

Reproductive Biology of *Glossogobius giuris* (Hamilton), in Manchar Lake Sindh, Pakistan

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Abstract

The study was carried out to elaborate the reproductive aspects, including size at sexual maturity, reproductive season, reproductive potential, and egg size of *Glossogobius giuris* from Manchar lake, Sindh, Pakistan for the first time. Manchar lake is polluted lake, it is situated in district Jamshoro. The survey was conducted from February to December 2010. In total 335 specimens comprising of 159 females and 176 males were brought to the laboratory. Fish specimen were measured for total length (cm) and weighed (g) on digital balance. After dissection gonads of each specimen were weighed. Gonadosomatic Index was calculated as $GSI=(GW \times 100)/BW$; Ovaries were preserved for fecundity estimation. The total length of smallest and largest specimen observed was 9.5 cm-24.8 cm, respectively. First size at the sexual maturity of female *G. giuris* was observed 9.5 cm. Gonadosomatic Index of *G. giuris* was high from April to June. Fecundity of fish ranged between 7346.45 to 39750.45. The average fecundity of *G. giuris* was 24835.84 ± 10361.74 . Study revealed that fecundity of *G. giuris* in Manchar lake is not as high as in neighboring countries. Study also revealed that the species has single and short spawning season in Manchar lake.

Keywords: *Glossogobius giuris*; Reproductive biology; Manchar lake; Chotiari reservoir

Introduction

Gobies are originally marine species, which are still under the process of fresh waterization. Due to their marine origin still many freshwater gobies are observed to tolerate high salinity ranges.

Therefore large numbers of marine gobies are reported to inhabit in freshwaters.

Distribution range of *Glossogobius giuris* (Hamilton) is reported from freshwater and estuaries of Bangladesh, India, Pakistan, and Burma [1]. In Pakistan, the fish is reported in all types of freshwaters in warm areas [2]. This fish is also reported from Chotiari Reservoir [3]. Most of the published worked on biological aspects of *G. giuris* is from our neighboring countries [4-6]. Previously in Pakistan studies are available on growth and feeding habit of the species [7,8].

Gonadosomatic Index (GSI) is most useful tool in fisheries biology to determine the spawning season of spawning. Knowledge about Gonadosomatic Index and fecundity of any fish is important for understanding its life history, and evaluating the potential of its stock for commercial purposes. Furthermore, such knowledge is also needed for the sound management for the conservation of the Gupta and Shrivastava [9-12].

Materials and Methods

Fish samples for the current study were collected from Manchar lake over the period of one year from January 2010 to December 2010. The fish samples were carried in ice box to the laboratory, where further observations were made. In the laboratory fishes were sexed, body measurements for total length (TL) were carried out at centimetre scale (0.1 cm) with the help of measurement tap and weighed (g) using scale. Body weight were taken with the help of, later on fishes were gutted to check the gonadal statu/maturation.

Gonadosomatic index (GSI) was calculated with following formula

$$GSI = (Gw \times 100)/Bw;$$

Where Gw stands for gonadal weight and Bw for the body weight

Eggs size measurement made with the help of Trinocular Microscope (Nikon ECLIPSE E200).

Fecundity estimations were by gravimetric method

$$F = (Wss \times N/Gw) \text{ average of three sub.samples}$$

Wss = weight of subsamples

N= average number of eggs

Gw= Gonadal weight

Fecundity was estimated by taking three subsamples of equal weight from anterior, middle and posterior portions of the ovary. The counting of eggs was carried out Dissecting Microscope (KYOWA TOKYO).

Egg size was measured during each month, small piece of ovary was removed it was placed on slide, the sketches of eggs were made under Trinocular Microscope (Nikon ECLIPSE E200) and with the help of drawing tube.

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Results

A total 335 specimen comprising 159 females and 176 males were examined to determine the reproduction of *G. giuris*. Percentage of male and female population was 52.53% and 47.46% respectively. The smallest size of mature female was 9.4 cm (Table 1).

