PROXIMATE COMPOSITION AND SIZE RELATIONSHIP IN *Parachanna obscura*, (Gunter 1861) OF THE CROSS RIVER, NIGERIA

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ABSTRACT
The aquaculture of African snakehead, Parachanna obscura, is gaining an increasing recognition, yet the proximate composition of the species is not known. Study was conducted to determine the proximate composition and their relationship with size of Parachanna obscura, from the Cross River, Nigeria. Ten specimens of Parachanna obscura were analyzed for moisture, protein, fat and crude fibre contents. Mean values for protein, fat and moisture were 18.11, 15.36, and 68.54 %, respectively. There was a direct correlation between protein and the size of the fish ($p \leq 0.01$, $r = 0.97$, $n = 10$). The relationship was defined by the linear equation $y= 6.215 + 0.0872(x)$. Similarly there was a linear correlation between the fat contents and size ($p \leq 0.05$, $r = 0.95$, $n=10$). The linear relationship was defined by the equation $y=10.38 + 0.367(x)$. There was ontogenetic shift in protein-fat ratio. The linear relationship between the protein and fats and the weight of the species means that the wet weight of the fish can be used to determine the percentage of protein and fats in the fish without the expensive, laborious and cumbersome method of proximate analysis. The ontogenetic shift in protein–fat ratio implies that people with energy related–health problems can choose between the young and older individuals of Parachanna obscura to meet their specific health challenges.
Keywords: Snakehead, nutrition, regression relationship, aquaculture

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). 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. Fish received increased attention as a potential source of animal protein and essential nutrients for human diets (Kromhout *et al.*, 1995; Zenebe *et al*., 1998a; Arts *et al.*, 2001; Fawole *et al.*, 2007). There is an increasing demand for fish production through aquaculture in Nigeria. One of the species being screened for aquaculture is the African snakehead, *Parachanna obscura*. Snakeheads are of high commercial value because of the good taste and high quality flesh. They are valued for their medicinal properties when eaten and the flesh is claimed to be rejuvenating, particularly during recuperation for serious illness and as a post-natal diet (Mat Jais *et al*., 1998). It is also recommended for post-operation patience. Snakeheads are considered to be nutritive than Carp and Tilapias, in terms of a higher protein to fat ratio (Sharma and Simlot, 1971).

In the Cross River Basin, *Parachanna obscura* is a highly valued fish with a commercial demand, hence it has a great potential for food security and income generation. Works done on the species so far include Victor and Akpocha (1992), on the biology of the species under a culture condition. Bassey and Ajah (2010) worked on the effects of different feeding regimes on growth of the species under pond condition. Ama-Abasi and Affia (2010) worked on food and feeding habit of the species and found out that it feeds mainly on fish, insects both aquatic and terrestrial and some plant materials. Adebayo *et al*., (2007) worked on the haematological profile of the species from some rivers in South West Nigeria.

Report on the proximate composition of snakehead is limited to that of Ama-Abasi and Ogar (2012), which was limited to only three specimens. Such information needs more number of specimens for reliability to strengthen the quest for this species as an aquaculture candidate and major source of protein and other nutritional requirements for healthy growth. In the present study, which is the expansion of the work of Ama-Abasi and Ogar (2012), attempt was made to provide information on the proximate values of more specimens of African snakehead fish (*Parachanna obscura*) found in the Cross River system. Apart from helping consumers to appreciate

fish based on their nutrient values, data from the results will also complement information on Nigerian Food Composition database. The study also sought to establish any relationship between the size of *Parachanna obscura* and its protein and fats contents.

MATERIALS AND METHODS

Live samples of *Parachanna obscura* were caught from the Cross River at Ayadehe Bridge head, about 65km from Calabar along Calabar-Itu highway. This is the usual landing site for the species in the River system. The samples were transported live to the analytical laboratory of Biochemistry Department, University of Calabar, Calabar, Cross River State, Nigeria. The specimens were scarified with a sharp blow on the head using dissecting scissors. Weight and length of the specimens were taken using Bosch compact electronic balance and meter board to the nearest 0.1g and 0.1cm respectively.

