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Proximate analysis of some small indigenous fish species (SIS) of Tripura, India

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Abstract
The proximate composition of ten small indigenous species (SIS) *viz.* Puti (*Puntius sophore*), Chanda (*Chanda nama*), Chanda or Ronga (*Parambassis ranga*), Mowka (*Amblypharyngodon mola*), Kholisa (*Colisa fasciata*), Rani (*Botia dario*), Tengara (*Mystus vittatus*), Darkina/ Dadhikha (*Esomus danricus*), Gunte (*Lepidocephalichthys guntea*), Baim (*Magrognathus pancalus*) were analysed to evaluate their nutritive value. Major nutrient compositions of raw muscles like protein, fat, moisture, carbohydrate and ash were estimated using standard methods. The protein content ranged between 12.89% and 16.75% with the highest protein content in *A. mola* and *M. pancalus* and lowest in *E. danricus* and *C. nama*. Likewise, the lipid content varied from 1.84% (*A. mola*) to 6.19% (*P. sophore*). Other nutrients such as moisture content show a discrepancy from 70.65% (*P. sophore*) to 76.95% (*P. ranga*), carbohydrate content from 0.68% (*P. ranga*) to 7.13% (*C. nama*) whereas, the ash content varied from 1.93% (*A. mola*) to 4.29% (*P. sophore*). From the present study, it could be concluded that the SIS are the good source of macronutrients thereby safeguarding both nutritional as well as livelihood security.

Keywords: Small indigenous species (SIS), proximate composition, nutritional value

Introduction
Fish is known to be one of the cheapest sources of a source of protein, micro-nutrients, essential fatty acids and other essential nutrients required for the maintenance of a healthy body [1, 2]. Fisheries are an important part of food security, particularly for many poor people in developing and under developed countries which make up about 22% of overall animal protein consumption [3]. Small indigenous fishes (SIF) constitute a major part of fish caught in the inland fisheries and contribute significantly to the nutritional as well as livelihood security of the rural mass. The small indigenous fish species (SIS) are those species which grow to a maximum length of 25-30 cm in the mature or adult stage of their lifecycle [3, 4]. Because of their large numbers and abundance, they comprise a significant group of total finfish population in the inland fisheries.

Tripura, a north-eastern state of India, is known to be the highest per capita fish consumer among the inland states of the country. With nearly 95% population being the fish eater, there is a huge demand for any form of fish. Though small indigenous fish species are nutrient dense, they are often overlooked in developing nations [5]. Earlier they were said to be miscellaneous fish, but nowadays, it is preferred in all classes of society and some of them are also included in organised farming as well. As the landless, marginal farmers and the people with low income are unable to afford costly species such as carp, there is an increasing demand for small indigenous fishes *viz.* Mola (*Amblyphanyngodon mola*), tengra (*Myshis vittatus*), colisha (*Colisa fasciata*), punti (*Puntius sophore*), Baim *(Magrognathus panchalus),* Chanda *(Chanda nama),* Chanda or Ronga *(Parambassis ranga), Rani (Botia dario)* both in rural and urban markets.

As far as public health is concerned, it is necessary to know the proximate composition of the small indigenous fish species from Tripura which could be helpful to know their nutritive importance and to understand the condition of the fish. So far, very few published information is available on the proximate composition on the small indigenous fish species (SIS) of Tripura. Considering the importance of the small indigenous fish, this study was undertaken to assess the nutritional value of some small fishes available in Tripura.

Materials and Methods

Fish samples of 10 different small indigenous fish species (SIS) *viz.* Puti (*Puntius sophore*), Chanda (*Chanda nama*), Chanda or Ronga (*Parambassis ranga*), Mowka (*Amblypharyngodon mola*), Kholisa (*Colisa fasciata*), Rani (*Botia dario*), Tengara (*Mystus vittatus*), Darkina/ Dadhikha (*Esomus danricus*), Gunte (*Lepidocephalichthys guntea*), Baim (*Magrognathus pancalus*) were collected from the local fish market of Badtala, Agartala, Lembucherra and Mohanpur localities of Tripura during the month of March to May 2018 (Figure 1). After the collection of specimens, they were identified up to species level using the authentic keys given by [6]. Physical data like wet weight (g) and total length (cm) were taken using the Vernier Calliper and weighing machine. To avoid contamination and spoilage, fishes were cleaned, beheaded, degutted and kept in a freezer (4°C) in an airtight container until laboratory analysis.

The proximate compositions of each species were analyzed by using the standard methods [7].

Moisture content:

The moisture was determined by drying the samples at 105 °C to a constant weight for 24 hours.

Moisture content (%) = (Weight loses/Weight of sample taken) × 100

Crude Protein: The protein content of the fish was determined by micro-kjeldahl method. Samples (0.5 g) were digested in digestion unit (Digestor, model2020) for 45 minutes. The digest was then distilled in distillation unit (Kjeltec System, Distilling 1.mit, model1026). Finally it was titrated with 0.1 N HCl (Commercially available) and crude protein was obtained by multiplying the total nitrogen by a conversion factor of 6.25.

