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Estimation of Fecundity and Gonado Somatic Index (GSI) to Detect the Peak-Spawning Season of Dhela (*Osteobrama cotio cotio*)

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Abstract: Fecundity of 50 specimen of dhela *Osteobrama cotio cotio* was studied. The number of eggs varied from 512 (total length 2.20 cm and body weight 1.12 g) to 6849 (total length 5.7 cm and body weight 7.1 g). The mean fecundity was 3273 ± 1708 (mean body length 3.880 ± 1.216 cm and mean body weight 3.667 ± 1.82 g and gonad weight 0.605 ± 0.302 g). The fecundity was found to have a linear relation with body length, weight and gonad weight of fish and all these relationships were highly significant. The maximum GSI value (15.31) was found in the month of June, which indicated the period of maximum gonadal growth. A sharp drop in the GSI value (3.79) took place in September indicated the spawning occurred before September. However, the breeding season of dhela started in the monsoon month of early June and extended until September.

Key words: *Osteobrama cotio cotio*, fecundity, GSI and spawning season

Introduction

Of the 260 species of freshwater fishes in Bangladesh, over 110 species have been classified as small indigenous species (SIS). The SIS are generally considered to be those fish that grow to a length of less than 25 cm (Felts *et al.*, 1996) at maturity. Dhela is one of the SIS, which plays an important role in the diet as a source of minerals and vitamins essential for healthy growth and development of lactating mother. In addition to other nutrients, dhela is a source of vitamin A, calcium, iron, zinc and other micronutrients. According to Zafri and Ahmed (1981), dhela weighing 2.7 to 3.0 g and contains about 22 mg of retinol and 31 mg of dehydroretinol per 100 mg edible tissues.

The declining of dhela population in Bangladesh is taking place due to many factors especially over population, habitat destruction, over fishing and water pollution. These complex factors have altered the landscape and water flow, which in turn declined the fish stock in rivers, beels, haors, baors and flood plains by affecting fish migration, spawning and nursing ground. However, due to such problems, this specie is now under severe threat of extinction and so need to be put under cultured fishery. Fecundity among egg laying animals is the number of eggs produced by a female individual in a spawning season. Knowledge about fecundity of a fish is essential for evaluating the potentialities of its stocks, life histories, practical culture and actual management of the fishery (Lagler, 1956; Doha and Hye, 1970).

Introduction on the different aspects of biology of this species is very scanty. Ali *et al.* (1989) first gave some detailed account of the food feeding habit of this specie,

though the other biological aspects are still in dark. Considering its importance, an attempt was made to study the different aspects of spawning biology especially fecundity and GSI of this specie.

Materials and Methods

Dhela was collected from the lake of Bangladesh Fisheries Research Institute (BFRI) at Mymensingh. Then dhela was reared in the growing pond of the Field Lab of the Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

In order to carry out the fecundity study, 50 gravid females were studied during May to September, 2000. The enlargement of the abdomen of the female fish was used to recognize the gravid condition. Gravimetric method was used to determine the fecundity of dhela according to Dewan and Doha (1979). Rao (1963), Gupta (1968), Islam and Talbot (1968), Evans (1969), Doha and Hye (1970) and Shafi and Quddus (1978) found satisfactory results using the gravimetric method in estimation of fecundity of fishes.

The GSI study was undertaken in 1st May to 31st September, 2000. Ten individuals were sampled randomly in each month for GSI study during the entire experimental period and the GSI value was calculated from the ratio of total body weight and gonad weight. All the statistical analysis was performed using Microsoft Excel 97.

Results

The gonad of dhela was a bilobed fleshy structure occupying a large part of the abdominal cavity. Generally the lobes were unequal and elongated. The middle portion

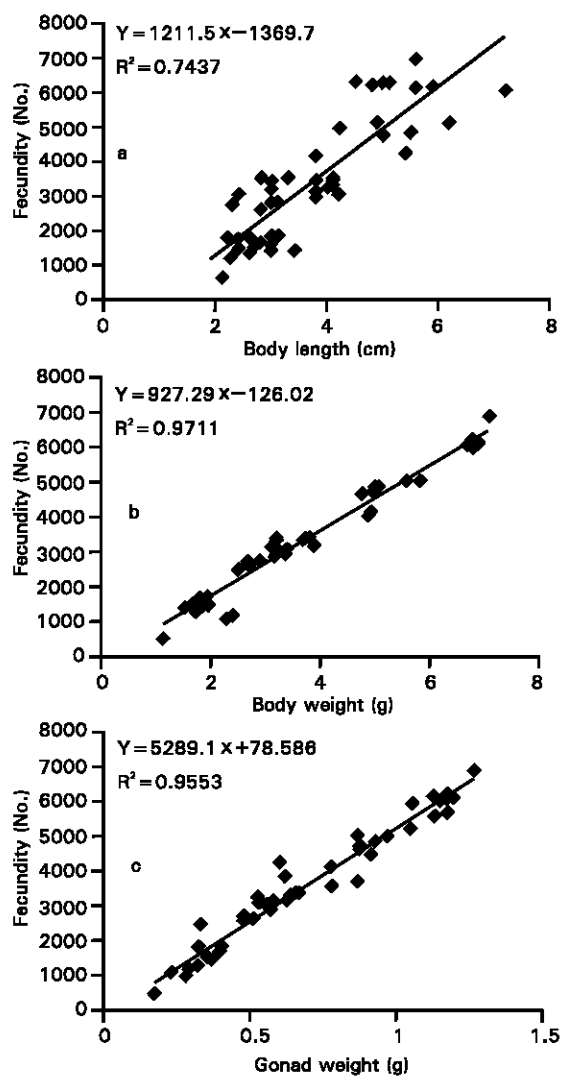


Fig. 1: Relationship between fecundity and a) length (cm), b) body weight (g) and c) gonad weight of dhela (*Osteobrama cotio cotio*)