The fish exhibits clear sexual dimorphism, male were with straight, thin and pointed genital papilla while females were with short fleshy and circular genital papilla (Figure 1). Total length of smallest and largest female carrying the mature ovaries recorded 9.4 cm and 24.8 cm, respectively. *G. giuris* mature females were found with a pair of granular ovaries unequal in length and fully ripen ovaries were open in color. Based on the smallest size of female with the mature ovaries it can be said that first size of *G. giuris* at the sexual maturity was 9.4 cm.

Increase in Gonadosomatic Index was observed from February; however it peaked in the month of March and it also remained high from April and June, then after it declined from July to September (Figure 2). It shows that the fish has prolonged breeding period which persists from March to September in Manchar Lake.

Sex	No	Percentage	Minimum length	Maximum length	Mean ± STD	Confidence level
Male	176	52.53	9 (cm)	21.5 (cm)	15.34 ± 2.72	0.38
Female	159	47.46	9.4 (cm)	24.8 (cm)	15.44 ± 2.47	0.4

Table 1: Descriptive statistics on total length (cm) of *Glossogobius giuris* in Manchar lake, Sindh, Pakistan.

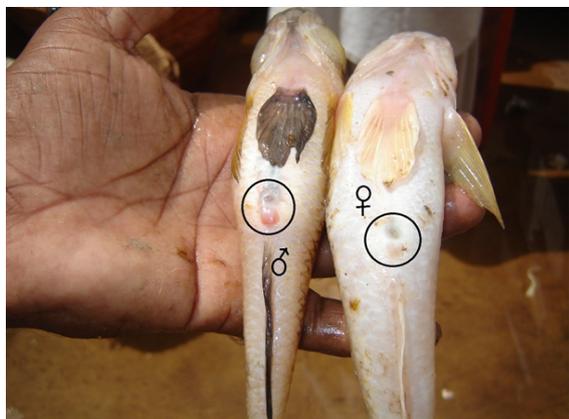


Figure 1: Both sexes of *Glossogobius giuris* showing distinct sexual dimorphism, males exhibiting prominent papilla.

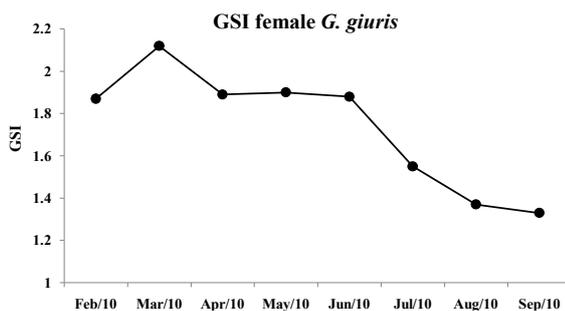


Figure 2: Monthly change in Gonadosomatic Index of *G. giuris*.

Total length (cm) mean ± STDEV	Total weight (g) mean ± STDEV	Gonadal weight (g) mean ± SD	Fecundity mean ± SD
17.32 ± 5.01	31.90 ± 10.11	1.77 ± 0.67	24835 ± 10361.74

SD=Standard deviation

Table 2: Mean and standard deviation of different body parameters and fecundity of *Glossogobius giuris* in Manchar lake.

