NUTRITIONAL VALUES OF SOME SELECTED SMALL INDIGENOUS FISH SPECIES (SIFS) IN BAWLE KYUN, HTANTABIN TOWNSHIP, YANGON REGION

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Abstract

The present study was aimed to investigate the nutritional values of small indigenous fish species. The study was conducted at Nethamein village (17°2´N and 95°49´E) at Bawle Kyun, in Htantabin Township, Yangon Region. The study period lasted from January to December 2018. A total of thirteen small indigenous species were selected for nutritional analysis. The analysis showed the moisture content of studied species ranged from 66.28% (*Anabas testudineus*) to 82.9% (*Heteropneustes fossilis)*. The ash content was recorded from 1.13% (*H. fossilis*) to 10.41% (*A. testudineus*). The protein content of SIS in the present study was examined between 14.16% (*Trichogaster pectoralis*) and 18.52% (*A. testudineus*). Regarding the fat content of SIFS was ranged from 0.05% (*Notopterus notopterus*) to 4.92% (*Osterobrama belengeri*). The fiber content was ranged from 0-0.08% whereas carbohydrate was ranged from 0-1.15%. The gross energy content in fresh matter basis of small indigenous fish species in the present study was ranged between 66 kcal/ 100g (*H. fossilis)* and 94kcal/100g (*Amblypharyngodon mola*). The small indigenous fish species can play a significant role to fulfill the nutrient demand of poorer sections of people of the country. It may be concluded that the small indigenous fish species make a choice based on that information from a consumer point of view.

Introduction

Fish is one of the most important sources of animal protein and has been widely accepted as a good source of protein and other elements for the maintenance of healthy body (Andrew, 2001). Fish is one of the main food constituents in our diet as it contains essential fatty acids, amino acids and some of the principal vitamins and minerals in sufficient amounts for healthy living (Borgstrom, 1961).

The small indigenous species of fishes are generally considered which grow to a length of about 25cm, *i.e.,* 9 inches at maturity (Felts *et al.,* 1996, Hossain *et al.,* 1999). Small indigenous freshwater fish species (SIFFS) are defined as fishes which grow to the size of 25-30 cm in mature or adult stage of their life cycle. Small indigenous fish species (SIFS) are found in all types of natural waterbodies. They inhabit in rivers and tributaries, flood-plains, ponds and tanks, lakes, streams, lowland areas, wetlands and paddy fields (NACA, National Association for Campus Activities, 2011). A large diversity of small indigenous fish species are found in freshwater systems. These small indigenous fish species form a major component of food consumed by family, especially those living closer to freshwater resources (ICSF, International Collective in Support of Fishworkers, 2010).

The SIFS are rich in terms of proteins, micronutrients, vitamins and minerals. Therefore, small indigenous fishes are important for poor and lower income groups in terms of nutrition. The rural poor prefer to eat SIS instead of cultured carps because they can afford to buy a small amount at a time, and it is easier for them to distribute the fish among their family members.

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Fish, especially SIS, are a rich animal-source food of multiple, essential, highly bioavailable nutrients. They are significant in respect of their taste, availability, lower market price and nutritional value (Rajts *et al*., 1997).

The body composition is used as indicator to assess the nutritional status and condition of fish. Fish proximate body composition is of great interest in aquaculture because it affects fish appetite, growth and the efficiency of food utilization. Proximate body composition also affects other aspects of fish biology and ecology, including reproduction, survival, and energy value to predator (Breck, 2014). Body composition is a good indicator of the physiology condition of a fish but it is relatively time consuming to measure. Protein, fat and water content of fish is important to consumers, scientists and manufacturer for nutritional value, seasonal variations and considerations regarding processing (Murray and Burt, 2001).

Among the fishing communities, small fish occupy an important position as a popular food item. Thus, considering the importance of the small indigenous fish, the present study was undertaken to assess the nutritional values of some selected small fish available in Bawle Kyun, Htantabin Township. The objectives of the present study are:

- to examine the nutritional values of selected fish species and
- to compare the nutritional values among the species.

Materials and Methods

Study area and study sites

Htantabin Township is located in Northern District of Yangon Region, is bounded by Hlaing River in the east and Bawle River in the west. Kokkowa River flows east to west and divides the area into two parts: Bawle Kyun in the north and Tetthit Kyun in the south. The present study was conducted at Nethamein village (17°2´N and 95°49´E) in Bawle Kyun.

Study period

The study period lasted from January to December 2018.

Specimen collection

Based on their length of the individual, small indigenous species of the present study were considered as minimum 4cm. The most commonly found 13 small indigenous were sorted out in the collection area with the help of fishermen or fish traders (Plate 1).

Identification and classification

Identification and classification of the studied species was based on Jayaram (1999) and Fish Base website (http://www.fishbase.org).

Sample preparation

The fresh specimen (about 150g/species) for each species were separately packed, labeled and stored in the refrigerator for further nutritional analysis.

Notopterus notopterus (Nga-phe)

Amblypharyngodon mola (Nga-be-phyu)

Osteobrama belangeri (Nga-phe-oung)

Puntius chola (Nga-khone-ma)

Mystus pulcher (Nga-zin-yine)

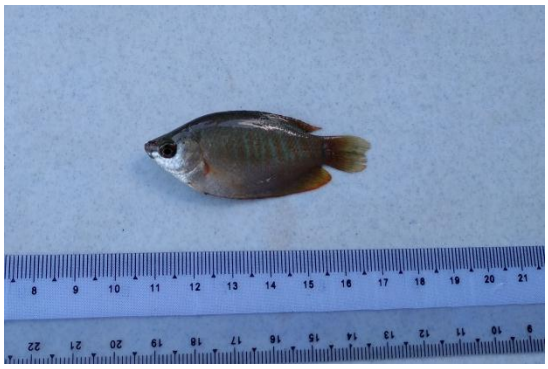
Ompok bimaculatus (Nga-nu-than)

Clarias batrachus (Nga-khu)

Heteropneustes fossilis (Nga-gyee)

Glossogobius giuris (Kat-tha-boe)

Anabas testudineus (Nga-pyay-ma)



Trichogaster labiosa (Nga-phyin-tha-let)

Channa punctatus (Nga- panaw)

Macrognathus aral (Nga-mway-doe)

Plate 1. The studied small indigenous fish species

Data analysis

The samples were analysed by AOAC-2000 test method for nutritional value in percentage (moisture, protein, ash and fat, fiber, carbohydrate) and energy values at Research and Innovation Analysis Department in Yangon.

