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COMPARATIVE ANALYSIS OF THE PROXIMATE COMPOSITIONS OF *Tarpon atlanticus*AND *Clariasgariepinus*FROM CULTURE SYSTEMS IN SOUTH - WESTERN NIGERIA

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ABSTRACT

The comparative analysis of the proximate compositions of *Tarpon atlanticus* (megalops) and *Clariasgariepinus* (African catfish) collected from two culture systems (Pen and concrete pond) were examined. Parameters of proximate composition analysed were moisture, ash, protein, fibre, fat and carbohydrate from the head and tail region. Proximate composition comparison was also done with various sizes of the two species of fish which are the juvenile, young adult and adult forms. The total length and weight of juvenile ranged from 24.5 - 26.5cm, 178.3 - 180g and 25.2 - 27.4cm, 177.6 -179.5g for *T. atlanticus*and *C. gariepinus*, respectively. For the young adult, the total length and weight ranged from 27.0 - 28.5cm, 212.0 - 220.1g and 26.9 - 29.4cm, 214.2 - 221.3g for *T. atlanticus*and *C. gariepinus,* respectively. For the adults, the total length and weight ranged from 40.20 - 42.10cm, 783 - 800g and 39.9 - 44.5cm, 785 - 805g for *T. atlanticus*and *C. gariepinus*, respectively. Analysis of variance (ANOVA) showed no significant difference ($P<0.05$) between the moisture content of *T. atlanticus*and *C. gariepinus* in the adult head although there was a significant difference ($P<0.01$) between the ash of *T. atlanticus* and *C. gariepinus* in the adult tail. There was no significant difference ($P<0.05$) between the protein of *T. atlanticus* and *C. gariepinus* in the young adult tail but there was a significant difference ($p<0.05$) between the fibre of *T. atlanticus* and *C. gariepinus*in the juvenile tail. There was a significant difference ($p<0.01$) between the fat and oil of *T. atlanticus* and *C. gariepinus*. Ash content was highest in the adult head of *T. atlanticus* and lowest in the adult tail of *C. gariepinus*. Protein was at its highest in the young adult tail of *C. gariepinus* and lowest in the juvenile head of *T. atlanticus*. The low concentration of lipids in the muscles of these species could be due to poor storage mechanisms and the use of fat reserves during spawning activities. Generally the two species contain high protein content as found out in this study. The high tissue protein content mayhave resulted from high protein content of their diets. Thus, both fish species constitute a high source of protein and low fatty acids, as well as an ideal dietetic fish food for human consumption.

Keywords:Proximate, *Tarpon atlanticus*, *Clariasgariepinus*, Protein, Nutrient

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INTRODUCTION

In Africa, fish is one of the most readily available sources of animal protein in the diet of rural and urban dwellers [1]. Fish and fish products are highly nutritious with protein content of 15-20% and are particularly efficient in supplementing the cereal and tuber diets widely consumed in Africa [2].It was further reported thatin Nigeria, fish are regarded as a major food item contributing a total of 40%to dietaryprotein.It is also a preferred and reliable source of animal protein with balanced amino-acids, vitamins and essential minerals for healthy human growth.

Fish allows for protein improved nutrition in that it has a high biological value in terms of high protein retention in the body [3]. This means that there is higher protein assimilation as compared to other animal protein sources, low cholesterol content and one of the safest sources of animal protein [4]. Out of 35g of animal protein per day per person recommended by the Food and Agriculture Organization (FAO), less than 7 g is consumed on the average [5]. As a result, many Nigerians suffer from protein deficiency due to low protein intake. Nigeria has become one of the largest importers of fish in the developing world, importing some 600,000 metric tonnes annually. To solve the country's high demand for fish, Nigerians must turn to their under-utilized inland water for improved fish production and aquaculture [6]. The major commercially important fishes include *Gymnarchusniloticus, Clariasgariepinus, Heterobrachusbidorsalis*and *C. anguillaris*[2]. The knowledge of their tissue composition is essential for their optimal utilization as food.Their chemical compositions vary widely, not only from fish to fish of the same species but also within the same fish [7].

