ROXIMATE COMPOSITION OF *ETHMALOSA FIMBRIATA* (BOWDICH, 1825) CAUGHT IN WARRI RIVER

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Abstract

The proximate composition of fresh and smoked specimens of *Ethmalosa fimbriata* from Warri River was investigated for its nutrient compositions. A total number of seventy-two specimens, comprising twelve monthly samples, were analyzed for six months (August, 2012-January, 2013).The twelve monthly samples were made up of six specimens analyzed fresh, while the other six specimens were smoked at 40^0C and 20^0C for two hours each, using the smoking Kiln. Data analysis revealed that the highest values for moisture content in fresh and smoked specimens are 23.65±0.90 and 14.45±0.42 respectively. Ash content in fresh and smoked fish was 8.75±1.11 and 15.50±1.19 respectively. The highest values for crude fibre in fresh and smoked specimens are 2.07±0.62 and 4.45±0.35. The highest values for crude protein in fresh and smoked specimens are 14.46±0.96 and 28.23±1.40. Lipid content was higher in smoke than in fresh specimens, with values of 22.16.±0.39 and 13.72±0.38 respectively. Smoked specimens recorded the highest values for all nutrients, except for moisture content which was higher in fresh than in smoked products. It is recommended that smoked samples of *Ethmalosa fimbriata* be consumed more in preference to the fresh ones based on their higher nutritive values. Appreciable consumption of such dried fish will significantly improve human health.

Keywords: Proximate, composition, *Ethmalosa fimbriata*, Warri River, nutrient

Introduction

Fish and fishery products are known for their nutritive values worldwide, hence there are very important in the diet of man. Fish products, no matter how they are processed, are widely consumed for their nutritive value and significance in improving human health (FAO 1999). Fish remains a nutritious food, contributing a considerable proportion of its protein diet to humans in many nations, Africa inclusive (Adeyeye and Adamu, 2005). It also contains vitamins, mineral salts and essential amino acids in their right proportions as required by man. Although the amount of protein in fish varies from species to species, and their composition either in meat and fish are comparable in dietary protein contents, those from fish are preferable because they are more digestible and adequate for health maintenance in human (Eyo, 2002).

Through the ages, different nutrient compositions have been reported in fishes. For instance in the nineteenth century, fish was reported to be particularly good for the brain, because it is rich in Phosphorus (Eyo, 2002). Undoubtedly, one reason for the depreciation in the quality of fish sold to consumers has been the primitive method of harvesting, poor processing and inadequate preservation. However, with the improved methods of harvesting, processing, preservation, storing and transportation of fish, the consumers can now receive them in a state where their quality and flavour are virtually unchanged from how they were at harvest (Burt, 2002). Now that all efforts are geared towards increasing fish production through better resource management, conservation and intensive aquaculture practices, the need now arises to continually ensure that such endeavour are matched with improved post harvest fish handling and efficient preservation methods. These will ensure that poor quality and or subsequent loss in fish quality are maintained. Investigation into the nutrient composition of fresh and smoked specimens of *Ethmalosa fimbriata*, caught in Warri River, is the issue to be considered.

Materials and Methods

Description of the Study Area

Warri River is a major navigable channel, which flows through zones of freshwater swamps, mangrove swamps and coastal sand ridges (Egborge 1991). The river is relatively large and stretches within longitude $5^0.20^l$ - $5^0.35^l$ N and latitude $5^0.15^l$ - $5^0.45E^l$. It drains various tributaries and empties into the brackish Forcados River which subsequently empties into the Atlantic Ocean. The substratum is composed of sandy and muddy soils. The water shed drains primarily through a thick freshwater swamp forest, dominated by such floating vegetations as *Ceratophyllum submersum, Utricularia* sp., *Lemna* sp, *Pistia stratiotes* and *Eichhornia crassipes*. It is also characterized by mangrove swamp vegetation, comprising of *Pandanus candlelabrum, Raphia hockerii* and *R. vinifera*. Warri River covers a surface area of about 255 sq. km with a length of about 150 km. The inhabitants are the Urhobo's, Itsekiri's, IJaw's, and Isoko nationalities (Egborge, 1991; Olomukoro and Egborge, 2003).

