

with a view to knowing about the induced breeding techniques and practices in some selected hatcheries of Rajshahi in Bangladesh.

Materials and Methods

Data on induced spawning practices from 22 hatcheries under 6 Upazilas of Rajshahi District were collected during

the period from March to December, 2009 (Table 1). Two public and 20 private hatcheries scattered over Paba, Puthia, Mohonpur, Durgapur, Bagmara and Bagha Upazilas were surveyed. For the study, a survey schedule was prepared and the data of induced spawning practices in the hatcheries were collected from the District and Upazila Fishery Offices by direct interview methods. The data were then scrutinized carefully, summarized and analyzed statistically.

Table 1. Name and addresses of the hatcheries under study in Rajshahi District.

Hatcheries	Names	Locations in Upazilas
1*	Rajshahi Matshow Beej Utpadon Khamar	Paba, Thana-Boalia
2	Mashud Matshow Hatchery	Paba, Thana-Rajpara
3	Anand Matshow Hatchery	Paba, Thana-Boalia
4	Sarkar Matshow Hatchery	Paba, Thana-Rajpara
5*	Puthia Matshow Beej Utpadon Khamar	Puthia
6	Mullata Hatchery	Puthia
7	Shuvo-Irin Matshow Prokolpo Hatchery	Puthia
8	Atique Matshow Hatchery	Puthia
9	Duivai Sonali Matshow Hatchery	Mohonpur
10	Faisal Agro Fisheries	Mohonpur
11	Merina Matshow Hatchery	Bagmara
12	Bani Matshow Hatchery	Bagmara
13	Bahi Bhai Matshow Hatchery	Bagmara
14	Monika Hatchery	Bagmara
15	Manchur Matshow Hatchery	Durgapur
16	Amagachi Carp Hatchery	Durgapur
17	Bhai Bon Matshow Hatchery	Durgapur
18	Inni Matshow Prozonon Khamar	Durgapur
19	Ibne Salam Matshow Hatchery	Durgapur
20	Zahid Matshow Hatchery	Durgapur
21	Sarker Matshow Hatchery	Durgapur
22	Seba Agro Company Ltd.	Bagha

*Government hatcheries.

Results and Discussion

Selection of brood fishes for spawning: According to the length, age and weight of the brood fishes, the appropriate species were selected in the hatcheries (Table 2). Length of the fishes varied around 42-73 cm, age between 1.96 and 3.08 years and weight between 1.87 and 7.54 kg. Khan (1943), Islam and Chowdhury (1976), Penman and McAndrew (1998) emphasized the role of proper species selection of brood fishes for successful induced spawning. The present results corroborate with those of Bhuiyan *et al.* (2008) who demonstrated that induced spawning of *Labeo rohita* was dependent on selecting healthy brood fishes.

Inducing agents for induced breeding: Mainly two types of inducing agents *viz.* pituitary gland (PG) and the human chorionic gonadotropin (HCG) were used in the hatcheries under survey. PG was used for all fishes except the silver and bighead carps where HCG was used. For the 1st and 2nd doses, PG of 1 to 4 mg/kg and 4-10 mg/kg,

respectively, were applied. On the other hand, 150-500 IU/kg HCG were applied only as the 1st dose (Table 3). Fontenel (1955), Atz and Pickford (1959), Das and Khan (1962), Chaudhuri (1976), Crim and Evans (1976), Mirza *et al.* (1993), Verdia (1994) and Alam and Bhuiyan (1999) also adopted similar practices for induced breeding in various fishes. It was found that fishes with correct dose of hormone injection spawned under artificial condition and gave good results. According to Ahmed (1945) PG influenced the spawning of *L. rohita*. In agreement with the present doses Khan (1938), Alikunhi *et al.* (1960), Haque (1975), Chaudhuri (1977), Moitra and Sarker (1970), Khan *et al.* (1992), Mahanta *et al.* (1998) and Bhuiyan *et al.* (2008) used similar doses for induced spawning in common carps.

Incubation and hatching: The incubation period of different fish species was found to range between the minimum of 10 and the maximum of 72 hours and the rate of hatching in different hatcheries ranged between 55% and 80% (Fig. 1). These findings are similar to the observations of Alikunhi *et al.* (1964), Ali (1967) and Singh *et al.* (2000).

