

SEASONAL VARIATION IN PROXIMATE COMPOSITION OF SOME SELECTED FISHES  
(*Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* AND *Chrysichthys auratus*): A CASE STUDY OF TAGWAI LAKE MINNA, NIGERIA

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### ABSTRACT

Comparative analysis of the proximate composition of five species of fish; *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, collected from Tagwai lake, Minna, Niger State, Nigeria was carried out from February to August, 2015. The moisture, ash, crude protein, lipid and carbohydrate content of the fillets were done in the department of Water Resources, Aquaculture and Fisheries Technology laboratory, Federal university of technology Minna. The proximate compositions were carried out using standard procedures. *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, did not exhibit significant differences in their seasonal variation in proximate composition within the sampling period. All the fish species examined were rich sources of protein, moisture, lipid, ash and carbohydrate. They belonged to the high-protein (10-23%), high moisture and low-oil (<5%, except *Alestes dentex*) category. They also meet the requirement for human nutritional needs. The two major constituents, crude protein and carbohydrate showed high seasonal variation ( $p < 0.05$ ) in *Alestes dentex* during the study period. The highest protein value (23.19%) was found in February and the lowest value (10.50%) in July. The highest carbohydrate value (21.84%) was found in March and the lowest (0.30%) in July.

**Keywords:** Seasonal Variation, Proximate Composition, Selected Fishes, Tagwai Lake.

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### INTRODUCTION

Proximate composition is the analysis of water, fat, protein and ash content of animals or plants for feed formulation (Daniel, 2015). Developing countries (Nigeria inclusive) are characterized by poor nutritional status especially in the area of protein and energy. In Nigeria, starchy foods from root crops and cereals

form majority of staple foods, depending on the area of the country involved. In recent years, research into increase production of fish as a cheap and available source of animal protein has been on with the assistant of government in various areas. Research findings have also rated fish nutrients quality very high

thus making it an ideal source of vital nutrient for both nourishment and medicinal purpose. Given that there are considerable evidences in the use of fish and fish products for solving health problems (Onasanya, 2002), the need therefore arise for investigation into the nutritional composition of freshwater fishes in respect to seasonal variations. An increasing amount of evidences suggest that, fish meat and oil contains high amount of poly-unsaturated fatty acid that are valuable in decreasing the serum cholesterol to prevent a number of coronary heart diseases (Nordoy *et al.*, 2001; Turkmen *et al.*, 2005). Regular consumption of fish can promote the defense mechanism for protection against invasion of human pathogens because fish food has antimicrobial peptide (Ravichandran *et al.*, 2010). Ingesting fish can reduce the risk of heart diseases and lower the risk of developing dementia, including Alzheimer's diseases (Grant, 1997). Breastfed babies of mothers who eat fish have better eyesight perhaps due to the omega-3- fatty acid transmitted in breast milk. Fish oil may be useful in treating dys-lipidemia in diabetes (Friedberg *et al.*, 1998). Eating fish during pregnancy may help to reduce the risk of delivery of a premature baby (Olsen and Secher, 2002). It has been reported that fish activities in Tagwai Lake, is all year round with variation in the types of fishes landed by fisher men. However, it has been observed that the composition of these fishes varied with season. The dietary analysis of organism in their natural habitat enhances the understanding of the growth, abundance and productivity of the fish species.

Therefore, this research is aimed at evaluating the seasonal variation in proximate composition of some selected fishes in Tagwai Lake, Nigeria as the nutritional components of fresh water fishes tend to differ between species, sizes, seasons and geographical locations. Thus information generated from this study will be necessary to ensure that these fishes meet the requirements of food regulations and commercial specification (Effiong *et al.*, 2005).