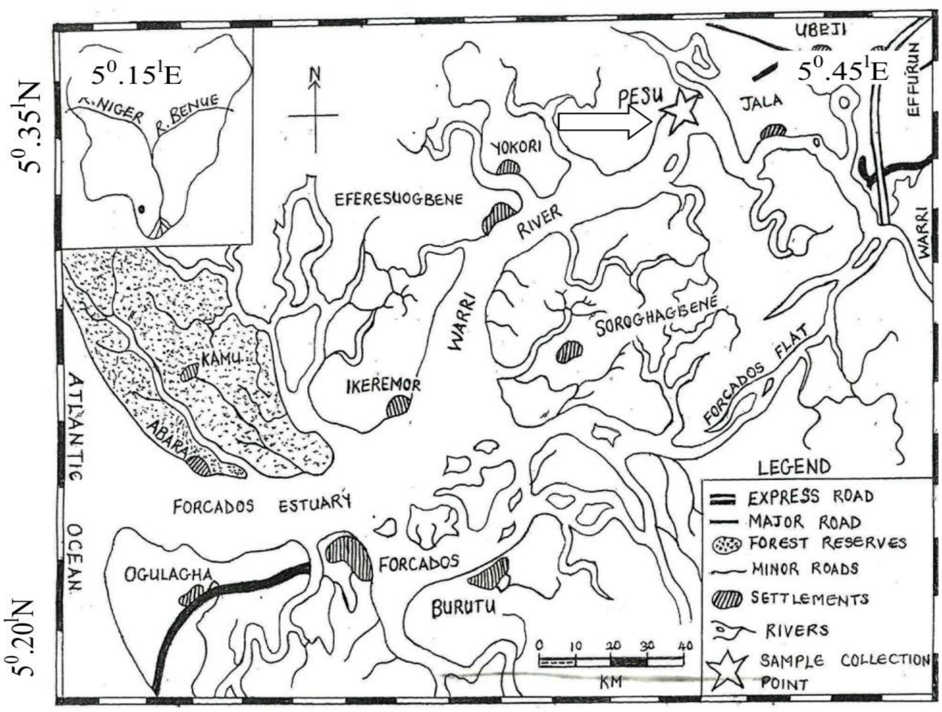

Fig 1: Map of Warri River and its environing showing (Pesu) where fish samples were harvested.

Specimen Collection, Measurements and Proximate Analysis

A total number of seventy-two specimens of *Ethmalosa fimbriata* were purchased from Pesu, in Warri River between August 2012 and January, 2013. The total length (TL) and standard length (SL) of each specimen was measured using a measuring board graduated to the nearest centimetre (0.01 cm). Weight measurement of each specimen was carried out with a top loading Mettler balance, and the reading was recorded to the nearest 0.01gram. These measurements enabled the researcher ascertain the sizes of the study samples. The twelve monthly specimens were washed clean with tap water. Each specimen was divided into two equal parts (head and tail portions) and shuffled adequately. Each portion was randomly selected into two groups. Members of each group consisting of six pieces each of head and tail portions were arranged on the wire gauze for smoking using red-hot charcoal obtained from wood. Smoking was carried out initially at a temperature of 40^0C for two hours, and later reduced to 20^0C for another two hours. The smoking procedure adopted was that reported by (Ayuba and Omeji, 2006). The other group consisting of six pieces each of head and tail portions were analysed for proximate composition in their fresh dried state. Both sets of specimens processed fresh dried and smoked, were analyzed for proximate composition (according to A.O.A.C. 2002) in the Fisheries Laboratory of the Delta State University, Asaba Campus, Asaba, Delta State, Nigeria.

Statistical Analysis

Proximate compositions of the specimens were analyzed with analysis of variance (at $P < 0.05$). Duncan Multiple Range Test (DMRT) was used to separate the means.

Results and Discussion

Moisture Content

The moisture content of the specimens examined is presented in Table 1. That table shows that the highest value in fresh specimens was recorded in November 23.65± 0.90 while the least was recorded in October 22.45± 0.45. Both concentrations cannot be compared with those reported by other workers among whom are Abdullahi, Abolude and Ega, (2001) who reported 62.74 - 68.04%; Chandrashekar and Deosthale (2003) reported a value of 69.0-80.0%; Fafioye, Fagbohur, and Olubanjo (2008) reported a value of 74.04%; Chukwu and Shaba (2009) reported a value of 71.85% while Abimbola, Kalode, Ibrahim, Oramadike, and Ozor (2010) reported a value of 79.50%. The reason for these disparities in values could have been due to differences in species, size of fish, trophic location of the fish sampled and season of the year, etc.

The value for moisture content in smoked specimens was highest in November 14.45±0.42 and lowest in October 12.61±0.44 (Table 1). This concentration could only be compared with the value of (10.80) reported (Salan, Juliana and Marilla, 2006). A higher value (28.92) than that observed presently (14.45±0.42) was reported by (Chukwu and Shaba, 2009). The moisture content for fresh specimens was generally higher than those for smoked specimens due to extraction of moisture by heat generated by the fire. Thus dehydration during the smoking process did not only condense nutrients but also increased shelf life as a result of the preservative processes employed Sigurgisladottir, Sigurdardottir, Torrissen, Vallet, and Hatsteinsson, (2000), Salan *et al.*, (2006) and Chukwu and Shaba (2009).