Results

Nutritional Values analysis

A total of 13 small indigenous species were selected for nutritional analysis during the study period (Fig. 1 and Table 1).

Notopterus notopterus

The nutritional values of *Notopterus notopterus* was observed as moisture (81.21%), ash (1.22%), protein (17.10%), fat (0.05%), fiber (0.04%), carbohydrate (0.38%) and energy value (71kcal/100g).

Amblypharyngodon mola

The nutritional values of *Amblypharyngodon mola* was examined as moisture (76.3%), ash (2.61%), protein (16.82%), fat (2.98%), fiber (0.00%), carbohydrate (0.00%) and energy value (94kcal/100g).

Osteobrama belangeri

The nutritional values of *Osteobrama belangeri* was analysed as moisture (72.69%), ash (4.12%), protein (17.06%), fat (4.92%), fiber (0.03%), carbohydrate (0.02%) and energy value (85kcal/100g).

Puntius chola

The nutritional values of *Puntius chola* was observed as moisture (79.28%), ash (1.79%), protein (15.27%), fat (3.35%), fiber (0.00%), carbohydrate (0.00%) and energy value (91kcal/100g).

Mystus pulcher

The nutritional values of *Mystus pulcher* was analysed as moisture (80.20%), ash (2.23%), protein (16.04%), fat (1.50%), fiber (0.05%), carbohydrate (0.00%) and energy value (82kcal/100g).

Ompok bimaculatus

The nutritional values of *Ompok bimaculatus* was examined as moisture (79.69%), ash (3.24%), protein (15.59%), fat (1.61%), fiber (0.02%), carbohydrate (0.01%) and energy value (71kcal/100g).

Clarias batrachus

The nutritional values of *Clarias batrachus* was analysed as moisture (81.11%), ash (1.63%), protein (15.79%), fat (0.37%), fiber (0.06%), carbohydrate (1.04%) and energy value (72kcal/100g).

Heteropneustes fossilis

The nutritional values of *Mystus pulcher* was observed as moisture (82.90%), ash (1.13%), protein (14.59%), fat (0.24%), fiber (0.01%), carbohydrate (1.15%) and energy value (66kcal/100g).

Glossogobius giuris

The nutritional values of *Glossogobius giuris* were analysed to be moisture (80.85%), ash (1.56%), protein (16.89%), fat (0.09%), fiber (0.03%), carbohydrate (1.04%) and energy value (73kcal/100g).

Anabas testudineus

The nutritional values of *Anabas testudineus* was examined as moisture (66.28%), ash (10.41%), protein (18.52%), fat (3.41%), fiber (0.01%), carbohydrate (1.00%) and energy value (90kcal/100g).

Trichogaster labiosa

The nutritional values of *Trichogaster labiosa* was observed as moisture (79.53%), ash (3.41%), protein (14.16%), fat (2.71%), fiber (0.00%), carbohydrate (0.00%) and energy value (81kcal/100g).

Channa punctatus

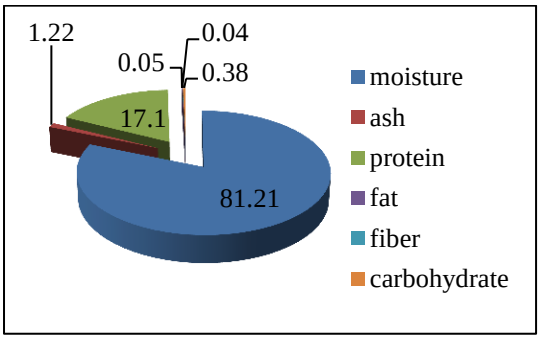
The nutritional values of *Channa punctatus* was analysed as moisture (79.91%), ash (1.53%), protein (17.19%), fat (0.46%), fiber (0.08%), carbohydrate (0.83%) and energy value (77kcal/100g).

Macrognathus aral

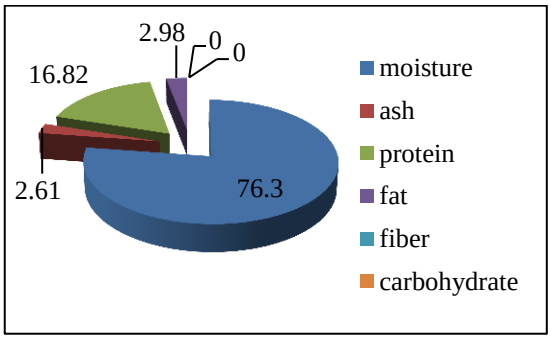
The nutritional values of *Macrognathus aral* was examined as moisture (79.28%), ash (2.16%), protein (15.88%), fat (1.72%), fiber (0.03%), carbohydrate (0.93%) and energy value (86kcal/100g).

