Evaluation on nutritive value of four commercial fish species in River Nile

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Abstract
The study was carried out to evaluate and assess the yield of edible, inedible parts and approximate composition of some River Nile species represented Heterotis niloticus, clarias gariepinus, tetraodon lineatus, Malapterurus electricus. The fillets percentage yield is 39.3±3.7%, 35.9±9.1%, 21.8±7.1%, 37.1±6.2% Heterotis niloticus, clarias gariepinus, tetraodon lineatus, Malapterurus electricus respectively. The mean nutritive value of protein 20.3±0.07, 18.3±0.04, 18.1±0.08, 19.3±0.08% Heterotis niloticus, clarias gariepinus, tetraodon lineatus, Malapterurus electricus, fat content 4.2±0.02%, 2.2±0.01%, 3.2±0.03%, 3.1±0.02% Heterotis niloticus, clarias gariepinus, tetraodon lineatus, Malapterurus electricus, moisture content 74.0±0.02%, 77.8±0.08%, 77.3±0.01%, 76.4±0.03%, ash content 1.5±0.06%, 1.7±0.06%, 1.3±0.04%, 1.3±0.02% respectively. At the end research concluded that all species are richest in food nutritive value.

Keywords: Evaluation, nutritive, value, commercial fish, species, river Nile

1. Introduction
Body composition of any edible animal, including fish, is a key indicator of its biological and functional condition. Measuring body composition is the key factor for evaluating the physiological condition, but is a time consuming process [11]. Proximate analysis for quantifying body composition of a fish is done through gaging different ingredients such as protein, fat, water content, Ash content, fibre and organic contents of that fish [5]. Fish Fillets according to [5], is a strip of flesh cut from a whole fish parallel to the backbone, it could be block or single fillet of which it is in high demand in developed world. The terms fillet and edible portion are difficult to define exactly since the portion eaten varied from one country to another [22] reported that the edible fraction of the different fish species varies widely between 30% -50% of total weight. The proximate composition of fishes is essential to estimate their energy value and to plan the most appropriate industrial and commercial processing [9]. Generally, composition of live-weight, whole fish is 70 to 80% moisture, 20 to 30% protein, and 2 to 12% lipid [15]. However, in different environmental conditions, the composition of the fish may differ in relation to the differences in water quality, feeding conditions, sex, and state of maturity and capture condition [4, 13, 18]. The lack of sufficient protein is one of the most widespread nutritional deficiencies in many tropical countries [6].

The purpose of this research is to evaluate and assess the yield of edible and inedible parts of some important second class fish species from River Nile (Kosti landing sites) represented by different species (clarias gariepinus, Malapterurus electricus, Heterotis niloticus, tetraodon lineatus (fahaka). To evaluate proximate chemical composition of four second class fish species.

2. Materials and Methods
2.1 Sample collection
Fresh fish samples were obtained from Kosti landing site eighty specimens of second class commercial fishes, twenty from each species. They were transported to the laboratory in fisheries research station Kosti for anatomical analysis.

2.2 Sample preparation and Estimated parameters
On arrival at the laboratory, the samples were identified to species level (using certified keys), cleaned and weighed (gm) using sensitive balance (5kg electronic balance scale).
Then the total length, standard lengths were measured in (cm). Furthermore fish samples were filleted, eviscerated, deheaded and skinned using sharpen knives. The weight of viscera, fillet with skin, head, skeleton and fins (with some adhesive meat), were weighed separately using the sensitive balance in (gm) to determine the percentages compared to the total body weight.

