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Dietary Items and Feeding Habits of Big Eye Grunt *Brachydeuterus auritus* (Valenciennes, 1832)

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Abstract: Dietary items and feeding habits of big eye *Brachydeuterus auritus* off the Lagos coast, Nigeria were investigated. Analysis of stomach content was done by numerical, occurrence and volumetric methods. The dietary items of *B. auritus* were crustaceans, fishes, annelids, nematodes, blue-green algae and diatoms. Crustaceans and fishes formed the major dietary item of *B. auritus* and accounted for 29.5 and 6.1% by number, 52.0 and 23.4% by occurrence and 62.4 and 15.0% by volume. *B. auritus* is a non-piscivorous predatory fish, other macroscopic animals formed part of the major diet. Crustaceans was the most prominent dietary item followed by algae and then fish in the dry season (January-April) and wet season (May-September). This study will increase the knowledge of fisheries biology of *B. auritus* by contributing to the trophic structure of *B. auritus* in the Lagos coast and is relevant for fishery management and aquaculture of *B. auritus*.

Key words: Big eye grunt, *Brachydeuterus auritus*, dietary items, feeding habits, Lagos coast, stomach content

INTRODUCTION

Apart from fisheries, study on dietary items and feeding habits of fish species is paramount in aquaculture. It emphasizes the type of food consumed by fish and the feeding habits of fish. Feeding habits of fish may be influenced by size of fish and depth of the water body (Ikusemiju *et al*., 1979). In order to understand the ecology of fish community, feeding habits of the fish community is essential (Kume *et al*., 1999; Hajisamaea *et al*., 2003). The use of aquatic resources by fish plays a major role in influencing the population interactions in a community (Mequilla and Campos, 2007). Information on natural feeding of fish will enable us to identify trophic relationships in the aquatic ecosystems by identifying food composition and feeding as well as stability and structure of food webs (Abdel-Aziz and Gharib, 2007). Big eye grunt *Brachydeuterus auritus* (Valenciennes, 1832) is commonly known as big eye grunt and belongs to the family Haemulidae. It can reach a maximum size of 20-27 cm in growth. It is abundant in inshore and deep waters and is a common fish species in the Nigerian coastal waters. It is economically important for fisheries and often caught in abundance by trawlers when fishing is done at deeper depths than the normal fishing depth in Nigerian coastal waters. It also serves as source of protein for man particularly, the coastal tribes. It is a bentho-pelagic fish species that inhabits marine and brackish waters and can be found at depth range of 10-100 m. It is widely distributed in the Eastern Atlantic ocean (Schneider, 1990).

The Lagos coast supports a major fishery in Lagos state and other Western states in Nigeria. It supports artisanal and trawl fishery. Other demersal fishery resources present in the Lagos coast apart from the grunts are croakers, soles and threadfins. *B. auritus* is one of the fish species that belongs to the Sciaenid community in the Lagos coast (Mensah and Quaatey, 2002).

Earlier reports on food and feeding habits of *B. auritus* off the Lagos coast was provided by Ikusemiju *et al*. (1979). However, biology of fish changes with time depending on the prevailing environmental condition (Bagenal, 1978). Due to long term exploitation of the fishery resource of the Lagos coast, the feeding habit of *B. auritus* in the Lagos coast could have changed. The aim of this study was to investigate the dietary items and feeding habits of *B. auritus* in the Nigerian coastal water, off the Lagos coast by identifying the dietary items and their abundance as well as seasonal variation in dietary items.

It is hoped that this study will contribute information on the trophic structure of fish community in the Nigerian coastal ecosystem and valuable information necessary for aquaculture and fishery management of *B. auritus* in the Lagos coast.