Table 1 Nutritional values of small indigenous fish species in the study sites

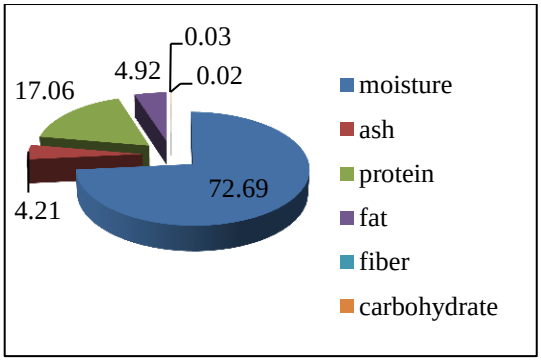
Fish species	Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Fiber (%)	Carbohydrate (%)	Energy value (kcal/100g)
N. notopterus	81.21	1.22	17.1	0.05	0.04	0.38	71
A. mola	76.3	2.61	16.82	2.98	0	0	94
O. belangeri	72.69	4.21	17.06	4.92	0.03	0.02	85
P. chola	79.28	1.79	15.27	3.35	0	0	91
M. pulcher	80.2	2.2	16.04	1.5	0.05	0	82
O. bimaculatus	79.6	3.2	15.5	1.61	0.02	0.01	71
C. batrachus	81.11	1.63	15.79	0.37	0.06	1.04	72
H. fossilis	82.9	1.13	14.57	0.24	0.01	1.15	66
G. giuris	80.85	1.56	16.89	0.09	0.03	0.58	73
A. testudineus	66.28	10.41	18.52	3.41	0.01	1	90
T. labiosa	79.53	3.41	14.16	2.71	0	0	81
C. punctatus	79.91	1.53	17.19	0.46	0.08	0.83	77
M. aral	79.28	2.16	15.88	1.72	0.03	0.93	86



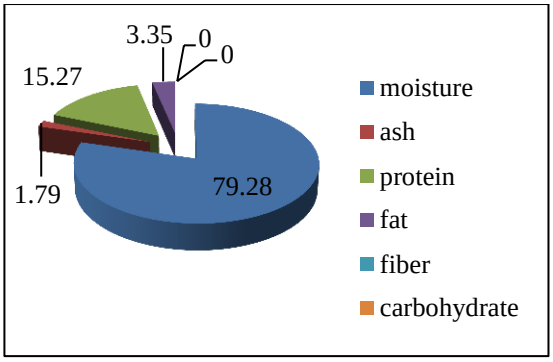
Notopterus notopterus (Nga-phe)



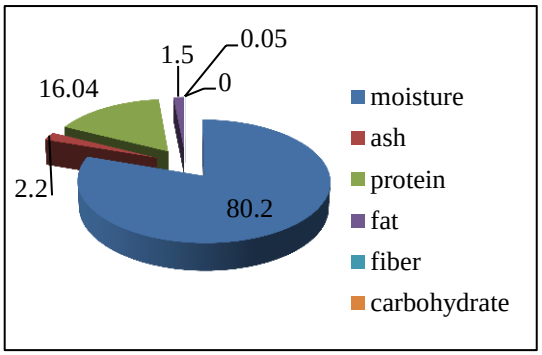
Amblypharyngodon mola (Nga-be-phyu)



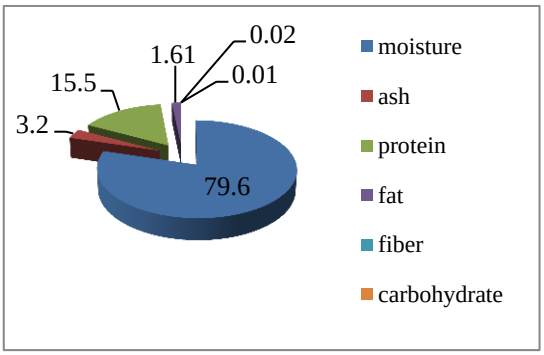
Osteobrama belangeri (Nga-phe-oung)



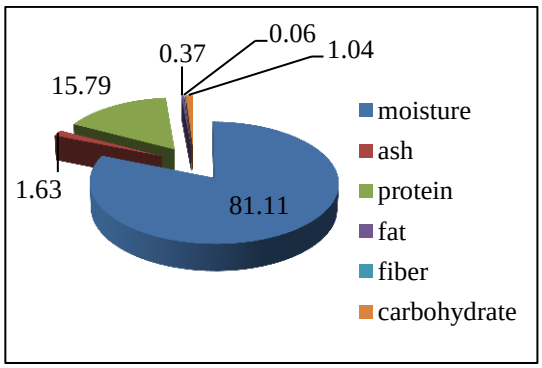
Puntius chola (Nga-khone-ma)



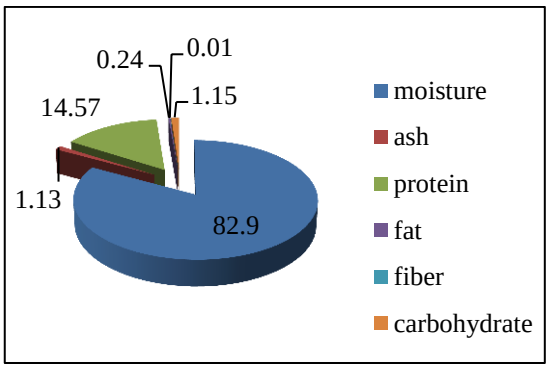
Mystus pulcher (Nga-zin-yine)



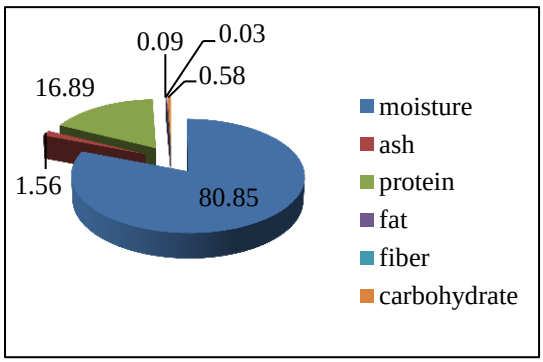
Ompok bimaculatus (Nga-nu-than)



