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Research Article

Comparative Studies on Nutrient Composition of Wild and Pond-Reared Catfish, *Clarias gariepinus* (Burchell, 1822)

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ABSTRACT

Proximate compositions of wild and pond-reared catfish (*Clarias gariepinus*, Burchell, 1822) were studied between May and July 2013. The comparative work was carried out to find out if habitat could affect the nutrient composition of the fish. Standard method were employed in the analysis of body nutrients, for the pond raised catfish, percentage crude protein was 13.36±0.4, Fat 4.81±0.06, moisture 75.99±0.93, dry matter 23.01±0.67 and Nitrogen free Extract, NFE 97.73±0.51. For the wild catfish caught from the river, percentage crude protein was 12.27±0.87, fat 10.94±4.12, moisture 74.28±2.18, dry matter 27.03±2.7, NFE 98.07±0.69, GE 2.95±0.21 Ash 0.93±0.41, Fibre 0.74±0.11. There were no significant difference (P>0.05) in nutrient composition between *Clarias garieprnus* from pond and wild for most of the nutrients analysed except for crude fat 10.94±4.12% wild fish which was significantly higher (P<0. 05) than 4.81±0.06% recorded in pond reared catfish. This was also true for dry matter 27.03±2.7% in river fish which statistically higher (P<0.05) than 23.0±0.67 observed in pond fish. The results indicated that will sourced *Clarias gariepinus* accumulate more fat than that of pond.

Key words: Body nutrients, Proximate compositions, Wild and pond-reared cat fish (*Clarias gariepinus*)

INTRODUCTION

Fish occupies one of the foremost places among the food products of animal origin (meat, poultry, milk and eggs) in nutritive value because of the presence of valuable proteins and easily assimilable oils rich in vitamins and minerals (Novikov, 1983). The importance of the nutritional value of fish (Novikov, 2008) lies on the fact that the complex organic compounds in fish tissues are easily hydrolyzed into simple substances assimilated as "building blocks" for the restoration of worn-out tissues, body maintenance and energy sources to the consumer.

The awareness of the unique nature of fish nutrients in human diets has tremendously increased in recent times resulting in unprecedented increase in demand for fish. Fish is now a preferred dietary menu in all important occasions as well as for patients on special dietary therapy. The chemical composition of fish depend upon the species; age, sex, season and environmental condition (Novikov, 1983). The family, *Clariidae* is the most important tropical fish cultured in ponds. This is as a result of their unique qualities in culture systems, including hardiness, resistance to diseases and parasites, tolerance of environmental conditions in captivity, fast growth, good table size and palatability.

This study therefore seeks to evaluate the nutrient profile of wild and pond-raised catfish, *Clarias ganepinus* in Imo State with a view to finding out if there is any difference in their nutritional status. It is hoped that the result will help close the gap in knowledge. This work was carried out to compare the nutrient composition of wild and pond raised catfish *Clarias gariepinus*. The importance of the nutritional content of fish lies on the fact that the nutrients are required by the body as building blocks to help restore worn out tissues and body maintenance (Novikov, 2008). Therefore this study helps determines and compare the nutrient composition of wild and pond-raised catfish to know if there is any difference in their nutritional status which will help the consumers to make a good choice in catfish consumption.

MATERIALS AND METHODS

Study area

The study as carried out in the Fisheries and Aquaculture Research Farm of the Federal University of Technology Owerri which provided the farm-raised

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specimens used for the study. Oguta lake, the largest natural lentic environment in South Eastern Nigeria was the source of the wild fish specimens evaluated. Owerri, the study area lies within the humid tropical climate, between longitude 6^0 45^1 and 6^0 56^1 E and latitudes 5^0 41^1 and 5^0 44^1 N (Nwadiaro, 1976).

Experimental design

Sixteen (16) table-sized fish sample of *Clarias gariepinus* comprising of 8 from wild and sample pond raised were evaluated per month for a period of 3 month. Live samples of wild *Clarias gariepinus* were caught from Oguta Lake with the help of fishermen while the pond raised sample was sourced from the Federal University of Technology, Owerri Fisheries and Aquaculture Technology Fish Farm. The samples were transported live to the Department of Animal Science Technology Laboratory, Federal University of Technology Owerri for analysis.

After the fish were landed they were identified with the aid of fish identification keys by Reed *et al.,* (1967) and Loveque *et al.,* (1990). After identification, the fish were weighed with top load salter balance in grams to the nearest 0.1 gram and length measured in centimeter to the nearest 0.1cm using a measuring board. The fish were then put in separate plastic buckets containing water and labeled as "wild" or "farmed", after which they were transported to the laboratory alive without any form of preservation for nutrient analysis. A random sample of 4 specimens from each group was analyzed per month while the study lasted for three months, April to June 2013.

Analysis of Fish samples for nutrient composition

Samples were analyzed chemically in accordance (AOAC, 2005).

Crude protein determination

Crude protein was determined in accordance with AOAC (2005). The crude protein in the sample was determined by the routine semi micro Kjeldahl, procedure and technique. This consists of three techniques of analysis, namely, digestion, distillation and titration.