Ash Content

The composition of ash, realised from proximate examination of the specimens is recorded in Table 1. The highest ash value was recorded in December (8.75±1.11) while the lowest (7.85± 0.89) was recorded in October for the fresh dried specimens. Ash content for smoked specimens recorded ranged between 11.56±0.24 to 15.50±1.19 (Table 1). The highest value was recorded in August while the lowest was recorded in January. The range for ash composition recorded in the present study for fresh specimens (7.85± 0.89 to 8.75±1.11) are comparable with the range (7.8 - 9.0) reported by Abdullahi *et al.*, (2001). However, Salan *et al.*, (2006) recorded a lower range (0.53-3.5) while Fafioye *et al.*, (2008) reported a higher value (15.15).

Records of ash content for smoked specimens in the present study were obviously higher than those recorded for fresh specimens. This observation is as a result of the significant reduction in moisture content when the fish was smoked, giving rise to an increase in its ash composition. High ranges in ash content were indicative of the fact that the fish maybe a good source of such minerals as calcium, potassium, zinc iron and magnesium (Abimbola *et al*., 2010).

Crude fibre content

Crude fibre composition of the fish of study is shown in Table 1. Data in the table shows that the crude fibre content for fresh specimens ranged from 1.19± 0.36 to 2.07±0.62. The highest data for fresh samples was recorded in December while the lowest was recorded in January. The overall crude fibre content for smoked samples ranged from 3.08±0.14 to 4.45±0.35 (Table 1). The value for smoked specimens was higher than those for fresh specimens. This observation can be compared with the value: 0.98-1.71 reported (Chukwu and Shaba, 2009). A value of (9.12) was reported by Abdullah *et al*., (2001) and (9.70) by Fafioye *et al*., (2008). Both values are higher and cannot be compared with those of present study. The differences observed in the ash composition of various species may be due to season of the year, size of the species and geographical location where the sample was collected etc.

Crude protein content

The crude protein composition for fresh specimens is shown in (Table 1). The highest value (14.46±0.96) for fresh samples was recorded in August while the lowest value (12.62±0.83) was recorded in October. The overall crude protein content for smoked specimens ranged from 25.03±1.60 to 28.23±1.40 (Table 1). Crude protein composition for smoked specimens was higher than those for fresh specimens. This observation was due to loss of moisture and increase in dry matter per unit weight of fish following dehydration. Such an observation suggests that the protein nitrogen composition of crude protein was not loss during smoking. Therefore since the reduction in percentage protein could not be explained by de-naturation, it suggests that protein nitrogen was not loss during smoking, an idea also shared by (Puwastien, Judprasong, Kettwan, Vasanachitt, and Bhattacharjee, (1999); Sigurgisladottir *et al*., 2000; Gokoglu, Yerlikaya and Cengiz, (2004); Tao and Linchun, 2008).

Table 1: Proximate composition of fresh and smoked specimens of *Ethmalosa fimbriata* used for the study.

Time in month	FRESH SPECEMENS					SMOKE SPECIMENS				
	Moisture	Ash	Crude fibre	Crude protein	Lipid	Moisture	Ash	Crude fibre	Crude protein	lipid
AUG	23.50± 0.63^{a}	8.18±1.12^{a}	1.91 ± 0.85^{b}	14.46± 0.96^{a}	13.30± 0.41^{a}	12.77± 0.69^{c}	15.50 ±1.19^{a}	3.46±0.82 ^{b}	27.44±0.80 ^{b}	21.67± 5.76^{b}
SEPT	23.58± 0.78^{a}	8.51 ± 1.19^{a}	1.93±0.29 ^{b}	13.01±1.10^{b}	13.72± 0.38^{a}	14.95± 1.14^{a}	11.97 ± 1.12^{c}	4.45±0.35 ^{a}	28.23± 1.40^{a}	22.16± 0.87^{a}
OCT	22.45± 0.48^{b}	7.85 ± 0.89 ^{b}	1.30±0.62^{b}	12.61± 0.83^{c}	13.65± 0.96^{a}	12.61± 0.44^{c}	11.75±0.14^{c}	3.24±0.28^{b}	25.61 ± 0.64^{c}	21.79± 0.40^{b}
NOV	23.65± 0.90^{a}	7.96 ± 0.25^{b}	1.28±0.31^{b}	13.35± 1.07^{b}	12.48± 0.39^{b}	14.45± 0.42^{a}	11.76 ± 1.04^{c}	4.06±0.11^{a}	27.45± 0.64^{b}	22.00± 0.38^{a}
DEC	23.32± 0.75^{a}	8.75 ± 1.11^{a}	2.07 ±0.62 ^{a}	13.30± 1.16^{b}	12.69± 0.80^{b}	12.81± 0.62^{c}	12.96 ± 1.09^{b}	3.08 ±0.15 ^{b}	26.42± 1.10^{d}	21.40± 0.40^{b}
JAN	23.20± 1.20^{a}	7.89 ± 0.68^{b}	1.19±0.36 ^{b}	12.90± 1.09^{c}	13.56± 1.25^{a}	13.27± 1.14^{b}	11.56 ± 0.24^{c}	3.68±0.57^{b}	25.04± 1.60^{c}	21.73± 0.39^{b}

