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Length-Frequency Distribution, Length-Weight Relationship and Condition Factor of Sompat Grunt *Pomadasys jubelini* (Cuvier, 1830) off Lagos Coast, Nigeria

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ABSTRACT

Length-frequency distribution, length-weight relationship and condition factor of sompat grunt *Pomadasys jubelini* off the Lagos coast, Nigeria were investigated in order to study the growth pattern of *P. jubelini*. A total of four hundred and fifty specimens of *P. jubelini* were used for this study with body lengths ranging from 13.9-26.6cm (total length) and 11.2-22.1cm (standard length). The body weight ranged from 26.8g to 175.1g. The length-frequency distribution revealed high abundance of *P. jubelini* in the 21.0-21.9cm (total length) size group which accounted for 17.8% of the total specimens examined. The length-frequency distribution showed a poly-modal size distribution. Length-weight relationship was determined by the regression equation Log W = -1.5325 + 2.8177 Log L (n= 450, r^2= 0.69, $p < 0.05$). *P. jubelini* showed negative allometric growth (b = 2.8177) which indicated proportionate growth was more in body length than in body weight. The mean condition factor was significantly higher for males (1.92 ± 0.02) as compared to females (1.75 ± 0.03) ($p < 0.05$). Results of this study are important and relevant for the stock assessment and fishery management of *P. jubelini* in the Lagos coast.

Keywords: Condition factor, growth pattern, Lagos coast, length-frequency distribution, length-weight relationship, *Pomadasys jubelini*, sompat grunts

INTRODUCTION

The Lagos coast supports a natural fishery resource for the Lagos State in Nigeria. There are several economically important fish species in this water body and *Pomadasys jubelini* (Family: Haemulidae) is one of

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the economically important, abundant and widely distributed fish species not only in the Lagos coastal waters but also in the much wider Nigerian coastal waters. It is economically important in both the coastal artisanal fisheries as well as trawl fisheries. *Pomadasys jubelini* belongs to the Sciaenid fish community constituting the demersal resources in the Gulf of Guinea and it inhabits soft, sandy, muddy bottoms at depths between 15-50m (Mensah & Quaatey, 2002). Notwithstanding its economic importance, studies related to growth and size of *P. jubelini* off the Lagos Coast has not been reported.

Information on fish growth is obtained through growth studies where growth parameters like length-frequency distribution, length-weight relationship and condition factor are determined. Length-frequency distribution gives information on specific fish sizes and their corresponding frequency within a given population (Cunha *et al.,* 2007). Information on age groups in a population with modal length range is collected from length-frequency distribution analysis. In temperate regions, scales and otoliths are fish hard parts that are used to determine age and growth of fishes for stock assessment, but this is difficult in tropical regions. Length-frequency distribution however, is a better alternative in tropical regions for fish age determination and for stock assessment (Sparre *et al.,* 1989).

In fisheries assessment, important information is obtained by length-weight relationship of fish species (Haimovici & Velasco, 2000). Fish weight from length, ontogenic allometric changes and condition index are determined from length-weight relationship (Teixeira de Mello *et al.,* 2006). Estimates of length-weight relationship are relevant in stock management and assessment (Koutrakis & Tsikliras, 2003). Variations in length-weight relationship parameters of fish may differ according to season and habitats (Olim & Borges, 2006).

The condition factor expresses the relative degree of robustness or wellbeing of fish and reflects the degree of nourishment and state of sexual maturity. Sex of fish, age of fish, type of fish species, maturity stage and season are some of the factors that influence the condition factor of fish, leading to variation in the condition factor (William, 2000; Anyanwu *et al.,* 2007). The assumption of the condition factor is that fish in better condition are heavier (Bagenal & Tesch, 1978). It also provides information on the physiological state of fish relating to fish welfare from the reproductive and nutritional perspectives (Le Cren, 1951) and also provides useful information that can be used as age, growth and feeding intensity indices (Oni *et al.,* 1983).

