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Studies on the proximate composition of Hilsa of different size group at Chandpur region

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ABSTRACT

Studies were conducted on the proximate composition of different size groups and body parts of hilsa of Chandpur region. Analysis of proximate composition was done at the Fisheries Technology laboratory, Bangladesh Agricultural University, Mymensingh. In this study the nutrient content varied greatly with age and size of the fish of same species. The protein and ash content was found to be more or less same in different size groups. However, there was an inverse relationship between the lipid and moisture content. The lipid content was increased gradually with increasing the size of fish, whereas the moisture content was decreased with increasing lipid content of different size group of hilsa. Protein content ranged from 17.61 to 18.55% with the highest value in adult and the lowest in Jatka (larvae and juveniles). Ash content ranged from 0.81 to 0.87%, moisture content ranged from 64.45 to 71.78% with the highest value in Jatka and the lowest value in Brood, while lipid content ranged from 9.37 to 16.15% with the highest value in Brood and the lowest in Jatka. It was also found that the protein content was highest in white muscle and lowest in viscera. The lipid content was highest in dark muscle, whereas the moisture content was found to be highest in viscera. However, the ash content was more or less same in different parts. From technological point of view, the high lipid content of dark muscle tissue is important because of problems with rancidity which is less suitable for preservation. Dark muscle also inhibits gel forming ability of muscle tissue which is an important characteristic of fish for heat treated textured foods. The moisture, protein, lipid and ash content of white muscle were 66.05, 18.23, 14.02 and 1.08% while in the dark muscle were 66.16, 17.54, 14.53 and 0.91%, respectively. On the other hand, in viscera, moisture, protein, lipid and ash content were 79.33, 14.27, 5.05 and 1.13%.

Keywords: Protein, lipid, moisture, ash, Hilsa, Bangladesh.

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INTRODUCTION

Hilsa (*Tenualosa ilishsa*) is the most important open water single species fishery in Bangladesh that occurs in all most all the major river systems, estuaries and the sea. Hilsa shad contributing 30 % of total fish production of Bangladesh, and about 40 % fishermen or 2 % of total population of the country earn their livelihood depending on Hilsa fishery directly or indirectly. Therefore, economic contribution from this single species of fish is very high, in an agricultural based country like Bangladesh.

Three distinct species of Hilsa Shad are found in Bay of Bengal, they are Hilsa kelee, Hilsa toli and Hilsa ilisha now *Tenualosa ilisha*. *Tenualosa ilisha* is considered as anadromous species while the other two species are restricted to marine environment. During the commencement of the south-west monsoon and consequent flooding of all the rivers, Hilsa shad starts its spawning migration upstream. A mature Hilsa shad with a

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length ranging from 30-55 cm lays 0.1-2.0 million eggs, the eggs are deposited in fresh water, and hatching takes place in about 23 to 26 hours at an average temperature of 23°C. The newly hatched larvae is recorded as 2.3 mm in size and the larvae and juveniles (locally known as "Jatka) 4-15 cm are widely available during the period from February to May in the foreshore and riverine water of Padma, Meghna and other deltaic rivers of Bangladesh.

Proximate analysis of a food sample determines the total protein, fat, carbohydrate, ash, and moisture reported as the percentage composition of the product. The proximate analysis of food refers to the analysis of the total content of a food component, not taking account of the individual compounds making up that food component. The macro components are generally analyzed for their proximate amounts. The main objective of this study was to know the nutritional composition of Hilsa fish at different size groups and body parts. The study will measure the proximate analysis parameter such as moisture, ash, lipid and crude protein contents.

MATERIALS AND METHODS

Collection of Sample

Fresh Indian shad Tenualosa ilisa were procured from Chandpur landing center during the month from (June to December)/2009. The fish were packed in layered ice (1:1, w/w) in a polystyrene insulated box and transported to the Bangladesh Agricultural University, Mymensingh. The box was provided with holes at the bottom to drain out melting water. Stowage in the box of a bottom layer of about 5 cm. in crusted ice and then layers of fish sprinkled with ice and a top layer of ice again of about 5 cm.

