



PROXIMATE AND MINERAL COMPOSITION OF FOUR *TENGRA* (*MYSTUS SP.*) FISHES OF BANGLADESH

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Abstract: Body flesh of the four fish species (*Mystus*) namely *Mystus gulio*, *Mystus bleekeri*, *Mystus cavasius*, and *Mystus vittatus* were collected and proximate composition and mineral contents (Na, K, Ca, Mg, P, Fe, Zn and Cu) were analyzed. The highest amount of protein (22.2±0.94%) and lipid (5.25±0.64%) were found in *M. gulio*. The maximum moisture (79.31±1.86%) and ash content (1.45±0.14%) were observed in *M. cavasius* where the *M. gulio* showed the lowest moisture content (71.5±0.95 %) and *M. vittatus* showed the lowest ash content (1.03±0.06%). The concentration range of Ca, Na, K, Mg, and P were 128±5.09 mg to 288± 2.94 mg, 67.2±0.8 to 86±2.16 mg, 254.5±2.43 to 316.8±3.98 mg, 43.0±1.31 to 47.4±1.31 mg and 122.5±1.89 to 220±1.8 mg per 100 g fish flesh respectively. *M. gulio* showed the highest amount of Na (86±2.16 mg) and P (220±1.8 mg). Among four species of *Mystus* fish, *M. cavasius* had the highest amount of Ca (288±2.94 mg) while *M. vittatus* showed the highest amount of both K (316.8±3.98 mg) and Mg (47.40±1.31 mg). Micro mineral contents in different *Mystus* species were more or less similar except the *M. bleekeri*, which showed a higher concentration of Fe (5.47±0.56 mg) where as *M. cavasius* contained no Cu.

Key words: *Mystu*, proximate composition, macro minerals, micro minerals

Introduction

Nature has endowed Bangladesh lavish sources of both marine and fresh water fishes. Fish is a nutrient-dense food which is high in proteins and minerals (both micro and macro minerals). These are essential for healthy growth and development of human and animals. In Bangladesh, fish accounts for 63% of the country's animal protein (Anon, 2001). *Mystus* fishes are preferred by the people of our country for their delicious tastes, therapeutic values and availability in Bangladesh throughout the year. Many minor and trace elements such as sodium, potassium, calcium, iron, iodine, zinc, magnesium, and phosphorus are present in the *Mystus* species. These are known to play important roles in physiological processes and in certain diseases. They especially help in bones and teeth formation, which are made up mainly of Ca, Mg, and P. Iron is an important constituent of blood. Minerals like zinc, molybdenum and manganese along with other ions like chloride, carbonate and bi-carbonate ions keep up the water balance and acid base equilibrium in the body (Hossain, 1999).

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Knowledge of proximate composition of an animal chosen for aquaculture is essential for not only selecting an ideal stock but also to formulate its diet (Davis and Gatlin, 1996). Fishes play the most crucial role in diet preparation as the source of protein and mineral. The normal composition of an animal is a useful baseline for comparison in establishing the state of an animal health and nutrition. The main objective of this study was to determine the mineral value and proximate composition of *Mystus* fishes in Bangladesh in order to establish its food value.

Materials and Methods

Sample collection: Depending on the availability of the adult fish in the local markets, four *Mystus* species namely *M. gulio*, *M. bleekeri*, *M. cavasius* and *M. vittatus* were selected for this study. *M. gulio* was collected from local market of Khulna City Corporation and the rest were obtained from a local market (*Lakshmipur bazar*) of Rajshahi City Corporation during the month of June, 2005 and were identified following the works of Talwar and Jhingram (1991). Keeping into ice, the fish were brought to the laboratory for analysis within 24 hours of collection. After gutted and dressed the body flesh was used for experiments.

Sample preparation: The fish-fillet samples of four *mystus* species were homogenized separately in a micro cutter and then mixed uniformly with pre-cooled petroleum ether in a homogenizer and filtered through a clean muslin cloth. The process was repeated at least twice in order to obtain lipid-free homogenate. Then each filtrate was clarified further by centrifugation at 8×10^3 r.p.m for 10 min. Finally, these precipitated mass were air-dried at room temperature (Yeasmin *et al.*, 2001). For iron estimation fish fillet is not needed to be defatted. For estimation of Na, K, Ca, Mg, Cu and Zn, sample solution was prepared by following the standard dry ash method (Anon, 1992). In the case of iron (Fe) estimation few ml. of Bromine water was added to the sample solutions in order to convert ferrous (Fe^{2+}) ion to ferric (Fe^{3+}) ion. Wet oxidation was performed in each *Mystus* species for P estimation (Didar-ul- Alam *et al.*, 1991).

