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Some aspects of biology of banded gourami, *Colisa fasciata* (Bloch and schneider 1801) in Jessore, Bangladesh

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Key words: *Colisa fasciata*, Food and feeding habit, maturity, Fecundity, Breeding season

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Abstract

The experiment was conducted to know some aspects of biology such as food and feeding habit, maturity size, breeding season and fecundity of the banded gourami, *Colisa fasciata* (Bloch and Schneider 1801) in Jessore region of Bangladesh during May, 2014 to April, 2015. Random samples were collected from different fish markets in Jessore and Jhenaidah districts. The males were larger in size and dominant over females. The gut status of the species was 48% empty, 23% ½ full and 29% full. Feeding intensity was low during April to July (spawning time) which increased afterward of January (post spawning). The gut in small size fishes was mostly empty and the food items increased with the increasing size. Various food items were encountered viz; Bacillariophyceae, Chlorophyceae, Balantideae, insect, mud and unidentified food materials. The alimentary canal was long and coiled and major food (48%) was plant materials which indicated that the fish is herbivore. The 50% of the females got maturity at 55-64 mm size class. The breeding period was March to September and fecundity was ranged from 360 to 865 with an average 744 ± 119. The findings could be used as baseline information for the management of the fish.

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Introduction

The banded gourami, *Colisa fasciata* (Bloch and Schneider, 1801) is one of 150 small indigenous species (SIS) of Bangladesh. It is locally known as "khoilsha" and has gained popularity for its good taste as well as nutritional value and high market price. Banded gourami is believed to have originated in Northern India and is presently distributed in South Asia (Jayaram, 1981; Talwar and Jhingran, 1991); also in Thailand and the Malay Peninsula as well as widely transported around the world (Welcomme, 1988).

In Bangladesh the fish is distributed all over the country wherever has fresh water. The fish is found in the swamps, ponds, ditches, marshes (Rahman, 1989) and the shallow margins of rivers covered with thick vegetation and weeds (Menon, 1999).

The fish has both food value as well as ornamental values (Goodwin, 2003). It is also a good predator of mosquito larvae for its small and feeble teeth in the mouth and buccal cavity. Though there was no data on population status, the fish is decreasing in the wild like other SIS due to tremendous loss of freshwater habitats in the country.

As the fish is hardy and can survive in foul water (Bhuiyan, 1964) it could be culture in almost all fresh water habitats in the country or impose better management system to enhance its production. The information on different aspects of biology such as food and feeding habit, maturity size, breeding season and fecundity are the prerequisites for both culture and fisheries management strategy.

There is no such study reported from Bangladesh water body except fecundity aspects of the species such as Banu *et al.* (1984) and Moniruzzaman (2006). However, there was some works on the biological aspects reported in India. Notably, Mitra *et al.* (2007) studied on biology and fishery of *C. fasciata* in a floodplain wetland of Ganga river basin, India. Sarkar and Deepak (2009) reported that the success on good scientific planning and management of any fish species largely depends on the knowledge of their biological aspects particularly food and feeding habits.

Maturity size is of special interest in fisheries management and is widely used as an indicator of minimum permissible capture size (Lucifora *et al.*, 1999).

Thus the present study was conducted regarding the biology of the natural population of the species mostly focusing on food and feeding habits, maturity size, breeding season and fecundity which could be act as the baseline information to manage or culture of this valuable species.

Materials and methods

Sample collection and preservation

A total of 201 specimens of banded gourami were collected randomly from six stations namely Monirampur (A1), Borobazar (A2), Chowgacha (A3) of Jessore district and Mohespur (B1), Barobazar (B2), Kotchandpur (B3) of Jhenaidah district (Fig. 1).

Samples were collected for a period of one year (May, 2014 to April, 2015) in each month from each station. Samples were taken from fish market which were collected nearby beel and baor and preserved in 10% formalin to prevent further digestion of food materials (Bhuiyan *et al.* 2006) and brought back to laboratory of the department of Fisheries and Marine Bioscience, Jessore University of Science and Technology, Jessore for further studies.

