FOOD AND BIOMETRIC FEATURES OF THE GREY MULLET, *Mugil cephalus* (LINNAEUS) FROM EPE LAGOON

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ABSTRACT
The food and biometric features of the grey mullet, Mugil cephalus caught in Epe Lagoon were investigated to ascertain the source of the recent occurrence of the species in Lekki Lagoon and the probable exchange of individuals between Lagos and Lekki Lagoons. A total number of 166 specimens of Mugil cephalus caught from Epe Lagoon (low brackish / freshwater) were examined for food and feeding habit and biometric features from November 2006 – May 2007. The food of the species consisted mainly of algae (Bacillariophta, Cyanophyta, Chlorophyta and Pyrrophyta) and detritus. The size range of fish examined were 12.4 – 27.0cm (standard length) while the weight ranged from 22.40 – 308.00g. The mean values of the biometric characters of Mugil cephalus did not reflect wide variations. The population dominant cohort in the lagoon represents the harvestable and marketable representative for a sustainable fishery and is a strong indication of potential for freshwater culture of this marine species.
Keywords: Epe, Lagoon, *Mugil cephalus*, food items, biometric features.

INTRODUCTION

Mugil cephalus L. (Family: Mugilidae) occurs worldwide mainly between latitudes 42^0N and 42^0S. It inhabits coastal waters, estuaries and freshwater in tropical and temperature waters of all seas (Render *et al.* 1995). In estuarine waters, grey mullets feed on detritus, diatoms, algae and microscopic invertebrates which they filter from mud and sand through their mouth and gills (QFMA, 1991; McDonough and Wenner, 2003). A proportion of the sand is ingested to assist the grading of food in the muscular stomach (Michaelis, 1993).In Nigeria, West Africa, mullets constitute important proportion of the catches by artisanal or subsistence fishermen in lagoons and rivers. *Mugil cephalus* has only been reported in both high brackish and low brackish water lagoons (Fagade and Olaniyan, 1974; Soyinka and Kassem, 2008) in the area unlike other genera caught in freshwater lagoons and rivers (Emmanuel, 2009). Soyinka (2008) reported the feeding ecology of *M. cephalus* from Lagos Lagoon (high brackish). Emmanuel (2009) reported the recent occurrence of *M. cephalus* in Lekki Lagoon (formerly regarded as a freshwater, but the author recorded 0.07 – 4.7‰ salinity recently), but in scanty quantities. There were suggestions as to the probable source of the increasing salinity of the Lekki Lagoon- either from the Mahin Lagoon in Ondo State or the probable overflow of the coastal waters of the Atlantic Ocean over the Lekki peninsula. Since Epe Lagoon connects the Lagos and Lekki Lagoons, it is necessary to investigate the source of recent species caught in the Lekki Lagoon to ascertain the probable exchange of individuals between the water bodies. Some ways of determining this include the examination of the growth pattern, food and feeding habits and use of biometric features of the species from the different environments for comparative assessment.

In this report, the diet and biometric features of the grey mullet, *Mugil cephalus* in Epe Lagoon (very low brackish/freshwater) of a tropical country as Nigeria were examined to provide basic information for future investigation of the source of the new stock in Lekki Lagoon and the culture potential of the species in freshwater.

MATERIALS AND METHODS

Study Area

The Epe Lagoon (Fig. 1) is located between latitudes 6^o 50' – 3^o 10' N and 6^o 30' – 5^o 40' E. It has a total surface area of 234km^2 (FAO 1969) and is connected to two other lagoons: the Lekki Lagoon (freshwater) to the east, and the Lagos Lagoon (high brackish) to the west. The vegetation around the lagoon is characterized by stilt-rooted trees with dense undergrowths of shrubs and herbs. Raphia palm (*Raphia sudanica*), oil palm (*Elaeis guineesnsis*) and coconut palm (*Cocos nucifera*) are widespread in the surrounding villages. Floating aquatic macrophytes occurring occasionally on the lagoon include water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), *Ipomea aquatica, Lemna* sp, *Salvinia nymphellula* and *Hydrocharis marsus-renae* (Edokpayi *et al.*, 2008).

Collection of Specimens

The specimens for the food studies were collected from November 2006 to May 2007 by fishermen using active gears in the lagoon. The collections were made fortnightly. Twenty-five (25) specimens of *M. cephalus*