Preparation of sample

The collected fish samples were washed properly with fresh water to remove all dirts, slime, and unnecessary particles. Then the fishes were separated according to size. The fishes were categorized into Jatka (Length: <23cm, Weight: 10 to 130 gm) Sub-adult (Length: 24 to 37 cm, Weight: 150 to 600 gm), Adult (Length: 38 cm and above, Weight: 700 gm and above) and Brood (Length: 38 cm and above, Weight: 700 gm and above). Then each category fish was cut by sharp knife and ground in a mechanical grinder to make a paste. This ground sample was used for all biochemical analysis.

Analysis of sample

Proximate analysis such as moisture, ash, lipid and crude protein contents were carried out following the methods of AOAC (1980).

RESULTS AND DISCUSSIONS

The tropical shad, Hilsa *Tenualosa ilisha* were studied in Chandpur region in Bangladesh by analyzing proximate composition and length-weight data. Composition described in terms of classes of substances present is generally referred to as proximate composition, because the classes or groups, for example proteins or minerals, are those first arrived at in the process of analysis; in proximate analysis the groups are measured as such, rather than as individual proteins or specific minerals. The different classes of substance for which methods are given are proteins, water, fats, minerals and carbohydrates. The measured weight of each class is usually stated in the singular, for example as protein content or fat content, and expressed as a percentage of the original weight of the sample. In samples of fish of the same species, the morphological and structural differences of the tissues, as well as age, size, collection site or seasonality, affect the total proximate composition.

Proximate composition of different size groups

Results of proximate analysis of Jatka, Sub-adult, Adult and Brood have been presented in Table 1. In fresh fish moisture was found to be the main component ranging from 64.45 to 71.78% with the highest moisture content in Jatka and the lowest in Brood. Protein, the most important component was in the range of 17.61 to 18.55% with the highest value in Adult and the lowest in Jatka. Ash content ranged from 0.81 to 0.87%, while lipid content was in the range of 9.37 to 16.15% with the highest value in Brood and the lowest in Jatka. The results obtained from this study are more or less in agreement with the general rule formulated

by Stansby (1962). An inverse relationship was found to exit between the oil and moisture content of fish, but sum of the two approximates 80%. The summation of oil and water is not necessarily constant and it frequently spans a range of 78 to 85%. However, samples of fish species investigated in the present study may be classified as high protein (15 to 20%) group according to the classification given by Stansby (1962). The results obtained from this study are in agreement with those of Kamruzzaman (1992) who reported that of proximate composition varies greatly from species to species. Azam et al. (2004) assessed fresh samples of different fish species biochemically which were collected from Kuakata, Bangladesh. They evaluated proximate composition, total volatile basic nitrogen, tri-methyl amine and pH of *Mugil cephalus*, *Setipinna phasa*, *Coilia dussumieri*, *Scatophagus argus*, *Sillanopsis panijus*, *Arius caelatus*, *Hilsa ilisha*, *Polynemus paradiseus*, *Platicephalus indicus and Pelamys chiliensis*. Moisture content of fresh fish varied over a range from 65.33 to 78.92%. Likewise, protein (8.58 to 19.06%), fat (6.12 to 12.99%) and ash (1.07 to 8.41%) content indicated wide variation in the ten fresh fish analyzed.

Table 1
Proximate composition of Hilsa at four different size groups.

Category	Protein (%)	Lipid (%)	Ash (%)	Moisture (%)
Jatka	17.61	9.37	0.82	71.78
Sub-adult	17.96	12.43	0.87	68.32
Adult	18.55	14.44	0.81	65.73
Brood	18.20	16.15	0.83	64.45

The nutrient content varies greatly with age and size of the fish of same species. In this study, the protein and ash content was found to be more or less same in different size groups. However, there was an inverse relationship between the lipid content and moisture content. The lipid content was increased gradually with increasing the size of fish, whereas the moisture content was decreased with increasing lipid content of different size group of hilsa (Table 1, Figure 1).

