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Seasonal Variation of the Proximate Composition of Freshwater Gobi, *Glossogobius giuris* (Hamilton) from the River Padma

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Abstract: The proximate composition and seasonal variation in proteins, lipid, ash and related substances of freshwater gobi, *Glossogobius giuris* (Hamilton) were recorded. The results indicated that the proximate composition of the fish depends on season but also to a great extent in reaction to sex and reproductive cycle. The results also showed that *G. giuris* is a 'low fat-high protein' fish. The highest amount was moisture content followed by protein, ash, lipid and carbohydrate. The female fish contained more moisture and lipid than those of the male fish (female>male) except protein and carbohydrate in male fish (male>female).

Key words: Proximate composition, seasonal variation, *Glossogobius giuris*, river Padma

INTRODUCTION

Fishes are valuable sources of high-grade protein and other organic products. Next to meat fish is the only protein that contains all the essential amino acids in about right proportion and as such called complete protein. Generally animal protein is better than plant protein in respect of qualities and it is particularly valuable for providing protein of high quality comparable of those of meat, milk and egg^[1]. Fishes occupy significant position in the socio-economic fabric of the south Asian countries by providing the population not only the nutrition but also income and employment opportunities. Most of the people of Bangladesh have been suffering from mental and physical diseases for nutritional deficiencies. The lack of balanced diet is the main cause of their malnutrition. About 90% of people have been suffering from this malady^[2]. Therefore, the greatest challenge to Bangladesh is to combat the prevalent malnutrition.

The nutritional quality of food is very important for the human consumer. Consumption of fish provides important nutrients to a large number of people worldwide and makes a very significant contribution to nutrition. In Bangladesh, fish accounts for 63% of the country's animal protein supply^[3]. Guha^[4] described the fish protein as high-class protein comparable to those derived from other animal sources. Among the fish protein, 85-95% is digestible part which contains all dietary essential amino

acid^[5]. Fish flesh contains for basic ingredient and varying proportion of water, protein, fat, ash, carbohydrate and other important nutrients and substances like mineral and vitamins^[6]. FAO^[7] has reported that normally fish contains 72% water, 19% protein, 8% fat, 0.5% calcium, 0.25% phosphorus and 0.1% vitamin A, D, B and C etc.

The frequency of changes in the composition of biochemical constituents of any organism varies with the variation of the environmental changes. The chemical composition in different fish species and in individuals of a single species has been reported in relation to their age, sex, habitat and seasons. Many workers have determined the macro and micro amount of nutrient contents of fish throughout the world. Lovern and Wood^[8] estimated the amount of moisture, protein and fat contents from the flesh of herrings and the values were 73.5, 19.2 and 2.9%, respectively. Del Riego^[9] pointed out the value of protein contents which varied seasonally in the Atlantic sardine and found in between 16% in March and 20.6% in July. Stansby^[10] observed that fishes contained 76.8% moisture, 19% protein, 5% fat and 1.2% ash. Borgstrom^[11] observed that the fat and protein contents in fish depend upon some factors, e.g., size, age, sex, seasonal change and habitat. Khuda *et al.*^[12,13], Jacquot^[14], Kamaluddin *et al.*^[15], Gopalan *et al.*^[16], Banu *et al.*^[17], Govindan^[18], Rubbi *et al.*^[19], Al-Habib^[20] and Molla *et al.*^[21] determined, analysed and compared the fish nutrients in different species. Jafri and Khawaja^[22] determined the

chemical composition and nutritional value of some small fishes. Ahmed *et al.*^[23] investigated on the variation of biochemical composition of seven species of gobi fish in respect of sex and season.

In tropical countries much is known of chemical composition of marine fishes^[24] but little of freshwater fishes except for some stray records on hill stream fishes^[25,26]. Bangladesh have a wide variety of small fish species, which are rich in vitamins and nutritive. Among *Channa*, *Glossogobius*, *Tilapia*, even small sized prawns etc. are palatable but at the peak season these fishes along with other small fishes fail to fetch a satisfactory market price^[27]. A little attention has been paid on the proximate composition of nutrients of *G. giuris*. The present investigation gives an information on the biochemical composition and nutritional values of *G. giuris* from the river Padma.