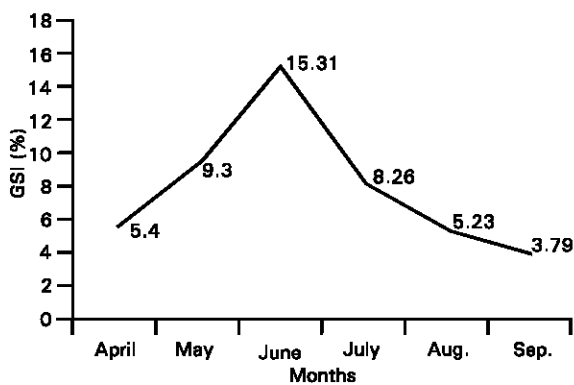


Fig. 2: Monthly changes in mean values of GSI in dhela (*O. cotio cotio*) during the spawning season

of the ovary was broader than the anterior and posterior regions.

In the matured ovary, the eggs were fully ripped and yellowish in colour with a lot of yolk. At this stage, the eggs become transparent and all look almost equal in diameter. The surface of the fully matured gonad was very smooth with a delicate black spotted covering. In matured ovaries, three types of egg categories i.e., immature, maturing and matured were found. The minimum and maximum weight of a matured ovary were 0.20 and 1.24 g, respectively. It has been observed that the ovaries changed their shape, size, colour and other morphological features in different stages of maturity in different months. Out of 50 specimens, during the study period, it was observed that the number of eggs varied from 512 (the total length 2.20 cm and body weight 1.12 g) to 6849 (the total length 5.7 cm and body weight 7.1 g). The mean number of eggs was 3270.44 ± 1755 for a fish with mean total length 7.47 ± 0.617 cm, mean body weight 5.334 ± 1.149 g and mean gonad weight 0.66 ± 0.369 g. The number of eggs increased linearly with the increase of body weight, body length and gonad weight. The mathematical relationships between fecundity and these variables were found highly significant ($P \leq 0.01$) (Figs. 1 a, b, c).

The maximum GSI value was found in the month of June (15.31) while minimum value was obtained in the month of September (Fig. 2). The ratio of male and female in the population was approximately 1:4.

Discussion

In this study, some variation was found in the fecundity of dhela of equal sized fish, which showed that a fish measuring 3.10 cm in total length (gonad weight 0.50 g) produced 3,079 eggs; where as another fish of the same length (gonad weight 0.37 g) produced 1740 eggs. This type of variation was also common in other fishes (Islam and Talbot, 1968; Doha and Hye, 1970; Afroze and Hossain, 1990; Islam and Hossain, 1990). This variation was found might be due to variable egg size, stages of maturity and month of the spawning.

The number of eggs was found to increase linearly with the increase in total length ($b = 1211.500$), body weight ($b = 927.290$) and gonad weight ($b = 5627.820$) which is supported by Shafi and Quddus (1978), Islam and Hossain (1990) and Kabir *et al.* (1998). All the relationships between fecundity and total length, body weight and gonad weight found to be highly ($P > 0.010$) significant. Significant relationships between fecundity and these variables were also reported by Shafi and Quddus (1978) and Das *et al.* (1989).

A comparison of the correlation coefficients of fecundity-total length ($r = 0.860$), fecundity-body weight ($r = 0.985$)

and fecundity-gonad weight ($r=0.977$) indicated that variation in fecundity can be explained better in terms of gonad weight and body weight than in terms of gonad length (Figs. 1 a,b,c). Shafi and Quddus (1974) reported the relationship between fecundity and gonad weight as the most significant than that of fecundity with others factors.

The GSI value was found in range from 3.790 ± 3.690 to 15.310 ± 2.620 in this study. The maximum GSI value was found in the month of June (15.310), which indicated the maximum gonadal growth. A sharp drop in the GSI value had taken place in September (3.79), which might have been caused by spawning. The ratio of male and female in the population was approximately 1:4. It attained sexual maturity at around 2.500 to 5.700 cm in total length.

As already mentioned, breeding commenced soon after the started of monsoon and continued until August with a peak in late June and early July. Monsoon rain and flood triggered the spawning activity in this species as amply evidenced during field studies. This result is supported by the findings of Afroze and Hossain (1990) who worked on another small species *Amblypharyngodon mola*.

Dhela is a high fecund SIS. Breeding took place at the start of the June and continued at the end of the September. The peak-spawning season of this species was the early June to late July. Shallow water bodies, raining and aquatic vegetation were found the main stimulating factors of breeding of this fish.

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