The habitual characteristics of the fish species collected from both districts have no variation as the distance of two districts is not much.

Food and feeding habit

Gut fullness

Gut fullness was assessed according to subjective scale described by Lebedev (1946) as empty, ½ full and full. The data have been used to calculate the monthly fullness index (F1) to determine the percentage of feeding intensity:

$$F1 = \frac{\text{No. of gut with same degree of fullness} \times 100}{\text{Total number of gut examined}}$$

Food items identification.

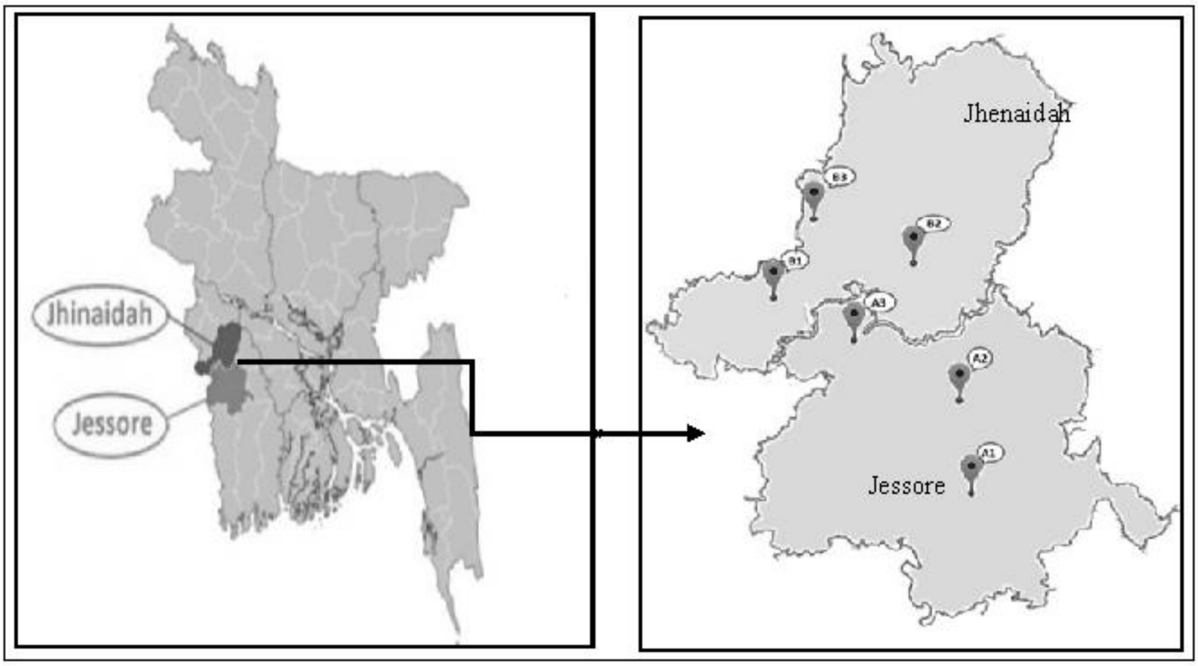

Fig. 1. Map showing the sampling substation (bold circle) of two districts; Jessore and Jhinaidah, Bangladesh. A1-Monirampur, A2-Borobazar, A3- Chowgacha of Jessore and B1- Mohespur, B2-Barobazar, B3-Kotchandpur of Jhenaidah district.

The gut of each fishes was dissected out and the contents were removed very carefully in a Petri dish and then diluted in distilled water for determining the different food items eaten by the fish under a photographic microscope (Model: Zeiss Primo Star). The food items were identified up to major taxonomic groups.

Maturity and the size at 50% maturity

In the present study mature females were denoted which has developed ovary with distinguishable eggs. Immature fish was that which were much younger or not fully developed ovary and the eggs could not be distinguished. The stage of female fish after spawning where the gonads have released their sperm or eggs are known as spent stage of fish.

Fish specimens were grouped into different length classes with interval of 10 mm. The length at maturity was determined directly by plotting the percentage of mature females against their length and the length at which 50% of the females were mature was considered as the length at maturity (Rao and Sharma, 1984; Suresh *et al.* 2006 and Mitra *et al.* 2007).