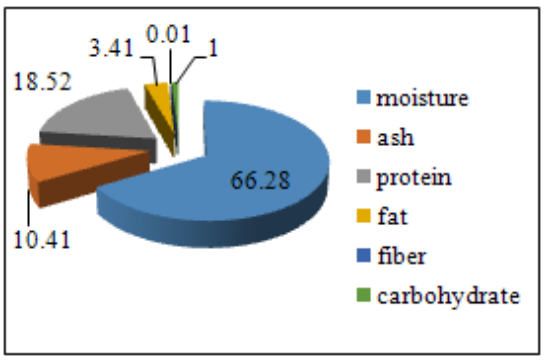
Clarias batrachus (Nga-khu)



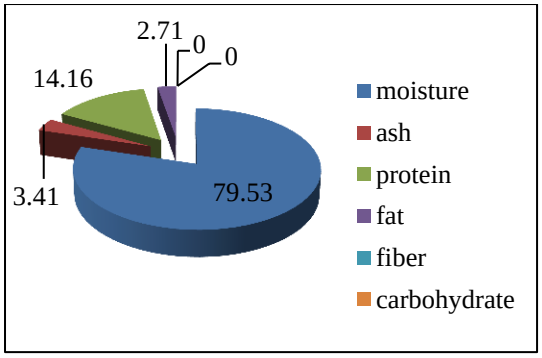
Heteropneustes fossilis (Nga-gyee)



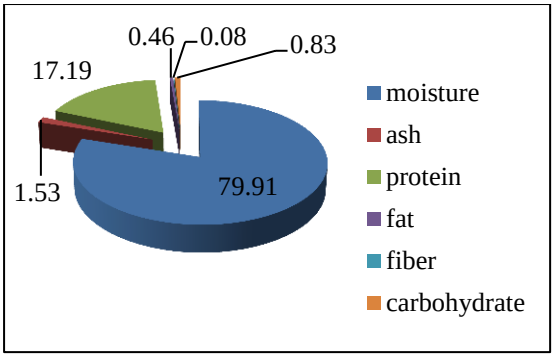
Glossogobius giuris (Kat-tha-boe)



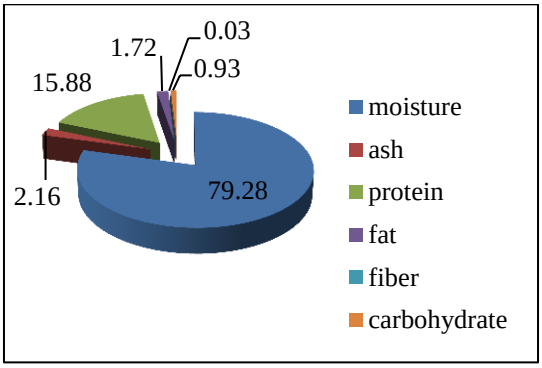
Anabas testudineus (Nga-pyay-ma)



Trichogaster labiosa (Nga-phyin-tha-let)



Channa punctatus (Nga- panaw)



Macrognathus aral (Nga-mway-doe)

Figure 1 Nutritional values analysed in the studied fish species

Variation of nutritional values among the species

The variation of moisture contents among the species ranged from 66.28% (*A. testudineus*) to 82.9% (*H. fossilis*) (Fig 1 and 2, Table 1). The variation of ash contents among the studied fish species ranged from 1.13% (*H. fossilis*) to 10.41% (*A. testudineus*) (Fig 1 and 3, Table 1). The variation of protein contents among the studied fish species ranged from 14.16% (*T. labiosa*) to 18.52% (*A. testudineus*) (Fig 1 and 4, Table 1). The variation of fat contents among the studied fish species ranged from 0.05% (*N. notopterus*) to 4.92% (*O. belangeri*) (Fig 1 and 5, Table 1). Highest crude fiber content was found in *C. puntatus* (0.08%) and no fiber content was found in *A. mola*, *P. chola* and *T. labiosa* (Fig 1 and 6, Table 1). Highest carbohydrate content was found in *H. fossilis* (1.15%) and no carbohydrate was found in *A. mola*, *P. chola*, *M. pulcher* and *T. labiosa* (Fig 1 and 7, Table 1). The variation of energy value among the studied fish species ranged from 66kcal/100g (*H. fossilis*) to 94kcal/100g (*A. mola*) (Fig 1 and 8, Table 1).