N (%) = [(Titration reading - blank reading) × strength of acid ×14×100]/Weight of the sample ×1000

Protein content (%) = N (%) ×6.25

Crude lipid: Ether extract (EE) was measured by Soxtec (1045 Soxtec Extraction Unit, Tecator, Sweden) using petroleum ether (boiling point, 40-60 °C) as a solvent.

%Crude lipid= (Weight of the residue/Sample weight) ×100

Ash: Total ash content was evaluated from weighed samples in a porcelain crucible placed in a muffle furnace (Nutronics, New Delhi, India) at 600 °C for 6 h.

Ash content (%) = (Weight of the ash/Sample weight) ×100

Total carbohydrate: Carbohydrate content was determined by calculating the difference between 100% (accepted total value of nutritional status) and the sum of values of moisture, protein, fibre, lipid and ash.

Data were analyzed by one-way analysis of variance and the significant difference was determined by Duncan's Multiple Range Test using SPSS (Version 19.0, SPSS Inc., Chicago, IL, USA). Each sample was analysed for proximate composition in triplicate. Results are presented as mean±SE (standard error). The level of significance employed was 0.05.

Table 1: Average length and weight of various small indigenous fishes used in this study

S. No	Local name/ Common name	Scientific name	Average body weight (g)	Average body length (cm)
1	Puti or Sar puti	*Puntius sophore*	8.56±0.96	6.99±0.90
2	Chanda	*Chanda nama*	4.81±0.25	5.36±0.54
3	Chanda or Ronga	*Parambassis ranga*	4.51±0.10	5.48±0.10
4	Mowka	*Amblypharyngodon mola*	2.36±0.13	5.36±0.16
5	Kholisa	*Colisa fasciata*	8.42±0.69	6.06±0.48
6	Rani	*Botia Dario*	5.59±0.10	7.14±0.15
7	Tengara	*Mystus vittatus*	4.39±0.09	6.75±0.04
8	Darkina/ Dadhikha	*Esomus danricus*	5.12±0.10	4.12±0.05
9	Gunte	*Lepidocephalichthys guntea*	2.63±0.48	6.33±0.30
10	Baim	*Magrognathus pancalus*	9.43±0.24	12.38±0.55

*Ten number of samples taken for average length and weight study (n=20).

*Mean±S.E.

Table 2: Proximate composition (% wet weight basis) of different small indigenous fish species

Fish species	Moisture	Protein	Lipid	Ash	Carbohydrate
Puntius sophore	70.65 ± 0.33^{a}	14.44 ± 0.29^{cd}	6.19 ± 0.12^{e}	4.29 ± 0.11^{e}	4.44 ± 0.61^{bc}
Chanda nama	74.19 ± 0.27^{c}	13.23 ± 0.23^{a}	2.87 ± 0.09^{b}	2.58 ± 0.01^{b}	7.13 ± 0.40^{d}
Parambassis ranga	76.95 ± 0.21^{e}	14.24 ± 0.20^{cd}	5.06 ± 0.26^{d}	3.08 ± 0.09^{c}	0.68 ± 0.20^{a}
Amblypharyngodon mola	74.68 ± 0.09^{cd}	16.75 ± 0.12^{e}	1.84 ± 0.03^{a}	1.93 ± 0.09^{a}	4.79 ± 0.17^{c}
Colisa fasciata	73.18 ± 0.17^{b}	13.86 ± 0.09^{bc}	4.79 ± 0.18^{d}	3.14 ± 0.04^{c}	5.03 ± 0.41^{c}
Botia dario	72.92 ± 0.71^{b}	14.59 ± 0.26^{d}	6.15 ± 0.17^{e}	3.13 ± 0.03^{c}	3.21 ± 0.80^{b}
Mystus vittatus	74.26 ± 0.29^{c}	13.33 ± 0.29^{ab}	3.84 ± 0.29^{c}	4.11 ± 0.15^{e}	4.46 ± 0.39^{bc}
Esomus danricus	75.58 ± 0.19^{d}	12.89 ± 0.14^{a}	3.83 ± 0.19^{c}	2.43 ± 0.10^{b}	5.28 ± 0.11^{c}
Lepidocephalichthys guntea	72.80 ± 0.27^{b}	14.10 ± 0.14^{cd}	5.81 ± 0.10^{e}	3.29 ± 0.18^{cd}	3.99 ± 0.26^{bc}
Magrognathus pancalus	75.12 ± 0.40^{cd}	16.53 ± 0.06^{e}	3.02 ± 0.13^{b}	3.58 ± 0.05^{d}	1.75 ± 0.33^{a}

* Mean values (± SE) in a row having the same superscripts are not significantly different ($p>0.05$)

