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Certain aspects of Reproductive Biology of *Glossogobius giuris* (Hamilton –Buchanan) from Upper Assam

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Abstract

The present study has been carried out from the fish landing sites of Brahmaputra River at Guijan Ghat and Hilika Ghat (downstream of Maguri beel), Tinsukia district of Assam during March, 2015 to February 2016. A total of 144 *Glossogobius giuris* specimens comprising of 94 males and 50 females were used for this analysis. Sexual dimorphism reveals that the males were straight, slender and pointed genital papilla and females were short, fleshy and circular genital papilla. The overall sex ratio (M:F) of the examined fish was recorded 1:0.53. Gonadosomatic ratio value for male was ranged from 0.2 ± 0.02 (December) to 0.81 ± 1.03 (May) and for female from 0.812 ± 0.08 (December) to 5.8 ± 0.01 (June). The average absolute fecundity was ranged from $5,124\pm 1342$ to 15289 ± 1245 and the relative fecundity from 631.03 to 931.69. The highest fecundity was observed in June and lowest in February. It reveals that the *G. giuris* has long spawning period from March to September and their peak being in June. The ova diameter was ranged from 0.12 to 0.50 mm and the average value of egg size was varied between 0.20 ± 0.04 (February) and 0.36 ± 0.13 mm (June-July). The size of the ova was gradually increase from February onwards and being peak in June.

Keywords: *Glossogobius giuris*, Reproductive biology, Spawning, Upper Assam

Introduction

Reproductive biology of fish is essential for evaluating the commercial potentialities of its stock, life history, culture practice and management of its fishery (Schaefer, 1998). The fish *Glossogobius giuris* a widespread species is recorded throughout the Indo- west pacific region and worldwide recognized as Tank Goby. *Glossogobius giuris* generally inhabits clear to turbid freshwater to estuarine habitats in rivers and streams with sand, gravel or rock substrate (Allen, 1991). Many workers studied on the different aspects of reproductive biology, food and feeding habit and length-weight relationship of *G. giuris* in relation to its size, sex and seasonal from Bangladesh and Pakistan (Bhuiyan and Haque, 1984; Islam, 2004; Islam and Joadder, 2005; Hossain *et al.*, 2016; Joadder, 2009; Hossain, 2014; Achakzai *et al.*, 2014; Achakzai *et al.*, 2015; Qambrani *et al.* (2015).

This fish is found both in lentic as well as lotic eco-systems in North East India and traditionally used as medicinal fish by certain communities. Unique taste, low fat content and high protein content gives a special place to this fish among other indigenous species. The species is widely considered as ornamental fish in the region and can also be found in the aquarium trade. However, different anthropogenic activities in aquatic ecosystems the species are suffering high depletion in its natural habitat. There is a few literature on the length-weight relationship and condition factor of *G. giuris* from the India and north-eastern Indian (Kaur and Rawal, 2015; Singh *et al.*, 2015; Das *et al.*, 2017). Recently, Sonowal *et al.* (2017) also investigated on the feeding biology of *G. giuris* from upper Assam. However, there is no comprehensive work so far on the reproductive biology of *G. giuris* from of north-eastern region of India as a whole. Therefore, the present investigation has been undertaken to obtain baseline information on different aspects of reproductive biology of *Glossogobius giuris* from Upper Assam, India.

Materials Methods

A total of 144 specimens of *Glossogobius giuris* (Figure 1) were collected from different fish landing sites of Brahmaputra River at Maguri Beel, Guijan Ghat and Hilika Ghat in Tinsukia district, Assam during March, 2015 to February 2016. Collected fish species were immediately preserved in 5 % formalin for further investigation. Fish specimen was measured for total length (cm) and weighed (g). After dissection of the specimens, the each gonad was weighed (g).

