

ABUNDANCE, LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF LUTJANIDS (SNAPPER) FROM SOMBREIRO RIVER, NIGERIA

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A study was conducted to investigate abundance, length-weight relationship and condition factor of Lutjanidae fishes in the Sombreiro River, Nigeria from January to June, 2018. A total of 173 specimens representing fish species were collected from five different sampling stations all along the river. The mean total lengths ranged from 23.97 ± 0.94 cm recorded for *Lutjanus goneensis* to 30.59 ± 2.47 cm for *Lutjanus campechanus* and mean weight varied between 188.67 ± 17.83 and 283.00 ± 35.69 for *Lutjanus goneensis* and *Lutjanus campechanus* respectively. The exponent b ranged from 2.52 recorded for *Lutjanus campechanus* to 3.48 recorded for *Lutjanus dentatus*. The mean values condition factor of the five lutjanid species studied ranged from 1.03 ± 0.08 to 1.39 ± 0.09 . The estimated status of this fish family could provide valuable information for protection and conservation of these valuable stocks.

Keywords: length-weight relationships, condition factor, Lutjanidae, Sombreiro River.

INTRODUCTION

The Niger Delta region of Nigeria is blessed with the numerous river systems that are very rich in fish species and huge fishing opportunities for small scale fisheries. Sombreiro River a tributary of Niger River is one of the important rivers in Niger Delta, runs downwards into the Southern tip of the Niger Delta basin and empties into coastal lagoons and creeks bordering the Atlantic Ocean. (Ezekiel *et al.*, 2011). The River occupies important place because of its fishery production, providing breeding grounds and nursery grounds for many commercially important species (Ezekiel *et al.*, 2002) as well as fishing ground for artisanal fishery in the region.

Lutjanidae fishes are important ichthyofaunal components of Sombreiro River and are of considerable economic value. The fish family has 17 genera with about 113 species and the genus *Lutjanus* forms the largest genus (Allen, 1985). Schneider (1990) reported six species in the Gulf of Guinean water while Longhurst (1961) identified seven species in Nigerian water. Mostly marine in habitat but with some members inhabiting estuaries, feeding in fresh water (Nelson, 1984). Lutjanidae are estimated to have 10 spines, 14 soft dorsal rays, 3 anal spines and 8–9 anal soft rays, which is a determinant features that distinguished lutjanids from other similar fishes especially the so-called popular lady fish (Allen, 1985). Nigerian fish production by species for Lutjanidae was estimated at 9,742 tonnes out of 1027058 tones fish produced in 2015 (NBS, 2017). Previously it was abundant in

coastal waters and rivers but now the populations are declining due to destruction of their habitats and overfishing (Ezenwa & Ayinla 1994). Exploitation status of the snapper species is suggested to be over-exploited in Nigerian coastal waters (Amiengheme, 1997, 2001).

Information on length-weight relationship of fish is important in fisheries assessment (Haimovici & Velasco, 2000). Length-weight relationship is an important input to the regional stock assessment as it is used to convert catches in weight into catch in number (Farley *et al.*, 2012). Estimation of the population size of a fish stock for the purpose of its rational exploitation often requires knowledge of these relationships (Le Cren, 1951). Length-weight relationship also provides information on the condition factor.

In spite of its abundance and economic importance, studies on the lutjanid species from Nigeria are few and fragmentary. The objective of the present study was to provide size structure, and length-weight relationships and status of the family Lutjanidae from the Sombreiro River, Niger Delta region of Nigeria.

MATERIAL AND METHODS

The study was carried out in the Sombreiro River, Niger Delta region of Nigeria between latitude 6° 30' 1" N and 7° 01' 1" E, and longitudes 4° 01' 21" N and 6° 00' 17' 1" N (Fig. 1) were chosen and sampled every month from April to September, 2018.