There is limited information on the biology of the grunts in Nigeria. Francis and Sikoki (2007) reported the growth coefficient of *P. jubelini* from the Andoni River, Niger Delta, Nigeria. Length-weight relationship of some fresh water and coastal fish species in Nigeria have been reported (King, 1996, Fafioye & Oluajo, 2005; Agboola and Anetekhai, 2008). There is paucity of information on the growth studies of *P. jubelini*. Hence, the objectives

of this study includes determining the length-frequency distribution, length-weight relationship and condition factor of *P. jubelini* from the Lagos coast. It is hoped that this study will enhance knowledge on the biology of *P. jubelini* in the Nigerian waters.

MATERIALS AND METHODS

Study area

The study area was the Lagos coast, Lagos, Nigeria located between longitude 02° 53¹E to 08° 14¹E and latitude 06° 21¹N to 03° 55¹N covering a distance of 85km and lies in between the Gulf of Guinea (Fig. 1). Nigeria's coastline is 853km long bordering the Atlantic Ocean and has a coastal shelf area of approximately 41,000km² (FAO, 1969; Nwankwo & Onyema, 2003).

Fish collection and sampling

Specimens of *P. jubelini* were purchased from fish mongers at the landing centre of trawlers fishing off the Lagos coast at the jetty in Ijora Olopa, Lagos, Nigeria. The specimens were collected from January to

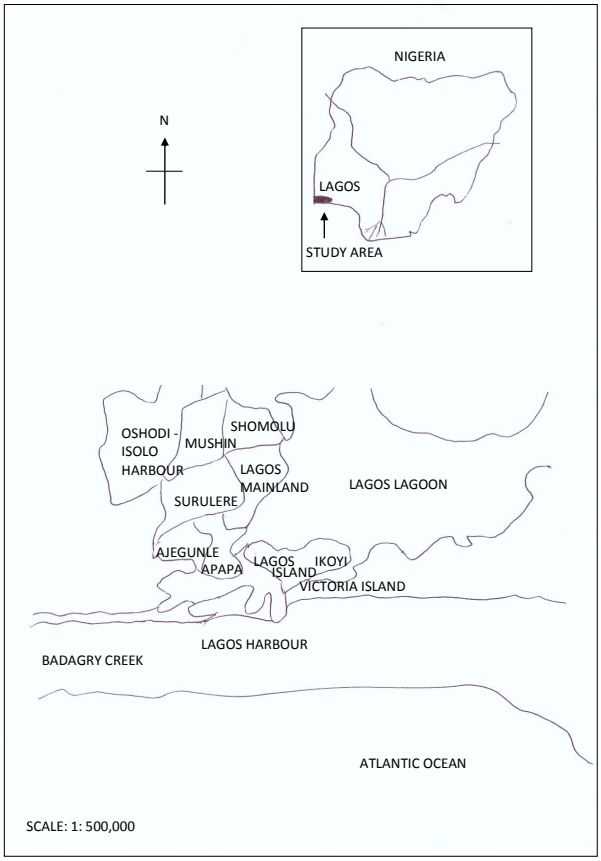

Fig.1: Map of Lagos showing the Lagos coast. Inset: Map of Nigeria showing the study area

September 2005. The fish was identified by the aid of taxonomic keys in Fischer *et al.* (1981). Fifty samples were randomly selected each month, making a total of 450 samples collected during the study period. Specimen selection was done by simple random sampling (Cochran, 2007). Each sample was randomly hand-picked without bias on its size, such that each fish size in the population had an equal chance of being selected. The samples were transported to the research laboratory and preserved in a deep freezer at -20°C. The samples were later allowed to thaw for examination in the laboratory for analysis.

Morphometric measurement

The total and standard lengths were measured using a one-meter measuring board graduated in cm. After wiping off water, the fish body weight was measured using a weighing balance (Sartorius model).

Growth studies

The growth pattern of *P. jubelini* was determined by determining the length-frequency distribution, length-weight relationship and condition factor.

