenid fish species (*Pseudotolithus senegalensis and Pseudotolithus typus*) of Cameroon. Fishbyte section, Nanga. The International center for living Aquatic Resources Management Quaterly 40.

48. Troadec JP (1971) Biology and dynamics of a West African *Sciaenidae Pseudotolithus senegalensis (V.)* 2: 1-225.

49. Ude EF, Ugwu LLC, Mgbenka BO, Nwani CD (2011) Evaluation of length weight relationship of fish species of Ebonyi River, Nigeria. Nigerian Journal of Fisheries 8(1): 136-144.

50. Youson JH, Holmes JA, Guchardi JG, Beaver RE, Gersmehl JE, et al. (1993) Importance of condition factor and the influence of water temperature and photoperiod on metamorphosis of sea lamprey, *Petromyzon marinus*. Canadian journal of Fisheries and Aquatic Science 50(11): 2448-2456.

51. Zacharia PU, Abdurahiman KP (2004) Methods of stomach content analysis of fishes. Winter school on towards ecosystem-based management of marine fisheries. Building mass balance trophic and simulation models.

DOI:10.19080/OFOAJ.2023.16.555950

How to cite this article: Abiaobo NO, Akpan II, Asuquo IE*, Udosen IE, Ekpetor E. Trophic Ecology, Growth Patterns and Wellbeing of Long Neck Croaker – Pseudotolithus Typus from Iko River Estuary, South Eastern Nigeria. Oceanogr Fish Open Access J. 2023; 16(5): 555950.
DOI:10.19080/OFOAJ.2023.16.555950