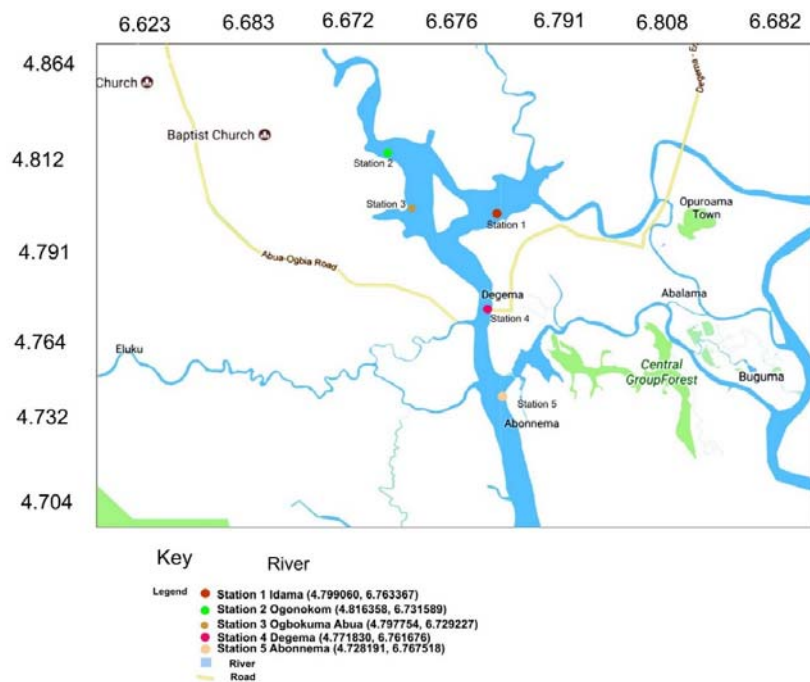


Fig. 1. Map of Sombreiro River showing study sites.

Fish samples were collected from five major fishing landing sites (Degema, Ogonokomi, Ogbokuma Abua and Abonnema). Captured fishes were identified to species level according to Schneider (1990). Total Length (TL) was measured to the nearest 0.01 cm using measurement boards and Body Weight (BW) was weighed by an electronic balance with 0.01 g accuracy for each individual. Length-weight relationship was calculated using the formula $W = aL^b$ (Le Cren, 1951), where W is weight (g) and L is length (cm), a is a coefficient related to body form and b is an exponent indicating isometric/ allometric growth. Condition factor (K) was computed using the formula $K = 100 w/L^3$ (Pauly, 1983); where W = weight (g) of a fish, L = total fish length (cm).

STATISTICAL ANALYSIS

Data were analysed using statistical analysis software (SAS 9.2) and Microsoft Excel 2003 software. Data were expressed as mean \pm standard error of mean.

RESULTS

SIZES AND CATCH COMPOSITION OF LUTJANID SPECIES

A total of 173 specimens of five lutjanid species were caught during the study (Table 1). The most prevalent species was *Lutjanus endecancathus* (25.7%) followed by *L. goneensis* (25.2%) and *L. agennes* (24.0%) while of these five species the least occurrence species was *L. campechanus* (5.8%). The results of the size distribution for lutjanid species are presented in Table 2. The length range obtained for *Lutjanus agennes*, *L. campechanus*, *L. dentatus*, *L. endecancathus*, and *L. goneensis* were 9.8–48.5 cm, 20.1–50.1 cm, 10.3–39.5 cm, 10.8–40 cm and 10.1–38.5 cm respectively. The mean total lengths ranged from 23.97 ± 0.94 cm recorded for *L. goneensis* to 30.59 ± 2.47 cm for *L. campechanus* and mean weights were 188.67 ± 17.83 g, 204.02 ± 18.32 g, 205.61 ± 16.67 g, 216.79 ± 17.91 g and 283.00 ± 35.69 g for *L. goneensis*, *L. agennes*, *L. endecancathus*, *L. dentatus* and *L. campechanus* respectively.

