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Growth pattern of the big eye grunt *Brachydeuterus auritus* (Valenciennes, 1832) off Lagos, Nigeria

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ABSTRACT

The growth pattern of the big eye grunt *Brachydeuterus auritus* (Valenciennes, 1832) off Lagos coast, Nigeria was investigated by determining the length frequency distribution, length-weight relationship and condition factor. Four hundred and fifty specimens were used for this study having body lengths in the range 11.7 - 19.3 cm total length and 9.6 - 16.3 cm standard length. The body weight ranged from 12.4 to 110.5 g. The length frequency distribution showed a unimodal pattern and and the modal size group was 15.0 - 15.9 cm which formed 26.7% of the specimens examined. The length-weight relationship was determined using the regression equation Log W = -1.3351 + 2.6829 Log L ($n = 450$, $r^2 = 0.5327$, $p < 0.05$). *B. auritus* had a negative allometric growth ($b = 2.6829$) which indicated that proportionate growth was more in body length than body weight. There was a positive correlation between body length and body weight of *B. auritus* ($r = 0.7299$). The condition factor for combined sexes was 1.97 ± 0.02. The condition factor was 1.98 ± 0.03 for males and 1.91 ± 0.03 for females. The males had higher condition factor than the females. However, there was no significant difference ($p > 0.05$) between the condition factor of males and females. The study is significant for estimation of growth parameters of *B. auritus,* which is essential for management of the fishery.

Keywords: *Brachydeuterus auritus*, Condition factor, Growth pattern, Lagos coast, Length frequency distribution, Length-weight relationship.

Introduction

Studies on fish biology are known to provide useful information for rational management of fisheries resources in natural water bodies. Information on the size group of fish that occurs in a given population is provided by study on length frequency distribution (Cunha *et al*., 2007) which in turn gives information on age groups in the population . In temperate waters, growth and age data required for stock assessment can easily be obtained using hard parts like scales and otoliths. However, this might be difficult in tropical waters. Sparre *et al*. (1989) suggested that analysis of length frequency data could be used for growth studies by researchers in the tropics in age determination and for stock assessment of tropical fish species.

Information on length-weight relationship of fish is important in fisheries assessment (Haimovici and Velasco, 2000). Length-weight relationship can be used to determine fish weight from length, condition index and ontogenic allometric changes (Teixeira de Mello *et al*., 2006). Estimates of length-weight relationships are necessary for stock assessment and is also useful for fishery conservation and management (Koutrakis and Tsikliras, 2003). Length-weight relationship in fishes is affected by several factors such as sex, diet, gonad maturity, health, stomach fullness and also on techniques of preservation (Tesch, 1971).

Condition factor expresses the relative degree of well being or robustness of fish. It reflects the degree of nourishment and state of sexual maturity in fish. Condition factor is based on the hypothesis that fish in better condition are heavier. Factors such as feeding intensity, growth and age indices; sex of fish, fish age, type of fish species, season, and maturity stage of fish influence variation in condition factor (Bagenal and Tesch, 1978; Oni *et al*., 1983; Williams, 2000; Anyanwu *et al*., 2007). Condition factor also reflects information on physiological state of fish as regards the welfare of the fish from both nutritional and reproductive perspectives (Le Cren, 1951)

The present study was conducted on big eye grunt *Brachydeuterus auritus* off Lagos coast, Nigeria with focus on length frequency distribution, length-weight relationship and condition factor. *B. auritus* belongs to the family *Haemulidae* and is widely distributed in Nigerian coastal waters. It is commercially exploited and encountered in catches of the coastal artisanal fishermen fishing along the Lagos coast. *B. auritus* accounts for more than 5% of the total marine fish catch. It can also be found in the coastal waters off the West African coast from Mauritania to South Angola. In inshore waters, it inhabits soft, sandy, muddy bottoms. It is mostly found at depths between 30 - 80 m, and its total depth range stretches from 10 to 100 m. *B. auritus* also dominates the sciaenid community of the

demersal fishery resources in the Gulf of Guinea in Eastern Atlantic Ocean (Schneider, 1990; Bannerman and Cowx, 2002; Mensah and Quaatey, 2002; Wirtz *et al*., 2007; Nunoo *et al*., 2009).

The Lagos coast supports coastal artisanal as well as trawl fisheries. *B. auritus* is a commercially important species caught along Lagos coast and is also a cultivable fish species.

Length-weight relationships of some freshwater and coastal fish species have been reported in Nigeria (King, 1996; Fafioye and Oluajo, 2005; Agboola and Anetekhai, 2008). There is dearth of information on length frequency distribution, length-weight relationship and condition factor of *B. auritus* off Lagos coast, Nigeria. Hence, this study aimed at filling this gap in knowledge.

Materials and methods

Study area

The study area was Lagos coast, Lagos, Nigeria with a narrow coastal shelf between 14, 816 km and 27,780 km with a total area of 41,000 km^2 (FAO, 1969; Nwankwo and Onyema, 2003).

Fish sampling

Specimens of *B. auritus* 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 during the period from January to September 2005. The fishes were identified using the FAO fish identification manual (FAO, 1981). Fifty samples were randomly selected each month, making a total of 450 samples during the study period. 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 during laboratory analysis.

Morphometric measurements

Total and standard lengths were measured using measuring board graduated in cm. The fish was wiped with dry tissue before weighing and body weight was measured using a weighing balance (Sartorius model).

