Comparative Evaluation of Proximate and Mineral Composition of *Chrysichthys nigrodigitatus* and *Macrobrachium macrobrachium* from Amadi-Creek Fish Landing Site, Port Harcourt, Niger Delta.

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Abstract
The comparative evaluation of proximate and nutrient composition of Chrysichthys nigrodigitatus and Macrobrachium macrobrachium were studied on wet basis. A total of 60 samples constituting 30 each of the species studied were gutted, washed, ground and subjected to analysis using standard methods. The result showed that the moisture, protein, carbohydrate, ash, and Ca values differed significantly at p<0.05. The moisture, protein, carbohydrate and Ca mean values for C. nigrodigitatus were respectively, 78.45±1.69%, 12.96±0.12%, 1.63±0.19%,0.93±0.02% and 1.36±0.15mg/l while that of M. macrobrachium were respectively 63.07±2.38%, 30.17±1.36%, 4.43±0.90% and 2.18±0.28mg/l. The Na, Ca and P mean values of C. nigrodigitatus were respectively 0.18±0.02mg/l, 1,36±0.15mg/l and 0.61± 0.04 mg/l while that of M. macrobrachium were 0.28±0.02mg/l, 2.18±0.28 mg/l and 0.92±0.05mg/l respectively. The mineral concentration of both species were higher in the order of magnitude of Ca>P>Na. Considering the proximate and mineral composition of the species compared, M. macrobrachium is of better quality than C. nigrodigitatus. It is therefore recommended that people should consume more of shellfishes especially M. macrobrachium than finfishes especially C. nigrodigitatus.

Keywords: *Proximate composition, catfish, shellfish.*

Introduction

Fish whether fin or shell constitutes the most important source of animal protein consumed by majority of people globally irrespective of race and class (Abolude and Abdullahi, 2005). That is to say that the quality of protein in fin and shell fish can compare favourably with any other source of animal proteins such as milk, pork and poultry. According to Akande (2011), fat found in fishes contain high level of polyunsaturated fatty acids (PUFAs) proven to lower the occurrence and complication of atherosclerosis and other heart related diseases. According to Edun (2012) processing processes in fishes alters its compositions and general characteristics depending on the method used. Silver and Chamul (2000) opined that the nutritional composition of fishes and their products change from time to time with respect to age , sex, species, feed intake, sexual changes, season and environment.

It is of importance to note that the determination of proximate composition and mineral content of fishes and their products is necessary to ensure their dietary requirements and commercial specification (Watchman, 2000). It is widely believed that shell fishes are more highly valued than the fin fishes especially with respect to their proximate and mineral

composition.
Species of wild catfish and shrimp belonging to the families' claridae and paleamonidae respectively are among the species of brackish and marine water fishes mostly utilized in aquaculture especially in the developing world.

Majority of the work done on these two species were centred on species composition rather than proximate composition in this creek. This research is therefore focused on the proximate and mineral composition of the two fishes *Chrysichthys nigrodigitatus* and *M. macrobrachium* from Amadi Creek fish landing site.

Materials and Methods

Study Area

Amadi creek (landing site) is located in Port Harcourt Local Government Area of Rivers State between longitude 5^0 60'E-6^0 60'E and latitude 6^0 06'N-6 07' (Figure 1). The Creek is one of the tributories of the upper Bonny Estuary, brackish and tidal in nature with fresh waters intrusion from the surrounding inland waters and flood during the wet season.

Fish Sample Collection and Preparation

A total of 60 *C. nigrodigitatus* and *M. macrobrachium* samples (30 each) were purchased from fish mongers at Amadi creek fish landing site within three (3) months in Port Harcourt, Rivers State. The samples were identified with the aid of keys (Holden and Reed, 1972, Powel, 1980 and Holthius, 1980) and preserved in domestic deep freezers for further analysis. Samples were prepared by removing the gills, guts, fins, viscera organs and scales/shells and washed with clean water. Edible portions of the fishes were blended and homogenized with the aid of mortar, pestle and a blender, packed separately in different bottles and labeled accordingly in readiness for analysis.

Proximate Analysis

Samples in their fresh States were subjected to chemical analysis using the procedures of the Association of Official Analysis for Chemists (AOAC), 1990 in the laboratory of Department of food science, Rivers State University, Port Harcourt, Rivers State. Parameters determined include crude protein, carbohydrates, lipids, ash, moisture and fibre. Carbohydrate value was obtained by difference 100%-(%moisture + %protein + %lipids + %ash) while minerals determined includes sodium, calcium and phosphorus.