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MATERIALS AND METHODS

Study area: The Lagos coast was the study area for this research. It is a narrow coastal shelf and lies between 14,816 and 27,780 km with a total area of 41,000 km^2. The Nigerian coastline is between longitude 02°53'-08°14'E and latitude 06°21'-03°55'N, covering a distance of 85 km and lies in between the Gulf of Guinea. It is a marine environment and salinity is a major limiting factor to the growth of some organisms in the Lagos coast (FAO, 1969; Nwankwo and Onyema, 2003).

Collection of specimens and 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 from January to September, 2005. The fish was identified by using the FAO (1981) fish identification manual.

Total 50 samples were randomly selected each month making a total of 450 samples collected during the study period. The samples were transported to the research laboratory and preserved in a deep freezer at -20°C until examination and analysis.

Morphometric measurements: The specimens were brought out of the deep freezer and allowed to thaw and the body length and weight were measured. Total and standard lengths were measured using a 1 m measuring board graduated in cm. The fish was wiped with a dry napkin before weighing and body weight was measured using a weighing balance (Sartorius Model).

Stomach content analysis: After measurements were taken, each specimen was dissected and the stomach was removed. Fullness of stomach was determined as 0/4 for empty stomach, 1/4 for quarter full, 2/4 for half full, 3/4 for three-quarter full and 4/4 for full stomach.

The stomach contents were emptied into a petri dish containing little amount of water which loosen up the materials for easier identification and estimation of number of organisms which were made under a monocular microscope. The contents were identified to the species level where possible and analyzed by numerical, occurrence and volumetric methods according to Bagenal (1978).

Numerical method: The number of each type of food items in each stomach was counted and expressed as a percentage of the total number of all food items found in the stomach. This method shows the dietary items occurring in the largest number.

Occurrence method: In this method, the number of stomach in which each food items occurred was counted and expressed as a percentage of the number of stomach containing food. This method provides information on the various types of food organism the fish fed upon.

Volumetric method: This method involved measurement of the volume of stomach and contents directly after dissection and the contents emptied into a petri dish. The volume alone was measured to obtain the total volume of food items by subtraction. The volume of the different food items was then expressed as a percentage of the total volume of all food items. This method shows the bulk relationship of the different food items.

Determination of diet importance: The importance of dietary items was determined by using Index of Relative Importance (IRI). This was calculated according to Cortes (1997) follows:

$$IRI = (N + V) \times O$$

Where:

IRI = Index of Relative Importance
N = Percentage of a certain food organism
V = Percentage of food volume
O = Percentage of frequency of occurrence of food

RESULTS AND DISCUSSION

In *B. auritus*, 42 out of 450 (9.3%) specimens examined had empty stomach. The monthly percentage of empty stomach is shown in Fig. 1. The percentage of empty stomach was high in April and August for *B. auritus* (20%).

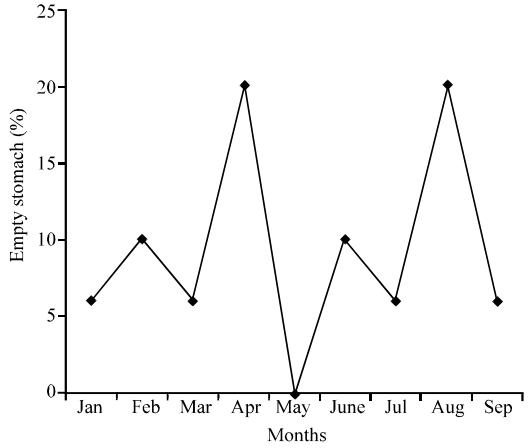

Fig. 1: Monthly percentage of empty stomachs of *Brachydeuterus auritus* off Lagos coast