Protein Analysis

Protein content was determined using the Kjeldahl method, AOAC 981.10 (AOAC, 1995). One gram of sample**,** one Kjeltec catalyst tablet and 10ml H_2SO_4 were put into Kjeldahl tube and digested for two hours at 420°C. The product was then made basic with 30% (w/v) NaOH before distillation into 0.1M HCl and titration against 0.25M HCl. The factor used to convert nitrogen into crude protein was 6.25.

Moisture Content

Moisture content was determined with a modified version of the AOAC 925.04 (AOAC, 1995). Ten grams of sample was dried at 105°C for 24 hours and the water content of the samples was gravimetrically determined.

Fat Content

Fat content was determined by using Soxhlet extractor (Behrotest, Behr Labor Technik Gro Bh. Dusseldorf, Germany). The water-free sample was put into pre-weight Soxhlet tube and petroleum ether was recycled through the sample for 2 hours. The remaining ether was evaporated and the sample was dried at 105° C overnight. Fat content was then determined gravimetrically.

Ash Content

Ash content was analyzed using modified version of AOAC 938.08 (AOAC, 1995). The water and fat free sample was combusted at 500°C for 12 hours and the ash content was determined gravimetrically.

RESULTS

The results of the proximate composition of *Parachanna obscura* is given in Table 1 below. Protein contents ranged from 9.62% to 27.56 %. Fats contents ranged from 11.1 % to 20.1 % Values for other nutrients are recorded in Table 1.The results of the present investigation showed that the proximate composition of *Parachanna obscura* varies with respect to nutrient value. Moisture had the highest values followed by the ash content. Protein content was slightly higher than the fat content. There was an ontogenetic shift in the ratio of protein to fat in this species. Younger *Parachanna* appears to have higher fat contents than protein; but as they grow older the value of protein becomes higher than that of fat. The crude fibre was the least recorded value. Table 2 compares the results of the mean percentage of moisture, protein, fat, crude fibre, and ash content in eight (8) other different fish species to that obtained in this present study.

Table 1: Proximate composition of different sizes of *Parachanna obscura (*mg/100g)

SN	Lt (cm)	Wt(g)	Moisture (%)	Protein (%)	Fat (%)	Crude fibre
1	20.4	56.4	68.1	9.6	12.8	0.03
2	21.5	64.4	70.0	11.5	11.1	0.01
3	21.0	73.3	73.1	13.1	13.6	0.01
4	25.3	95.5	71.6	15.9	14.3	0.00
5	26.0	106.0	67.2	16.8	15.4	0.01
6	29.0	153.5	67.1	17.9	16.0	0.01
7	27.6	162.8	65.1	18.8	15.5	0.00
8	28.2	181.8	72.9	23.5	16.8	0.00
9	28.0	207.6	64.4	26.4	18.0	0.01
10	35	259.4	66.0	27.6	20.1	0.01

Table 2: Comparison of the proximate composition of *Parachanna obscura* with that of other fishes

Species	Moisture (%)	Protein (%)	Fat (%)	Source
Salmon gairdneri	78.0	19.0	2.0	Kinsella *et al*. (1984)
Sarotherodon melanotheron	N/A	29.3	3.5	Baliu *et al.* (2007)
Channa striatus	N/A	23.0	11.9	Zuraini *et al.* (2006)
Channa micropeltes	N/A	22.1	10.1	Zuraini *et al.* (2006)
Synodontis clarias	N/A	22.0	3.4	Baliu *et al.* (2007)
Snakehead murrel	80.4	18.6	0.4	Nurhasan (2008)
Heterotis niloticus	65.45	13.3	25.26	Ekanem & Osuya (1997)
C. nigrodigitatus	61.8	17.5	39.7	Ekanem & Osuya (1997)
Parachanna obscura	68.5	18.1	15.36	This study

On the relationship between the size of *Parachanna obscura* and protein content, as well as fat quantity, there are direct correlations. The smallest fish of 56.44g had the lowest protein content of 9.62% while the largest fish of 259.4g had protein content of 27.56%. This same trend was also observed for fat content. The linear relationship between the protein and size of *P.obscura* was expressed as y= 6.215 + 0.0872 (x) (Fig. 1). Similarly the linear relationship between fat and the size of *P. obscura* was expressed as y =10.38 + 0.0367(x) (Fig. 2).