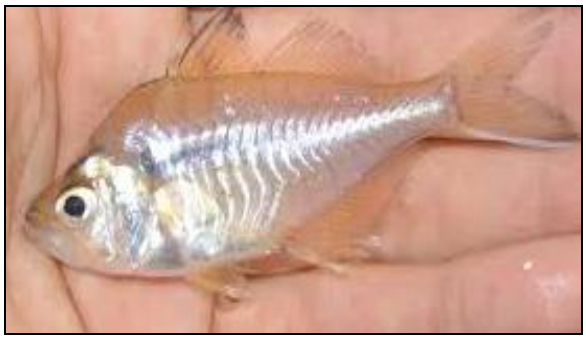
**n=15 for each species

Esomus danricus

Mystus vittatus

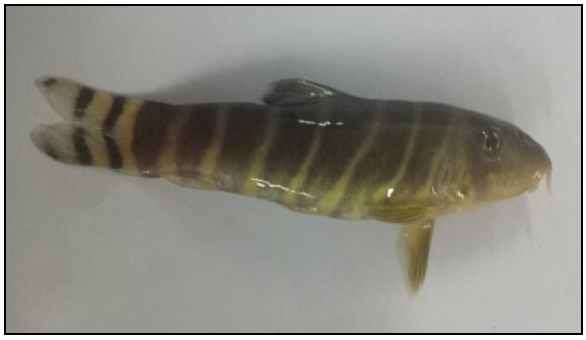
Chanda nama

Lepidocephalichthys guntea



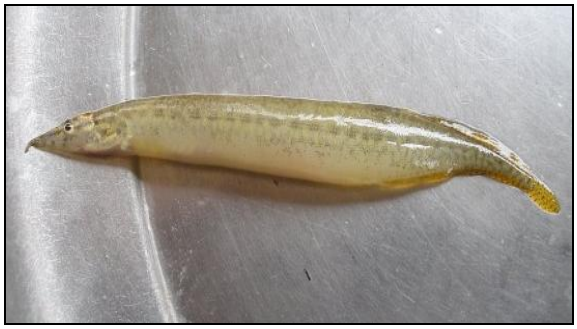
Parambassis ranga

Amblypharyngodon mola



Botia Dario

Colisa fasciata



Magrognathus pancalus

Puntius sophore

Fig 1: Small indigenous fish species (SIS) collected during sampling

Results and Discussion

Fish is a highly proteinous food consumed by the people where larger percentages do eat fish because of its availability, flavours, palatability while fewer percentages do so because of its nutritional value. The present study demonstrated the proximate composition of some of the local small fish species of Tripura (Figure 1). The morphometric data (average length and weight) and proximate composition of various small indigenous fish has been presented in Table 1 and 2, respectively. The result from the present study elucidates the levels of moisture, protein, lipid, carbohydrate and ash showed variations among the ten collected small fish species (P<0.05). The protein content ranged between 12.89% and 16.75%. The highest protein content was observed in *A. mola* and *M. pancalus* while lowest in *E. danricus* and *C. nama* (P<0.05). The quantity of crude protein generally remains higher than all other nutrient compositions in the fish [8-10] evaluated the nutrient properties of small fishes in Bangladesh and reported the higher protein percentage in *A. mola* (Mola) than other species which is matched with the present findings. Comparatively, the lipid content of all the fish species ranged between 1.84 and 6.19%. The maximum (P<0.05) total lipid percentage was found in *P. sophore, L. guntea* and *B. dario* and lowest in *A. mola* (1.84%). It was observed that the small fish contained less fat and it increased with their size [10, 11] analyzed the nutritional properties of SIS in Bangladesh where they found lipid content ranged from 1.54 to 6.28%. In relevance to this finding, some studies also reported the similar lipid content in small indigenous fishes [9, 12]. Other nutrients such as moisture content varied (P<0.05) from 70.65% (*P. sophore*) to 76.95% (*P. ranga*) and carbohydrate content from 0.68% (*P. ranga*) to 7.13% (*C. nama*). Higher (P<0.05) levels of carbohydrate in *C. nama* followed by *A. mola*, *C. fasciata* and *E. danricus* might be due to over-activeness for reproduction with the approach of monsoon. The two small fish species such as, *P. sophore* and *M. vittatus* contained more than 4% of inorganic residue or ash remaining other eight species with lowers than 3.5%. In the study, the ash content varied (P<0.05) from 1.93% (*A. mola*) to 4.29% (*P. sophore*) which is lesser than large fishes as reported by [13]. The lower ash concentration in SIS might be due to the minimal amount of bone. Other researchers such as [9, 10, 13, 14, 15] also reported the proximate composition of SIS which is more or less relevance with the present findings. In overall, this variation in nutrient content might be attributed to differences in species, environmental conditions, age and size of fish, season of sample collection, food availability, etc. [15-17]. Future studies are needed to explore the quantities of minerals to establishing a standard nutritional database of SIS in Tripura, India.

Conclusion

In a nutshell, the result of the present study entails that despite some variations in nutrient contents, SIS in Tripura are rich in nutrients and can ensure better nutritional security. These small indigenous fishes can improve the nutritional security of low-income groups in Tripura. Therefore, it can be recommended that small fish species might be a good alternative in mass poor people of Tripura to meet their daily nutritional requirement in improving their health status. In this study, we focused only on selected elements in fish and their high levels indicated that they also would be rich in other nutrients, which are expected to be high in fish.

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