Table 1: Dietary items of *Brachydeuterus auritus* off Lagos coast

	Numerical method		Occurrence method		Volumetric method	
Dietary items	No.	Percentage	No.	Percentage	No.	Percentage
Crustacea						
Shrimp	75	0.3	44	10.8	39.6	18.0
Shrimp appendages	4539	18.9	90	22.0	49.7	22.6
Hermit crab	6	0.0	6	1.5	1.3	0.6
Crab appendages	582	2.4	24	5.9	13.8	6.4
Isopod	25	0.1	14	3.4	14.6	6.6
Copepod	1846	7.7	26	6.4	15.2	6.9
Amphipod	23	0.1	8	2.0	2.8	1.3
Fishes						
Fish scale	373	1.5	24	5.9	4.8	2.2
Fish bone	277	1.2	22	5.4	7.2	3.3
Fish	25	0.1	20	5.0	13.5	6.1
Fish flesh	798	3.3	29	7.1	7.4	3.4
Annelida						
Nereis sp.	43	0.2	21	5.1	10.6	4.8
Nematoda						
Nematodes	53	0.2	39	10.0	39.7	18.0
Blue-green algae						
Algal filaments	7644	31.6	107	26.2	-	-
Diatoms						
Coscinodiscus sp.	7761	32.2	78	19.1	-	-
Detritus	-	-	314	77.0	-	-
Unidentified mass	-	-	342	83.8	-	-

Table 2: Relative importance of dietary items of *Brachydeuterus auritus* off the Lagos coast

Dietary items	No. (%)	Occurrence (%)	Volume (%)	IRI
Crustaceans	29.5	52.0	62.4	4778.80
Fish	6.1	23.4	15.0	493.74
Annelids	0.2	5.1	4.8	25.50
Nematodes	0.2	10.0	18.0	182.00

The dietary items of *B. auritus* are shown in Table 1. Analysis of stomach content of *B. auritus* showed that crustaceans accounted for 29.5% by number, 52.0% by occurrence and 62.4% by volume. Fishes accounted for 6.1% by number, 23.4% by occurrence and 15.0% by volume. Other food items were annelids which accounted for 0.2% by number, 5.1% by occurrence and 4.8% by volume. Nematodes accounted for 0.2% by number, 10.0% by occurrence and 18.0% by volume.

Algal filaments accounted for 31.6% by number and 26.2% by occurrence while diatoms accounted for 32.2% by number and 19.1% by occurrence. Detritus and unidentified mass accounted for 77.0 and 83.8% by occurrence, respectively. Table 2 shows the relative importance of dietary items of *B. auritus* of the Lagos coast.

The seasonal variation in dietary items was determined by the numerical monthly variation in food items of *B. auritus*. The seasonal variation of dietary items of *B. auritus* is shown in Fig. 2. Crustaceans were the most prominent dietary item followed by algae and then fish in the dry and wet seasons. Annelid was the least prominent dietary item in both seasons. The percentage of empty stomachs of *B. auritus* was relatively low which