Fish is a highly proteinous food consumed by a larger percentage of populace because of its availability and palatability [8]. Also, when compared to other protein sources like goat and chicken meat,it is safer, healthier and is also known to be an excellent source of protein from amino acid composition and protein digestibility [9]. Fish is also one of the main sources of protein in the developing countries [10]. The flesh of oil-rich fish, such as herring, mackerel and catfish are important sources of the long chain n-3 polyunsaturated fatty acids (PUFA) including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), due to the large amounts of these fatty acids in marine algae upon which the fish feed [11]. However, the fat composition of fish is highly susceptible to various factors such as the time of year and the type of feed available.Processing and cooking methods may also result in alterations to the nutritional composition of fish. There is increasing interest in the beneficial role of oil-rich fish in various human diseases, which is likely to be due to them being more or less unique sources of the long chain fatty acids [12].

Since fish lipids are rich in polyunsaturated fatty acids, particularly omega -3 fatty acids, which have important role in disease prevention and health promotion, fish as a source of lipids is highly recommended [13 - 15]. Fish has a greater nutritional value when compared to meat; it has been found to contain a certain percentage of fatty acid composition depending on the species consumed [16]. It has been noted that pathogens and food intake have been investigated by proximate composition and fatty acid contents of the food items [17]. In an ecological study conducted, fish consumption was associated with a reduced risk from all ischemic heart disease and stroke mortality across 36 countries [18].

Recent studies were carried out in Japan showing the relationship between the frequency of weekly fish intake and reduced risk of certain diseases like obesity, hypertension, glycohaemoglobin and cerebral infarctions (stroke) [19]. Nutritional deficiencies may take the form of inadequacies of total caloric intake, protein intake, or certain essential nutrients such as the vitamins and, more rarely, specific amino acids (components of proteins) and fatty acids.

*T.atlanticus*is generally dark blue or black on the back and bright silver on the belly, while the flesh is edible but not generally recommended as food. It belongs to the family megalopidae.They reach more than 2 m (more than 6 ft) in length and 68 kg (150 lb) in weight.The African catfish *Clariasgariepinus*is one of the most suitable species for aquaculture in Africa [20]. It is mainly afresh water species belonging to the family Clariidae (the air breathing catfish). It is also known in the central and northern parts of Africa as *Clariasgariepinus*, in the southern part it is called the *Clariaslazera* and in the western part it is referred to as the *Clariasmossambicus* [21].In Nigeria, *Tarpon atlanticus* is a species found migrating into the Lagos lagoon but the culture technique is yet to be discovered while *Clariasgariepinus*is highly relished due to its fast growth and table value of the fish [22].

The aim of this study was to consider the various nutritional benefits associated with the consumption of *Tarpon atlanticus* and *Clariasgariepinus*. The measurement of some proximate profiles such as protein content, carbohydrates, lipids, moisture content and ash percentage is often necessary to ensure that they meet the requirement of food regulations and commercial specification with a view to providing nutritional data for dietary planning and recommendation for health purposes.

MATERIALS AND METHODS

Collection and Preservation of Specimen

Fresh catfish, *Clariasgariepinus*(30) were purchased from the Department of Marine Sciences, University of Lagos fish farm. *C. gariepinus* were grown in a concrete pond and fed with artificial feed (35% Crude protein).*Tarpon atlanticus*(30) were purchased from a Pen culturist atMakoko, Lagos. The pen was constructed directly in Lagos Lagoon near the farmer's house and was fed with fish trash and food waste from the farmer's house. They were transported live to the laboratory for analysis.

Sample preparation

The fish were measured for standard length, total length, and head length to the nearest centimeter on a measuring board and weighed on a digital weighing balance model C830 to determine the weight in gram. The fish specimens were dissected, and weighed to determine the tissue weight composition of the fish flesh and cleaned, filleted and placed in a blender and homogenized for 15mins. Samples for different

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chemical analyses were then taken from the homogenous material. Triplicate determinations were carried out on each chemical analysis.

