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## Research Article

### PROXIMATE COMPOSITION AND MINERAL COMPONENTS OF SOME SPECIES OF FISH SOLD IN BIDA FISH MARKET

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#### Abstract

This study was conducted on the proximate and mineral compositions of different species of fish sold in Bida fish market in Niger state Nigeria. The five (5) species which includes: *Protopterus anectens*, *Claria gariepinus*, *Gymnarchus niloticus*, *Oreochromis niloticus* and *Heterotis niloticus* were evaluated using standard techniques for the proximate analysis such as carbohydrate, protein, fat, moisture, ash, fibre and fat content were analyzed while Mg, Mn, Ca, Fe, Zn and K were evaluated for the mineral analysis using the AOAC methods and Atomic Absorption Spectrometric techniques. The species shows variable results in the proximate analysis. However the proximate analysis shows encouraging high crude protein content in (61.90%). Fat contents recorded highest in *Claria gariepinus* (23.81%). Crude fibre was highest in *Heterotis niloticus* (3.32%). Moisture content was recorded high in all the species *Gymnarchus niloticus* (78.5%) and low in *Protopterus anectens* (66.9%) respectively. The ash content was high in *Heterotis niloticus* (12.44%) the carbohydrate content was recorded highest for *Gymnarchus niloticus* as 5.39%. the mineral analysis shows K was relatively high in almost all the species except in *Protopterus anectens* and other minerals determined were in present in relatively small amount and also Mn was not detected in all the species of fish.

**Keywords:** Bida fish, carbohydrate, protein, fat, moisture, ash, fibre, mineral analysis.

#### Introduction

Fish is known to be one of the cheapest sources of animal and other essential nutrient required in human diets (Fawoleet *al.*, 2007). Fish is also important protein food in the tropics. In Nigeria fish constitute 40% of the total animal protein of the animal protein intake of the people. But 40% of fish caught in Nigeria was lost annually due to inadequate or poor preservation, processing and handling (Daramolaet *al.*, 2007).

The nature and quantity of nutrients in most animals is dependent on their feeding type. Feeding habits of an individual fish species has a great effect on its body nutrient composition. The importance of fish in developing countries increases greatly after the savannah drought of 1971-1974 which greatly deaminate the cattle population and make the price of live stocks virtually prohibited to the majority of Nigerians, a trend which trigger a corresponding

increasing the demand for fish which then was the major alternative animal protein source (Fawoleet *al.*, 2007).

The nutritional characteristics of fish and fishery products are of vital interest to consumers. Fishery products are highly nutritious and an excellent means of obtaining dietary essentials, like protein, minerals and vitamins. Fish fat contains a high proportion of polyunsaturated fatty acids, which may help to decrease the incidence of atherosclerosis, and heart related diseases. The flesh of a fish in good condition is made up of five main chemical components namely protein, lipid, water, minerals and vitamins. Fishes reduce vulnerability to hunger by providing a complementary food source as part of diversified livelihood strategies. Fisheries especially provide food when other food sources such as agriculture are at a seasonal low (Abisoyeet *al.*, 2012).

Fish is a major source of food for mankind, providing a significant amount of the animal protein diet, excellent dietary sources of highly unsaturated fatty acid (HUFA) and polyunsaturated fatty acid (PUFA), especially the omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Today, there is increasing interest in fish consumption because of their high PUFA content. Moreover, consumption of fish has been linked to health benefits, as the long chain PUFA has gained attention because of prevention of human coronary artery disease, improvement of retina and brain development, decreased incidence of breast cancer, rheumatoid arthritis, multiple sclerosis, asthma, psoriasis, inflammatory bowel disease and regulation of prostaglandin synthesis (Dhaneeshet *et al.*, 2012).

## Materials and Methods

**MATERIALS AND METHODOLOGY** of the numerous species of fish sold in Fish market Bida, five species that are common and widely consumed were obtained. They are:

### EXPERIMENTAL PROCEDURES

Proximate compositions (residual moisture content, ash content, crude fibre, crude lipid, crude protein) of the fish species were determined using standard experimental procedure as adopted by AOAC (1990). Carbohydrate content was estimated by difference.

Mineral analysis was conducted after wet digestion with a mixture of nitric acid, sulphuric acid and perchloric acid.