Table 2. Species-, length-, age- and weight-wise selection of brood fishes for spawning in Rajshahi.

Type	Common names	Scientific names	Length (cm)		Age (year)		Weight (kg)	
			Min	Max	Min	Max	Min	Max
Native species	Rui	<i>Labeo rohita</i>	45.72	76.2	2	3	2	8
	Catla	<i>Catla catla</i>	63.5	88.9	3	5	3	15
	Mrigel	<i>Cirrhina mrigala</i>	45.72	76.2	2	3	2	8
	Calibaush	<i>Labeo calbasu</i>	30.48	50.8	2	3	2	5
	Bata	<i>Labeo bata</i>	17.78	22.86	1	2	0.4	1
	Gonia	<i>Labeo gonius</i>	45.72	96.52	1.5	3	1.5	10
Exotic species	Silver carp	<i>Hypophthalmichthys molitrix</i>	45.72	81.28	2	3	2	8
	Bighead carp	<i>Aristichthys nobilis</i>	50.8	101.6	2	3	2	8
	Grass carp	<i>Ctenopharyngodon idella</i>	50.8	88.9	3	4	3	7
	Common carp	<i>Cyprinus carpio</i>	40.64	63.5	3	4	2	7
	Thai pangus	<i>Pangasius sutchi</i>	43.18	96.52	1	2	1.5	12
	Rajputi	<i>Puntius gonionotus</i>	20.32	30.48	1	2	0.5	1.5
Total			500.38	873.76	23.5	37	21.9	90.5
Mean±SD			41.70 ± 13.02	72.81 ± 25.98	1.96 ± 0.75	3.08 ± 0.90	1.83 ± 0.79	7.54 ± 3.92

Table 3. Hormonal doses used in different brood fishes for induced spawning in Rajshahi.

Common names of fishes	Hormonal doses			
	1 st doses of PG (mg/kg) and HCG (IU/kg)		2 nd doses of PG (mg/kg)	
	Minimum	Maximum	Minimum	Maximum
Rui	1.25	2.5	6	8
Catla	1.25	3	5	8
Mrigel	1	3	5	8
Calibaush	1	3	4	8
Bata	1	4	4	8
Gonia	1	3	6	8
Silver carp	150*	500*	6	8
Bighead carp	150*	500*	6	9
Grass carp	1	3	4	8
Common carp	1	3	4	8
Thai pangus	2	2	6	10
Rajputi	1	4	4	8

PG = pituitary gland; HCG = Human chorionic gonadotropin; *values for HCG doses only.

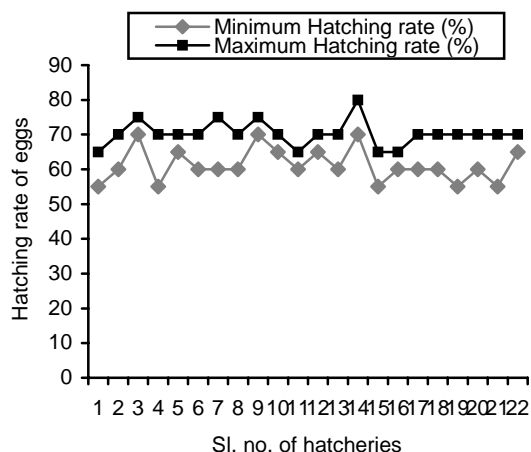


Fig. 1. Hatching rates of eggs in different hatcheries under study.

Conclusion

Six native and six exotic fish species were used by the surveyed hatcheries for induced spawning. The average length of the brood fishes was 41.70±13.02 to 72.81±25.98 cm, age 1.96±0.75 to 3.08±0.90 years and weight 1.83±0.79 to 7.54±3.92 kg in which PG and HCG were used. The 1st doses of PG varied from 1 to 4 mg/kg but the 2nd doses ranged between 4 to 8 mg/kg and 4 to 10 mg/kg for the native and exotic species. Whereas only the 1st dose of HCG is used for exotic species, that varied between 150 and 500 IU/kg. The hatching rate of the studies fishes ranged between 55% and 80%. The present study thus gives a brief account of induced spawning practices in 22 hatcheries from 6 Upazilas in Rajshahi District of Bangladesh.