Proximate Composition Analysis

Proximate composition of catfish *Clariasgariepinus* and *Tarpon atlanticus* were determined using Association of Official Analytical Chemists methods [23]. Moisture content was measured by weighing the differences before and after drying the fish and this was done at 100-105 ^{0}C for 16 h. Protein content (% N x 65) was determined by the Kjeldahl method described by [2].A known weight (0.5g) of prepared fish sample was accurately weighted on a nitrogen – free paper and the paper wrapped round the sample and then dropped into the bottom of the Kjeldahl digestion flask together with 6 – 8 glass beads, 4 – 5 spatula full of granular mixture of $CuSO_4$ and KSO_4 as catalyst. Twenty milliliters of concentrated H_2SO_4 was carefully added. The flask was gently heated in an inclined position on a heating mantle (Gerhardt model) in a fume cupboard until full digestion when the liquid was completely clear from brown colour to colourless. The content of the flask was transferred to a clean 100ml volumetric flask and made up to volume. Of the 100ml, 25 ml aliquot was used for distillation. The total nitrogen was determined calorimetrically. The Ash content was determined using dry ashing procedures. Fat content was measured by drying the samples at 100 ^{0}C in an oven and then extracting the crude fat with petroleum ether in a Soxhlet extractor for 4 hours. Carbohydrate content was obtained by difference from the combined percent of moisture, protein, ash and fat from 100.

Statistical Analysis

Analysis of Variance (ANOVA) was used to compare means of the proximate composition data. Further analysis was carried out where there were significant differences ($p<0.05$) using Least Significant Difference[24].

RESULTS

MorphometricCharacteristicsof*T.atlanticus*

The total length 24.5-26.5cm with mean total length of 21.15 ± 0.85 andweight range of 178.3- 180g with a mean weight 178.15 ± 0.25 was recorded for juvenile*T. atlanticus*.The young*T. atlanticus*had a total length range of 27.0 - 28.5cm (27.75 ± 0.75), and weight (212- 220.1g). The total length of adult *T. atlanticus*ranged from 40.20 - 42.10cm while the weight range was 783-800g (Table 1).

Morphometric Characteristics of *Clariasgariepinus*

The morphormetriccharacteristics of *C. gariepinus* are shown in Table 2. The juvenile mean total length was 26.3 ± 1.1cm (178.55 ± 0.95g), 28.15 ± 1.25cm (217.75 ± 3.55g) for young adult and 42.2 ± 2.3cm (795.0 ± 10.0g) for adult fish.

Proximate compositions of juvenile, young adult and adult *Tarpon atlanticus*

The proximate composition analysis for moisture, ash, protein, fibre, fat and oil and carbohydrate in the juvenile, young adult and adult of *T.atlanticus*are shown in Table 3.Higher moisture content was recorded for the adult head region followed by the young adult tail region. Higher ash content was noted in the juvenile head region while the least value was recorded in the adult head region. The adult *T. atlanticus* had high protein value in both the head and tail regions but higher in the tail region compared to the head. A close range value of protein content was recorded in juvenile tail region. Fibre content was also highest in the adult head region and least value was in the juvenile head region. The highest fat and oil values were noted in adult tail followed by adult head region. Carbohydrate value was highest in juvenile head followed by young adult head region and least value was recorded for adult tail.

PROXIMATE COMPOSITIONS OF JUVENILE, YOUNG ADULT AND ADULT *Clariasgariepinus*

The proximate composition analysis for moisture, ash, protein, fibre, fat and oil and carbohydrate in the juvenile, young adult and adult of *C.gariepinus* are shown in Table 4.Young adult tail of *C. gariepinus* had the highest moisture content (36.21 ± 0.11 %) followed by young adult tail and the least (21.53 ± 0.13%) was recorded for juvenile head. The ash content was highest in young adult head and the least (12.79±0.19) was recorded for juvenile tail. The highest protein value (30.31± 0.01%) was recorded for young adult tail and the least value (23.06 ± 0.06 %) was recorded in juvenile tail. The highest fibre content (0.68± 0.08%) was found in young adult head while the least value (0.36 ± 0.02%)was recordedin juvenile tail. The fat and oil component of the fish was highest for young adult tail (0.06±0.02%) and the least (0.31±0.06%) was noted in juvenile tail. The highest carbohydrate value (37.15±0.10%) was recorded in juvenile head and least (15.5±0.01%)in young adult tail.

