

INDUCED BREEDING OF *Labeo gonius* (HAM.) IN BANGLADESHQ. Z. Hossain^{a*} and A. S. Sarder^b^aEnvironmental Science Discipline, Khulna University, Khulna-9208, Bangladesh.
^bArabpur Fish Farm, Airport Road, Puratan Kashba, Jessore, Bangladesh.

KUS-02/21-150902

Manuscript Received: September 15, 2002;

Accepted: October 01, 2003

Abstract: *Labeo gonius* is a threatened species. It was successfully bred by PG (pituitary gland) injections at the Arabpur Fish Farm, Jessore. Three pairs of fish were collected from Brahmanbaria district and were transported to Jessore. After rearing for one month only one pair was induced to breed. The female (700g) was first injected with a dose of 2.5 mg PG/kg body weight. The second dose of 6 mg PG/kg body weight was administered 6 hours after the first dose. The male was administered a single dose of 2 mg PG/kg body weight 3 hours after the first dose was given to the female. Eggs and milt were stripped for fertilization 4 hours after the second dose of female. Hatching occurred after 18 to 19 hours at 27°C-28°C in a cemented conical bottom incubation jar with water flow of 0.3 l/sec. Fertilization and hatching rate of 87% and 81%, respectively were obtained. Yolk sac absorption occurred after 56-60 hours of hatching. A total of 500g (approx. 0.1 million) spawn of average length 7 mm was collected. Nursing of the spawn was done in a small pond measuring 0.065 ha. After 14 days of nursing they attained an average length of 34 mm and weight of 450 mg with 37% survival. Fry were thinned out by transferring two-third of the fry to another pond measuring 0.117 ha and were reared for 14 days. The survival of the fry in the first and second ponds was 74% and 78% , respectively and the length ranged from 44 mm to 46 mm after two weeks. The weight varied between 830 mg and 880 mg.

Key words: Induced breeding; *Labeo gonius*; Threatened species; Spawn.

Introduction

Labeo gonius (Ham.) is known as goni, ghainna, kurchi in Bangladesh. This fish is easily recognized by the reddish colour on its back, which becomes lighter on the two sides. Scales with dark margin appear to show dark longitudinal lines. Though the fish is available throughout Bangladesh but its supply is not abundant anywhere. So, the fish is enlisted as a threatened species in Bangladesh (Ameen *et al.*, 2000; Hussain *et al.*, 1996).

This minor carp, like other Indian carps, breeds in inundated rivers during the monsoon months. The species breeds only once in a year. Observations on the maturation indicate that the gonads begin to develop from October to November and mature fish become available from late March to August, with peak in May and June (Parameswaran *et al.*, 1974). The spawning habits of this fish have been studied by Khan (1924) and Ahamed (1936, 1944). Some observations on the induced breeding of *L. gonius* have been done by Parameswaran *et al.* (1970) and Bhuyan *et al.* (2000). Though few works have been reported in India, there is no systematic investigation in the field of breeding behaviour of this species in Bangladesh. The fish has a high market demand. So, the present study was undertaken to develop induced breeding technique in Jessore district where the fish has recently disappeared.

Materials and Methods

Three brood females and three males were transported to Jessore from a pond in Brahmanbaria district in 1997 and reared in a pond of the Arabpur Fish Farm in Jessore for a month. Out of three pairs, one pair (female 700g and male 600g) was selected for induced breeding. The female fish was given two doses of acetone dried pituitary gland (PG) - the first dose of 2.5 mg PG/kg body weight and the second dose of 6.0 mg PG/kg body weight 6 hours after the first dose. The male was given a single dose of 2.0 mg PG/kg body weight 3 hours after administering the first dose to the female. The acetone dried PGs were squeezed and dried well with blotting paper. After weighing the required amount of PGs was finely crushed with a tissue homogenizer and diluted with distilled water. Both male and female were kept in a hapa under a shower. Eggs and milt were collected separately by stripping the fish in plastic bowl 4 hours after administering the second dose to the female. The fertilized eggs were then placed in a cemented conical bottom incubation jar with water flowing of 0.3 l/sec. To determine the rate of fertilization, three samples were collected and observed under compound microscope after 3 hours of stripping. Transparent eggs with cell divisions were considered as fertilized, while the translucent eggs with milky colour were regarded as unfertilized. Three samples were taken to record the hatching rate. One hundred eggs were put in a small floating plastic cylinder (dia.10 cm) with a nylon mesh at the bottom and placed in cemented conical bottom incubation jar.