Data Analysis

Obtained data were subjected to Analysis of variance (ANOVA) and mean comparism was carried out using Duncan Multiple Range Test (DMRT) (Duncan, 1955) at probability level of 0.05.

Results

Table 1 and figure 2 showed the proximate composition of *Chrysichthys nigrodigitatus* and *Macrobrachium macrobrachium* in the study area. The result showed that the moisture, crude protein and carbohydrate content of *C. nigrodigitatus* ranged between 76.60% and 79.90%, 12.88% and 13.10% and 1.42% and 1.80% with the overall mean value of 78.45±1.69%, 12.98±0.12% and 1.63±0.19% while that of shrimp ranged between 60.50% and 65.20%, 28.90% and 31.60% and 3.40% and 5.00% with the overall mean values of 63.07±2.38%, 30.17±1.36% and 4.43±0.90% respectively. There were significant difference in moisture, crude protein, carbohydrate and ash content of both *C.nigrodigitatus and M. macrobrachium* statistically at probability level of <0.05.The moisture content of *C. nigrodigitatus* was higher

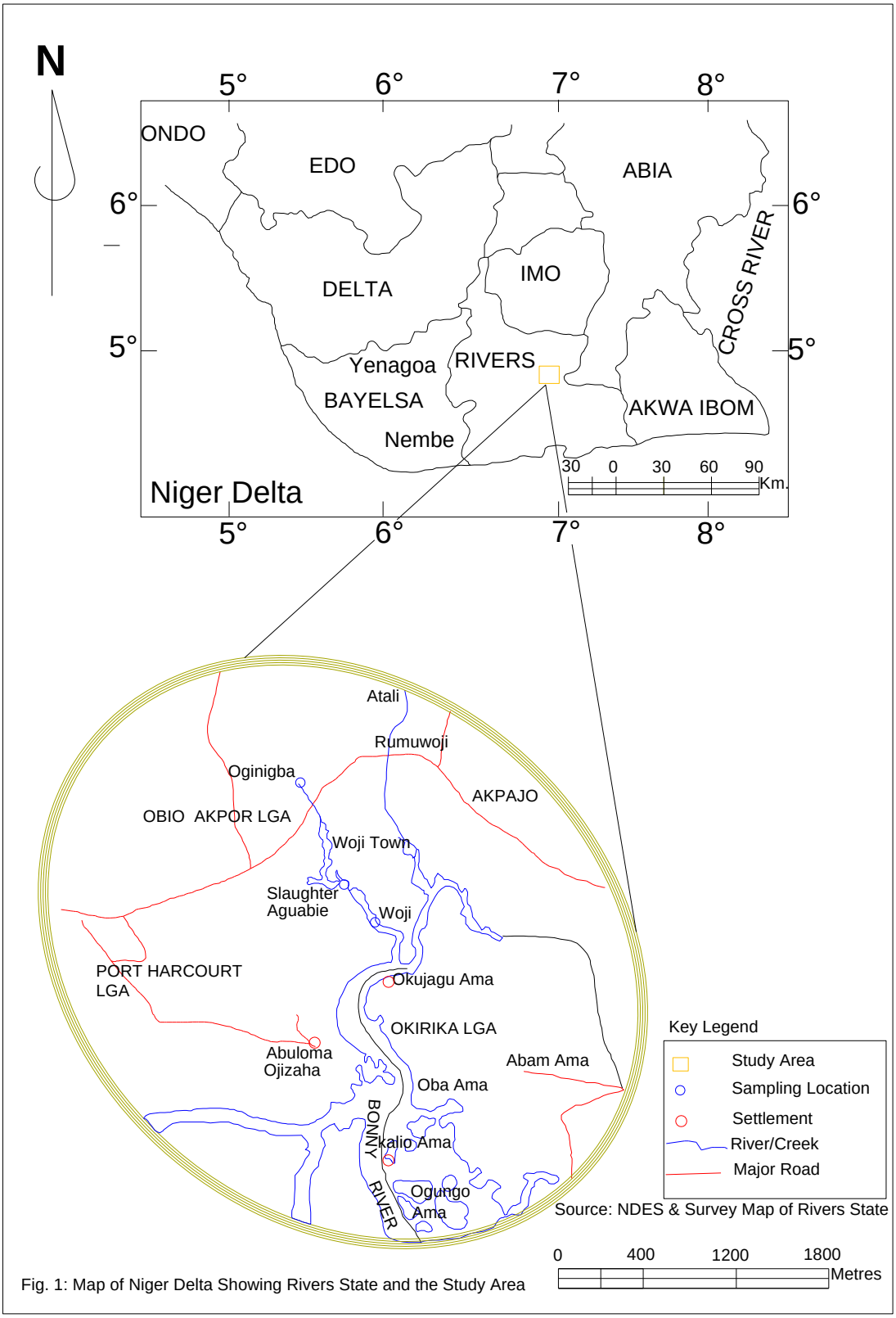

Fig. 1: Map of Niger Delta Showing Rivers State and the Study Area

than that of *M. macrobrachium* while the protein, carbohydrate and ash content were lower than that of the *M. macrobrachium respectively* (Table 4.1 and Figure 4.2).
Table 4.2 and Figure 4.3 showed the mineral composition of *C. nigrodigitatus and M. macrobracium* in the study area. The sodium (Na), calcium (Ca) and Phosphorus values ranged from 0.16mg/l - 0.20mg/l, 1.20mg/l -1.50mg/l and 0.58mg/l - 0.68mg/l for *C. nigrodigitatus* while that of *M. macrobrachium* ranged from 0.26mg/l - 0.30mg.l, 1.95 - 2.50mg/l and 0.88mg/l - 0.98mg/l respectively with Ca showing significant relationship in the mean values.
Table3: showed the correlation coefficient of the proximate and mineral composition of both C. *nigrodigitatus and M. macrobrachium* in the study area. Crude protein showed strong and negative correlation with moisture content (-0.965). Fat also showed strong and negative correlation with protein (-0.980) and carbohydrate (-0.965) at probability level of $p<0.001$ and 0.005. Ash, Na, and P also showed strong and negative correlation (-0.967, -0.971, -0.-0.995) with moisture value at probability level of <0.001 and 0.005.

Discussion