Length-frequency distribution

The fish were grouped into different size classes and the percentage frequency and total lengths were used for the length-frequency distribution.

Length-weight relationship

The standard length and body weight of fish were used for the length-weight relationship.

The length-weight relationship was represented by the regression equation of Dadzie and Wangila (1980):

$$W = a + bL.$$

$$\text{Log } W = a + b \text{ Log } L$$

where W = weight of fish (g), L= standard length of fish (cm), a= regression constant, b= regression coefficient.

Condition factor

The condition factor was calculated according to Bannister (1976). It was calculated for males, females and combines sexes as follows

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

where K= condition factor, W= weight of fish (g) and L= standard length of fish (cm).

Statistical analysis

Data were analysed using statistical analysis software (SAS 9.2) and Microsoft Excel 2003 software. Data were expressed as mean ± standard error of the mean. The difference in the condition factor of the male and the female fish was analysed by utilising the student-t test at $\alpha = 0.05$

RESULTS AND DISCUSSION

Length-frequency distribution

The total length of *P. jubelini* ranged from 13.9 cm to 26.6 cm with a mean of 16.75 ± 0.10 cm. The length-frequency distribution

showed polymodal distribution. The modal size class was 21.0-21.9 cm. Fig.2 shows the length-frequency distribution of *P. jubelini*.

Length-weight relationship

Body weight of *P. jubelini* ranged from 26.8 g to 175.1 g (mean = 103.0 ± 5.5g) and the standard length ranged from 11.2cm to 22.1cm (mean = 15.1 ± 0.4cm). The length-weight relationship of *P. jubelini* is shown in Fig.3, and is represented by the regression equation, LogW = -1.5325 + 2.8177 Log L ($r^2 = 0.69$, $r = 0.83$, $p < 0.05$).

Condition factor

The condition factor, K for males (mean = 1.92 ± 0.02; range = 0.69 - 3.15) was significantly higher than that of females (mean = 1.75 ± 0.03; range = 0.71 - 2.79). The condition factor for the combined sexes ranged from 0.69 to 3.15 with a mean value of 1.92 ± 0.02.

The length-frequency distribution suggested that *P. jubelini* belonged to more than one size group due to the poly-modal size distribution observed. This indicated the presence of several size groups in the fish population. The modal class of 21.0 - 21.9 cm which had the highest frequency accounted for 17.8% of the total specimens examined.

The length-weight relationship of *P. jubelini* reflected the expected increase in weight with increasing length irrespective of age or sex. The value of the regression coefficient b showed that the pattern of growth was negative allometric ($b < 3$). It can be inferred that growth was more in body length than in body weight. Similar results of negative allometric growth were also reported for *P. jubelini* from the Badagry Creek (b = 2.91) (Agboola & Anetekhai, 2008) and from the Qua Iboe estuary (b = 2.81) (King, 1996), Nigeria. In contrast, positive allometric

