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Diets and Feeding Patterns of Big Eye Grunt *Brachydeuterus Auritus* Valenciennes, 1831 in Ghana

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ABSTRACT

The feeding habit and diet of *Brachydeuterus auritus* at Apam in the central region of Ghana was investigated over an 8 months period using the Index of Preponderance. Shrimp was found to be the most preferred food item accounting for 59% occurrence by number, with annelids and blue green algae being the least preferred accounting for 7% each. In the same vain, the most ranked food item using the Index of Preponderance was shrimps followed by fish with annelids recording the least rank. Correlation between food items number and the nutrient rich upwelling season was observed. Continuous study of the feeding preferences of this species is recommended owing to its importance to both the Ghanaian marine catches and as a relatively cheap source of animal protein.

Introduction

Feeding habit studies of fishes are essential in understanding their ecology [1] and specifically identifying trophic relationships [2]. Information from these studies would also be beneficial in effective fish meal formulation and production in aquaculture. The big-eye grunt, *Brachydeuterus auritus* Valenciennes, 1831 is from the family Pomadysidae and characterized by its prominent big eyes. *Brachydeuterus auritus* are benthopelagics that habits both marine and brackish waters [3] and commonly collected with fishing gears ranging from bottom trawls, gill nets and set nets and purse seine. They are abundant in inshore and deep waters and quite common in Ghanaian waters accounting for over 5% of the total marine fish catch [4]. This species also serve a major protein source especially to the coastal tribes who make them a major component of their dishes partly due to its low market price while converting them to fish meal is also common practice among coastal communities in Ghana [5].

Three traditional indices were enumerated by [6] for use in stomach content analysis which include percent composition by number (N), percent composition by weight (W), and frequency of prey occurrence (O). However, each of them gives different emphasis on the fish's diet and has inherent challenges in their accuracy when used. Smaller sized preys can disproportionately dominate a fish's diet when percentage numbers (N) is used due to their size, so will larger sized preys when percentage composition by weight (W) is used while frequency of occurrence provide information that emphasizes frequency but doesn't indicate relative importance of the prey to the fish's overall diet. The Index of Preponderance is a feeding Index that addresses these gaps as it provides a definite and measurable basis for grading food items by integrating both frequency and bulk while also ranking the food items in order of importance.

Several aspects of *Brachydeuterus auritus* within Ghanaian coastal waters have been conducted, ranging from population parameters [5], and reproductive biology [7]. However, information on the feeding habits of this important fish species is limited hence this attempt at bridging that gap.

Materials and methods

Study Area

Ghana lies between latitudes 4° and 12°N, and longitudes 4°W and 2°E and has a coastline that stretches 560 kilometers (350 miles) on the Gulf of Guinea. The coastline stretches from Half Assini in the western region down to Denu in the Volta region (Fig.1). However, the study focused on Apam fish landing site in the Central region of Ghana.
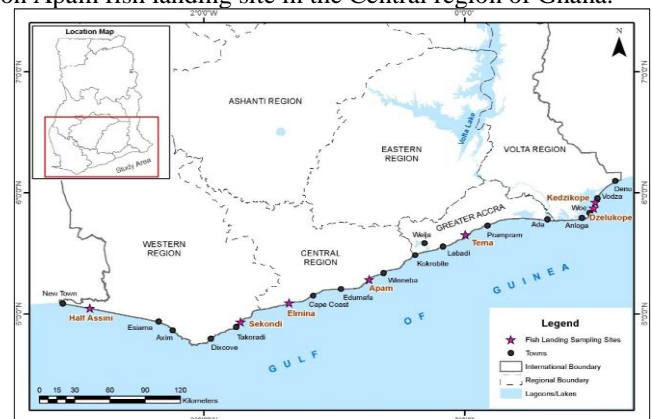

Fig 1. Map of Ghana's coastline showing the sampling site.

Sampling

The samples of *Brachydeuterus auritus* were bought from fisher folks at the selected fish landing site for a period of 8 months from May to December, 2016.

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Samples were preserved on ice inside iced chests and conveyed to the laboratory at the Marine and Fisheries Sciences department of the University of Ghana. At the laboratory, identification was done using [8]. Morphometrics such as total length and standard length (SL) were measured to the nearest 0.1 cm using 100 cm graduated wooden fish measuring board. Body weight was taken using electronic digital balance with 0.01g accuracy. A total of 50 samples of *Brachydeuterus auritus* were randomly sampled each month, making a total of 400 fishes sampled for the entire study period.

Stomach contents analysis

After the morphometric measurements, each fish sample was dissected and the stomach removed. Stomach fullness was determined thus:

4/4 – full stomach

3/4 – three quarter full stomach

2/4 – half full stomach

1/4 – quarter full stomach

0/4 – empty stomach

The contents of the stomach were emptied into a petri dish and spread out with a forcep for ease of identification and identified under a microscope. Individual items were counted and volume determined using displacement method. Occurrence was determine as the ratio of the number of stomach in which each food item occurs over the total number of stomachs containing food items. Identification of individual food item was done to species level where possible.

Feeding Index

The Index of Preponderance (I) was applied using the formula

$$I = V_i * O_i \: / \sum V_i * O_i \: * 100 \; [9]$$

Where I is the Index of Preponderance, V is percentage volume, O is percentage occurrence

Results

The feeding habits of *Brachydeuterus auritus* was investigated at Apam, central region, in Ghana between May and December, 2016. A total of 400 stomachs were examined with a high average food volume in stomach rate with only 4.4% of them being empty, which points to a constant level of feeding activities.