MATERIALS AND METHODS

The monthly sampling of *G. giuris*, which provided most of the data on different parts of biological study and fishery. The fishes of same habit, having uniform size (180 to 200 mm) in total length and mostly in a live condition have been collected from the fishermen from July 2000 to June 2001. The samples were identified as of male and female in the laboratory, the specimens were brought to the Protein and Enzyme Research Laboratory, Department of Biochemistry, Rajshahi University to detect the seasonal variation of proximate composition.

Proximate compositions of the samples were analysed according to standard AOAC methods^[28] in replicate. Total nitrogen of crude protein in fish was determined according to the Micro-Kjeldahl technique^[29]. Oil, triglyceride portion of *G. giuris* is extracted by suitable solvent under the operating condition. Continuous

Soxhlet extraction device was used for the extraction of oil^[30]. The Polysaccharide content of *Glossobobius giuris* was determined by the Anthrone method^[29].

RESULTS

The proximate composition and seasonal variation of protein, lipid, ash and related substances in body muscles of freshwater gobi, *G. giuris* were recorded in twelve months. The results indicated that the proximate composition of the fish depends on season but also to a great extent in relation to sex and reproductive cycle.

Moisture contents: The major component of fish fillets was moisture. It was found that the moisture contents in different months varied from 78.05% (September) to 80.26% (April) in male and 79.08% (December) to 81.41% (August) in female (Table 1). It has been shown that the moisture contents of *G. giuris* increased during summer and late autumn, which was the breeding season of the fish. The results also indicated that the average moisture content was high in the female fish (79.95%) than male (78.91%).

Protein content: It was observed that the protein content varied from 14.09% (February) to 16.03% (August) in male and in female 13.88% (February) to 15.56% (November) (Table 1). Both in male and female of *G. giuris*, the protein content is high in the spawning season particularly in second breeding period of the female fishes. The average protein content of the female (14.61%) *G. giuris* is lower than the male (15.23%).

Ash content: The ash content ranged from 2.15% (January) to 2.92% (May) in male and 2.28% (February) to 2.96% (June). There was no remarkable variation of ash

Table 1: Seasonal variation in the percentage of the proximate composition of *G. giuris*

Year and months	Male					Female				
	Moisture	Protein	Ash	Lipid	Carbohydrate	Moisture	Protein	Ash	Lipid	Carbohydrate
2000										
July	78.24	15.22	2.50	1.41	1.08	79.26	14.43	2.95	1.71	0.92
August	79.27	16.03	2.33	0.95	0.97	81.41	14.12	2.68	1.52	0.88
September	78.05	15.72	2.45	1.39	0.92	80.12	15.18	2.61	1.19	0.73
October	79.12	14.89	2.29	1.48	0.88	79.35	14.63	2.50	1.42	0.83
November	79.06	15.47	2.82	1.45	0.91	79.50	15.56	2.32	1.37	0.87
December	78.07	15.82	2.64	1.05	1.09	79.08	15.09	2.36	1.28	0.91
2001										
January	78.28	16.00	2.15	0.99	0.93	79.56	14.36	2.61	1.11	0.86
February	78.32	14.09	2.55	1.08	0.96	79.73	13.88	2.28	1.82	0.80
March	78.66	15.36	2.18	1.52	0.89	80.36	14.08	2.56	1.50	0.79
April	80.26	14.24	2.78	1.14	1.05	80.17	14.45	2.85	1.65	0.85
May	80.10	14.73	2.92	1.30	0.95	80.39	15.11	2.33	1.48	0.76
June	79.50	15.18	2.66	1.42	0.94	80.43	14.46	2.96	1.06	0.82
Average	78.91	15.23	2.52	1.27	0.97	79.95	14.61	2.58	1.42	0.84

content was found in an average both in male and female (Table 1).