COMPARISON BETWEEN THE PROXIMATE COMPOSITIONS OF*T.atlanticus*and *C.gariepinus*

Evaluation of the proximate composition comparison between two species of fish with various sizes revealed that the percentage of the moisture and ash content were relatively higher in *T. atlanticus*than those in *C. gariepinus*. The mean values of moisture values for*T. atlanticus* juveniles were 31.81% in the head and 32.10% in the tail and for ash, the values were 17.64% in the head and 16.03% in the tail. For the young adults, the mean values of moisture were 32.15% in the head and 33.29% in the tail and for ash, the values were 17.85% in the head and 15.99% in the tail. For the adult, the mean values were 25.95% in the head and 31.84% in the tail and for ash the mean values were 19.37 and 14.97 in the head and tail, respectively.

For *C. gariepinus*, the mean values of moisture for juveniles were 21.53% in the head and 29.34% in the tail and for ash, the values were 15.90% in the head and 12.79% in the tail. For the young adults, the mean values of moisture were 25.57% in the head and 36.21% in the tail and for ash, the values were 19.33% in the head and 16.53% in the tail. For the adult, the mean values were 23.40% in the head and 32.19% in the tail and for ash the mean values were 17.79% in the head and 14.60% in the tail.

The fats and oil, fibre and protein contents on the other hand had variable values and this can be seen in Table 5.

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Analysis of variance showed no significant difference (p<0.05) between the moisture of *T. atlanticus*and *C. gariepinus*. There was a significant difference (p<0.01) between the ash of *T. atlanticus* and *C. gariepinus*. There was no significant difference (p>0.05) between the protein of *T. atlanticus* and *C. gariepinus*. There was a significant difference (p<0.05) between the fibre of *T. atlanticus* and *C. gariepinus*. There was a significant difference (p<0.01) between the fat and oil of *T. atlanticus* and *C. gariepinus*. There was no significant difference (p>0.05) between *T. atlanticus* and *C. gariepinus*.

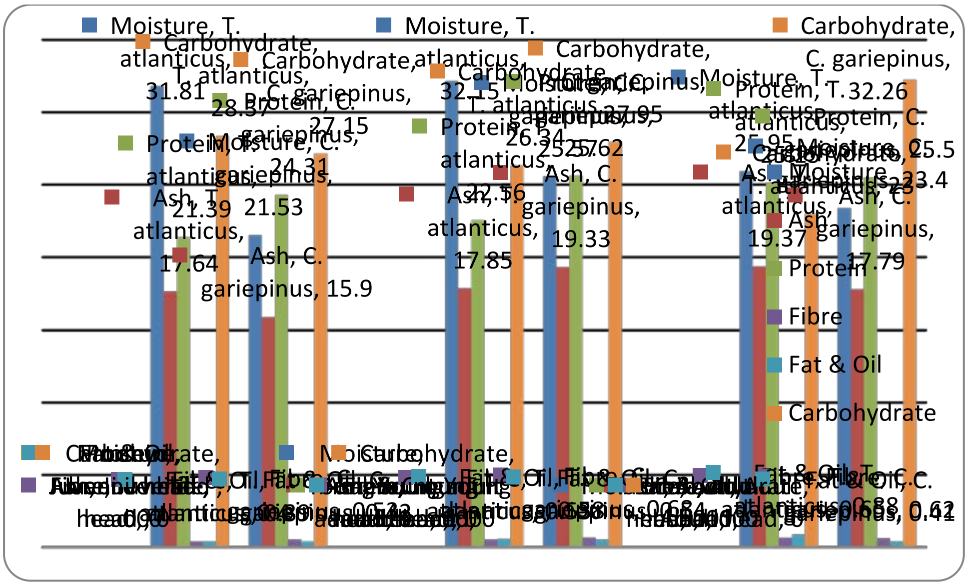

Figure 1: Mean values with various sizes of the head regionof *T. atlanticus* and *C. gariepinus*