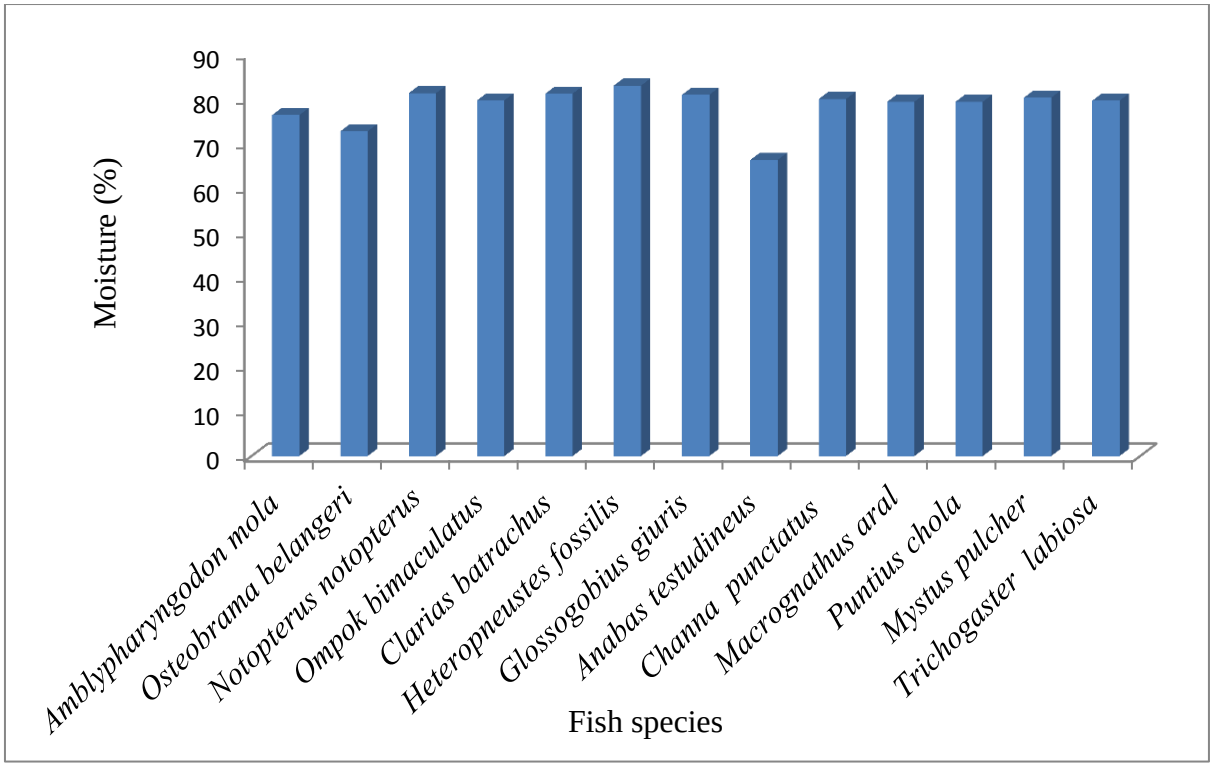


Figure 2 The variation of moisture contents among the species

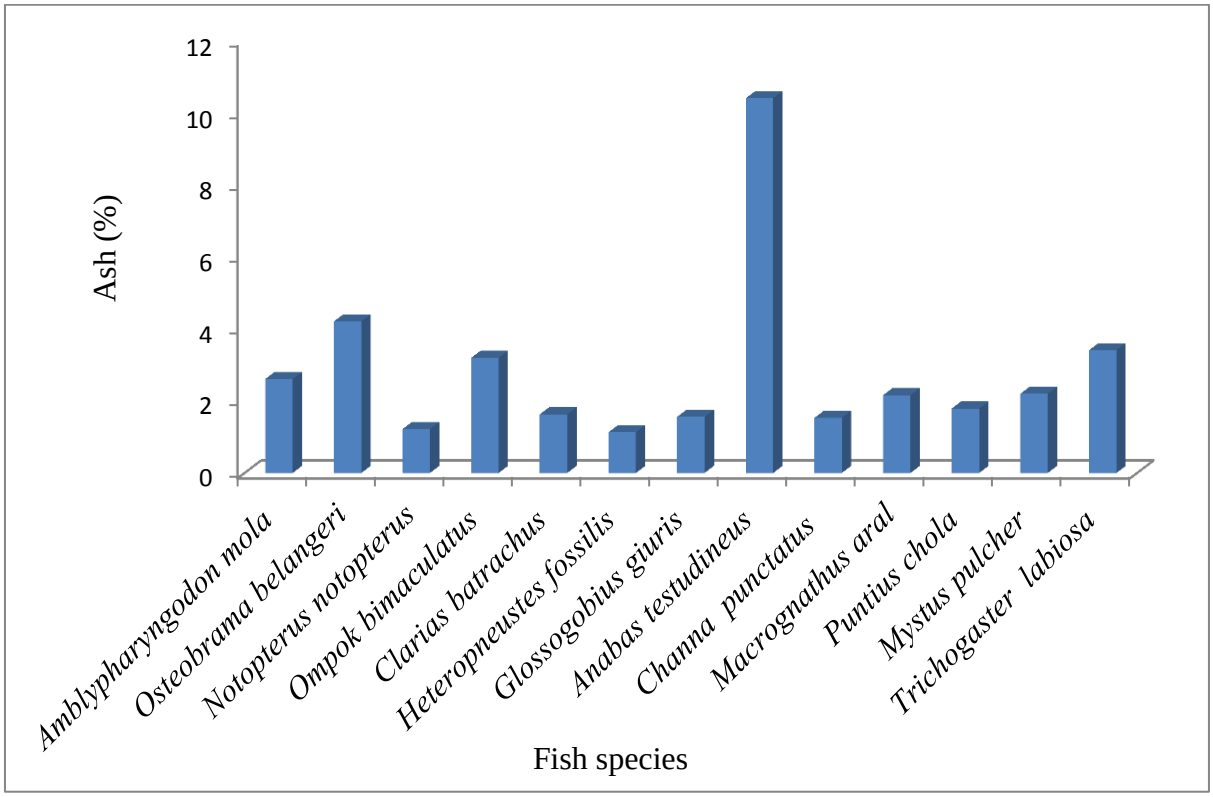


Figure 3 The variation of ash contents among the species

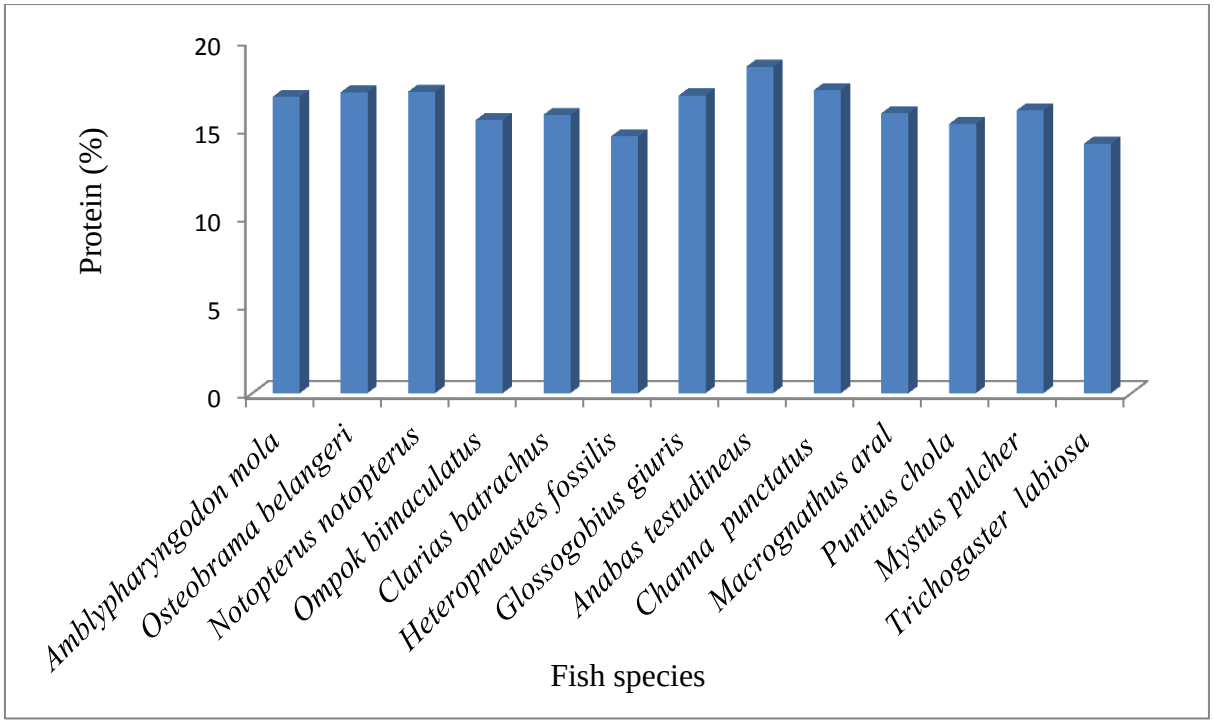


Figure 4 The variation of protein contents among the species

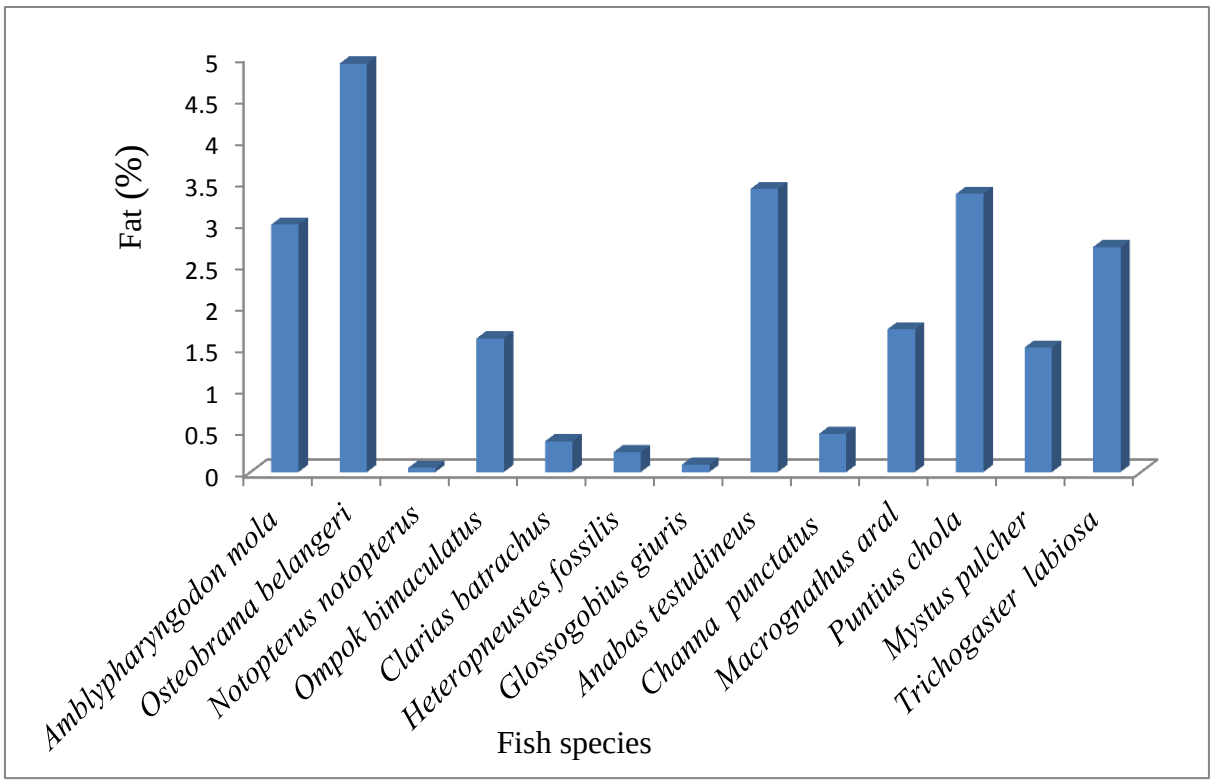


Figure 5 The variation of fat contents among the species

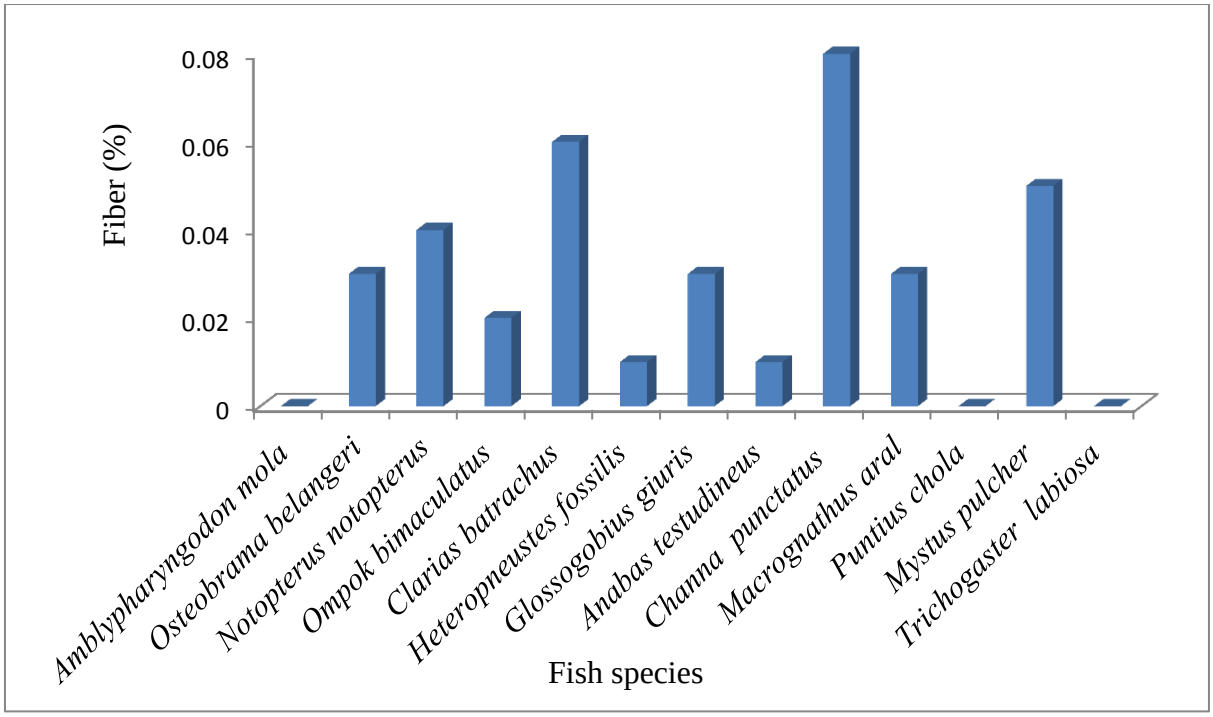


Figure 6 The variation of fiber contents among the species

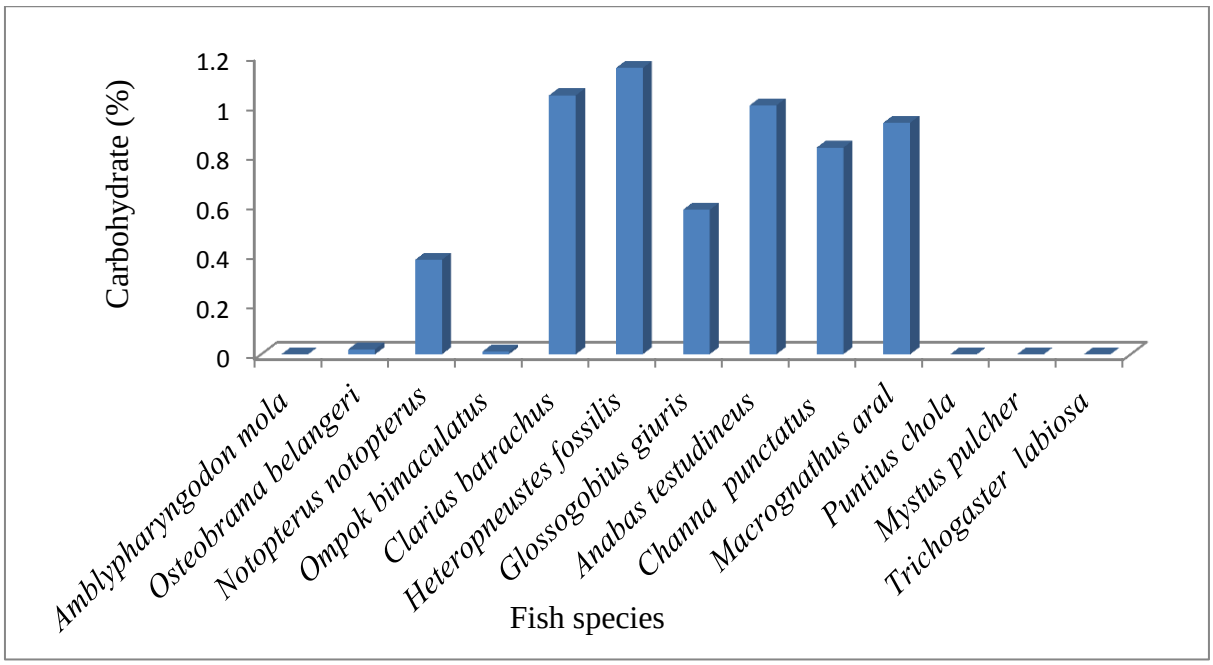


Figure 7 The variation of carbohydrate contents among the species

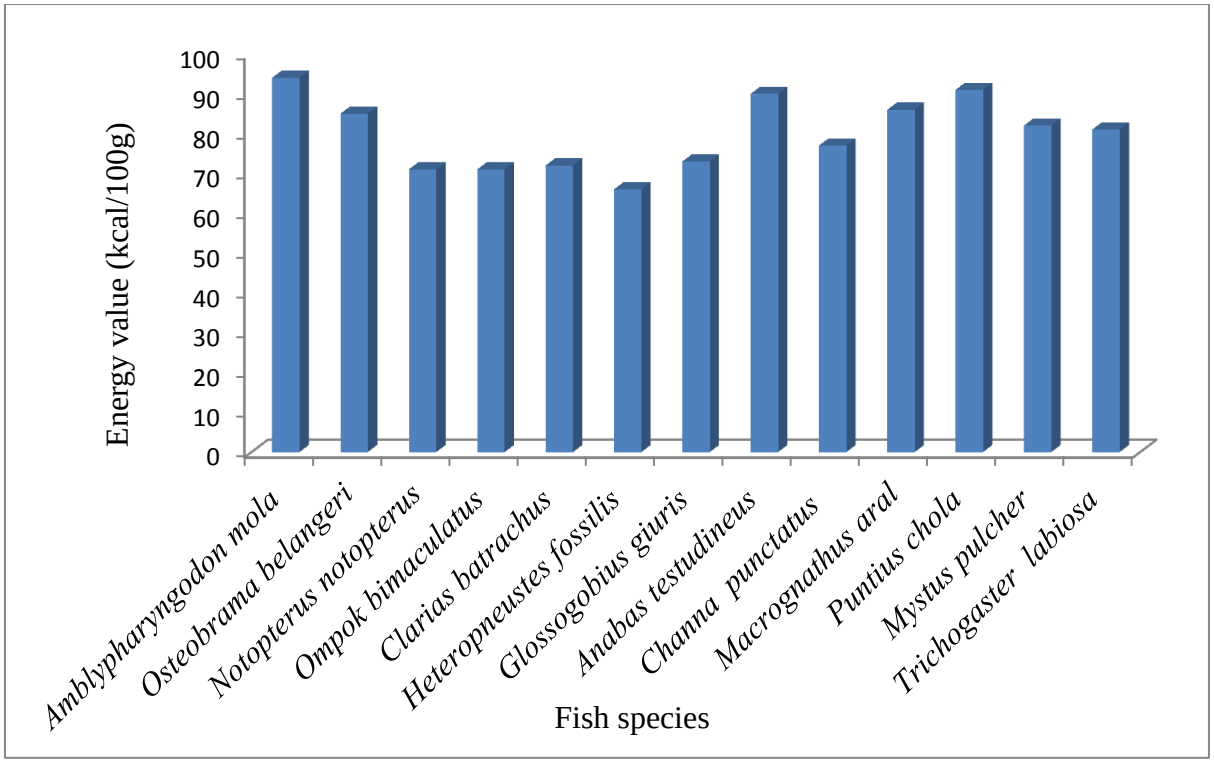


Figure 8 The variation of energy value contents among the species

Discussion

Small indigenous fish species of freshwater origin are not only a source of vital protein to the rural poor but also of micro-nutrients such as calcium, zinc, iron and fatty acids (Roos *et al.*, 2007). Considering the importance of the small indigenous fish species, this study is undertaken to assess the nutritional value of SIFS from the view of public health.