Food spectrum and importance

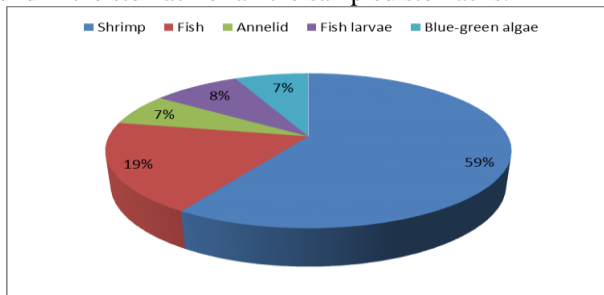Fig. 2 shows the frequency of occurrence of food items found in the stomach of all the sampled stomachs.

Figure 2. Composition of food items in stomach of
Brachydeuterus auritus.

This was dominated by shrimps which accounted for 59%, followed by fish (19%) with fish larvae, annelid and blue-green algae following in that order representing 8%, 7%, and 7% respectively.

Monthly Feeding preferences

Fig. 3 below shows the feeding preference by month by the specie. Although there was a distinct preference for shrimps across the months, fluctuations were observed among all the food items. The highest number shrimp food item was recorded in July followed by June with the least in December. October recorded the highest fish larvae food item with the least recorded in August and September. While both shrimp and fish were recorded in during the entire study period, annelids were not encountered in October, November and December while blue-green algae were missing in the stomach contents for the months of May, October and November.
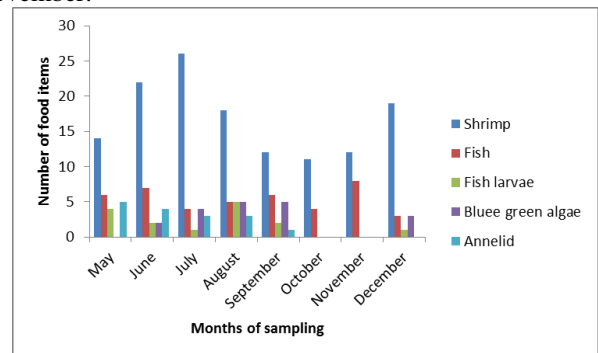

Figure 3. Monthly food items composition in
Brachydeuterus auritus.

Index of Preponderance

The index of preponderance for all encountered food items are presented in Table 1. Shrimp recorded the highest Index (89.6) which signifies it as the most preferred food item by the specie. This was followed by fish (6.5) implying the second most preferred diet while annelid was the least preferred which recorded an Index of 0.8. The Index rankings indicated shrimps with the highest rank, followed by fish, fish larvae, blue green algae and annelids (Fig. 4).
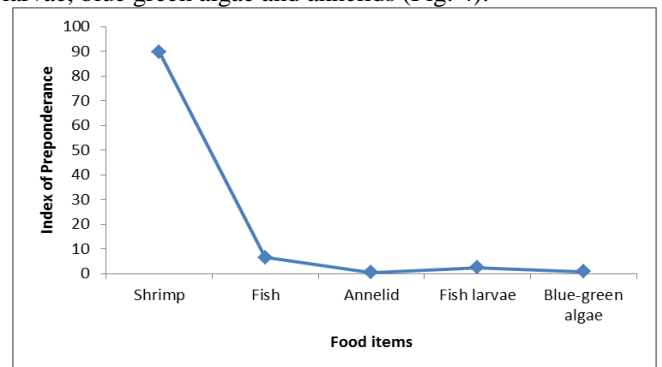

Fig. 4. Index of Preponderance for all food items.

Discussion

The food spectra showed a general carnivorous diet bias by Brachydeuterus *auritus* with distinct preferences for shrimps and fish.

Table 1. Index of Preponderance of all food items.

Food items	Number	% Occurrence (O)	Volume (ml)	% Volume (V)	O * V	Index of Preponderance (V*O/∑V*O*100)	Rating
Shrimp	134	59.03	100.93	64.5	13524.6	89.6	1
Fish	43	18.94	22.93	14.6	986.0	6.5	2
Annelid	15	6.61	5.33	3.4	80.0	0.5	5
Fish larvae	19	8.37	19.36	12.4	367.8	2.4	3
Blue-green algae	16	7.05	8	5.1	128.0	0.8	4
	227	100	156.55	100	15086.4	100.0	

The finding of shrimps as the most preferred food item by this species agrees with [10] in Ghana and [3] in Nigeria. However, [11] found fish as the most preferred food item for *Brachydeuterus auritus* in the Northeastern Atlantic which is at parallel with the findings of this study. Worthy of note is the abundance of blue green algae, shrimps and fish items in the stomach contents coinciding with the major upwelling months of July through to October when typically the nutrients are higher. This indicates that the season had impact in the quantity of preferred food items by the fish.

A perusal of the index indicated that shrimp (89.6) and fish (6.5) occupy the first and second positions in the Index of Preponderance ranking, making them the most consumed / preferred food item by species. The third most preferred food item was fish larvae (2.4) followed by blue green algae which recorded an Index score of 0.8. The least ranked food item of preference for the species was annelid which recorded the lowest Index of 0.5.

Conclusion

It can be concluded from the study that *Brachydeuterus auritus* is bias towards a carnivorous diet with preferences for crustaceans particularly shrimps, then fish, fish larvae, blue green algae and annelids in order of decreasing importance. There appears to be a correlation between the number of food items found in the stomach contents and the upwelling season. Owing to the importance of this fish species to the marine catches of the Ghanaian fisheries and its food security implication as a cheap protein source to the populace, there is need to continuously use the variability in feeding preferences and intensity as a veritable tools for the effective management of this important fish species with the ultimate objective of sustainability for maximal benefit to the riparian communities around the coast and the nation at large.

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