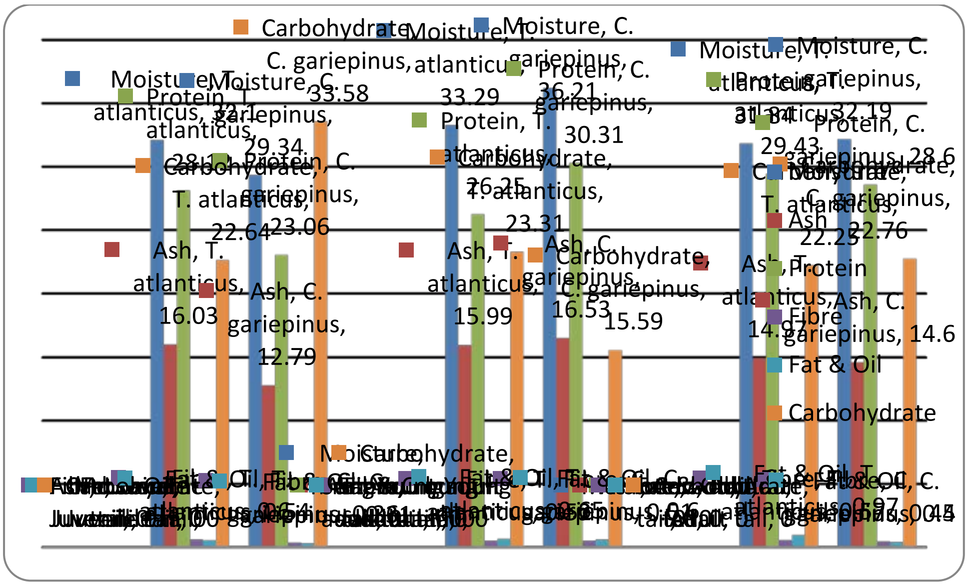

Figure 2: Mean values with various sizes of the tail region of *T. atlanticus* and *C. gariepinus*

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DISCUSSION

Fish hasbeen suggested to be a useful key component for a healthy diet in humans [25]. The fish species examined belonged to high-protein (15-20%) low-oil (<5%) category. They contained lower calorie content per unit of protein than do meats or poultry, and were ideal sources of animal protein for use in controlling diets [26].Moisture content was highest in the young adult tail and lowest in the adult head of *C. gariepinus*hopefully because the fish has not spawn prior to the sampling period as reported by Eyo and Olatunde[27].

Ash content was highest in the adult head of *T. atlanticus* and lowest in the adult tail of *C. gariepinus*. Protein was at its highest in the young adult tail of *C. gariepinus* and lowest in the juvenile head of *T. atlanticus*. Generally, the two species contain high protein content as observed in this study. The high tissue protein content may result from high protein content of their diets [26].The relatively high to moderate percentage proteinin the fishes could be attributed to the fact that they are good sources of protein.Also the differences observed in the obtained values may also be attributed to fish's consumption or absorption capability and conversion potentials of essential nutrients from their diet or their local environment into such biochemical attributes needed by the two fishes[28;29].Fibre was at its highest in the young adult's head of *C. gariepinus* and lowest in the juvenile tail of *C. gariepinus*. Fat and oil was at its highest in the adult tail of *T. atlanticus* and lowest in the juvenile tail of *C. gariepinus*. Carbohydrate was at its highest in the adult head of *C. gariepinus* and lowest in the young adult of *C. gariepinus*.

The observed range of ash content indicated that both species are good sources of minerals but there was a significant difference ($p<0.01$) between both species for all the samples due to the fact that *T. atlanticus*had a higher level of ash[26]. Fish with lipid content below 5% are considered lean [30]. The low concentration of lipids in the muscles of these species could be due to poor storage conditions and the use of fat reserves during spawning activities [26]. Fibre and carbohydrate contentswere relatively high in *C.gariepinus*than in *T.atlanticus* but there was significant difference ($p<0.05$) in the fibre content and no significant difference ($p<0.05$) in the carbohydrate. The variation in the proximate composition among individuals of the same species is a common phenomenon in fish [31,32]. These variations were attributed to factors such as thegeographical area in which the fish was caught, age, sex, size and the nature of feed used to feed the fish in the culture system.

T.atlanticus and *C.gariepinus* can be used in the diets to avoid excessive consumption of saturated fat as they are non-fatty fish. The daily energy requirement for an adult human is between 2500 – 3000 kcal depending on his physiological state while that of infants is 740 kcal [33]. This implies that while an adult man would require between 6 -7g of *C.gariepinus*to meet his minimum requirement, an infant would require about 1g-2g. In addition, the protein concentration in *C.gariepinus* in terms of energy would

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be more than enough to prevent malnutrition in children and adults fed solely on the fish [33].