Distillation

The distillation was done with Markham Distillation Apparatus which allows volatile substances such as ammonia to be steam distilled with complete collection of the distillate. The apparatus was steamed out for about ten minutes. The steam generator was then removed from the heat source to the entire developing vacuum to removed condensed water. The steam generator was placed on the heat source and each component of the apparatus fixed up appropriately. 5ml portion, of the above digest was pipetted into the body of the apparatus via the small funnel aperture. To this was added 5m1 of 40% (WV) NaOH through the same opening with 5ml pipette. The mixture was then steam distilled for 2 minutes into a 5ml conical flask containing 10ml of 2% Boric Acid plus mixed indicator solution placed at the received end of the condenser.

Statistical analysis

The two sets of data on nutrient composition emanating from fish of different ecological habitats were subjected to t-test for two sample classification in accordance with Ejiola and Fuller (1979).

RESULTS

Tables 1-3 present result of proximate composition of *Claris gariepinus* from two different aquatic environments as evaluated. A total of eight parameters were considered including crude protein, crude fat, crude fibre, ash, moisture, dry matter (DM) nitrogen free extract (NFE) and gross energy (GE).

Nutrient composition of clarias gariepinus from the wild

Crude protein was (12.44±1.76), Crude fat (11.53± 8.65), Crude fibre (0.75±0.230), Ash (0.935±0.005), Moisture (72.96±5.79), Dry matter (27.05±5.75) NFE (92.6±1.33) and GE (2.97±0.42).

Nutrient composition of cultured *Clarias garipinus*

Table 2 summarizes the nutrient composition of *Clarias gariepinus* from pond. Crude protein was (13.72± 0.095), crude fat (4.81±0.00221), Crude fibre (0.95± 0.007071), Ash (76.94±1.6501), Moisture {76.94± 1.501), DM (23.0±1.615), NFE (98.08±0.86 and GE (3.28±0.070).

Comparison of proximate composition of wild and pond culture *Clarias gariepinus*

Table 3 summarizes the comparison of proximate composition of wild and pond raised *Clarias gariepinus.*

Crude protein of wild was (12.27±0.87) pond (13.36±0.24), crude fat of wild (l0.94±4.12) pond (4.81±0.06), crude fibre of wild (0.74±0.ll) Pond (0.94±0.005), Ash of wild (0.93±0.41) pond (0.99±0.17), Moisture of wild (74.28±2.15) Pond (75.99±0.93) DM of wild (27.03±2.7) Pond (23.0±0.67), NFE of wild (98.07±0.69) Pond (97.73±0.51) and GE of wild (2.95±0.21) Pond (3.27±0.11).

Table 3 shows the results of the comparison of nutrient composition of the wild and pond raised catfish, *Clarias gariepinus* studied. A total of eight parameters were compared, including crude protein, crude fat, crude fibre, ash, moisture, digestible matter (DM), Nitrogen free extract (NFE) and Gross energy (GE). The proximate composition shows that pond raised cattish (*Clarias gariepinus*) had 13.36±0.24 crude proteins while the same fish from the wild contained 12.27±0.87 crude proteins. The difference in crude protein content of pond raised fish and its counterpart from the river was not significantly ($P>0.05$) different. This is also true of fibre. Wild fish had a crude fibre of 0.74±0.11 while in pond raised fish, crude fibre was only slightly higher (0.94±0.005). The difference was however found to be statistically insignificant ($P>0.05$) as in crude protein. For moisture, pond cultured fish had 75.99±0.93 of moisture as against 74.28 in the wild fish. The difference was insignificant ($P>0.05$). This is also true of nitrogen free extract (NEE), of which a value of 97.77±0.51 was found in fish from the pond as against 98.07±0.69 from wild fish, which do not differ statistically. Gross energy (GE) was 3.27±0.06 from pond fish and 2.95±0.21 in wild fish. The two figures were non-significant ($P>0.05$). However a significant difference ($P<0.05$) in proximate values of nutrients was observed between ponds raised fish and wild counterpart

Table 1: Nutrient composition of *Clarias gariepinus* from the wild (Lake Oguta).

Samples	Nutrient (%)							
	CP	Fat	Fibre	Ash	Moisture	DM	NFE	GE
I	14.19	2.88	0.52	0.94	78.75	21.27	97	27
II	10.68	20.17	0.98	0.93	67.17	32.84	99.93	2.55

in terms of crude fat which was 4.8l±0.06 for fish from the pond and 10.94±4.12 for wild fish and also for dry matter (DM) which was 23.0I 0.67 for cultured fish and 27.03±2.7 for wild fish.