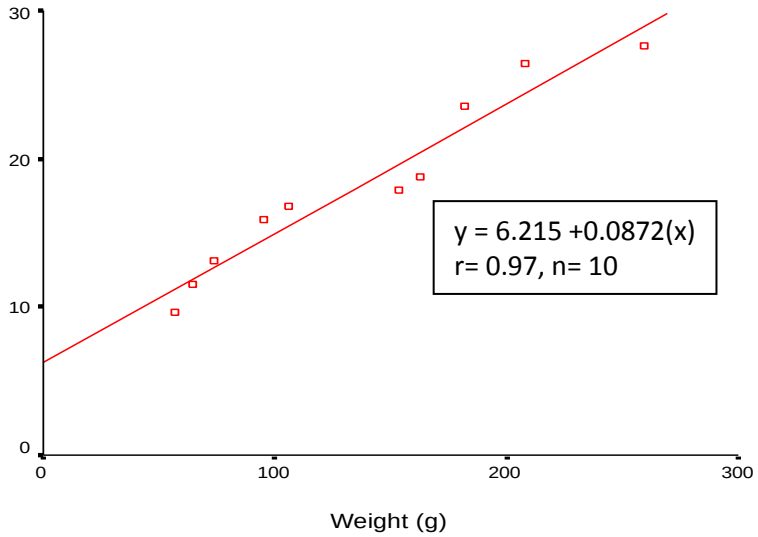

Fig.1: Relationship between weight and protein content of *Parachanna obscura*

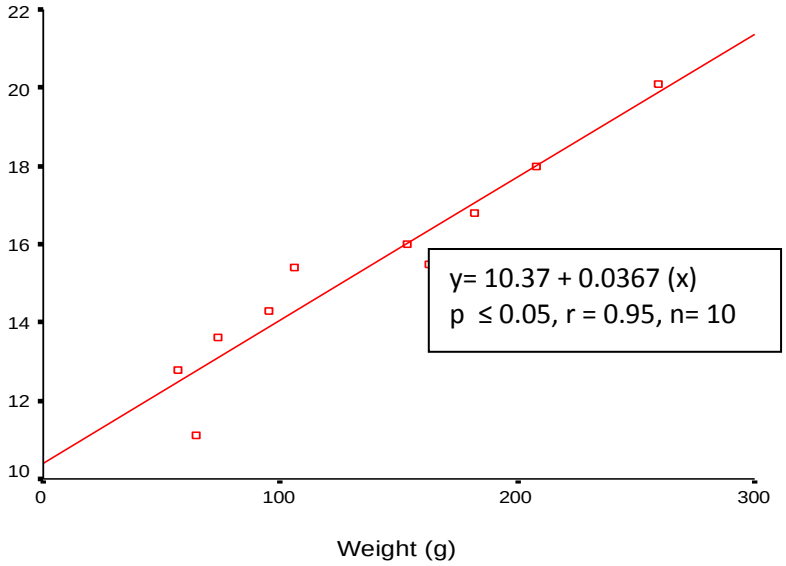

Fig. 2: Relationship between weight and fat content of *Parachanna obscura*

DISCUSSION

The results of the present investigation showed that the protein content of *Parachanna obscura* was within the range for other members of the family Channidae (*Channa striata*, 23.0%, *Channa micropeltes*,22.1% and snakehead murrel,18.4%)(Zuraini *et al*., 2006; Nurhasan, 2008). This lends credence to the reliability of the study. The proximate composition of *Parachanna obscura* is very rich hence these indigenous fishes can play a significant role to fulfill the nutrient demand of poorer sections of people of the Cross River Basin and the country at large. Moisture, proteins, fat, and crude fiber as well as the ash content were the major constituents, which had been considered in evaluating the nutritional value of the species studied. In the study, protein recorded a higher mean value than the fat. This makes the African snakehead fish important fish resources of dietary protein as other sea and freshwater fish (Vlieg and Murray, 1988; Zuraini *et al*., 2006). The results of the present study were in line with the report of Steffens (2006) which stated that protein forms the largest quantity of dry matter in fish. The results of this study confirms the report of Ama-Abasi and Ogar (2012) on snakehead as a rich source of protein. The present work had elucidated more on the importance of *Parachanna obscura* as a good source of protein and had also broadened the knowledge on the nutritional value of this important freshwater fish species that has not been properly appreciated.