*T.atlanticus*is an ideal dietetic food, which can be substituted for *C.gariepinus* due to its relatively high fatty acid profile while the protein content of *C.gariepinus* shows a reasonable percentage difference in the developmental stage. *T.atlanticus* is a good protein sourceand its dietary benefits good. In general, the two fish species are good protein sources. This ultimately means that they provide vital constituents, which enable the body to carry out certain functions such as promoting growth. They are also important for the repair and renewal of the tissues that are constantly undergoing wear and tear.

CONCLUSION

The data presented in this paperwere intended to provide baseline information on nutrientcharacteristics of *T. atlanticus* and *C. gariepinus* muscle in relation to their body section. This was done basedon the economic aspect of the consumption since smaller fish commands lower price, and to ascertain the value for the money spent. The muscle nutrient profile shows that both fishes are highly nutritious – high in protein, low in fat, and a good source of carbohydrate and ash. The sectional (head and tail region) nutritional profile may be useful in assessing the nutrient content of the fish. The adult tail region of *T. atlanticus* is highly proteinous compared to other sizes and this revealed that it is better to consume bigger size of the fish for protein. The same was recorded for fat and oil but the juveniles are a good source of carbohydrate.In *C. gariepinus,* the young adult tail is a good source of protein and the juvenile head is good for carbohydrate. It is, therefore, obvious that these fishes are good nutrientsources.

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Table 1: Morphometric range values of *T.atlanticus*

Sample	Total length (cm)	Mean total length(cm)	Weight (g)	Mean weight (g)
Juvenile	24.5 - 26.5	21.15 ± 0.85	178.3-180	178.15 ± 0.25
Young Adult	27.0 - 28.5	27.75 ± 0.75	212-220.1	216.05 ± 4.05
Adult	40.20 – 42.10	41.15 ± 0.95	783-800	791.50 ± 8.50

Table 2: Morphometric range values of *C.gariepinus*

Sample	Total length (cm)	Mean total length (cm)	Fresh Weight (g)	Mean weight (g)
Juvenile	25.20 - 27.40	26.30 ± 1.10	177.6 - 179.5	178.55 ± 0.95
Young Adult	26.90 - 29.40	28.15 ± 1.25	214.2 - 221.3	217.75 ± 3.55
Adult	39.90 - 44.50	42.20 ± 2.30	785.0 – 805.0	795.0 ± 10.0

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Table 3: Proximate compositions of juvenile, young adult and adult *T.atlanticus*

Sample	Moisture (%)		Ash (%)		Protein (%)		Fibre (%)		Fat & oil (%)		Carbohydrate (%)	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Juvenile Head	31.80 – 31.82	31.81 ± 0.01	17.62 – 17.65	17.64± 0.02	21.38 – 21.40	21.39 ± 0.01	0.39 – 0.41	0.40 ± 0.01	0.38 – 0.40	0.39 ± 0.01	28.37 – 28.38	28.37 ±0.01
Juvenile Tail	31.09 – 32.11	32.10± 0.01	16.01 – 16.05	16.03 ± 0.02	28.10 -28.14	28.12 ±0.02	0.59 – 0.61	0.60±0.01	0.53 – 0.56	0.54± 0.01	22.33 – 22.65	22.64 ±0.01
Young Adult Head	32.12 – 32.17	32.15 ± 0.03	17.83 – 17. 87	17.85 ± 0.02	22.54 – 22.57	22.56 ± 0.02	0.50 – 0.55	0.53 ± 0.03	0.57 – 0.60	0.58 ± 0.01	26.31 – 26.37	26.34 ±0.03
Young Adult Tail	33.20 – 33.36	33.29± 0.09	15.90 – 16.13	15.99 ± 0.09	16.20 26.31	26.25 ± 0.05	0.49 – 0.55	0.52 ± 0.03	0.62 – 0.67	0.65 ± 0.03	23.25 – 23.38	23.32 ± 0.07
Adult Head	35.93 – 35.97	35.95 ± 0.02	14.35 – 14.38	14.36 ±0.02	25.13 – 25.17	25.15 ± 0.02	0.63 – 0.67	0.65 ± 0.02	0.86 – 0.90	0.88 ± 0.02	22.98 – 23.03	23.01 ± 0.05
Adult Tail	31.81 – 31.87	31.84 ± 0.03	14.94 – 14.99	14.97 ± 0.03	29.43 – 29.44	29.43 ± 0.01	0.54 – 0.60	0.57 ± 0.03	0.96 – 0.99	0.97 ± 0.01	22.22 – 22.28	22.25± 0.03