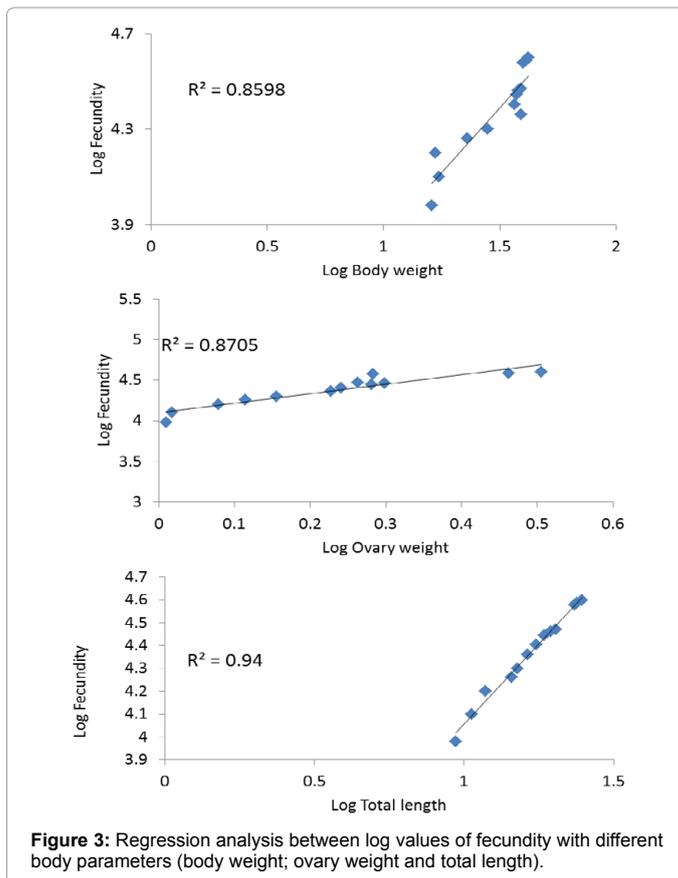


Figure 3: Regression analysis between log values of fecundity with different body parameters (body weight; ovary weight and total length).

For fecundity analysis total 13 females were used, their total length ranged between 9.4 cm to 24.8 cm. Fecundity of *G. giuris* ranged from 7346.45 to 39750.45. The average fecundity of *G. giuris* was 24835.84 ± 10361.74 (Table 2).

Regression analysis between log values of total length and fecundity, gonadal weight and fecundity and total weight and fecundity showed significant relationship. However, fecundity showed comparatively high correlation with total length and gonadal weight, respectively (Figure 3).

The eggs of *G. giuris* were very small and oval in shape, size ranged between 0.17 to 0.75 (mm) on their longitudinal axis, The average value of egg size was 0.36 ± 0.13 mm (Table 3).

Discussion

Glossogobius giuris exhibited distinct sexual dimorphism, male were found with thin and pointed genital papilla. External sexual dimorphism helps to study the reproductive biology of fishes, and life history traits it also support for determining morphological difference between populations [13]. In total 335 specimens were used to determine the reproduction of *G. giuris*. The study is based on large number of specimen, percentage of male and female population

Minimum	Maximum	Mean ± SD.
0.17	0.75	0.36 ± 0.13

Table 3: Mean and standard deviation of egg size of *G. giuris*.

(52.53% and 47.46%, respectively) indicating the dominance of female population which is considered as most observed phenomena is fishes and reported for many species by different authors [14].

Based on the size of smallest female carrying the mature ovaries (9.4 cm), this can be concluded that the maturity size of the fish in Manchar lake is 9.4 cm. Previously size of sexual maturity was estimated based on smallest egg bearing female by Soomro et al. [10].

Gonadosomatic index of *G. giuris* was higher from February to September it declined then after, suggesting that the species has single breeding season which last from April to July, previously single and prolonged breeding season for *G. giuris* was observed from Bangladesh in Payara river Bangladesh [12]. However in other study from Bangladesh same fish was reported to breed several times in a year [15].

Fecundity of *G. giuris* in the present study ranged between 7346.45 to 39750.45, previously similar fecundity for *G. giuris* was observed by Doha, (10760-29580), Although previously from the Payali River Bangladesh fecundity of same species was observed much high (88495 to 264104). Variations in fecundity of a same species in different environment are not exceptional case [12]. Such variations can be attributed to food availability, fish stock, maturity stages and other environmental factors [9,12]. Small sized fishes are reported to have matured earlier in smaller size class and they bear small sized eggs, low fecundity [16].

All the body parameters (total length, gonadal weight and body weight) showed better relationship with fecundity in the result of regression analysis, similar findings are reported by Roy et al. and Khan et al. [12,17]. Increase in fecundity with increase in total length is related with the growth in body, linear relationship between total length and fecundity is also much evident phenomena in fishes. Soomro Study revealed that *G. giuris* has single spawning season in Manchar lake, Sindh, with peak from April to June [10].

Conclusion

The study gives the first information regarding any reproductive aspect of the species from Pakistan. This basic information will be helpful for the fisheries management and conservation of the species.

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