

Proximate and Anatomical Weight Composition of Wild Brackish *Tilapia guineensis* and *Tilapia melanotheron*

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Abstract. The proximate and anatomical weight composition of fresh wild brackish *Tilapia guineensis* and *Tilapia melanotheron* were analysed. The proximate analysis result for *T. guineensis* were 18.65% protein, 0.55% lipid, 1.30% ash and 79.50% moisture while that of *T. melanotheron* showed that protein in the edible tissue of the fish was 18.74%; the lipid, ash and moisture contents was 0.70%, 1.06% and 79.50% respectively. The mean values of length for *T. guineensis* and *T. melanotheron* were 156.99±6.45 and 171.4±76.9 while the weight data were 20.37±0.53 and 20.82±3.9 respectively. The data obtained for the anatomical weight composition of *T. guineensis* showed a percentage decrease in the order of fillet, head, frame, scale and gut 39.50 > 26.77 > 16.80 > 11.72 > 4.90 while *T. melanotheron* showed a percentage decrease in the order of fillet, head, frame, scale and gut 36.28 > 33.28 > 17.36 > 5.31 > 4.11. The result obtained indicated that both *Tilapia* species are nutritionally high in protein with low-oil content while the anatomical weight composition indicated that *T. guineensis* had a higher recovery of edible portion than *T. melanotheron*.

Keywords: Anatomical weight, proximate composition, *Tilapia guineensis*, *Tilapia melanotheron*.

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Introduction

Fish is one of the most important sources of animal protein available in the tropics and has been widely accepted as a good source of protein and other vital nutrients for the maintenance of a healthy body (Andrew, 2001). The less developed countries capture 50% of the world harvest and a large proportion of the catch are consumed internally (FAO, 1985). In many Asian countries over 50% of the animal protein intakes comes from fish while in Africa, the proportion is 17.50% (Williams *et al.*, 1988). In Nigeria, fish constitute 40% of the animal protein intake (Olatunde, 1998). They have significant role in nutrition, income, employment and foreign exchange earning of the country.

Fresh fish is a central point in fish for food utilization. The knowledge of fish composition is essential for its maximum utilization. The nutritional composition of fish varies greatly from one species and individual to another, depending on age, feed intake, sex and sexual changes connected with spawning, the environment and season (Silva and Chamul, 2000). Processors have direct interest in the proximate composition of fish in order to know the nature of the raw material before chilling, freezing, smoking or canning can be correctly applied (FAO, 2004).

Studies on the proximate and anatomical weight compositions are essential for fish and fish products to be utilised efficiently. Especially relevant is the potential of the non edible portion as a source of raw material in the feed industry. Studies that have been carried out on the physical composition and yield of other fish and fish products include those done by Murray and Burt (1980) and Eyabi Eyabi (1994, 1995) and on proximate composition by Seno (1974), Bykov (1974), and Waterman (1980) and on both aspects by Egwele *et al.*, (1986), Obanu and Ikeme (1989) and Akande and Faturoti (2005). However, there is paucity of information on the proximate (distribution of nutrients) and anatomical weight compositions of *Tilapia* fish species found in the tropical waters. Thus, the aim of the present study was to determine the proximate and the anatomical weight composition of *T. guineensis* and *T. melanotheron* for food processors to know the nature of the fish before chilling, freezing, smoking or canning can be correctly applied.

Materials and Methods

Sampling. A good number of fresh samples of wild brackish *T. guineensis* and *T. melanotheron* were obtained from the commercial landing at Ogudu/Agboyi Lagos lagoon fishing grounds in Lagos south western coast Nigeria. The fish samples were kept on ice in an insulated box and transported to the Nigerian Institute for Oceanography and Marine Research, Victoria Island, Lagos for further analysis.

Proximate composition determination. The fillet of the fish samples were homogenized and were used to determine proximate composition. All analysis was done in triplicate. The moisture content was estimated by drying samples to constant weight at $103\pm 2^{\circ}\text{C}$ using the oven dry method (AOAC, 1994). Lipid determination was carried out using the modified Bligh and Dyer procedure (1959), the ash content of the fish was determined by igniting the sample at 550°C for 5-6 hours until the sample was completely free from

carbon particles in a carbolite Sheffield LMF3 muffle furnace while the total nitrogen was determined by the Kjeldahl method as described by AOAC, 1994 and a factor of 6.25 was used for converting the total nitrogen to crude protein content of the fish sample.

Anatomical weight composition determination. The fresh fish samples were first weighed whole using an analytical weighing balance. The head, standard and total lengths was measured using a standard graduated fish measuring board. The fish was headed, gutted and filleted. The separate parts were weighed in grammes for each fish sample. The percentage of the separate parts determined was compared to the local body weight of each fish sample.

Statistical analysis. The data obtained were analysed using the SPSS 15.0 evaluation version production mode facility.

Table 1: Proximate compositions (%) of *T. guineensis* and *T. melanotheron*.