5.0ml of sample was measured into digestion tube. 5.0ml of digestion mixture containing 1 volume of perchloric acids to 4 volume of nitric acid and 2 volume of hydrochloric acid was added respectively and placed in a fume cupboard over night. The mixture was then digested for 2 hours in Kjeldahl digestion block at 150-200°C. The digest were allowed to cool and 30ml of distilled water was added and the content were shaken vigorously and filtered through a filter paper into 100ml volumetric flask and the volume was made up to 100ml. The digest were then used for the determination of the minerals

The instrument was set up according to the manufacturer's instructions which include selection of fuel gas and oxidant gas, burner type, optimum wavelength and slide-width settings. The sample solution was then aspirated into the flame and concentrations of each metal determined separately. The calibration was done using standard solutions of each metal.

### Results

The result of the proximate analysis of the various species of fish: *Gymnarchus niloticus*, *Heterotis niloticus*, *Protopterus anectens*, *Clariagariepinus* and *Oreochromis niloticus* was presented in Table 1 and the mineral analysis was presented in Table 2.

SCIENTIFIC NAME	COMMON NAME	NUPE NAME	HAUSA NAME
<i>Heterotis niloticus</i>	Osteoglodid	Egogi	Bali
<i>Claria gariepinus</i>	Cat Fish	Zhengi	Kumgi
<i>Oreochromis niloticus</i>	Nile Tilapia Fish	Tsokungi/Parapata	Gargaza
<i>Protopterus anectens</i>	African Lung Fish	Edangi	Maimana
<i>Gymnarchus niloticus</i>	Trunk Fish	Eshin	-----

**Table 1:** Proximate Composition of Different Species of Fish (%)

Name of Species	Moisture content	Fat	Crude protein	Crude fibre	Ash content	carbohydrate
<i>Protopterus anectens</i>	66.9	19.17	58.97	1.73	6.32	5.28
<i>Heterotis niloticus</i>	77.8	4.8	49.47	3.32	12.44	2.69
<i>Gymnarchus niloticus</i>	78.5	13.92	50.04	1.48	6.51	5.39
<i>Oreochromi sniloticus</i>	72.1	12.85	56.61	1.58	6.22	4.39
<i>Claria gariepinus</i>	73.6	23.81	61.9	1.17	5.32	3.6

**Table 2:**Mineral Contents of the various Species of Fish (mg/kg)

<b>Name Of Species</b>	<b>Zn</b>	<b>Mg</b>	<b>Ca</b>	<b>K</b>	<b>Mn</b>	<b>Fe</b>
<i>Gymnarchus niloticus</i>	0.085	0.775	0.003	49.00	ND	ND
<i>Protopterus anectens</i>	0.05	0.375	0.02	ND	ND	ND
<i>Claria gariepinus</i>	0.075	1.075	0.0142	4.650	ND	2.00
<i>Heterotis niloticus</i>	0.075	1.060	0.1450	6.000	ND	1.425
<i>Oreochromis niloticus</i>	0.085	1.19	0.01	6.150	ND	ND

ND: Not detected.

## Discussion

The result of the proximate analysis shows variation in concentration/ proportion of Biomolecules (carbohydrate, fats, protein) and other contents such as (ash fiber, moisture). The proximate composition shows encouraging high crude protein contents of 58.97%, 49.47%, 50.04%, 56.61% and 61.90% respectively (Table 4.1). The relatively high % of crude protein could be attributed to the fact that; fishes are good source of pure protein, but the differences observed, in the obtained value may also be attributed to fishes consumption or absorption capability and conversion potentials of essential nutrients from their diet or their local environment into such biochemical attributes the organism (Adewole *et al.*, 2003). The crude proteins are relatively high indicating that fish are good source of protein. Therefore, these fishes under examination are likely to be a good source for meeting our daily protein needs if it has a balanced amino acid, an added advantage of fish is that its protein is highly digestible (Albert, 1998). Higher protein content in fish has been observed by several workers when studying fresh water fish species collected from different locations in Nigeria (Aboluade and Abdullahi, 2005). Adults, pregnant and lactating mothers required 34-56g, 13-19g and 71g protein daily respectively (Anon, 2002). It has been reported that protein-calories malnutrition is a major factor responsible for nutritional pathology (Roger *et al.*, 2005).

Similarly *Claria gariepinus* has the highest fat content (23.81%), followed by *Protopterus anectens* (19.17%), *Gymnarchus niloticus* (13.92%), *Oreochromis niloticus* (12.85%) and lastly *Heterotis niloticus* with the lowest fat content (4.80%). The difference in this value could be due to the fact that fat content in fish vary according to season, species and geographical variations. Age variation and maturity in the same species may also contribute to the significant difference in total lipid (Piggot and Tucker, 1990).