There was difference in proximate and mineral composition of the two species of fish. This variation according to Afolabi (1984), Silver and Chamul (2000), nutritional composition of fish and its products is attributed to age, species, sex, fed intake, sexual changes, seasons, metabolic efficiency and environmental factors. According to Adewoye *et al.*,(1997) the differences observed in percentage protein in the individual fishes in this study could be attributed to the food the fish consume or its absorption capability and conversion potentials of essential nutrients from this diet from their environment of origin.
The moisture and protein contents in the *C.nigrodigitatus and M. macrobrachium* samples in this study are in agreement with those reported by Krzynowek and Murphy (1987), who reported a moisture content of 82.1% and a protein content of 17.4% for fresh fillets/fish. The high moisture content of the catfish (*C. nigrodigitatus*) and the shrimp (*M. Macrobrachium*) observed in this study is in conformity with the findings of John and James (2017) who reported moisture content of shrimps of 65.30% in Okoro River, South East, Nigeria and keremah and Amakiri (2013) who reported 79.53% moisture value for *C. nigrodigitatus* in Yenagoa, Nigeria. The result of this finding also agreed with the moisture content of 66.01% and 73.35% reported by Arazan and Udo (2015) for *M. Macrobrachium* and *M. Volenhovenii* respectively in River Niger at Onitsha, South East Nigeria. The proximate composition of the fishes in this study is also in line with previous studies, e.g., a moisture content range of 60%–75% and a protein range of 17%–25% was reported in a study examining a large number of salmon samples [Colwell *et al*.,2011). There were significant difference in moisture, crude protein, carbohydrate and ash content of both *C.nigrodigitatus and M. macrobrachium* statistically at probability level of <0.05 in this study. This is in conformity with the observation that higher water content is present in the fish body which contains low fat content (Osman *et al*., 2007). Memon *et al*.,(2011) found higher moisture content of about 76.05% and 2.57% fats in *C. catla* while in *L. rohita* percentage of water detected was 72.10% and 3.11% fat content.

For physiological reasons, strong relationships exist between protein and moisture levels in meat (De Greef, Verstegen and Kemp, 1992) and seafood (Breck, 2014,Yeannes and Almandos, 2003).Fish meat contains low amount of lipids and comparatively higher amount of water as compared to beef and chicken (Muhammad Naeem,2017).