### 2.3 Proximate composition of different species

Moisture content, crude protein, fat and ash were determined for wet sample according to standard methods of Association of Official Analytical Chemists [2] as follows:

#### 2.3.1 Determination of Moisture Content

The samples were first weight (Initial weight) then dried in an electric oven at 105 °C for 24-30 hours to obtain a constant weight. The moisture content was calculated as follows:

\[
\text{Moisture content} \% = \frac{\text{Initial weight – Dry weight}}{\text{Initial weight}} \times 100
\]

#### 2.3.2 Determination of Crude Protein

The Kjeldal method for estimation of nitrogen was applied. Nitrogen content was converted to protein percentage by multiplying by 6.25 as follows:

\[
\text{Nitrogen content} \times 6.25 = \text{Crude protein %}
\]

#### 2.3.3 Determination of Ash

Ash content was measured by weighing out sample into silica dish ignited and cooled before weighting then dish and content were ignited first and consequently at 500 °C until Ash got grey/white color.

\[
\text{Fresh weight – Ashed weight} \times 100
\]

\[
\text{Fresh weight}
\]

#### 2.3.4 Determination of Fat

Fat content was measured by drying the samples at 100 °C in an oven and then extracting the crude fat with petroleum ether in a Soxhlet extractor for 4 hours.

#### 2.3.5 Statistical analysis

The data were analysis by SPSS software (version 21), by one – way analysis of variance (ANOVA), at 5% confidence level using LSD.

All data were presented as mean ± standard deviation.

### 3. Result and Discussion

The present study was carried out on two mains aspect; body weight characteristics and proximate chemical composition of the four second grades fish species in White Nile River. The body characteristics of four second class fish species are shown as Heterotis niloticus had the highest edible portion percentage of 39.30%, while malapterurus electrics had 37.91%, clarias gariepinus had 35.91% and Tetraodon lineatus had lowest fillet percentage 21.84% respectively as shown in table (2) with their significant different at level (p<0.05). The means condition factor (K) of all species examines as they shown in table (3) there were no significant different at level (p<0.05) that mean all samples are in good condition.

### Table 1: Body characteristics of Four Tropical Freshwater Fish Species.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T. B.W (g)</th>
<th>T. L (cm)</th>
<th>S. L (cm)</th>
<th>H. W (g)</th>
<th>V. W (g)</th>
<th>S. W (g)</th>
<th>Frame</th>
<th>Fillet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species</strong></td>
<td><strong>M±St.D</strong></td>
<td><strong>M±St.D</strong></td>
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<td><strong>M±St.D</strong></td>
<td><strong>M±St.D</strong></td>
</tr>
<tr>
<td>Heterotis niloticus</td>
<td>730.0±202.4</td>
<td>41.5±6.5</td>
<td>38.0±6.1</td>
<td>136.3±30.8</td>
<td>63.8±30.7</td>
<td>100.0±50.5</td>
<td>135.0±51.2</td>
<td>283.8±66.3</td>
</tr>
<tr>
<td>Clarias gariepinus</td>
<td>468.3±122.5</td>
<td>39.2±3.8</td>
<td>34.7±3.8</td>
<td>126.7±24.7</td>
<td>18.3±10.4</td>
<td>51.7±2.9</td>
<td>73.3±7.6</td>
<td>173.3±72.5</td>
</tr>
<tr>
<td>Tetraodon lineatus</td>
<td>275.0±76.0</td>
<td>24.0±5.4</td>
<td>20.2±4.7</td>
<td>43.5±21.3</td>
<td>45.0±28.1</td>
<td>31.7±16.3</td>
<td>101.5±60.9</td>
<td>60.8±30.5</td>
</tr>
<tr>
<td>Malapterurus electrics</td>
<td>356.7±122.9</td>
<td>26.7±3.5</td>
<td>23.0±3.0</td>
<td>41.7±12.6</td>
<td>23.3±10.4</td>
<td>100.0±22.5</td>
<td>51.7±22.5</td>
<td>135.0±58.9</td>
</tr>
</tbody>
</table>

*a,b,c,d* Means superscript in the same column are significant different at level (p<0.05).

whereas:

- T.B.W= total body weight, T.L= total length, S.L= standard length, H.W= head weight, V.W= viscera weight
- V.W= viscera weight
- Frame=