While analyzing the fibre content of the species it was recorded that *Heterotis niloticus* (3.32%) having the highest percentage, followed by *Protopterus anectens* (1.73%), *Oreochromis niloticus* (1.58%), *Gymnarchus niloticus* (1.48%) and the lowest content of fiber is *Claria gariepinus* with (1.17%). On the other hand the dietary intake of fiber can lower serum cholesterol level, risk of coronary heart diseases, hypertension, constipation, diabetics, colon and breast cancer (Ishida *et al.*, 2000). The RDA of fiber for children, adults pregnant and lactating mothers are 19-25%, 21-38%, 28% and 29% respectively.

The carbohydrate content of the species of fish *Gymnarchus niloticus* (5.39), *Protopterus anectens* with (5.28), *Oreochromis niloticus* (4.39), *Claria gariepinus* (3.60) and ego with the lowest has (2.69). However, carbohydrate content could be considered insignificant, as values were derived and estimated as the difference of other compounds. After all, carbohydrate content in fish are generally very low and practically considered zero (Antony *et al.*, 2000).

The ash content which is the index of mineral content biota was high in *Heterotis niloticus* (12.44%), *Gymnarchus niloticus* (6.51%), *Protopterus anectens* (6.32%) *Oreochromis niloticus* (6.20%) and lowest in *Claria gariepinus* (5.32%). The value for ash content range between 3.85-7.97% for *Oreochromis niloticus*, the values which were compared to the observation of Aboluade and Abdullahi (2005) who studied the proximate analysis and mineral content of *Clarias gariepinus*.

Comparing the moisture content of the species, it was recorded highest in *Gymnarchus niloticus* (78.5%), *Heterotis niloticus* (77.8%) followed by *Claria gariepinus* (73.6%), *Oreochromis niloticus* (72.1) and lowest in *Protopterus anectens* (66.9%).

The high moisture content would increase the deterioration level of fish when kept for a long time. This is because micro-organisms would be highly active with high moisture content (Love, 1980). Similar observation has been reported by Aboluade and Abdullahi (2005), Otitologbonet *al.* (1996).

The mineral composition of *Gymnarchus niloticus*, *Heterotis niloticus*, *Protopterus anectens*, *Claria gariepinus* and *Oreochromis niloticus* are presented in Table 2. The concentration of Zn, Mg, Mn, Fe, Ca and K were all determined.

The positive impact of zinc supplementation on the growth of some stunted children, and on the prevalence of selected childhood diseases such as Diarrhea, suggests that zinc deficiency is likely to be a significant public health problem especially in developing countries (Hussainet *al.*, 2009). According to FAO food balance data, it has been calculated that about 20% of the world's population could be at risk of zinc deficiency. The daily intake is less than 70ug per day (Holt and Brown, 2004).

Fe is an essential trace element for hemoglobin formation, normal functioning of the central nervous system and in the oxidation of carbohydrate, protein and fats (Adeyeye and Otokili, 1999).

The extent of concentration of the minerals in fish sample can suggest to what degree a particular fish picks up particular matter from the surrounding water and sediments while feeding, bottom feeders are known to concentrate more metals than surface feeders (Okoye, 1989). High level of K and Fe in fish could be associated with the fact that metals are naturally abundant in the soil (Adefemi and Awokunmi, 2010) and no matter the source of the metals the final repositories are the aquatic system. The limit set by World Health Organization standard for food (WHO, 1993). The concentration of Ca, Mg, and K ranged between 6.20-10.10, 5.86-6.20, and 8.90-10.10mg/100g respectively. Potassium (K) is the most abundant mineral present in the fish samples from all dams. The metals under investigation are not toxic to fish; their bio-accumulation could be very beneficial to man since they are essential minerals in human nutrition (Adeyeye, 1999).

Composition of the fish samples recorded variation in their concentration both within and between the selected species samples. This observation was supported by findings of Windom *et al.*, (1987) which shows that variation in concentrations of these mineral elements from one species to another was due to the chemical forms of the elements and their

concentration in the local environment. This report is in agreement with the one obtained by Ako and Salihu (2004). Most of these micro element that are present in trace amount in this work is equally important in the body but in trace amounts as observed, but they tend to become harmful when their concentrations in body tissue exceeds metabolic demand.

Fresh water fishes are good source of minerals. Thus, it is right to say that, the mineral elemental contents of each species is a function of the availability of these elements in their local environment, diet absorption capability and as well as their preferential accumulation.

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