Fecundity

Fecundity was studied by examining 32 mature preserved ovaries. The gravimetric method was done by the following equation:

$$\text{Fecundity (F1)} = \frac{\text{No. of eggs in sub sample} \times \text{Gonad weight}}{\text{Weight of sub sample}}$$

(Source: Yelden and Avsar, 2000).

Later, by taking the mean number of three sub-samples fecundities (F1, F2, F3), the individual fecundity for each female was calculated by the following equation Fecundity $= \frac{F1+F2+F3}{3}$

Breeding season

The maturity stages of females were recorded monthly and plotting the percentage of maturity stage against different months. The breeding periodicity also developed on the basis of season.

Results

Food and feeding habit

Gut status

The status of gut fullness of the collected specimen was 48% empty, 23% ½ full and 29% full.

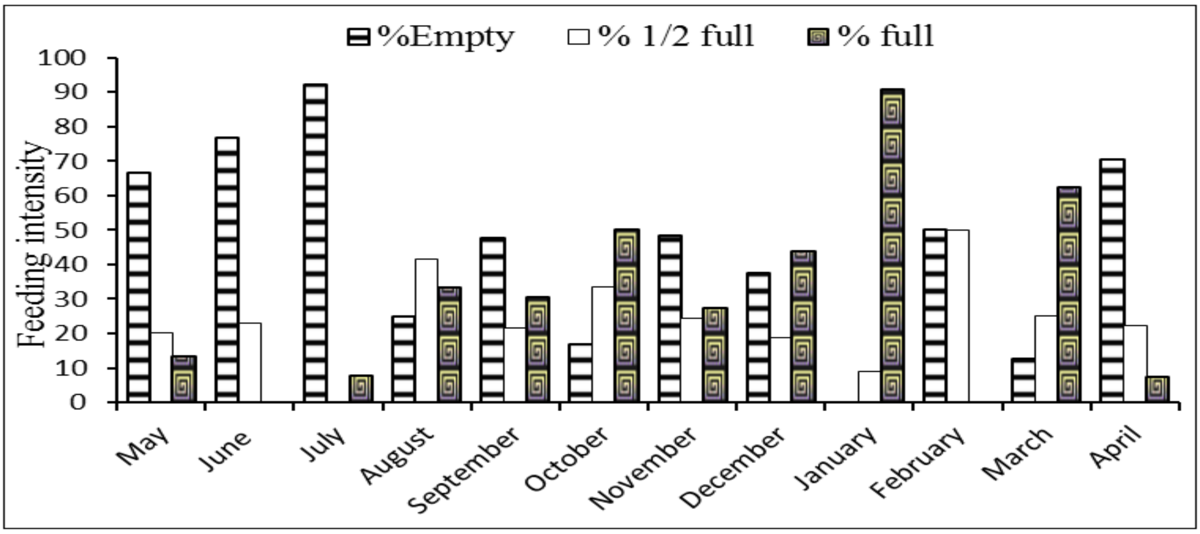

Fig. 2. Month-wise gut index of *C. fasciata* collected from different fish markets in Jessore and Jhenaidah districts during May, 2014 to April, 2015.

The feeding intensity was low during April to July which increased afterward in January (Fig. 2).

Food items and their abundance

The mouth of the fish is bordered by thick lips, the upper being protrudable and more pronounced in the female. Small and feeble teeth are present in the mouth and buccal cavity.

The intestine is long and coiled. The gut content analysis showed that the encountered food items were Bacillariophyceae, Chlorophyceae, Balantideae, insect, mud, and some unidentified food materials. Phytoplankton (Bacillariophyceae and Chlorophyceae) was observed as the most dominant (48%) food group of the fish (Fig. 3A).