Lipid content: The percentage composition of lipid of *G. giuris* has been determined and similar patterns of fluctuation to that of protein in both male and female fishes were observed. The result revealed that lipid content increased in female during the pre-spawning season and reach to minimum (1.06%) in June, in its spawning peak. In case of male, the similar results were found and it reached to its maximum (1.52%) in March and decreased to reach of its minimum (0.95%) in August during the post breeding period of this fish (Table 1).

Carbohydrate content: Fish flesh contains minimum quantities of carbohydrate. Glycogen is present in living fish and is rapidly converted to lactic acid after death. The amount of carbohydrate present in *G. giuris* samples were found very negligible variation both in male and female fishes (Table 1).

DISCUSSION

The present investigation deals with proximate composition and seasonal variation of protein, lipid, ash and related substances with a view to understanding the nutritive value in terms of total composition and the fluctuation of the same in different season. It was evident that these results were in good agreement with the work of Khuda *et al.*^[12,13], Jafri *et al.*^[31], Ahmed *et al.*^[32] and Ahmed *et al.*^[23].

The major component of fish fillets was moisture that varied seasonally both in male and female fish. Table 1 indicates that on an average value of the moisture content was higher in female fish (79.95%) compared to the male fish (78.91%) both in spawning peak and off peak season. Lovern and Wood^[8], Dietrich^[33] also made similar observations in the herrings. The present investigation shows that the freshwater gobi, *G. giuris* contained more moisture but less protein in the same season. The maximum moisture content observed in the month of April for male (80.26%) and August for female (81.41%) corresponds to their onset of spawning time and post breeding period in female which might be the fact of further chance to spawn. Such variation in composition might be due to age and size differences^[23,34].

Results clearly indicated a marked fluctuation of protein in all the months both in male and female fishes. The minimum percentage of protein both in male and females were observed in the same month (February, 14.09 and 13.88%) which are the resting period of gonad of this fish. This is in agreement with Love^[35] who reported that

amino acid related to depletion at the end of spawning time to show the selection of materials for building up the gonads for further reproduction. However, in the case of protein content, the variation was not significant but less variation of protein might be influenced by their feeding and breeding capabilities^[11,34]. The protein cycle appears to be having a strong correlation with feeding and spawning reported in a number of fish species. Maximum protein values recorded in male and female during winter months and late autumn coincided with a period of intense feeding of this fish. This intense feeding perhaps is more in the months, i.e., immediately after spawning as the fish while spawning incurs energy expenditure along with the loss of gonadal elements and recoups to compensate the expenditure through vigorous feeding activity. Stansby^[10] made similar observations in the trout. The highest value of muscle protein was observed immediately after spawning. This might be due to the fact that while maturing and at the mature stage, most of the proteins might have been accumulated in the gonads and at the time of spawning. The gonadal elements get released either as eggs or sperm carrying the protein along with them. But immediately after spawning, as the gonad is in recovery stage and without any gonadal elements, the food that is consumed by the fish might have been used in the building up of the muscle. These observations confirm the earlier findings of Greene^[36] and Bruce^[37].

Love^[38] indicated that the availability of food at different time of the year has a considerable effect on the tissue component, particularly fat. As far as the nutritive value of the fish is concerned as given in Table 1 that body muscle contains more fat both in male and female before it starts spawning. During mature stage of the gonad studded with the lipid hence, the muscles contain less fat. Thus it was observed that fat content of muscle is less in the month of August for male (0.95%) and June for female (1.06%) during their spawning season. A little variation was also found on an average for the male (1.27%) and female (1.42%) that might be a function of age, sex, season, feeding habit etc.

There was no remarkable variation of ash and carbohydrate content found in the body muscle of freshwater gobi, *G. giuris* during the study period. The percentage of carbohydrate both in the male and female fishes follows the same pattern of fluctuation that of ash (Table 1). The above information clearly showed that the freshwater gobi, *G. giuris* is a 'low fat-high protein' fish. According to Stansby's^[6] classification moisture, ash and lipid in female fish are greater than those of the male fish (female > male) except protein and carbohydrate in male fish (male > female).

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