## MATERIALS AND METHODS

### Description of the Study Area

The study was carried out in Minna, Niger State, located within longitude 6°33'E and latitude 9°37'N, covering a land area of 88km<sup>2</sup> with an estimated human population of 1.2 million. The area has a tropical climate with mean annual temperature, relative humidity and rainfall of 30°C, 61.00% and 1334.00mm, respectively. The climate presents two distinct seasons, a rainy and a dry season, a rainy season (between April to October) and a dry season (between November and March). The vegetation in the area is typically grass savannah with scattered trees. Tagwai Lake is about 10km away from Minna town. Mean maximum temperature remain high throughout the year having about 30°C, particularly in March and June. The vegetative cover is characterized by woodland and tall grasses inter-spread with tall dense species. In some areas, traces of rain forest species is seen of Sudan savannah along the plains of the river (Chukwuemeka *et al.*, 2014).

### Sample Collection

Replicate samples of five freshwater fish species, *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus* were obtained from Tagwai Lake fishing settlements in Chanchaga Local Government Area, Niger State, Nigeria. The fish samples were kept in cold iced box and transported to the laboratory. They were washed and weighed for analysis in their fresh state in both the dry and wet seasons. The study was conducted covering parts of the wet and dry seasons from February to August 2015.

### Sample Analysis

The fish samples were kept in cold iced box and transported to the Department of Water Resource, Aquaculture and Fisheries Technology (WAFT) laboratory, Federal University of Technology Minna, where they were thoroughly washed and weighed for analysis in their fresh state in both dry and wet season samples.

### Methods

All procedures for the proximate compositions were carry out following the official methods of Association of Official Analytical Chemists (AOAC, 2000).

## RESULTS

Comparative analysis of the proximate composition of the five species of fish; *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, for dry season, the variation proximate composition within the sampling periods are presented in Table 1, indicating that there were no significant differences ( $P>0.05$ ) in the proximate composition of the dry season samples.

### Proximate Compositions of the Selected Fish Species for Wet Season

Comparative analysis of the proximate composition of the five species of fish; *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, for wet season, the variation in proximate composition within the sampling period sare presented in Table 8, indicating that there were no significant differences ( $P>0.05$ ) in the proximate composition of the wet season samples.

Table 1: Proximate Compositions of the Selected Fish Species for Dry Season

Parameter (%)	<i>T. zillii</i>	<i>T. galilaea</i>	<i>A. dentex</i>	<i>C. auratus</i>	<i>A. occidentalis</i>
Moisture	71.14±1.04 <sup>ab</sup>	69.08±1.09 <sup>b</sup>	62.19±1.26 <sup>c</sup>	73.17±1.58 <sup>a</sup>	73.10±1.62 <sup>a</sup>
Ash	0.77±0.19 <sup>b</sup>	1.86±0.49 <sup>a</sup>	1.40±0.27 <sup>ab</sup>	1.31±0.28 <sup>ab</sup>	0.91±0.16 <sup>b</sup>
Crude Protein	15.75±1.33 <sup>ab</sup>	17.21±1.32 <sup>ab</sup>	19.40±1.60 <sup>a</sup>	16.63±1.13 <sup>ab</sup>	14.00±0.48 <sup>b</sup>
Lipid	1.30±1.23 <sup>c</sup>	1.56±0.60 <sup>c</sup>	4.60±0.77 <sup>a</sup>	3.10±0.40 <sup>b</sup>	1.90±0.36 <sup>b</sup>
Carbohydrate	11.04±1.37 <sup>a</sup>	10.29±1.32 <sup>ab</sup>	12.41±2.38 <sup>a</sup>	5.80±1.49 <sup>b</sup>	10.10±0.50 <sup>ab</sup>

Means on the same row with different superscript are significantly different from each other (P<0.05) using Duncan's Multiple Range Test (DMRT)