From the results of the present study, it was observed that *Parachanna obscura* is a better source of protein when compared with other important food fishes in the Cross River system. Ekanem and Osuya (1997) reported that protein content of *Chrysichthys nigrodigitatus* was the same as that observed by Sidwell *et al.* (1974). The results of Ekanem and Osuya (1997) showed that *Heterotis niloticus* had 13.33% while *Chrysichthys nigrodigitatus* had 17.53% whereas the present study showed that *Parachanna obscura* had a 18.11%. This proves that *Parachanna obscura* is more proteinous than *Heterotis niloticus* and *Chrysichthys nigrodigitatus*, all from the Cross River System. Indeed, the protein content of the species is higher than that of the egg yolk reported by CFCD (2002) to be 15%.

A comparison of the proximate analysis of *Parachanna obscura* with that of other fishes shows that the species has a higher fat content than other fishes. Higher fat content seems a feature of the genus *Channa* since *Channa striata* is reported to have a high fat content of up to 11.9% (Zuraini *et al.*, 2006). It is the high content of lipids that makes *Channa striata* very good healing agent for post-operation patience (Mat Jais *et al.*, 1998). It follows therefore that *Parachanna obscura* with a higher fat content than *C. striata* could still prove a better healing agent. Therefore a diet of *Parachanna obscura* is strongly recommended for post-natal and recuperating patients.

The present study however doubts the exceptionally high fat values for *Heterotis niloticus* and *Chrysichthys nigrodigitatus* given by Ekanem and Osuya (1997). This is because, in almost all cases, protein values in fishes are higher than fat

values (Nurhasan, 2008, Baliu *et al*., 2006, Zuraini *et al.*, 2006 and Kinsella *et al*., 1984). Where fat values are exceptionally higher than protein values is an indication of error in the analysis. This study therefore suggests a repeat of proximate analysis in *Chrysichthys nigrodigitatus* and *Heterotis niloticus.* The rich nutritional composition of *Parachanna obscura* shows that the fish species 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 a particular organism (Aberoumad and Pourshafi, 2010). The high level of protein content (up to 27.56%) in this fish species makes it a highly valuable food fish. The moisture level is lower when compared to other species, hence the shorter time during smoking, if it should be considered as a suitable means of preservation.

Of interest also is the relationship between the size of *Parachanna obscura* and the quantity of protein and fat. The direct correlation between size and protein content in *Parachanna* seems a feature of fishes. Ramseyer (2002) reported a direct correlation between protein quantity and size of 68 species of fishes in North America. The present work has extended the number of species with this trend to 69. Also, this study is the first to report on correlation between fat quantity and size of fish. This direct correlation between protein and size means that diet of bigger *Parachanna* should be given to growing children. Moreover, with the direct correlation between the protein, and fat contents and size of the fish, the wet weight of the fish can be used for the calculation of the protein and fats contents without using the expensive, laborious and cumbersome method of proximate analysis. The ontogenetic shift in protein–fat ratio observed here might probably be attributed to a shift in diet. Ama-Abasi and Affia (2010) reported that young *Parachanna obscura* feeds on detritus, worms, young fishes and plant materials while the adults feed mainly on fish, insects (both terrestrial and aquatic) and worms.

Ama-Abasi and Ogar (2012) reported on an apparent inverse relationship between the protein content and size of *Parachanna obscura* but with caution, because of the small sample size. This work has proved that larger sample size was needed to ascertain the true trend between size of fish and quantity of protein and fat.

CONCLUSION

It can be concluded that the African snakehead fish, *Parachanna obscura* is rich in protein and fat content and promises to compete favourably with the current aquaculture species including *Heterobranchus longifilis*, *Clarias* species, *Tilapia*, etc. Indeed its high protein and fat contents make it prized food fish whose culture should be encouraged. *Parachanna obscura* having being discovered to be a good source of protein can as well substitute the red meat as a good source of dietary nutrient capable of reducing and solving the problem of malnutrition in humans. Hospitalized patients, after major and minor operations, are encouraged to eat much of this fish species to facilitate fast healing of the wound and blood replenishment. It also implies that people who have energy- related health problems can choose between the older and younger individual of *Parachanna obscura* to meet their specific energy needs.

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