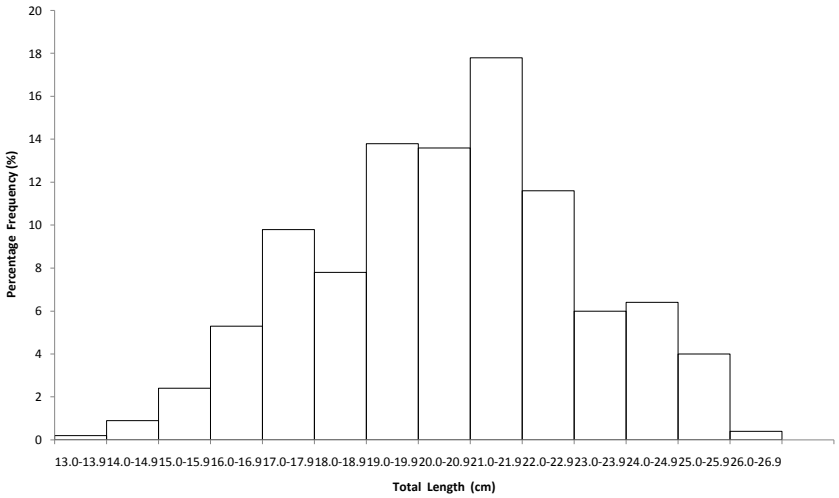

Fig.2: Length-frequency distribution of *Pomadasys jubelini* off Lagos coast

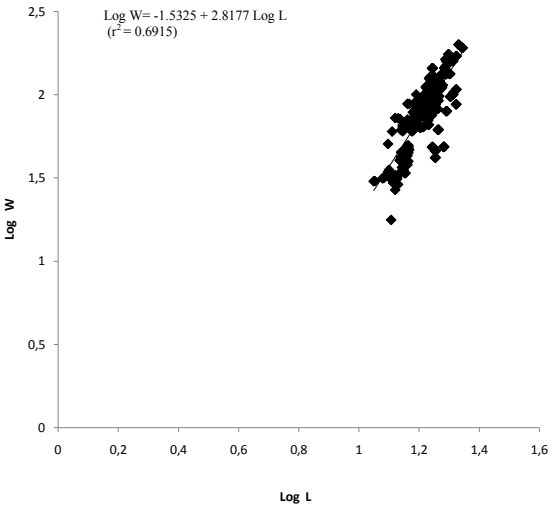

Fig.3: Length-weight relationship of *Pomadasys jubelini* off Lagos coast

growth was reported for *P. jubelini* from the Ivory Coast (b = 3.04) (Konan *et al*., 2007). Conspecifics of *P. jubelini* such as *P. branickii* demonstrated positive allometric growth (b = 3.1) (Rodriguez-Romero *et al*., 2009) while *P. incisus* (bastard grunt) showed negative allometric growth (b = 2.88) (Agboola & Anetekhai, 2008). *Pomadasys incisus* demonstrated similar growth pattern to *P. jubelini* in this study.

P. jubelini were in good condition in the Lagos coast where males had higher condition factor than the females ($p < 0.05$). This implied that male *P. jubelini* were in better condition than the females, and suggested that the males were heavier than the females. This was also demonstrated for *Pomadasys incisus* where the mean value of the male condition factor was 1.98 ± 0.16 and that of the female was 1.40 ± 0.11 (Fehri-Bedoui & Gharbi, 2008).

The information obtained in this study on the length-frequency distribution, length-weight relationship and condition factor of *P. jubelini* has implications on the fishery and fish stock management of Lagos coast. The results are valuable as a guide and would be useful for stock assessment in the development and formulation of fishery management policies in the Lagos coast and sustainability of the stocks available. It is also possible to use the data from this study in estimating the potential yield of *P. jubelini* fish stocks. The information is relevant in determining the future potential for recruitment and useful for monitoring and management of fisheries. This study revealed information on the available fish stocks of *P. jubelini*. Based on the results of the length-frequency distribution 19.0-30.0 cm size classes are in abundance and it is pertinent to monitor and manage these

size groups. Reduction in the population of these size groups (19.0 – 30.0 cm) could have negative effect on the population of *P. jubelini* in the Lagos coast. This is because these size groups (19.0 – 30.0 cm) are susceptible to exploitation and over fishing. The results on length-weight relationship can be used for length-based stock assessment of *P. jubelini.* Generally, this study has contributed to the information on growth parameters of *P. jubelini* in Lagos coast and the information can be utilised for fishery management.

CONCLUSION

It is pertinent to note that the significance of this study in fish biology was that it provided information on the growth parameters (length-frequency distribution, length-weight relationship and condition factor) of *P. jubelini* off the Lagos coast, Nigeria, which is a valuable tool for stock assessment and fishery management of *P. jubelini* in the Lagos coast. The length-frequency distribution suggested that 19.0 – 30.0 cm size class groups are abundant. This data is useful in quantifying the numerical abundance in the by-catch composition of *P. jubelini* in the Lagos coast. Length-based stock assessment can also be done by utilising the information obtained from the length-weight relationship of *P. jubelini* in this study.

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