*Corresponding Author: Tel: 88-041-720171-3, Ext. 234; Fax.: 431244; e-mail: regekuly@btb.net.bd
DOI: <https://doi.org/10.53808/KUS.2002.4.2.0221-L>

Water temperature and Secchi disc reading were recorded daily at noon. The pH, total alkalinity and total hardness were measured at weekly intervals.

A total of 500g spawn (70 hours old) was stocked in a pond measuring 0.065 ha. The pond was limed with CaCO_3 at a dose of 250 kg/ha before the spawn was released. It was manured with cow dung and mustard oil cake at a rate of 1250 and 500 kg/ha, respectively. To kill the backswimmers a mixture of diesel (99%) and mortene oil (1%) was used after two days of manuring at a rate of 10 l/ha (Rajts *et al.*, 1997). Fry were fed with mustard oil cake @ 100, 50, 20 and 10% of body weight in the first, second, third and fourth week, respectively.

Results and Discussion

The period of spawning varied from species to species. It was found to depend on the physiological conditions (maturity of the gonads, fattening conditions and absorption stages) of the recipient fishes. In the present study out of three pairs of broods two pairs were found to be not suitable for induced breeding as eggs might have gone to the absorption stage probably due to transportation hazards. In case of *Labeo rohita* the non-response of fish to the injection might be associated with the absorption stage of the recipient (Rahman *et al.*, 1985). Mustafa *et al.* (1997) found better response in spawning of grass carp (*Ctenopharyngodon idella*) with PG. So, PG was used for induced breeding of *L. gonius* in the present study. The availability and low cost was also contributed in favour of selecting PG for the present experiments.

Bhuyan *et al.* (2000) reported that *L. gonius* successfully ovulated naturally at a temperature of 19°C to 21°C through intraperitoneal injection of pituitary hormone at the rate of 5.33 mg/kg for the first dose with an interval of three hours for second dose at the rate of 7.80 mg/kg body weight for both the female and male. It was necessary to strip out the eggs in the present study probably due to lower doses of hormone (2.5 mg and 6.0 mg/kg body weight). Eggs hatched out rather quickly (18-19 hours) in the present study probably due to higher temperature (27°C to 28°C) than the hatch out time (28 to 30 hours) reported by Bhuyan *et al.* (2000) at 19°C to 21°C. Fertilization of eggs were found to be 87% in the present study but Bhuyan *et al.* (2000) reported the same to be 70%. The probable reasons were full maturity of male in the study. Ananda (1973) reported the fertilization percentage of *L. rohita* to be 75-90%. Hatching percentage as obtained in the present study is almost similar to that of Bhuyan *et al.* (2000). Islam and Choudhury (1976) found better performance in respect of ovulation (60%), fertilization (76%) and hatching (60%) in case of *L. rohita*. Yolk sac resorption took place within 56-60 hours of hatching. Observation of the resorption of yolk sac was confirmed after horizontal movement of spawn was noticed in the incubation jar and feeding with boiled egg yolk merge was done. A total of 500g of spawn (approx. 0.1 million) were obtained from a single pair of fish (Table 1).

Water temperature, secchi depth, p^{H} , total alkalinity and total hardness of nursery rearing ponds of spawn are presented in Table 2. The water quality variables did not vary much. Water temperature was found to range from 28.5°C-34.2°C at noon. Water temperature was found to be slightly higher in P_1 probably due to higher stocking density. Water colour was always greenish with secchi disc reading ranging between 34 to 65 cm. The chemical variables viz., p^{H} , total alkalinity and total hardness were found to range from 7.6 to 8.3, 170 to 200 ppm and 140 to 160 ppm, respectively. However, all the variables were within the suitable range for fish culture as mentioned by Mumtazuddin and Khaleque (1987) specially for mrigal (*Cirrhinus mrigala*) rearing ponds.