Proximate analysis is in term of nutritional values analysis a partitioning of compounds in a feed into six categories based on the chemical properties of the compounds. The six categories are: (1) moisture (2) ash (3) crude protein (or Kjeldahl protein) (4) crude lipid (5) crude fiber and (6) nitrogen-free extracts (digestible carbohydrates) (Analytical Techniques in Aquaculture Research, 2016).

The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The lower percentage of water showed greater the lipids and protein contents and higher the energy density of the fish (Dempson *et al.*, 2004). The moisture content in the present study ranged between 66.28-82.9%. The moisture contents of SIFS recorded by Hossain *et al.* (1999) as 71.00-81.94%. The moisture contents of fishes in the present study slightly different than those that obtained by Hossain *et al.* (1999) and in culture fishes that obtained by Ali *et al.* (2006) with (66.75- 71.06%) and Bogard *et al.* (2015) with (65.5-84.19).

Concerning the ash content, the fish species in present finding was recorded between 1.13-10.41%. The ash content of fishes was recorded as 2.25-5.22% (Hossain *et al.*, 1999). The ash content of culture fishes was recorded as 1.11-7.02% (Ali *et al.*, 2006) and 0.9-1.5% (Bogard *et al.*, 2015). So this present result unbalanced with the previous data may be due to different feeding habits.