The ash content of *M. Macrobrachium* (3.03%) which was significantly higher than that of *C. nigrodigitatus* statistically at P< 0.05 was phenomenally attributed by Adeyeye (2002) to the

high level of chitin strengthened by a high level of calcium metal in the exoskeleton and appendages of *M. Macrobrachium*. Hanan *et al* (2009) also opined that high ash content is of significance in determining the mineral content of a species as ash shows the richness of the food in terms of element composition. Adeyeye (2002) also reported high level of ash in shrimp in Lagos Lagoon.

The non significant difference between the mean values of the minerals, Na and P at P<0.05 in this study could be attributed to the fact that both species inhabit similar environment, feeds on virtually similar food items etc making their chemical compositions to be similar (Udo, 2005). The higher mean values of Calcium in *M. Macrobrochium* with significant difference could be due to the fact that its exoskeleton and appendages as a crustacean contain high level of chitin strengthened by high level of calcium metal as reported by Adeyeye (2002).

The study also showed that ash, fibre, sodium, calcium and phosphorus showed strong and negative correlations with moisture content of the fishes which corroborates with the assertion that high ash content of food (fish) suggests high mineral composition of the species as opined by Jike-Wai and Deekae (2011).

Table 1: Mean proximate Composition of *C.nigrodigitatus and M. macrobrachium in the study area (*% wet basis)

Species	Components (%)					
	Moisture	Protein	Carbohydrate	Fat	Ash	Fibre
C.nigrodigitatus	78.45±1.69[a]	12.96±0.12[b]	1.63±0.19[b]	4.64±0.15[a]	0.93±0.02	3.79±0.12[a]
Range	76.6-79.90	12.88-13.10	1.42-1.80	4.50-4.80	0.91-0.95	3.70-3.92
M. macrobrachium	63.07±2.38[b]	30.17±1.36[a]	4.43±0.90[a]	3.06±0.12[a]	3.03±0.15[a]	4.20±0.30[a]
Range	60.50-65.20	28.90-31.60	3.40-5.00	2.98-3.20	2.90-3.20	3.90-4.50

Means with same superscript for a given parameter in the same vertical row are not significantly different (P<0.05).

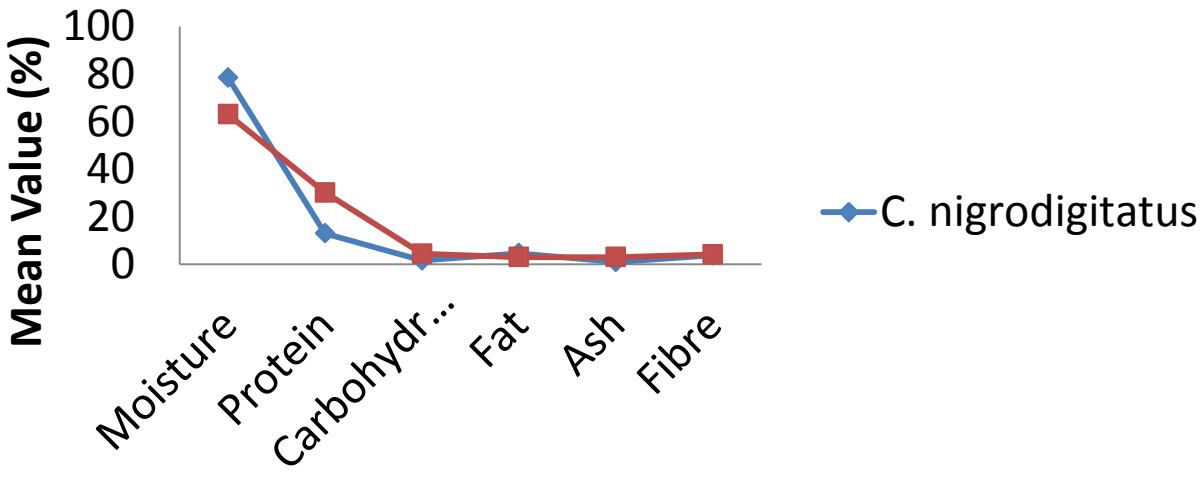

Figure 2: Mean values of Proximate Composition of *C.nigrodigitatus and M.macrobrachium* in the Study Area