The initial length of spawn was 7 mm in total length (after 70 hours of hatching). The density was 7.7 kg/ha in weight and 1.5 million/ha in number. After 14 days of nursing it attained an average length of 34 mm and weight of 450 mg with 37% survival. After thinning out the density of fry in the first and second ponds became 2.3 million/ha and 1.9 million/ha, respectively. It attained an average length 44 mm and 46 mm, and average weight 830 mg and 880 mg in another 14 days of rearing. The percentage of survival in first and second ponds was 74% and 78% respectively, (Table 3). The feed given to the ponds was based on the fish biomass of the pond. Published report on nursery of spawn and fry of *L. gonius* is rather scarce. Haque *et al.* (1993) reported the maximum survival at the lowest stocking density with a steady fall in the survival rate of the fingerlings with the increase in stocking rate in case of mrigal (*Cirrhinus mrigala*). Saha *et al.* (1988) also obtained higher survival in low stocking density in case of *Labeo rohita*. Kohinoor *et al.* (1994) also found higher survival in low stocking density in case of *Puntius gonionotus*.

Table 1. Details of the induced breeding of *Labeo gonius* using pituitary gland extract (PG)

Brood injected with PGs				Doses of PGs			Time between injection and spawning (hr)	Percentage of fertilization (%)	Time between fertilization and hatching (hr)	Percentage of hatching (%)	Production of spawn (g)
Number Female	Male	Weight (g) Female	Male	(mg/kg) Female	Male	Single					
1	1	700	600	First 2.5	Second 6.0	2.0	4	87	18-19	81	500

Table 2. Some water quality variables of the two spawn nursery rearing ponds (P₁ and P₂)

Week	Temperature (°C)		Secchi depth (cm)		p ^H		Total Alkalinity (ppm)		Total Hardness (ppm)	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
1st	29.0-33.0	-	34-52	-	7.8	-	190	-	150	-
2nd	29.0-34.0	-	37-48	-	7.6	-	180	-	140	-
3rd	29.5-33.0	29.5-32.5	38-56	37-61	7.7	8.1	170	200	140	160
4th	28.5-32.0	28.5-31.5	42-62	45-65	8.0	8.3	200	180	160	150

Table 3. Stocking density, growth attainment with survival of spawn/fry of *Labeo gonius* in nursery rearing ponds

Pond (ha)	Nursing period (1st 14 days) before thinning out						Rearing period (last 14 days) after thinning out					
	Stocking density		Growth attainment		Survival		Stocking density		Growth attainment		Survival	
	million/ha	kg/ha	Average length (mm)	Average weight (mg)	Total number	Percentage	million/ha	kg/ha	Average length (mm)	Average weight (mg)	Total number	Percentage
P ₁ (0.065)	1.5	7.7	34	450	37,000	37	2.3	104	44	830	9,126	74
P ₂ (0.117)	-	-	-	-	-	-	1.9	86	46	880	19,204	78

Conclusion

Fish stock particularly those dwelling in inland open waters, have gradually become endangered. Attempts to establish a protocol for the induced breeding of *L. gonius* in the present study are the first of its kind in Bangladesh. While there remains areas for further improvement with regard to effective brood management and optimization of pituitary doses, the results of the present study would undoubtedly play a significant role for future propagation and conservation of this highly valuable indigenous species as well as for the restoration of similar other endangered species of Bangladesh.