Table 1
Monthly fish catch of Lutjanid species

Species	April	May	June	July	Aug.	Sept.	Total	Percentage
<i>Lutjanus agennes</i>	5	0	24	0	6	6	41	24.0
<i>Lutjanus campechanus</i>	0	5	0	5	0	0	10	5.8
<i>Lutjanus dentatus</i>	11	11	0	7	4	0	33	19.3
<i>Lutjanus endecancathus</i>	8	4	10	10	12	0	44	25.7
<i>Lutjanus goneensis</i>	12	0	6	9	10	6	43	25.2
							171	100

Table 2
Mean weight, total length and standard length of Lutjanid species

Species	Weight (g)		Total Length (cm)	
	Mean \pm SE	Range	Mean \pm SE	Range
<i>Lutjanus agennes</i>	204.02 \pm 18.32	20–500	24.75 \pm 1.20	9.8–48.5
<i>Lutjanus campechanus</i>	283.00 \pm 35.69	100–500	30.59 \pm 2.47	20.1–50.1
<i>Lutjanus dentatus</i>	216.79 \pm 17.91	20–411	26.53 \pm 1.21	10.3–39.5
<i>Lutjanus endecancathus</i>	205.61 \pm 16.67	25–411	24.73 \pm 1.04	10.8–40
<i>Lutjanus goneensis</i>	188.67 \pm 17.83	25–500	23.97 \pm 0.94	10.1–38.5

The parameters of the length-weight relationships of lutjanid species are presented in Table 3. The exponent b ranged from 2.52 recorded for *Lutjanus campechanus* to 3.48 recorded for *L. dentatus*. The coefficients of determination (r^2) of the length-weight relationships regressions ranged between 0.77 and 0.94. The mean condition factors of the lutjanid species studied were 1.36 ± 0.08 , 1.03 ± 0.08 , 1.20 ± 0.08 , 1.39 ± 0.09 and 1.30 ± 0.07 for *L. agennes*, *L. campechanus*, *L. dentatus*, *L. endecancathus* and *L. goneensis* respectively.

Table 3
Overall condition factors and the growth pattern of fish catch

Species	N	a	b	r^2	K	Range	Growth pattern
<i>Lutjanus agennes</i>	41	-5.82	3.48	0.87	1.36 ± 0.08	0.44–2.60	Positive allometry
<i>Lutjanus campechanus</i>	10	2-.94	2.52	0.82	1.03 ± 0.08	0.40–1.30	Negative allometry
<i>Lutjanus dentatus</i>	33	-3.93	2.92	0.77	1.20 ± 0.08	0.53–2.39	Negative allometry
<i>Lutjanus endecancathus</i>	44	-3.48	2.73	0.79	1.39 ± 0.09	0.54–3.46	Negative allometry
<i>Lutjanus goneensis</i>	43	-3.02	2.59	0.94	1.30 ± 0.07	0.27–3.02	Negative allometry

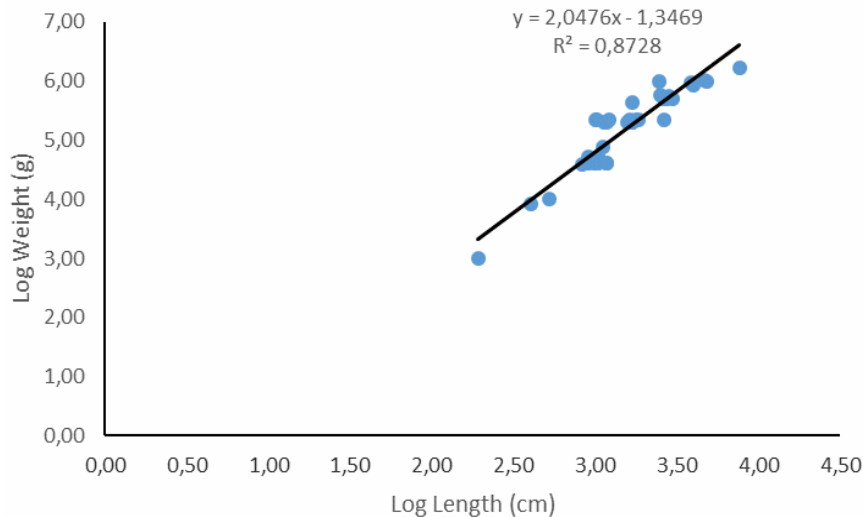


Fig. 2. Allometry growth patterns for the species *Lutjanus agennes*.