Estimation of macro (Ca, P, Na, K, and Mg) and micro (Fe, Cu, and Zn) minerals: The concentration of Na, K, Mg, Cu and Zn were measured by atomic absorption spectrometry (Perkin-Elmer, model-3110, England) method (Anon, 1990 and Anon, 1992). Iron content of *Mystus* species were estimated Spectrophotometrically (Erma, AE-300) by thiocyanate colourimetric method (Vogel's, 1989). Colourimetric method Arsenazo III (2,2-[1,8-Dihydroxy-3,6-disulpho-2,7-naphthalene-bis-(azo)] dibenzearsonic acid) was used to determine the amount of calcium at pH 8.5 (Bauer, 1981). Phosphorus content in each species was determined Spectro-photometrically by Phosphovanadomolybdate method (Vogel's, 1989).

Proximate composition: Defatted homogenate samples (1g) were digested at 390 °C in a digestion unit (2040 digester) for two hours. The digested mass of each species were then distilled in a KJELTEC system 1002 distilling unit and titrated with 0.05 M NaOH. Crude protein was obtained by multiplying the total nitrogen content by a conversion factor of 6.25 (Peterson, 2002). Lipid from the each sample was extracted with petroleum ether (40-60 °C) in a soxhlet apparatus (Southcombe, 1971). A weighed quantity of samples were ignited in a muffle furnace (Perkin-Elmer, model-3110) at 600 °C for about 6 hours. Moisture content was determined by drying of each sample in a thermostat oven at 105 °C until a constant weight was obtained (Khunna, 1978).

Data analysis: Proximate and mineral composition of these four species were compared by one-way analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT, $p < 0.05$) by using Statistical Packages for Social Science (SPSS) software. Each experiment replicated three times.

Results

The analyzed mean values of proximate composition and mineral contents of fish fillet of four *Mystus* species are summarized in Table 1.

Table 2. The protein content of various *Mystus* species in the present study

Table 1. Proximate composition in four *Mystus* species.

Local name	Scientific Name	Moisture (%)	Protein (%)	Lipid (%)	Ash (%)
Nuna-tengra	<i>Mystus gulio</i>	71.50±0.95 ^c	22.20±0.94	5.25±0.64 ^a	1.04±0.06 ^b
Kabasi-tengra	<i>Mystus cavasius</i>	79.31±1.86 ^a	19.47±1.04	2.26±0.17 ^b	1.45±0.14 ^a
Golsha-tengra	<i>Mystus bleekeri</i>	75.23±0.76 ^b	21.29±1.06	2.85±0.33 ^b	1.22±0.07 ^b
Tengra	<i>Mystus vittatus</i>	76.94±1.01 ^b	21.70±1.56	2.25±0.29 ^b	1.03±0.06 ^b

Mean value in the same column having similar superscripts are not significantly different ($p > 0.05$).

varied between 19.47 ±1.04% to 22.2±0.94% and lipid content varied from 2.26±0.17% to 5.25±0.64%. The highest amount of protein (22.2±0.94%) and lipid (5.25±0.64%) were observed in *M. gulio*. The lowest value of protein was found in *M. cavasius* (19.47±1.04%) and lipid (2.25±0.17%) in *M. vittatus*. The moisture contents of these *Mystus* species varied over a range of 71.5±0.95 to 79.31±1.86% and ash content ranged from 1.03±0.06% to 1.45±0.14%. The maximum amount of moisture (79.31±1.86%) and ash (1.45±0.14%) contents were obtained in *M. cavasius*. The lowest amount of moisture was found in *M. gulio* (71.5±0.95%) while *M. vittatus* contained the lowest amount of ash (1.03±0.06%).

Table 2. Macro and Micro mineral contents in four *Mystus* species.

<i>Mystus</i> Species	Macro minerals (mg/100g)					Micro minerals (mg/100g)		
	Ca	K	P	Na	Mg	Fe	Zn	Cu
<i>M. gulio</i>	256±4.55 ^b	288.4±2.01 ^b	220±1.80 ^a	86.0±2.16 ^a	45.1±1.83	1.5±0.16 ^b	3±0.82	1±0.20
<i>M. cavasius</i>	288±2.94 ^a	273.7±3.12 ^c	162.5±1.24 ^c	73.3±1.56 ^b	43±1.31	1.25±0.09 ^b	3±0.40	—
<i>M. bleekeri</i>	128±5.09 ^d	254.5±2.43 ^d	122.5±1.89 ^d	67.2±0.80 ^c	44.1±0.66	5.47±0.56 ^a	2±0.46	1±0.02
<i>M. vittatus</i>	224±2.16 ^c	316.8±3.98 ^a	207±1.81 ^b	75.6±0.89 ^b	47.4±1.31	1±0.11 ^b	2±0.26	1±0.08

Mean value in the same column having similar superscripts are not significantly different ($p > 0.05$).