Sex ratio of the fish was compared following Fisher (1970). Gonado-somatic ratio (GSR) of the male and female was estimated separately by using the following method of

Biswas (1993), $GSR = \text{weight of gonad (g)} \times 100 / \text{total body weight (g)}$. On the other hand, the absolute fecundity was calculated as suggested by Grimes and Huntsmen (1980). It was obtained by using the following formula: $F = N \times G \cdot g^{-1}$. Where, F = fecundity, N= no. of eggs in sub sample, G= total weight (g) of ovary and g= weight (g) of the sub-sample. Similarly, relative fecundity was estimated by simply dividing the absolute fecundity with total body weight (g). The ova diameter progression was recorded monthly as described by Biswas (1993). It was calculated for each ovary as $OD = 1 \cdot n^{-1}$, whereas OD=ova diameter, n= number of eggs in 1 cm.



Fig. 1: Mature male of *Glossogobius giuris*

Results and Discussion

Sexual dimorphism and Sex ratio (male: female)

Sexual dimorphism of *G. giuris* is somewhat difficult to identify the sexes externally during young whereas in adult fishes it can be easily distinguished. Internally, the sexes of the fishes can be easily distinguished by dissection and examination of gonads. Mature females were found a pair of unequal ovaries in length and ripe ovaries with reddish in colour. The males were straight, slender and pointed genital papilla and females were short, fleshy and circular genital papilla. During breeding season, the pelvic fins of the mature and ripe females were slightly blackish in colour than the males. In overall, body yellowish-brown with some shine of gold on the sides. On the dorsal and flanks there are numerous blackish spots, forming large irregular spots.

The present study reveals that the overall sex ratio of the examined fish was recorded 1:0.53 (Table 1). The sex ratio of different month has showed wide variation from 1:0.2 (May) to 1:0.9 (March). Out of 144 fish specimens examined, 94 were males and 50 female. The sex ratio studies have been considered important in fisheries. Sex ratio of different months has shown that there was highly variation from the expected 1:1 ratio favoured by males in most of the months. The present finding was almost similar with the findings of Rao and Rao (2007) and Hossain (2014). Generally, a sex ratio of bisexual species is close to 1:1 (Swarup et al., 1972). The concept of 1:1 sex ratio was confirmed by Pathani (1978) in *Tor tor* and Jhingran and Khan (1979) in *Cirrhinus mrigala*.

Table 1: Monthly variation in sex ratio of *G. giuris*

Month	Males	Female	Total no	M%	F%	Sex ratio
January	7	4	11	63.63	36.36	1:0.57
February	7	3	10	70	30	1:0.43
March	10	9	19	52.63	47.36	1:0.9
April	19	11	30	63.33	36.67	1:0.58
May	10	2	12	83.33	16.67	1:0.2
June	6	2	8	75	25	1:0.33
July	8	2	10	80	20	1:0.25
August	4	3	7	57.14	42.85	1:0.75
September	7	3	10	70	30	1:0.43
October	6	4	10	60	40	1:0.67
November	6	4	10	60	40	1:0.67
December	4	3	7	57.1	42.8	1:0.8
Total	144	94	50	65.28	34.72	1:0.53

Gonadosomatic ratio (GSR): Monthly variation in GSR value of male and female was given in Table 2. GSR value for male was ranges from 0.2 ± 0.02 to 0.81 ± 1.03 and for female from 0.812 ± 0.08 to 5.8 ± 0.01 . The highest GSR for male was observed in May and for female in June whereas lowest for both sexes in December. The GSR value for both

sexes increases with the maturation of fish and gradually declining July onwards. The present observation was slightly contrasted with the findings of Islam (2004) as he opined that this species is a prolific breeder that bred throughout the year with a peak in August. This slight variation may be due to the physiological strain of maturity and other environmental factors of the habitat.