References

- Ahamed, N., 1936. Observations on the spawning habits of the carp, *Labeo gonius* (Day). *Proceedings of Indian Science and Congress*, 23 (3): 385.
- Ahamed, N., 1944. The spawning habits and early stages in the development of the carp, *Labeo gonius* Hamilton), with hints for distinguishing eggs, embryos and larvae of *Labeo gonius*, *Cirrhinus mrigala* and *Wallagonia attu*. *Proceedings of National Institute of Science, India*, 10 (3) : 85-98.
- Ameen, M., Islam, M. A. and Nishat, A., 2000. Red book of threatened fishes of Bangladesh. *IUCN - The World Conservation Union, Bangladesh*, xii + 116 pp.
- Ananda, J.N., 1973. Experiments on induced breeding of Indian major carps by pituitary hormone injection in Uttar Pradesh. *Journal of the Inland Fisheries Society, India*, 5: 37-45.
- Bhuyan, R.N., Ghosh, D., Kharbuli, S.M. and Sarma, D., 2000. Induced breeding of *Labeo gonius* at high altitudinal region Shillong, Meghalaya. *The Fifth Indian Fisheries Forum*, 17-20 January, 2000, CIFA, Kausalyaganga, Bhubaneswar 751002, India, AQ 3 : p. 1.
- Haque, M.Z., Rahman, M.A. and Hossain, M.M., 1993. Studies on the effect of stocking densities on the growth and survival of mrigal (*Cirrhinus mrigala*) fry in rearing ponds. *Bangladesh Journal of Zoology*, 21 (1) : 51-58.
- Hussain, M.G., Kohinoor, A.H.M., Akhteruzzaman, M., Rahman, M.A. and Mazid, M.A., 1996. Biodiversity of Small Indigenous Fish Species and FRI Research Activities for Production and Conservation. *Proceedings of National Workshop on small indigenous fish culture in Bangladesh*, 12 December 1996, Rajshahi University, Rajshahi, Bangladesh, pp. 45-55.
- Islam, M.Z. and Choudhury, A.Q., 1976. Induced spawning of major carp for commercial production of fry in the fish seed farm. *Bangladesh Journal of Zoology*, 4 (2) : 51-61.
- Khan, H., 1924. Observations on the breeding habits of some freshwater fishes in the Punjab. *Journal of Bombay National Historical Society*, 29 (4) : 958-962.
- Kohinoor, A.H.M., Haque, M.Z., Hussain M.G. and Gupta, M.V., 1994. Growth and survival of Thai punti, *Puntius gonionotus* (Bleeker) spawn in nursery ponds at different stocking densities. *Journal of the Asiatic Society of Bangladesh (Sci.)*, 20 (1) : 65-72.
- Mumtazuddin, M. and Khaleque, M.A., 1987. Observation on the relative growth potential of carp hatchlings in relation to fertilization and supplemental feeding. *Bangladesh Journal of Zoology*, 15 (1): 71-77.
- Mustafa, G., Das, M. and Huda, M. N., 1997. Induced spawning of grass carp, *Ctenopharyngodon idella* (Cuv. & Val.) . *Bangladesh Journal of Zoology*, 25 (2): 157-160.
- Parameswaran, S., Selvaraj, C. and Radhakrishnan, S., 1970. Observations on the maturation and breeding season of carps in Assam. *Journal of the Inland Fisheries Society of India*, 2 : 16-29.
- Parameswaran, S., Selvaraj, C. and Radhakrishnan, S., 1974. Observations on the biology of *Labeo gonius* (Ham.). *Indian Journal of Fisheries*, 21(1) : 54-75.
- Rahman, M.A., Dewan, S., Rahmatullah, S.M. and Das, M., 1985. Experiment of induced breeding of indigenous major carps, by pituitary hormone injection. *Bangladesh Journal of Aquaculture*, 6-7 (1) : 51-57.
- Rajts, F., Ahmed, K.K., Khan, A.M. and Kaiya, M.K., 1997. Pond management and controlled breeding of mola, *Amblypharyngodon mola* -a small indigenous fish species in Bangladesh. *Proceedings of National Workshop on small indigenous fish culture in Bangladesh*, 12 December 1996, Rajshahi University, Rajshahi, Bangladesh, pp. 71-78.
- Saha, S.B., Gupta, M.V., Hussain, M.G. and Shah, M.S., 1988. Growth and survival of rohu (*Labeo rohita* Ham.) fry in rearing ponds at different stocking densities. *Bangladesh Journal of Zoology*, 16 (2) : 119-126.