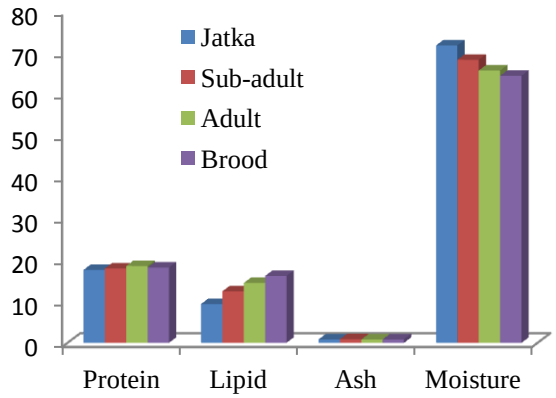

Figure 1
Comparision of proximate composition of Hilsa at different size groups

Proximate composition of different body parts

The results of proximate analysis of different parts of Hilsa were presented in Table 2. In white muscle, the nutrient contents were found to be 66.05%, 18.23%, 14.02% and 1.08% for moisture, protein, lipid and ash content, respectively. In dark muscle, the moisture content was 66.16%, protein content 17.54%, lipid content 14.53% and ash content was 0.91%. On the other hand, in viscera, the moisture content was 79.33%, protein content 14.27%, lipid content 5.05% and ash content was 1.13%.

The above results represent that the variation of moisture content ranged from 66.05 to 79.33% with the highest moisture content in viscera (79.33%) and the lowest in white muscle (66.05%). The protein content ranged from 14.27 to 18.23% with the highest value in white muscle (18.23%) and the lowest in viscera (14.27%). However, the ash content ranged from 0.91 to 1.13%, while the lipid content was in the range of

5.05 to 14.53% with the highest value in dark muscle (14.53%) and the lowest in viscera (5.05%) (Table 2, Figure 2). Total fat content was estimated by Huq et al. (1999) in different body parts of three fish species of Bay of Bengal. The fat contents in the body muscle of shark (*Carcharhinus melanopterus*), hilsa (*Tenualosa ilisha*) and mullet (*Liza subviridis*) were 16.2%, 18.7% and 7.28%, respectively. Fat content was highest in shark liver (73.5%).

Table 2
Proximate composition of different body parts of hilsa.

Category	Protein (%)	Lipid (%)	Ash (%)	Moisture (%)
White muscle	18.23	14.02	1.08	66.05
Dark muscle	17.54	14.53	0.91	66.16
Viscera	14.27	5.05	1.13	79.33

The nutrient content also varies in different parts of any fish. In this study, the protein content was highest in white muscle and lowest in viscera. The lipid content was highest in dark muscle, whereas the moisture content was found to be highest in viscera. However, the ash content was more or less same in different parts (Table 2, Figure 2).

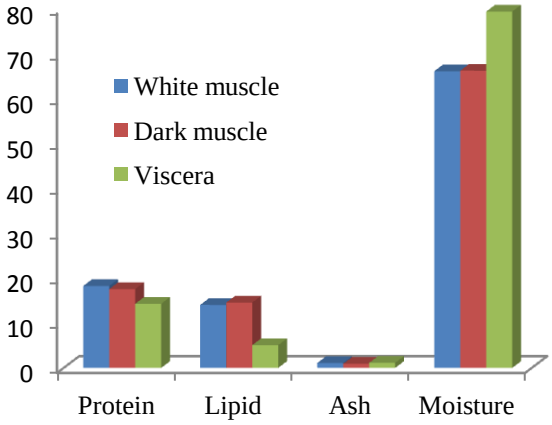

Figure 2
Comparison of proximate composition of different body parts of hilsa.

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