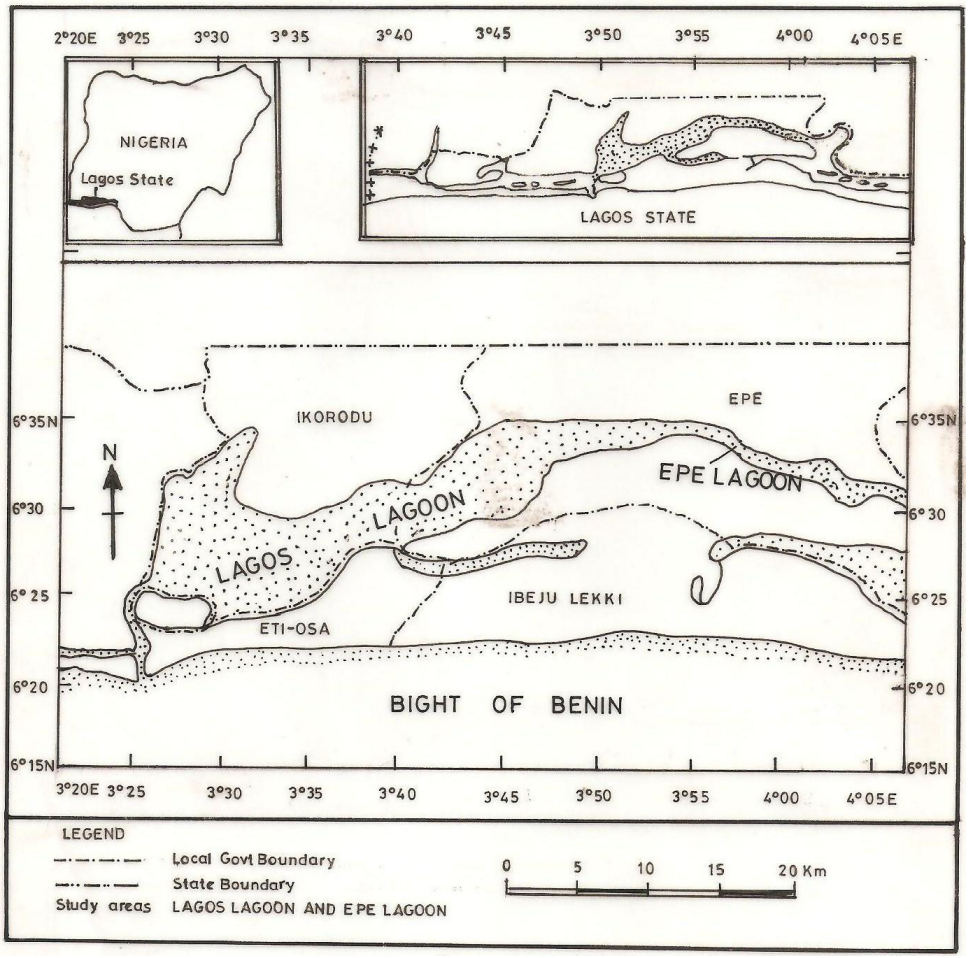

Fig. 1: Map of Epe Lagoon with the maps of Lagos State and Nigeria inserted

were collected separately for examination of biometric features. The fish were transferred into a deep freezer at temperature of -20^{0}C in the laboratory for further analysis.

Laboratory Procedures

The preserved specimens were thawed and wiped dry before laboratory analysis. The standard and total lengths (in centimeters) were measured to the nearest 0.1cm on a fish measuring board while the weights (in grams) were determined to the nearest 0.01g using a sensitive "Sartorious' balance (Model 1106). The stomachs were dissected and the contents emptied into Petri dishes and examined under a binocular microscope. The food habits were studied using the numerical and occurrence methods (Hyslop, 1980). Counts were made of meristic features: anal fin rays, pelvic fin rays, pectoral fin rays, dorsal fin rays and caudal fin rays. Measurements were made of morphometric features: fork length, head length, pupil length, adipose layer length, distance from snout to 1st dorsal fin and inter-dorsal fins length of the fish and were recorded.

RESULTS

Food Habits

The food items in the stomach of *M. cephalus* during the period of collection are presented in Table 1. The stomach contents were made up of five groups of food items: algae (green, blue-green, diatoms and dinoflagellates) and detritus. The most abundant food items consumed were the blue-green algae, *Nostoc* sp. (number: 23.18%; occurrence: 31.25%); diatoms, *Nitzschia* sp. (number: 20.29%; occurrence: 27.68%)

and *Navicula* sp. (number: 19.90%; occurrence: 27.68%). Detritus were the most frequent food item consumed by *M. cephalus* accounting for 94.64% by occurrence.

Biometric features

The counts of meristic features and measurements of morphometric features *M. cephalus* collected from Epe Lagoon are presented in Table 2. The counts of 1st dorsal fin rays (n=4), pectoral fin rays (n=8), caudal fin rays (n=12) and anal fin rays (n=5) were constant for all specimens examined, while the differences observed in the counts of 2nd dorsal fin (range+ 8-10) and pelvic fin rays (range= 4-6) were not significant. The differences observed in morphometric measurements did not reflect significant deviation from the means.