Table 2: Proximate Composition of the Selected Fish Species for Wet Season

Parameter (%)	<i>T. zillii</i>	<i>T. galilaea</i>	<i>A. dentex</i>	<i>C. auratus</i>	<i>A. occidentalis</i>
Moisture	75.05±1.82 <sup>b</sup>	79.72±1.33 <sup>a</sup>	77.45±1.61 <sup>ab</sup>	76.28±1.15 <sup>ab</sup>	79.05±1.27 <sup>ab</sup>
Ash	0.99±0.25 <sup>b</sup>	0.87±0.30 <sup>b</sup>	2.01±0.25 <sup>a</sup>	2.34±0.16 <sup>a</sup>	0.90±0.11 <sup>b</sup>
Crude Protein	12.08±0.69 <sup>c</sup>	14.41±0.65 <sup>b</sup>	14.83±1.25 <sup>ab</sup>	16.87±0.61 <sup>a</sup>	12.42±0.55 <sup>c</sup>
Lipid	1.34±0.26 <sup>b</sup>	2.97±0.51 <sup>a</sup>	3.04±0.30 <sup>a</sup>	1.01±0.25 <sup>b</sup>	1.08±0.18 <sup>b</sup>
Carbohydrate	10.53±1.60 <sup>a</sup>	2.03±0.40 <sup>c</sup>	2.67±0.29 <sup>c</sup>	3.49±0.95 <sup>c</sup>	6.55±0.10 <sup>b</sup>

Means on the same row with different superscript are significantly different from each other (P<0.05) using Duncan's Multiple Range Test (DMRT)

## DISCUSSION

The monthly variation in the proximate composition of nutrients in the selected fishes *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, conducted between February, March, April, June, July and August are presented in Fig. 1 and Fig.2 indicating that there were no significant differences (p<0.05) in the mean monthly variation and did not exhibit significant differences (p<0.05) within the samples. The comparative analysis of the proximate composition for the

selected fish species did not exhibit significant differences in their seasonal variation. All the fish species examined were rich sources of protein, moisture, lipid, ash and carbohydrate. They belong to the high-protein (10-23%), high moisture and low-oil (<5%) except *Alestes dentex*. Similarly, all the fish species were rich in crude protein, lipid, moisture, carbohydrate and ash and meet the requirement for human nutritional needs. The two major constituents, crude protein and carbohydrate showed high seasonal variation (p>0.05) with *Alestes dentex* during the study period. The

nutritional composition of these fishes fell within reported values for fish. This means that they can be utilized for production of other valued fish products. Protein and fat are the major nutrients in fish and their levels help define the nutritional status of the fish. All the species had high moisture content in the range of (60.09% - 81.78%). High moisture contents have been reported in other freshwater species (Abdullahi, 2001; Abdullahi *et al.*, 1999; Effiong, 2005). The values of crude protein (10.50% - 23.19%) in dry and wet season samples of the five species indicate that they are rich source of protein. Abdullahi, (2001) reported that variation in the protein content of fish species might be due to certain factors such as the season of the year, effect of spawning and migration, food available etc. The ash content of dry and wet samples of *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus* were low (0.05% - 3.73%); Fishes with lipid content below 5% are lean (Stanby, 1982), hence *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus* is considered a lean fish. The low lipid content value might be as a result of the environment, species and the type of diet the fishes feed on (Daniel, 2015). These fishes can be referred to as high protein fishes. They can be used maximally by food processors

in fish canning and other value added fish products such as fish burger, fish cake and fish crackers. Hence, they are suitable as potential industrial material for possible utilization for different products.

### CONCLUSION

The proximate composition of *Auchenoglanis occidentalis*, *Tilapia galilaea*, *Tilapia zillii*, *Alestes dentex* and *Chrysichthys auratus*, showed that there is need to encourage mass production, as they are good sources of protein intake in every diet.

Generally, the nutrients content of the five species analyzed were not significantly different for the dry and wet season samples. The little variation observed could be due to increase activity in fish species especially reproduction during the wet season.

Although there were no significant differences in the proximate composition of the fishes in both dry and wet season, the proximate composition of the fishes in wet season were slightly higher than that of dry season.

Furthermore, the findings of this study revealed that Tagwai Lake, Minna, Nigeria is rich in great diversity of fish species with high nutritional value and thus there should be maximum sustainable management of Tagwai lake Minna, Nigeria in order to conserve these fish species, and the upcoming ones

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