Parameters measured	% composition for <i>T. guineensis</i>	% composition for <i>T. melanotheron</i>
Crude protein	18.65	18.74
Total Lipid	0.55	0.70
Total ash	1.30	1.06
Moisture	79.5	79.5

Table 2: Anatomical weight compositions of *T. guineensis* and *T. melanotheron*

Parameter measured	<i>T. guineensis</i>	<i>T. melanotheron</i>
Total weight (g)	156.99 \pm 6.45	171.4 \pm 6.90
Total Length (cm)	20.37 \pm 0.53	20.82 \pm 3.90
Standard length (cm)	15.91 \pm 0.43	16.24 \pm 3.17
Head length (cm)	5.18 \pm 0.20	4.58 \pm 0.88

Data are mean \pm SD

Table 3: Yield indices of *T. guineensis* and *T. melanotheron*.

Parameters measured	<i>T. guineensis</i>	<i>T. melanotheron</i> .
Gut as a % of whole fish	4.90±1.01	4.11±1.06
Head as a % of whole fish	26.77±3.82	33.85±6.18
Fillets skin as a % of whole fish	39.50±5.50	36.28±5.60
Frame as a % of whole fish	16.80±3.37	17.36±3.80
Scales as a % of whole fish	5.93±1.19	5.31±2.41

Data are percentage mean± SD.

Results

The proximate composition of *T. guineensis* and *T. melanotheron* as shown in table 1. The result shows that *T. guineensis* contains 18.65% protein, 0.55% lipid, 1.30% ash and 79.50% moisture while *T. melanotheron* contains 18.74% protein, 0.70% lipid, 1.06% ash and 79.50% moisture.

The anatomical weight composition of *T. guineensis* and *T. melanotheron* were measured as shown in table 2. *T. guineensis* had a total body weight range from 73.10-229.91 g, total length range from 17.5-23.0 cm, standard length range from 13.6-18.0 cm and head length range from 4.00-6.50 cm while *T. melanotheron* had a total body weight range from 51.49-243.72g, total length range from 14.4-24.50cm, standard length range from 11.10-19.2cm and head length range from 3.30-5.5cm.

The yield indices of *T. guineensis* and *T. melanotheron* as shown in table 3, showed a percentage decrease in the order of fillet, head, frame, scale and gut for the two fish species. For *T. guineensis* the order was 39.50 > 26.77 > 16.80 > 5.93 > 4.90 and *T. melanotheron* was 36.28 > 33.28 > 17.36 > 5.31 > 4.11 respectively.

Discussion

T. guineensis and *T. melanotheron* belongs to high protein category because it is within the range of 15-20% and low oil of much less than 5% (0.55 and 0.70%) category. They have higher protein content than the fatty fishes, meats or poultry, and an ideal source of animal protein. Fishes with lipid content below 5% are lean (Stanby, 1982), hence, both fish are considered as a lean fish. The low lipid content value might be as a result of the environment, specie and the type of diet the fishes feed on.

Moisture content in the two species was within the range as previously reported by (Gallagher

et al., 1991). According to FAO, 1999, moisture and lipid contents in fish fillets are inversely related and their sum is approximately 80% with other components accounting for the remaining 20%.

The range for the ash content gave an indication that the fish samples may be good sources of minerals such as calcium, potassium, zinc iron and magnesium.

The mean value of the total weight, total length, standard length and head length were presented in table 2 for *T. guineensis* and *T. melanotheron* respectively. The anatomical weight composition of *T. guineensis* were relatively smaller than that of *T. melanotheron* except the head length, despite their similar feeding habit as omnivorous animals feeding mainly on plankton, diatoms, small crustacean, higher plants and decomposing vegetable matter. This may be due to the general body structure and the state of maturity of the species.

The yield characteristics for *T. guineensis* and *T. melanotheron* as shown in table 3 revealed a low fillet yield of 39.5% for *T. guineensis* and 36.28 in *T. melanotheron* compared to the whole percentage of the local body weight. The percentage yield of edible portion (trunk) for *T. guineensis* and *T. melanotheron* were 56.30% and 53.64% respectively. This was gotten from the total of filleted skin and the frame of the fish sample, the remaining portion such as the head, gut and scale are regarded as waste. The percentage yield for *T. guineensis* and *T. melanotheron* (56.3% and 53.64%) respectively is lower than those from croakers (63%) and mullet (66%), this is probably because of the small size and bony structure of tilapia fish (Akande, 1989). The yield of edible portion of the fish will make a good source of raw material for canning and other value added products.

It could be concluded that both *T. guineensis* and *T. melanotheron* can be referred to as high protein, low-oil (lean) and bony fish. However, they can be utilized maximally by food processors in fish canning and other value added fish products such as fish burger, fish cake and fish crackers and also for use in

controlling diet while the wastes recovered can be used for fish meal or silage production for animal feeds. Hence, they are suitable as potential industrial material for possible utilization for different products.

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