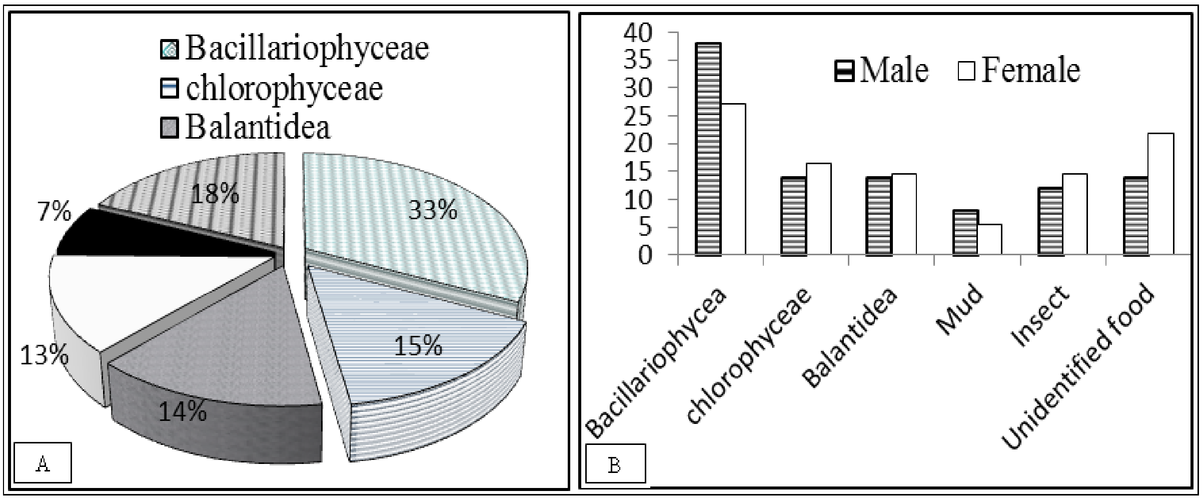

Fig. 3. Food items and their abundance of all individuals (A) and male-female (B) *C. fasciata* collected from different fish markets in Jessore and Jhenaidah districts during May, 2014 to April, 2015.

The feeding pattern in both sexes was almost same (Fig. 3B). In seasonal aspect, insect (29.63%) was most dominant food item in the gut during summer season (Fig. 4).

The feeding habits of the fishes in two districts were almost similar and bacillariophyceae was the main food item. The diet pattern in aspect of various size groups, it is showed different diet in different size.

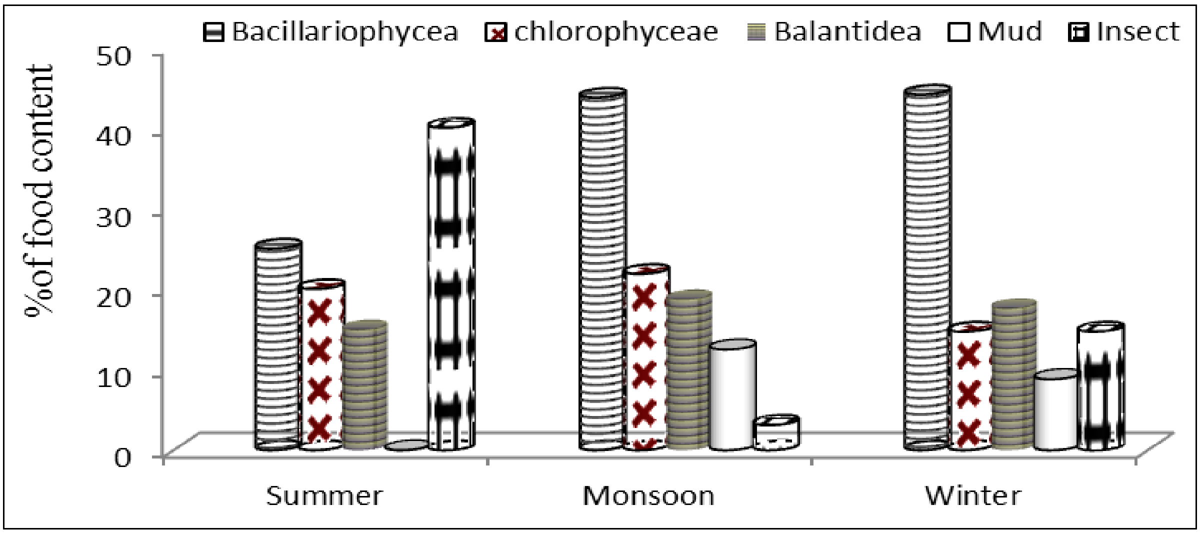

Fig. 4. Season-wise food items and their abundance of *C. fasciata* in Jessore and Jhenaidah districts.