Proteins are not only necessary for hormonal and enzyme development (Wilsom, 1986), but are also an important source of energy (Halver and Hardy, 2002). The protein content of SIFS in the present study examined between 14.16-18.52%. The result showed little variations with Hossain *et al.*, (1999) who obtained the protein content range between 13.14-22.28% and Bogard *et al*. (2015) who recorded in culture fishes from 14.9-18.9%. Thus the present findings lie within the normal range.

Lipids are regarded as one of the most important food reserve contributing to the condition and this has led to the use of fat indices as a measure of relationship between percent water and percent fat (Sinclair and Duncan, 1972). It also provides much of energy and the essential body fatty acid (Gatlin, 2010). Regarding the fat content of SIFS in the present data ranged between 0.05 to 4.92%. The fat contents of indigenous fishes were recorded as 1.87-9.55% (Hossain *et al.*, 1999) and larger fish showed 0.31-8.2% (Ali *et al.*, 2006) and 0.7-17.7% (Bogard *et al*., 2015). It is considered that the variation of the lipid concentration is due to the different fish species examined.

In the present study, the fiber content ranged from 0-0.08% and carbohydrate showed 0-1.15%. The main body constituents of the fish include water, lipid, ash and protein. Carbohydrates and non-protein compounds are present in negligible amount and are usually ignored for routine analysis (Cui and Wootton, 1988).

The gross energy content in fresh matter basis of small indigenous fish species in the present study ranged between 66-94kcal/100g. The gross energy content of small indigenous fishes in Bangladesh was more or less similar to that reported by Hossain *et al.* (1999) who recorded as 97-169kcal/100g and and in culture large fish with 64-221kcal/100g by Bogard *et al*., (2015). Thus the energy values in SIS showed similar with that of larger culture fishes.

Conclusion

The small indigenous fish species can play a significant role to fulfill the nutrient demand of poorer sections of people of the country. It may be concluded that the small indigenous fish species make a choice based on that information from a consumer point of view.

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