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TABLE 4: **Theproximate compositions of juvenile, young adult and adult *C. gariepinus***

Sample	Moisture		Ash		Protein		Fibre		Fat & oil		Carbohydrate	
	% range	%mean	% range	%mean	% range	%mean	% range	%mean	% range	%mean	% range	%mean
Juvenile Head	21.40 - 21.60	21.53 ± 0.13	15.89 – 15.91	15.90± 0.01	24.29 – 24.33	24.31 ±0.02	0.50 – 0.55	0.53 ± 0.03	0.40 – 0.45	0.42 ± 0.02	37.05 – 37.37	37.15 ± 0.10
Juvenile Tail	29.30-29.40	29.34 ± 0.04	12.60 – 13.17	12.79 ± 0.19	23.00 – 23.15	23.06 ± 0.06	0.30 – 0.41	0.36 ± 0.06	0.25 – 0.35	0.31 ± 0.06	33.46 – 33.75	33.58 ± 0.12
Young Adult Head	25.20-25.70	25.57 ± 0.37	19.30 – 19.40	19.33 ±0.03	25.50 – 25.70	25.62 ± 0.12	0.60 – 0.75	0.68 ± 0.08	0.47 – 0.60	0.54 ± 0.07	27.75 – 28.10	27.95 ± 0.20
Young Adult Tail	36.10 -36.32	36.21 ± 0.11	16.41 – 16.70	16.54 ± 0.13	30.30 – 30.33	30.31 ± 0.01	0.50 – 0.52	0.51 ± 0.01	0.58 – 0.62	0.60 ± 0.02	15.58 – 15.60	15.59 ±0.01
Adult Head	23.38-23.41	23.40 ± 0.02	17.78 – 17.80	17.79 ± 0.01	25.48 – 25.51	25.50 ±0.02	0.60 – 0.64	0.61 ± 0.01	0.39 – 0.42	0.41 ± 0.02	32.24 – 32.28	32.26 ±0.02
Adult Tail	32.18-32.20	32.19 ± 0.01	14.59 -14.60	14.60 ± 0.01	28.59 – 28.62	28.60 ± 0.01	0.43 – 0.48	0.45± 0.02	0.39 – 0.40	0.40 ± 0.01	22.75 – 22.78	22.76±0.01

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Table 5: Comparison between the proximate composition of *T.atlanticus*and *C. gariepinus*

Sample	Moisture (%)	Ash (%)	Protein (%)	Fibre (%)	Fat & oil (%)	Carbohydrate (%)
Juvenile (head)						
T. atlanticus	31.81	17.64	21.39	0.40	0.39	28.37
C. gariepinus	21.53	15.90	24.31	0.53	0.42	27.15
Juvenile (tail)						
T. atlanticus	32.10	16.03	28.12	0.60	0.54	22.64
C. gariepinus	29.34	12.79	23.06	0.36	0.31	33.58
Young adult (head)						
T. atlanticus	32.15	17.85	22.56	0.53	0.58	26.34
C. gariepinus	25.57	19.33	25.62	0.68	0.54	27.95
Young adult (tail)						
T. atlanticus	33.29	15.99	26.25	0.52	0.65	23.31
C. gariepinus	36.21	16.53	30.31	0.51	0.60	15.59
Adult (head)						
T. atlanticus	25.95	19.37	25.15	0.65	0.88	23.00
C. gariepinus	23.40	17.79	25.50	0.62	0.41	32.26
Adult (tail)						
T. atlanticus	31.84	14.97	29.43	0.57	0.97	22.25
C. gariepinus	32.19	14.60	28.60	0.45	0.40	22.76

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