The gut in small size fishes (juvenile) was mostly empty and the food items increased with the increasing size (adult). In the present study, adult was considered >55 mm in length as 50% females got maturity in 55-64 mm size group.

The bacillariophyceae was maximum (35.4%) in 75-84 mm size group. However, highest contribution in food materials was mud (57.14%) in size class 65-74 (Fig. 5).

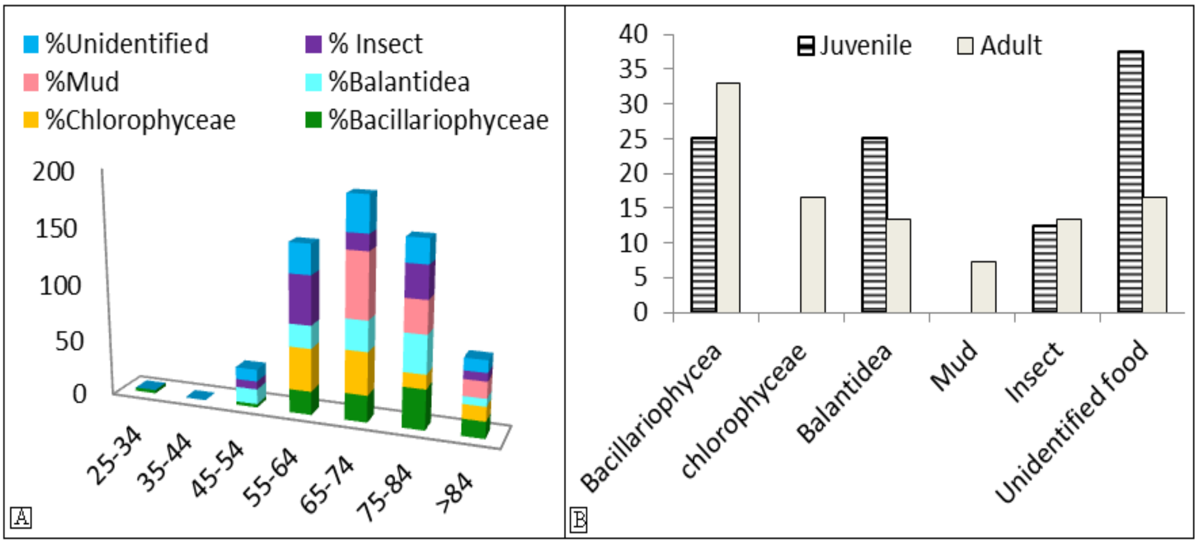

Fig. 5. Food items of *C. fasciata* in different size group (A) and juvenile and adult (B) collected from different fish markets in Jessore and Jhenaidah districts.

Size At 50% Maturity

Size at maturity in fish refers to the length or weight of the fish when it attains maturity or as defined by the minimal size at which 50% of the population reached maturity. The percentage occurrence of matured individuals was plotted against different size group in female and presented in figure 6.

It showed that the species started mature at the size group 25-34 mm in length while 50% of the females got maturity in the size group 55-64 mm or >55 mm in length (Fig. 6).

Breeding Season

It is noticed that the major breeding period of the fish was March to September due to maximum females were matured.

However, the month July could be peak breeding time as about 86% females were matured (Fig. 7). Most of the individuals were spent in winter (November to February). Virtually, fishes with immature and maturing gonads in all the year round indicated protracted breeding behavior. Thus the major spawning season of *C. fasciata* was March to September with peak breeding activity in July, i.e. in monsoon season.