DISCUSSION

Nutrient composition of wild catfish *Clarias gariepinus*

The nutritional elements showed variable values in the fish sample analyzed with crude fat and dry matter having the highest values in wild fish. This was supported with the findings of (Mustafa and Mederiros 1985) who reported low % crude fat in farm raised catfish and higher fat content in wild fish. The protein content of wild sourced catfish crude protein was 12.27±0.87, fat (10.94±4.12), moisture (74.28 $\underline{c}$ 2.18), dry matter (27.03±2.7), NFE (98.07±0.69), GE (2.95±0.2I) Ash (0.93±0.41), Fibre (0.74±0.11) shows slight variation which was supported to the findings of Nettleton (1990), who reported that protein content which is a vital constituent of living cells tends to vary relatively little in healthy fish unless drawn upon during particular demands of reproduction or during food deprivation periods. The slight variation observed in percentage crude fibre, Ash, Moisture, NFE and GE within habitats may also be attributed to fish size, environment and type of food they eat. Orban *et al.,* (2003) found similar results on European seabass (*Dientrarchus labraec)* and wild yellow perch (*Perca flavescens*). These explorations validate my feelings that higher dry matter and lower protein and higher fat contents is a characteristic feature of wild fish population.

Nutrient composition of pond raised catfish *Clarias gariepinus*

The proximate composition of pond catfish varied in terms of fat and dry matter content which was higher in wild sourced catfish. This finding does not however support the findings of Alasaivar *et al.,* (2002) on sea bass (*Dicentrarchus labrax*), Grigorakis *et al.,* (2002) on gilthead sea bream who reported higher lipid content in farmed *Labeo rohita* when compared with specimens from the river. This difference might be as a result of variety of factors including size, weight, species and types of food.

Comparison of nutrient status of wild and cultured *Clarias gariepinus*

Results of the present study have revealed that environment does not significantly change the nutritional quality *Clarias gariepinus*. The proximate composition of wild and pond reared catfish varied significantly only in terms of fat and dry matter content which was statistically higher in wild sourced catfish. This finding does not however support the findings of Alasalvar *et al.,* (2002) on sea bass (*Dicentrarchus labrax*), Grigorakis *et al.,* (2002) on gilthead sea bream (*Sparius aurata)*, Grigorakis *et al.,* (2003) and Orban *et al.,* (2003) on seabass. The result does not support the findings Au *et al.,* (2001) who reported higher lipid content in farmed *Labeo rohita* when compared with specimens from the river. This difference might be as a result of variety of factors including size, specie, weight and types of food. The major difference between farm raised catfish and wild catfish is the size they reach. Farm raised catfish are harvested at 18 months of age while wild catfish will get bigger because there are no time limit for wild fish to be harvested. Mat-Jais *et al.,* (1998) found that lipids in fish vary greatly and this variation is related to feed, migratory swimming or sexual changes in connection with spawning. Lipids vary in different parts of fish body and also they show enormous variation in different seasons of the year. Recently, Novikov (1983) found a linear relationship between protein and age/size of fish in there carnivorous fish species (*Wallagu Attu, Mystus Seen ghala and Chinna Maruitus*) but quite inverse in lipids, because there was proportionate decline in the nutrient with increase in size. These studies further verify that changes in lipid content appear to be function of body weight. The apparent inverse relationship between the size of the wild sourced and fat content could imply that the biggest fish contains more fat than small size. Kinsella (1988) findings are in line with the findings of this work. In contrast to the present trial, Lie (2001) did not observe significant differences (P>0.05) in lipid contents when comparing wild and farmed yellow perch.

The nutrients content varies slightly in the values of the fish sample analyzed, with crude protein of pond raised having slightly high values than that of wild sourced, but the difference is not significant. The result agrees with the findings of (Maclean, 2003) that are of the option that the protein content of a fish species is the same irrespective of the habitat where it was raised but many differs with the protein content of another fish species. Maclean (2003) further reported that moisture contents were lowest and protein deposition higher under the influence of fertilizer treatment. Morri (2001) also reported high protein contents in the farmed *Labeo rohita*. Au *et al.*, 2001) reported that protein content which is a vital constituent of living cells tends to vary relatively little in health fishes unless drawn upon during particular demands of reproduction or during food deprivation periods.

The physical appearance of the sixteen (16) table size fish samples in this study shows that they are under the same healthy condition. Thus the protein content only shows slight variation. In the study conducted by Baliu *et al.,* (2007) on grass carps it was discovered that the protein contents of farm raised grass carps (*Ctenophargngodon idealla*) and silver carp were significantly lower than those caught from the wild. This does not conform to the present study; the reason might be attributed to species difference.

The slight variation observed in percentage crude protein with habitats 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 organisms body (Chen *et al.,* 1995). This current finding is supported by the findings of (Adewumi and

Olaleye, 2011). There is also significant difference between the dry matter in wild and pond raised fish within the sampled locations with fish from the wild having highest values of dry matter content. This could be attributed to the level of minerals available in water or the material they feed on.

Conclusion and recommendation

The study shows that there is significant difference in fat content between the pond raised and wild sourced catfish, which indicates that wild sourced catfish has higher fat content than that of pond raised, which might be as a result of variety of factors including size, weight and types of food (Jankowska *et al.*, 2003). In my findings the biggest fish from wild with the weight of 1500g and length of 60.5cm has the highest fat content. Wild catfish is also recommended for post-operation patients as it is a good healing agent. (Mat-Jais *et al.*, 1998). After a considerable research the American Heart Association (AHA, 2002) has recommended the consumption of fatty fish because of their high content of n-3 fatty acids, at least twice a week for those individuals with coronary heart disease.

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