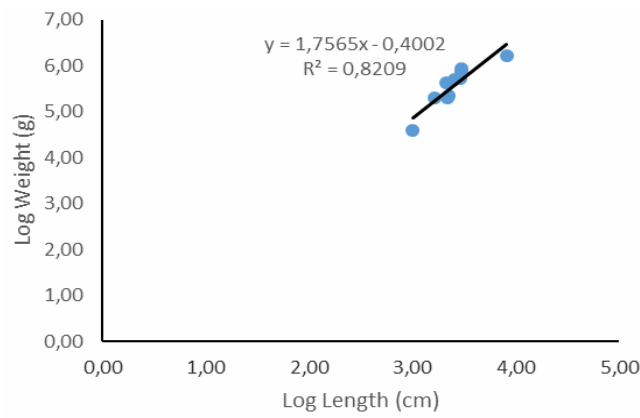


Fig. 3. Allometry growth patterns for the species *Lutjanus campechanus*.

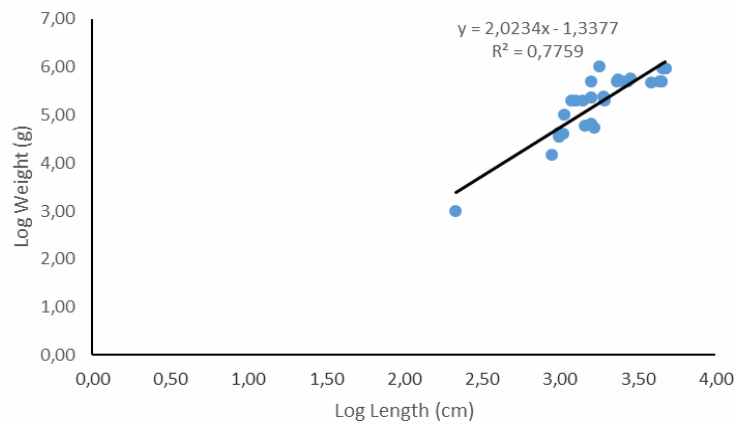


Fig. 4. Allometry growth patterns for the species *Lutjanus dentatus*.

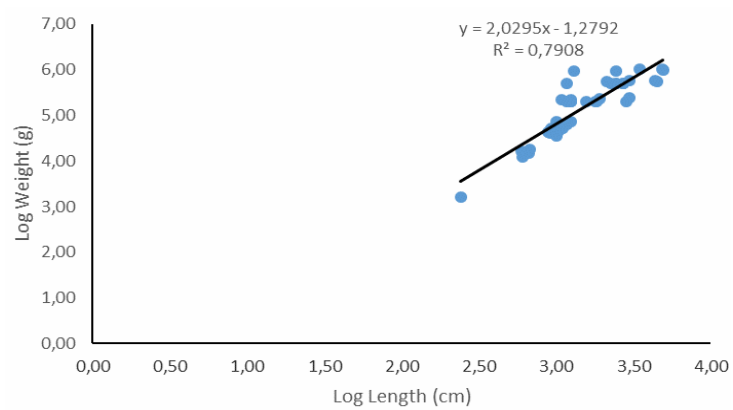


Fig. 5. Allometry growth patterns for the species *Lutjanus endecancathus*.

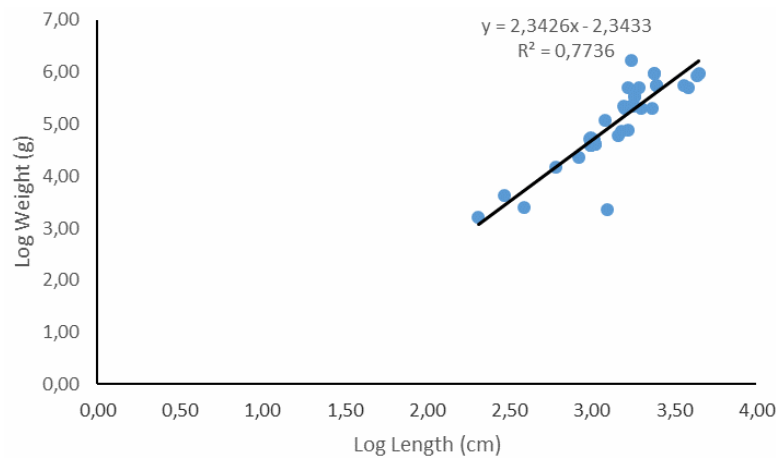


Fig. 6. Allometry growth patterns for the species *Lutjanus goneensis*.