Growth studies

After all the required measurements were taken, the growth pattern was investigated by estimating the length frequency distribution, length-weight relationship and condition factor.

Length frequency distribution

The fish were grouped into different size groups based on total length and frequency of fish that belonged to each size group was recorded. The percentage frequency and total length were used for analysing length frequency distribution.

Length-weight relationship

The standard length and body weight of fish were used for estimating length-weight relationship. The length-weight relationship was represented by the regression equation of Dadzie and Wangila (1980) using the equation:

$$W = a + bL$$

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

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 also for both sexes combined using the equation

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

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 mean. A histogram was used to analyse the length frequency distribution. The length-weight relationship was analysed using regression analysis. The relationship of body length and body weight of fish was also analysed using Pearson's correlation analysis. Difference in condition factor of male and female fish was analysed by students' t test (level of significance was $p < 0.05$).

Results and discussion

Length frequency distribution

Four hundred fifty fishes were examined for the study; the total length ranged from 11.7 to 19.3 cm with mean of 13.0 ± 0.06 cm. The length frequency showed unimodal distribution. The modal length was15.0 - 15.9 size group.

Length-weight relationship

Body weight of *B. auritus* ranged from 12.4 to 110.5 g and the standard length ranged from 9.6 to 16.3 cm. The length-weight relationship of *B. auritus* is shown in Fig. 1, and represented with the regression equation: Log W= -1.3351 + 2.6829 Log L (r^2 = 0.5327). A positive correlation was noticed between body length and weight (r = 0.7296).

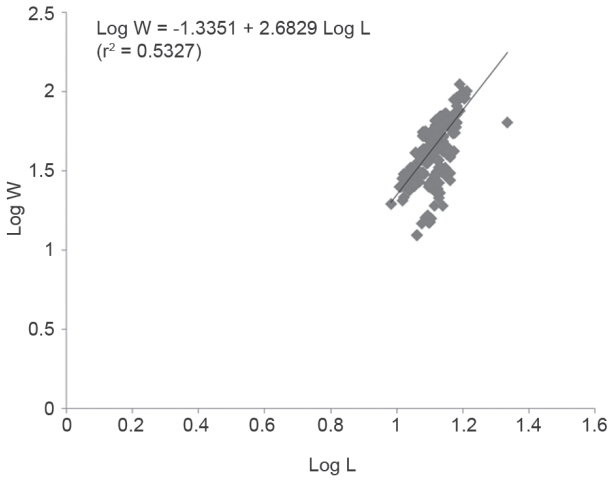

Fig. 1. Length-weight relationship of *B. auritus* off Lagos coast

Condition factor

The value of condition factor K ranged from 0.76 to 3.20 in males with a mean value of 1.98 ± 0.03 while in females it ranged from 0.75 to 3.07 with a mean value of 1.91 ± 0.03. The condition factor for combined sexes ranged from 0.75 to 3.20 with a mean value of 1.97 ± 0.02. There was no significant difference ($p>0.05$) between the condition factor of male and female *B. auritus*.

Length frequency distribution of *B. auritus* indicated unimodal size distribution which suggests that it probably belonged to one size group. The weight of fish could be predicted by the regression equation obtained for the length-weight relationship of *B. auritus*, and this is a useful tool in fish biology. The length-weight relationship reflected the expected increase in weight with increasing length regardless of sex or age. The value of the regression coefficient *b* showed that the pattern of growth was negative allometric, as the value of *b* obtained, was less than 3.

According to Fiobge *et al.* (2003) for *B. auritus* studied in Benin, positive allometric growth was observed with a *b* value of 3.36. The maximum size (total length) of *B. auritus* recorded by Fiogbe *et al.* (2003) was 18.6 cm. This was in contrast to the result obtained in this study for *B. auritus* off the Lagos coast in Nigeria. The length-weight relationship indicated that *B. auritus* had negative allometric growth, which indicated that proportionate growth was more in body length than body weight. Also, the maximum size of *B. auritus* recorded was 19.9 cm, which was higher than that of *B. auritus* recrded in Benin.

In Senegal, Samb (2003) reported that male *B. auritus* had positive allometric growth ($b = 3.115$) and the females had negative allometric growth ($b = 2.908$), for *B. auritus* with total length in the range 10.5 - 20.6 cm. This is unlike the results obtained for this study, where both male and female *B. auritus* had negative allometric growth. A similar result as observed in this study was obtained for elongate grunt *Haemulopsis elongatus*, which had negative allometric growth ($b = 2.737$) (Rodriguez-Romero *et al.*, 2009).

The results of length-weight relationship of *B. auritus* reported in this paper will provide baseline data for *B. auritus* on its length-weight relationship information in the Lagos coast, and it can be useful for comparative studies with other fish species along the Lagos coast.

The results of the condition factor of *B. auritus* indicated that *B. auritus* were in good condition off the Lagos coast. There was no significant difference between the condition factor of males and females. The condition factor of bastard grunt *Pomadasys incisus* ranged between 1.67 - 2.21 for males and 1.18 - 1.60 for females (Fehri-Bedoui and Gharbi, 2008). The males had higher condition factor than the females. This was in line with the results obtained for big eye grunt *B. auritus* in this study.

The significance of this study was that it provided information on the growth pattern of *B. auritus* off the Lagos coast, Nigeria, which is a valuable tool for the fishery management and stock assessment of *B. auritus* in the Lagos coast.

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