### Table 4: Average length, weight and condition factor of four different fish species.

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Average Weight (g)</th>
<th>Average Length (cm)</th>
<th>Condition Factor (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Heterotis niloticus</em></td>
<td>730.0</td>
<td>41.5</td>
<td>1.0214</td>
</tr>
<tr>
<td>clarias gariepinus</td>
<td>468.3</td>
<td>39.2</td>
<td>0.777</td>
</tr>
<tr>
<td>Tetraodon lineatus</td>
<td>275.0</td>
<td>24.0</td>
<td>1.989</td>
</tr>
<tr>
<td>Malapterurus electrics</td>
<td>356.7</td>
<td>26.7</td>
<td>1.874</td>
</tr>
</tbody>
</table>

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All the fillets portions percentage of species examined in agreement with many reported that the edible fraction of the different fish species varies widely between 30% - 50% of total weight [22, 5, 17, 6] also reported 42.74% fillet for Clarias gariepinus with 54.83% of inedible parts. The filleting yield of the studied fish species was a reflection of their anatomy i.e. species with large heads and skeleton relative to musculature give lower filleting yield than those with smaller heads and skeletons [7, 1].

The result of proximate chemical composition of four second grades fishes in white Nile River as presented in table (4), the highest protein content was observed in Heterotis niloticus (20.28±0.07), followed (19.25±0.08) obtained Malapterurus electrics with their significant different (p<0.05). There no significant different at level (p>0.05) obtained between clarias gariepinus and Tetraodon lineatus as shown in table (4). The highest moisture content was observed from clarias, Tetraodon, while least was observed from Heterotis niloticus and malapterurus electrics. There were no significant different (p>0.05) obtained among species in Ash content. Fat content and nitrogen free extract there were significant among species (p<0.05) as shown in table (4). This result were in Agreement with [1, 21, 16, 19]. The relatively high percentage of crude protein may be attributed to the fact that these fishes are good source of protein but the differences observed among the selected groups could be as a result of fish consumption or absorption capability and conversion potentials of essential nutrients from their diets or their local environment. Similar findings were revealed by [20, 11, 8]. The four major constituents in the fillet portion of the fish are moisture, protein, fat and ash. The analysis of these four basic constituents of fish is often referred as proximate analysis [16, 14].

<table>
<thead>
<tr>
<th>Parameters Samples</th>
<th>Moisture</th>
<th>C.P</th>
<th>Fat</th>
<th>Ash</th>
<th>N.F.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterotis niloticus</td>
<td>74.00±0.02*</td>
<td>20.28±0.07*</td>
<td>4.21±0.02*</td>
<td>1.52±0.06*</td>
<td>52.01±0.04*</td>
</tr>
<tr>
<td>Clarias gariepinus</td>
<td>77.81±0.08*</td>
<td>18.34±0.04*</td>
<td>2.15±0.01*</td>
<td>1.71±0.06*</td>
<td>44.38±0.17*</td>
</tr>
<tr>
<td>Tetraodon lineatus</td>
<td>77.30±0.01*</td>
<td>18.17±0.08*</td>
<td>3.22±0.03*</td>
<td>1.32±0.04*</td>
<td>45.48±0.03*</td>
</tr>
<tr>
<td>Malapterurus electrics</td>
<td>76.42±0.03b</td>
<td>19.25±0.08b</td>
<td>3.12±0.05b</td>
<td>1.29±0.02b</td>
<td>47.24±0.01b</td>
</tr>
</tbody>
</table>

*Means in the same column with superscript are significant different at (p<0.05).

**Table 4: Illustrate proximate chemical composition of four commercial fishes**

4. Conclusion

The research concluded that there are different variations in fillets parts and also in chemical composition in different fish species. All the four experimental fish species are richest in protein content so are important to solve hungry and food security because are source of animal protein for the people around the River and entire community.

5. References

19. Omer AS. Preliminary Studies on the Chemical Composition of the Flesh of Hydrocyon forskali (Cuvier and Valenciennes, 1868) B.Sc. Honors dissertation