Table 1: The major food items in the stomach of *Mugil cephalus* from Epe Lagoon (November 2006 – May 2007)

Food items	Epe Lagoon			
	Numerical method		Occurrence method	
	No.	% Frequency	No.	% Frequency
Pyrrophyta (Dinoflagellates)				
Ceratium sp.	95	3.03	23	20.54
Chlorophyta (Green algae)				
Spirogyra sp.	90	2.87	21	18.75
Chlorococcum sp.	63	2.01	22	19.64
Bacillariophyta (Diatoms)				
Navicula sp.	625	19.90	31	27.68
Tabellaria sp.	92	2.93	23	20.54
Melosira sp.	278	8.85	23	20.54
Nitzschia sp.	637	20.29	31	27.68
Cymbella sp.	98	3.12	21	18.75
Cyanophyta (Blue-green algae)				
Oscillatoria sp.	157	5.00	22	19.64
Microcystis sp.	155	4.94	24	21.43
Nostoc sp.	728	23.18	35	31.25
Spirulina sp.	122	3.89	22	19.64
Detritus	-		106	94.64
Total	**3140**			

Table 2: Biometric features of *M. cephalus* from Epe Lagoon

	Epe Lagoon Specimens		
Meristic features	Min.	Max.	Mean ± SD
1st dorsal fin ray	4	4	4 ± 0.00
2nd dorsal ray	8	10	8.88 ± 0.39
Pectoral fin ray	12	12	12 ± 0.00
Caudal fin ray	12	12	12 ± 0.00
Pelvic fin ray	4	6	5.3 ± 0.52
Anal fin ray	5	5	5 ± 0.00
Morphometric features (cm)			
Adipose layer length	0.9	1.2	0.98 ± 0.15
Pupil length	0.4	0.7	0.55 ± 0.07
Head length	3.7	5.3	4.51 ± 0.44
Head width	2.1	3.9	2.78 ± 0.26
Snout to 1st dorsal fin distance	8.9	12.2	10.35 ± 0.60
Inter-dorsal distance	3.8	5.8	4.8 ± 0.49

NB: Min – Minimum; Max – Maximum; SD – Standard deviation

DISCUSSION

The present investigation of *M. cephalus* in Epe Lagoon, a low brackish to freshwater, revealed that the species fed mainly on algae and detritus in the dry season period. Diatoms were the most abundant algal food items in the diet of *M. cephalus* by number. Detritus were the most commonly occurring food item in the stomach of *M. cephalus* from Epe Lagoon. This result can be compared to the works of Fagade and Olaniyan (1973) that diatoms and organic detritus (bottom deposit) were the important food items found in the stomach of mullets. Soyinka (2008) however, reported that *M. cephalus* from the Lagos Lagoon, a high brackish water, fed on other food items such as crustaceans, mollucs, annelids, plant materials, fish parts, sand grain and desmids in addition to those reported in the present investigation. This suggested an omnivorous feeding nature of the species. Odum (1970) hypothesized that grey mullet show a distinct preference for live plant material (algae) over plant detritus when both are in abundance. However, Wells (1984) suggested that little or no preference for algal over macrophyte detritus in Lake Waahi and Waikato River was observed in *M. cephalus.* The size range of the species in this study was within the juveniles and adults as reported by Soyinka (2008). According to McDonough and Wenner (2003), juvenile grey mullet are omnivorous and feed on zooplankton and phytoplankton. Adults are herbivorous and feed primarily on diatoms and algae siphoned from soft bottom mud, except in areas of submergent vegetation where they often feed on attached algae.

The food items consumed by *M. cephalus* from Epe Lagoon indicated the type of environment where they were collected. The green and blue-green algae reported indicated a freshwater condition, nutrient-rich and the relatively shallowness of Epe Lagoon (Nwankwo and Akinsoji, 1992). The diatoms, *Navicula* sp, *Melosira* sp, *Nitzschia* sp and *Cymbella* sp are usually found attached to submerged vegetation or substrates (Nwankwo and Akinsoji, 1989). This is indicative of a grazing ability of *M. cephalus* (Collins, 1985; Soyinka, 2008). The occurrence of a dinoflagellate as *Ceratium* sp. which is normally a high pH and salinity tolerant species is probably indicative of an exchange of *M. cephalus* from Lagos Lagoon (a high brackish water with salinity as high as 28.0‰ in the dry season) with those in Epe Lagoon (Onyema *et al* 2006). However, the occurrence of *Ceratium* sp. in the diet of *M. cephalus* in Epe Lagoon was relatively low.

Meristic and morphometric characters were the biometric features employed. Specimens collected were predominantly juveniles and young adult *M. cephalus* from Epe Lagoon. The mean values did not show wide variations in the biometric characters of *Mugil cephalus* in Epe Lagoon. Kusemiju (1975) suggested the combination of many meristic and morphometric characters for the purpose of comparison. Biometric data of *M. cephalus* from other waters such as the Lagos Lagoon can be collected for comparison in further studies.

CONCLUSION

In conclusion, the occurrence of the grey mullet, *M. cephalus*, a marine species in this freshwater lagoon in harvestable quantities is a strong indication of its great potential for freshwater culture. The species also has the potential to accept supplementary feed and consume algae resulting from fertilization of ponds.

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