Table 2: Monthly variation in GSR of *Glossogobius giuris*

Months	Male	Female
January	0.35±0.15	0.88±0.49
February	0.48±0.21	1.94±0.48
March	0.67±0.8	3.78±2.8
April	0.71±0.15	4.3±1.5
May	0.81±1.03	4.6±0.42
June	0.61±0.01	5.8±2.01
July	0.36±0.033	3.0±1.32
August	0.36±0.04	2.7±2.1
September	0.24±0.48	2.0±1.85
October	0.23±0.04	1.3±0.46
November	0.23±0.03	0.9±0.36
December	0.21±0.02	0.81±0.08

Fecundity: A total 13 females were used for fecundity estimation and their total length ranged between 9.2±0.81

and 17.9±0.47 cm and body weight between 7.57±1.3 and 16.41±3.3 g. The average absolute fecundity was ranged from 5,124±1342 to 15289±1245 and the relative fecundity was ranged from 631.03 to 931.69 (Table 3). The highest fecundity was observed in June and lowest in February. The average length and weight of the highest fecund was recorded as 17.9±0.47 cm and 16.41±3.3 g respectively. The average length and weight of the lowest fecund was recorded as 10.4±0.81 cm and 8.12±1.4 g respectively. It was also noticed that the ovaries of equal size contained different number of ova. This may be due to the variation in environmental factors and availability of food items. It reveals that the *G. giuris* has long spawning period from March to September and their peak breeding being during April to August. The present observation was contrasted with the Hossain (2014) where the highest fecund of the *G. giuris* was found in August.

Table 3: Monthly mean variation of fecundity in *Glossogobius giuris*

Month	Total length (cm)	Body weight (g)	Ovary weight (g)	Absolute Fecundity	Relative fecundity
January	11.5±0.81	10.83±1.5	0.78±0.05	--	--
February	10.4±0.81	8.12±1.4	1.16±0.15	5,124±1342	631.03
March	13.6±1.4	12.37±4.4	1.58±0.34	9082±3748	734.2
April	15.3±1.9	13.86±5.8	1.38±0.08	12689±1042	915.51
May	15.2±1.8	15.53±7.3	2.39±0.15	14377±1101	925.76
June	17.9±0.47	16.41±3.3	3.96±0.17	15289±1245	931.69
July	15.5±1.2	14.67±1.4	1.39±0.12	12624±1584	860.53
August	14.9±0.69	13.13±1.3	1.63±0.11	11706±1173	891.55
September	14.3±0.36	9.65±1.4	0.94±0.8	7133±344	739.17
October	9.2±0.81	8.41±1.3	0.58±0.05	6048±397	642.72
November	9.4±0.81	7.57±1.3	0.42±0.05	--	--
December	10.4±0.81	11.46±1.2	0.57±0.05	--	--

Ova diameter and its morphology: The ova diameter of *G. giuris* was ranged from 0.12 to 0.50 mm (Table 4). The average value of egg size was varied between 0.20±0.04 (February) and 0.36 ± 0.13 mm (June-July). The size of the ova was gradually increase from February onwards and being peak in June. The ovary was yellowish colour, cylindrical shaped, almost equal size, double lobes lying in the body cavity and occasionally one lobe was larger than the other. The similar observation was also made by Qambrani *et al.* (2015).

Table 4: Monthly progression of mean ova diameter of *G. giuris*

Month	Ova diameter (Range)	Mean± SD
January	--	--
February	0.12-0.28	0.20±0.04
March	0.12-0.30	0.21±0.07
April	0.12-0.45	0.28±0.04
May	0.22-0.48	0.35±0.03
June	0.22-0.50	0.36±0.07
July	0.25-0.47	0.36±0.04
August	0.30-0.40	0.35±0.03
September	0.30-0.38	0.34±0.02
October	0.24-0.34	0.29±0.03
November	--	--
December	--	--

Conclusion

The present study concluded that the *Glossogobius giuris* is moderately fecund and spawning continues for a prolonged periods, extending from March to August. Based on the GSR, fecundity and ova diameter value, the breeding

period as well as spawning period of *G. giuris* was lies between March and July. This baseline information will be helpful for the fisheries management, future improvement and conservation of the species.

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