DISCUSSION

Lutjanid species recorded in the current study included *Lutjanus agennes*, *L. campechanus*, *L. dentatus*, *L. endecancthus* and *L. goneensis*. The result is similar to Schneider (1990) who reported six species in the Gulf of Guinea. This is in contrast with the findings of Ibim & Bongilli (2016) who recorded only two species from the middle reach of the same river. These species recorded in this study appear to be more susceptible to artisanal fishing gear used by local fishers in the study area. The number of species could vary depending upon differences in the sampling methods and sampling effort, as well as fish abundance (Olopade & Rufai, 2014).

The mean sizes of lutjanid species obtained in this study ranged from 23.97 ± 0.94 to 30.59 ± 2.47 cm. Allen (1985) recorded the maximum total length of 80 cm for most lutjanids in the Gulf of Guinea. These results revealed that the size distributions of species studied were mainly juveniles. Apart from *L. endecancthus* with maximum total length of 20 cm the remaining five species recorded in the Gulf of Guinea varied in length from size range of 60–90 cm (Schneider, 1990). Kafayat *et al.* (2015) observed that *L. goneensis* with sizes ranging from 7.90–19.99 cm and 20.00–34.99 cm were believed to be juveniles and sub-adult members of the species, respectively. Schneider (1990) reported that young are frequently encountered in coastal waters, particularly estuaries and sometimes in rivers.

The results obtained in this study (Figs. 2–6) similar to Allen's (1985) reported that juveniles were more common on mangrove estuaries, creeks, coastal rivers and lower reaches of freshwater.

The exponent b is close to 3.0 for most species (Figs. 2–6) but when the value of b exceeds 3.0 (Fig. 3), fish become fatter and when the value falls below

3.0, fish become leaner. In this study four out of five species demonstrated allometry growth patterns with the b values varied between 2.52 and 2.92. These results suggest a pattern of distinct morphological similarity in the stocks of lutjanid species from the Sombreiro River. Only *L. dentatus* showed isometric growth and implies that fish become rotund as they grow in length (Anderson & Gutreuter, 1985). Ralston (1988) reported allometric growth for some lutjanid species from the Mariana Archipelago.

Growth pattern and growth rates are highly species specific. However, the variations in the value of the exponent 'b' could be attributed to factors such as seasonal fluctuations, physiological conditions of the fish at the time of collection, sex, gonadal development and nutritive conditions of the environment (Le Cren, 1951). Variations in these factors affect the growth rate and result in varying degrees of fluctuations in the growth rate within population (Gupta & Gupta, 2006). The correlation coefficient of lutjanids obtained in the present study varied between 0.77 (moderate) and 0.94 (high).

In this study the (K) condition factor of *Lutjanus* species ranged from 1.03 ± 0.08 to 1.39 ± 0.09 . This implies that fish species are in good condition during the study. But the values recorded are below that of Bagenal & Tesch (1978) which indicated a range of 2.9–4.8 as the ideal range of K value for the normal growth and utilization of nutrients by a normal fresh water fish. The value of condition factor depends upon the external environment of the fish. Based on the results of this study proper steps should be taken for the protection and conservation of these valuable fish species through effective fishing regulation measures.

CONCLUSIONS

This study has demonstrated that Sombreiro River harbors five lutjanid species with *L. endecanctus*, *L. goneensis* and *L. agennes*, account for almost 70% of the landings. The total length ranged from 23.97 ± 0.94 to 30.59 ± 2.47 cm indicating juveniles and sub-adult members of the species. Of the species examined, all were characterized by allometric growth and condition factor of *Lutjanus* species ranged from 1.03 ± 0.08 to 1.39 ± 0.09 . The information gained in the present survey may be a valuable tool for the protection and conservation of lutjanid species in the Sombreiro River.

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