Means with the same superscripts on the same column are not significantly (P>0.05) different. Mean values are given as Mean ± SE (Standard Error of Mean)

The protein concentration in this study (25.03-28.23) was comparable with that (22.0-23.0) reported by Chandrashekar and Deosthale (2003) and also with the value (18.74) reported by Abimbola *et al*., (2010). However, the present observation cannot be compared with the higher values (58.42) reported by Abdullah *et al*., (2001) and values of (43.64) reported by Fafioye *et al*., (2008). High protein composition in fish might be due to the environment and the type of diet the fish fed on (Abdullahi *et al*., 2001; Fafioye *et al*., 2008 and Ezekiel, Akande, Salauden, Olusola, Adeyemi and Babalola, 2011) before its capture. The protein composition of Atlantic mackerel shows that the fish is high in protein. It provides a source of easily digestible high quality protein containing essential amino acids (particularly Lysine in high concentration) Ezekiel *et al*., (2011).

According to Saliu (2008), low protein composition in fish is as a result of obvious reduction in percentage protein, occasioned by de-naturation. The processing and storage methods in this study, may have accounted for the differences observed in the protein composition and gross energy content in all the specimens of study. Smoking as a processing method increased the percentage protein content of the specimens while simultaneously reducing the percentage fat content. Processing methods have varying effects on nutrient composition, texture and flavour contents of the fish (Andrew, 2001). Audrey, Audia and Olise, (2006) observed that smoking had been known to cause increase in nutrient composition due to the associated heat flow of gases and interaction of smoke with the protein composition of the fish.

The findings of Sigurgisladottir *et al*., (2000), agree with those of present study in that it generally, showed that the quality and characteristics of smoked fish were influenced by differences in the fish species and preservative methods used, among others etc.

Lipid content

The composition of fat as observed in the present study is recorded in Table 1. The table shows that the fresh specimens recorded ranges between 12.48±0.39 and 13.72±0.38. The highest value recorded in fresh specimens was observed in September while the least was recorded in November. In contrast with the above values lipid content for smoked specimens ranged from 21.40±0.40 to 22.16±0.87 (Table 1). The highest data for smoked specimens was recorded in September while the lowest was recorded in December.

Lipid content for smoked specimens was higher than those for fresh specimens. The increased concentration of lipids in smoked specimens was probably due to loss of moisture and increase in the dry matter content per unit of weight following samples dehydration (Salan *et al*., 2006). This observation indicates that the fat loss phenomena were less in smoked than in fresh fish. The lipid content of the present study (12.48±0.39 to 22.16±0.87) was within the range reported (14.28 to 21.20) by Chukwu and Shaba (2009), a higher value of 23.90 was reported by Salan *et al*., (2006) and 26.27 by Sigurgisladottir *et al*., (2000).

According to some investigators (Akande and Faturoti., 2005 and Candela *et al*., 2002); the type of food eaten by the fish and the preservative methods applied, has influence not only on lipid content, but also on other nutrients of the fish. Reduction in the percentage of lipid was associated with oxidation (Saliu, 2008). The need to look at the effect of processing on nutrient composition of the fish is therefore high. The low lipid composition in the present study may be due to environmental factors, species type and varieties of diet of the fish. This observation was similar to those reported by (Abimbola *et al*., 2010). It is worthy of note that the nutritional composition of fishes vary greatly from species to species. Such variation may depend on age, feed intake, length/size, sex and sexual changes connected with spawning, migratory swimming, environmental conditions and seasons (FAO 2004).

Summary and Conclusion

The mean data for all parameters except moisture content were higher in smoked than in fresh fish specimens. In conclusion therefore smoked specimens of *Ethmalosa fimbriata* should be recommended to consumers for its higher nutritive values and significance in improving human health.

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