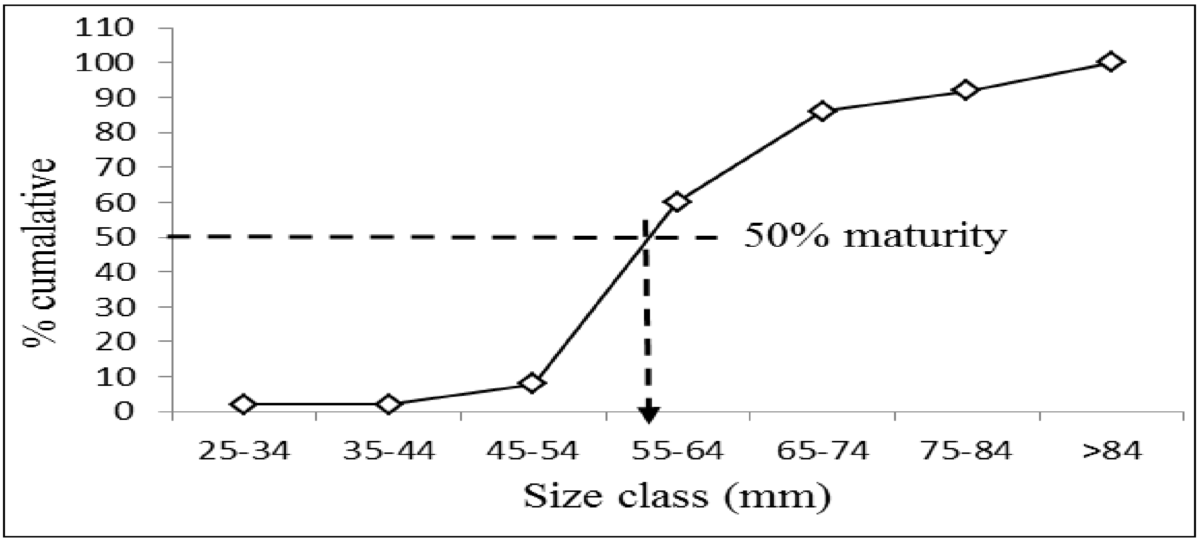

Fig. 6. Size at maturity (50% maturity) of female *C. fasciata* in different size class (mm) collected from different fish markets in Jessore and Jhenaidah districts.

Fecundity

The fecundity of *C. fasciata* was estimated on 32 females in the present study with a range of 360 to 865 eggs for a corresponding total length and body weight of the fish 33.6 mm, 3.52 gm and 89.8 mm, 16.47 gm, respectively. The mean fecundity was calculated 744± 119.

Discussion

Food and Feeding

The present study showed that most of the gut was empty (48%) in all season in both Jessore and Jhenaidah districts. The gut index of both sexes was empty during April to July and the maximum gut was full during the month of January which indicated high feeding intensity (Fig. 2). Mitra *et al.* (2007) reported that the low gut index during May to August and the most feeding intense period was in September to December which is more or less similar to the present findings. The alimentary canal of *C. fasciata* is long and coiled and the presence of maximum (>48%) plant materials or phytoplankton in the gut of the fish demonstrated its planktivorous or herbivorous nature which is supported by Mookerjee *et al.* 1946; Dasgupta, 2004 and Mitra *et al.* 2007 who reported the fish subsisted mainly on phytoplankton. While Das and Moitra (1963) was mentioned the species as a typical omnivore, feeding on almost equal quantities of plant (49.4%) and animal (44.6%) mater. These could be due to different habitat that insisted the animal bit different food materials. There was no variation in food items between two districts. Phytoplankton was the major food item in both districts. The diet pattern at various length group showed that there was no variation from smaller size to larger size fish. But in case of juvenile there was minute amount of food found and the food items increased with the increasing size of the individuals (Fig. 5).

Size at maturity

Mitra *et al.* (2007) reported that the length at maturity (50% maturity) of *C. fasciata* was 57 mm. In the present study 50% mature females was observed in the size group 55-64 mm (>55) in length which is close to the findings of Mitra *et al.* (2007).

Breeding Season

The present findings suggested the prolonged breeding period of the species from March to September which is similar to the findings of Mitra *et al.* (2007) in case of the fish from a floodplain wetland of Ganga river basin in India. However, particular limited time period mentioned by Banu *et al.* (1984) whom suggested only the months of March to April.