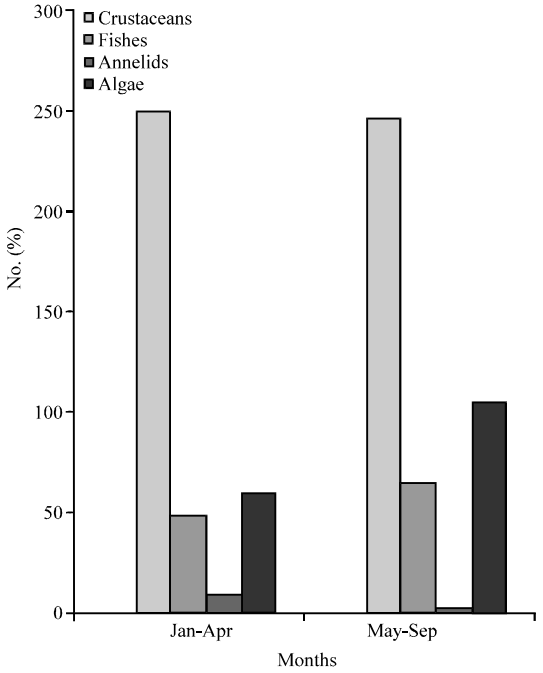

Fig. 2: Seasonal variation in dietary items of *Brachydeuterus auritu*

indicated that *B. auritus* was feeding well in the Lagos coast. The dietary items found in the stomach of fish are related to their availability in the environment they inhabit. The dietary items and feeding habits showed that *B. auritus* is a predatory fish. There are two types of predatory fish. Piscivorous predatory fish is the fish species that has fish constituting its major dietary items and non-piscivorous predatory fish which has other macroscopic animals other than fish as its major dietary items. In this study, *B. auritus* had crustaceans constituting its major dietary items. Hence, it can be said to be a non-piscivorous predatory fish. According to Ben-Tuvia and Kay (1986), *B. auritus* fed on phytoplankton, invertebrates and small fishes. This was in conformity with the results of this study, annelids, blue-green algae, crustaceans and fishes were among the dietary items of *B. auritus* in the Lagos coast. *B. auritus* was categorised as a piscivorous predatory feeder by Ben-Tuvia and Kay (1986). However based on the results of this study, *B. auritus* can be categorised as a non-piscivorous feeder because crustaceans formed its major food items.

Ikusemiju *et al.* (1979) encountered crustaceans in the stomach of *B. auritus* which included shrimp, hermit crab, isopod, copepod and amphipods. This was similar to the results obtained in this study as the stomach contents of *B. auritus* also contained similar dietary items. The importance of fishes came next to crustaceans in the

dietary items of *B. auritus* in this study. Ikusemiju *et al.* (1979) also reported the presence of fish and fish eggs in the stomach of *B. auritus*. Other dietary items consumed by *B. auritus* in the Lagos coast were nematodes and annelids, mainly polychaete worm (*Nereis* sp.). Nematodes and annelids found in the stomach of *B. auritus* might have been picked while browsing on the epifauna. The presence of nematodes in the stomach of *B. auritus* suggested that it is prone to parasitic infestation. In this study, nematode worms present in the stomach of *B. auritus* were regarded as stomach contents though they could equally be parasitic infestation. The presence of nematodes in the stomach of *B. auritus* was also reported by Ikusemiju *et al.* (1979).

Blay *et al.* (2006) found out that *B. auritus* fed on fish larvae, shrimp and cuttle fish in Cape coast, Ghana. Similar dietary items were found in the stomach of *B. auritus* in this study. However, cuttle fish was not present. Also, fish formed the major dietary items of *B. auritus* in the Cape coast which conformed to the results of this study. Crustaceans and fish formed the major dietary items of *B. auritus*. Relative importance of dietary items was determined by Index of Relative Importance (IRI). The results showed that crustaceans were the most important dietary item of *B. auritus* followed by fish. The index of relative importance was not calculated for dietary items that had no value for percentage number and percentage volume so as to get an unbiased and fair value for the dietary items of importance. The study period was from January to September and seasonal variation in dietary items of *B. auritus* off the Lagos coast revealed that crustaceans were the most prominent dietary item, followed by algae and then fish in the dry season (January to April) and wet season (May to September). While annelids were the least prominent dietary items in both seasons. There was similarity in the prominent dietary item consumed by *B. auritus* in both seasons. Fishes were the most prominent dietary items of *B. auritus* in January to May and preference of dietary items shifted from fish to crustacean (shrimp) from June to September (Blay *et al*., 2006). In this study, *B. auritus* fed mostly on crustacean in both seasons (January-September) based on the fact that crustaceans were the most prominent dietary item observed in the stomach in the dry and wet seasons.

CONCLUSION

It can be said that *B. auritus* is a non-piscivorous predatory fish that feeds on crustaceans, fish, annelids, diatoms and algae. Also, the dietary items of *B. auritus* were not affected by variation in season. Further research is needed to investigate the effect of season on the dietary items and feeding habits of *B. auritus* in the Lagos coast. This study is significant in the fish biology of *B. auritus*.

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