Table 2: Mean Mineral Composition of *C.nigrodigitatus and M. macrobrachium in the study area* (% wet basis)

Species	Components		
	Na	Ca	P
C.nigrodigitatus	0.18±0.02[a]	1.36±0.15[b]	0.61±0.04[a]
Range	0.16-0.20	1.20-1.50	0.58-0.68
M. macrobrachium	0.28±0.02[a]	2.18±0.28[a]	0.61±0.04[a]
Range	0.26-0.30	1.95-2.50	0.88-0.98

Means with same superscript for a given parameter in the same vertical column are not significantly different (P<0.05).

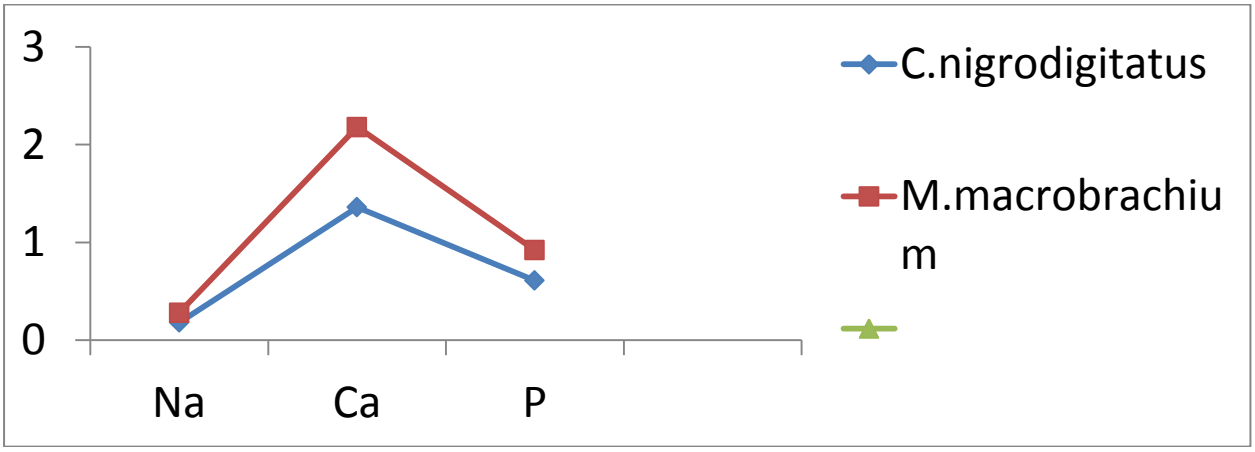

Figure 3: Mean values of Mineral Composition of *C. nigrodigitatus and M. macrobrachium* in the Study Area

Table 4.5: Correlation of Proximate and Mineral Composition of Fishes in the Study Area

	Moisture	Protein	Carbohydrate	Fat	Ash	Fibre	Na	Ca	P
Moisture	1.000								
	0.000								
Protein	-0.965	1.000							
	0.002	0.000							
Carbohydrate	-0.924	0.904	1.000						
	0.008	0.013	0.000						
Fat	0.976	-0.980	-0.965	1.000					
	0.001	0.001	0.008	0.000					
Ash	-0.967	0.999	0.906	-0.981	1.000				
	0.002	0.001	0.013	0.001	0.000				
Fibre	-0.638	0.794	0.520	-0.698	0.791	1.000			
	0.173	0.059	0.291	0.123	0.061	0.000			
Na	-0.971	0.930	0.968	-0.969	0.931	0.535	1.000		
	0.001	0.007	0.001	0.001	0.007	0.274	0.000		
Ca	-0.936	0.886	0.864	-0.887	0.889	0.511	0.881	1.000	
	0.006	0.019	0.027	0.018	0.018	0.300	0.020	0.000	
P	-0.995	0.957	0.937	-0.981	0.961	0.634	0.965	00.932	1.000
	0.000	0.003	0.003	0.001	0.002	0.177	0.002	0.907	0.000

Correlation is significant at the 0.001 and 0.005 level (2tailed)

Conclusion

It is glaring from this study that the proximate and nutrient compositions of *C.nigrodigitatus and M. macrobrachium* are within the range of dietary requirement and commercial specification but that *M. macrobrachium* is of better quality than the formal considering their proximate and mineral compositions.

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