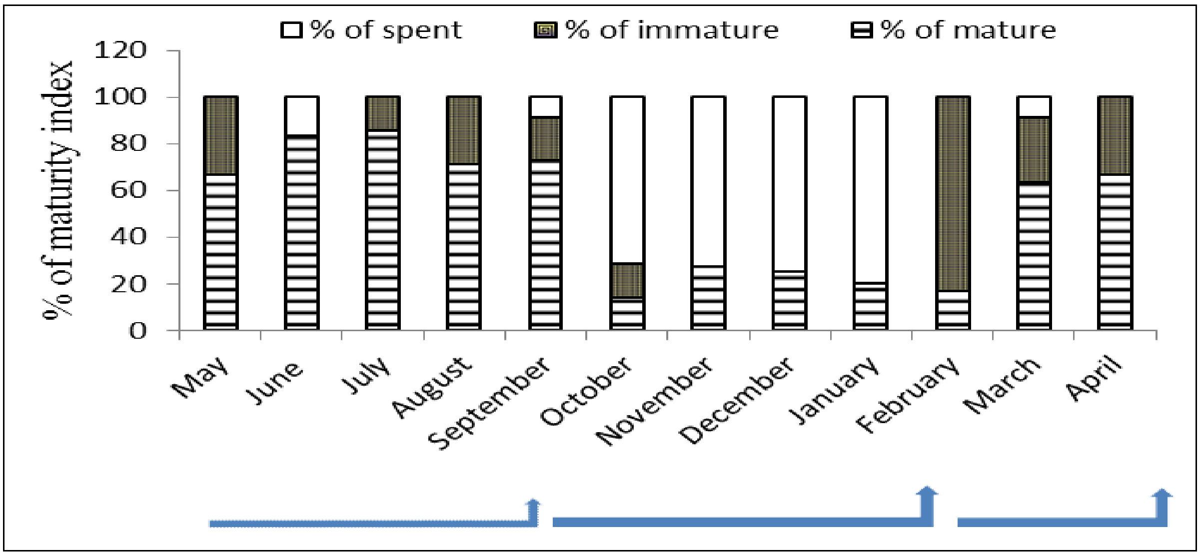

Fig. 7. Monthly variation in maturity index of *C. fasciata* collected during May, 2014 to April, 2015 from Jessore and Jhenaidah districts.

Fecundity

The fecundity of *C. fasciata* in the present study was lower than the other workers like Behra *et al.* (2005), Moniruzzaman (2006) and Mitra *et al.* (2007). The present findings estimated fecund 360 to 865 eggs while 599 to 5522 and 1095 to 19291 reported from Indian water by Behra *et al.* (2005) and Mitra *et al.* (2007) respectively. In respect of Bangladesh water body, Moniruzzaman (2006) calculated (an unpublished data) 1506 to 24091 which was also much larger than present findings. The size of the species which estimated fecundity was about 37-90 mm and about 4-16 gm in weight. While from Indian water body the size was 59-72 mm and 61-89 mm reported by Behra *et al.* (2005) and Mitra *et al.* (2007), respectively. So the lower fecundity of the fish could be due to getting early maturity of the fishes in the locality which also indicated population is under pressure. The smaller size fishes resulting smaller number of eggs. However, the variation in fecundity is very common in fish and is dependent on various factors like size, age, condition and types of the samples (Lagler *et al.* 1967). Variation of fecundity among the population also may result largely from selectively different environmental factors (temperature, sunlight, weather, etc.), of which temperature is considered the most probable selective factor (Jonsson and Jonsson, 1999).

Conclusion

C. fasciata is a herbivorous or planktivorous species which mostly like to take phytoplankton (Bacillariophyceae and Chlorophyceae). The fish attains sexual maturity at >55 mm in length and breeds during March to September. Closed fishing during breeding months would help in the conservation of the natural stock of the fish that consequences maximum possible yield. In conclusion, the present study provides baseline information on biological aspect of the species that will be useful for fishery biologist, managers and conservationist.

Acknowledgements

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