The highest calcium content was found in *M. cavasius* (288±2.94 mg) while the lowest was in *M. bleekeri* (128±5.09 mg). Highest amount of phosphorus (220±1.8 mg) and sodium (86±2.16 mg) contents were found in *M. gulio*. The lowest amount of phosphorus (122.5±1.89mg) and sodium (67.2±0.8 mg) were observed in *M. bleekeri*. The potassium content among different species ranged 254.5±2.43 to 316.8 ±3.98 mg. *M. vittatus* contained the highest amount of potassium (316.8±3.98 mg), but the lowest was observed in *M. bleekeri* (254.5±2.43 mg). *M. vittatus* contained the maximum amount of Mg (47.4±1.31 mg) and *M. cavasius* contained the minimum amount of Mg (43±1.31 mg). Results of iron, zinc, and copper contents of the four species varied over a range from 1±0.11 to 5.47±0.56 mg, 2 ±0.26 to 3±0.82 mg, and 0 to 1±0.2 mg respectively. The highest value of iron (5.47±0.56 mg) was obtained in *M. bleekeri* and the lowest (1±0.11 mg) in *M. vittatus*. The copper content in all species was equal (1 mg) except *M. cavasius* which contained no copper.

Discussion

The level of lipid content (5.25%±0.64) in *M. gulio* is significantly higher than other species ($p < 0.05$). The lipid content of the three *Mystus* species is low as compared to that of the various small indigenous fishes available in Bangladesh (Hossain, 1999). Rahman (1990) reported that *Tengra* fish contained 6.5% lipid and Hossain *et al.* (1999) also reported 2.26% and 2.76% lipid present in *M. cavasius* and *M. vittatus* respectively which is supported by the findings of the present study. Protein content of these fish species are not statistically different ($p > 0.05$). Hossain *et al.* (1999) reported that the protein content for *M. cavasius* and *M. vittatus* are 16.16% and 17.59% respectively which agree with the results of the present study. It has to be mentioned that large size fish exhibited the higher level of protein than smaller size. Protein content of fish varies widely, depending on facts such as natural feeding habits and availability of feed, fasting during spawning, migration etc (Viswanath and Mathew, 2000).

The present study revealed that *M. cavasius* contain highest amount of moisture (79.31±1.86%) and ash (1.45±0.14%) which are statistically significant ($p < 0.05$). Rahman (1990) observed *Tengra* contain 70% moisture. There is an inverse relationship between the size and moisture content of fish. The moisture content in *M. cavasius* and *M. vittatus* were found 78.9% and 79.45% respectively and ash content were 4.77% and 4.30% respectively (Hossain *et al.*, 1999). Lilabati (1996) stated that the moisture, crude protein, lipid and ash contents of Indian fresh water catfish (*Wallago attu*) are 79.43%, 16.7%, 1.98%, and 1.23% respectively. According to Rahman *et al.* (2003), *M. vittatus* contains 75.6% moisture which agrees more or less with this present investigation. However, the crude protein (21.70), lipid (2.25%) and ash content (1.03%) of *M. vittatus* as observed in this present work differ considerably from 14.8% crude protein, 6.3% lipid and 4.97% ash as stated by Rahman *et al.* (2003).

Hossain *et al.* (1999) studied some small fishes and reported *M. cavasius* contained 0.3% Ca, 0.43% P. He also reported that *M. vittatus* contained 0.43% Ca, 0.49% P. Rahman (1990) reported Tengra contain 270 mg Ca and 2.1 mg Fe. The present study differs from the reports of Hossain *et al.* (1999). In this investigation, calcium, potassium and phosphorus in different species differed significantly ($p < 0.05$). It also revealed that sodium contain (86.0±2.16 mg) in *M. gulio* and iron (5.47±0.56 mg) in *M. bleekeri* are comparatively higher ($p < 0.05$) irrespective of other species. Mg, Zn and Cu content in different *M.* species are showed similar trend ($p > 0.05$). The Food and Nutrition Board of the National Research Council of Canada recommended dietary allowances for adults are 63 g Protein, 800 mg Ca, 800 mg P, 350 mg Mg, 10 mg Fe, 15 mg Zn, 1100-3300 mg Na, 1875-5625 mg K and 1.5-3 mg Cu (Murry *et al.*, 1996).

Conclusion

All the mystus species are good sources of protein, lipid and macronutrients. *M. gulio* has found the highest amount of protein, lipid, phosphorus and sodium in comparison to other three *Mystus* species. *M. bleeker* is rich in iron where *M. cavasius* contain highest amount of Ca among other *Mystus* species. In view of these results discussed above it is observed that intake of these species of cat fishes in required quantity will fulfill the necessity of the biochemical and minerals requirements.

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