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References

- Ahmed MK. 1983. Induced breeding of Indian major carps, Chinese carps and catfish. *Freshwater Fish Research Station Chandpur, Bangladesh*. pp. 44-52.
- Ahmed N. 1945. Factors influencing the spawning of Indian carps. Symposium of the "Factors influencing the spawning of Indian carps". *Proc. Nat. Inst. Sci. India*. 11(3): p. 329.
- Alam AKMA. 1983. Low cost hatchery. *Adam News* 10(L): 27-33.
- Alam MM and Bhuiyan AS. 1999. Determination of the optimum PG dose for induced spawning of *Labeo rohita* (Hamilton, 1822). *Univ. j. zool. Rajshahi Univ.* 18: 103-108.
- Ali MH. 1967. Induced breeding of major carps in ponds by pituitary hormone injection, *Agric. Inform. Serv.* Dhaka, pp. 23-26.
- Ali ML. 1998. Fishery resources development and management technique. *Fish week 98 compendium*. Department of Fisheries, Ministry of Fisheries and Livestock, Government of the Peoples Republic of Bangladesh, Dhaka, pp. 1-10.
- Alikunhi KH, Sukumaran KK, Parameswaran S and Banerjee SC. 1964. Preliminary observations on commercial breeding of Indian carps under controlled temperature in the laboratory. *Bull. Cent. Ind. Fish. Res. Inst. Barrackpore*. 3: 20.
- Alikunhi KH, Vijayalakshman MA and Ibrahim KH. 1960. Preliminary observation on the spawning on Indian carps, induced by injection of pituitary hormone. *Ind. J. Fish.* 7(1): 1-19.
- Atz JW and Pickford GE. 1959. The use of pituitary hormones in fish culture. *Endeavour*. 18(71): 125-129.
- Bhuiyan AS, Islam MK and Tanjeena Z. 2007. Induced spawning of *Puntius gonionotus* (Bleeker). *Bangladesh J. Zool.* 35(2): 245-249.
- Bhuiyan AS, Musa ASM and Islam MK. 2008. Some observations on the induced spawning of *Labeo rohita* (Hamilton; 1822) by pituitary hormone injection. *Bangladesh. J. Life Sci.* 20(1): 89-94.
- Chaudhuri H. 1976. Uses of hormones in induced spawning of carps. *J. Fish. Res. Board. Can.* 33: 940-947.
- Chaudhuri H. 1977. Experiments on induced spawning of Indian carps with pituitary injections. *Ind. J. Fish.* 7(11): 20-24.
- Crim LW and Evans DN. 1976. Gonadotropic hormone treatment of rainbow trout (*Salmo gairdneri*) Plasma hormone profile following a single injection. *J. Fish. Res. Board Can.* 33: 2841-2844.
- Das SM and Khan HA. 1962. The pituitary and pisciculture in India with an account of the pituitary of some Indian fishes and review of techniques and literature on the subject. *Ichthyobiologica* 1: 43-58.
- DoF (Department of Fisheries) 2009. Fishery wealth of Bangladesh(in Bengali). *Jatio matshow shaptaho, 2009 (Shonkolon)*, Department of Fisheries, Ministry of Fisheries and Livestock, Govt. of People's Republic of Bangladesh. pp. 105-111.
- Fontenel O. 1955. Injecting pituitary (hypophyseal) hormones into fish to induce spawning. *Prog. Fish. Cult.* 17(2): 71-75.
- Haque KA. 1975. Some observations on the induced spawning of major carps by pituitary hormone injection. *Freshwater fish. Res. Sta. Chandpur. Bull.* 1: 19-33.
- Hossain DG and Siddiqui AB. 2009. Present status of hatcheries and fish production of Rajshahi. BSS, Rajshahi, Bangladesh. p. 2.
- Islam MZ and Chowdhury AQ. 1976. Induced spawning of major carps for commercial production of fry for fish seed in Bangladesh. *Bangladesh J. Zool.* 4(2): 51-61.
- Khan H. 1938. Ovulation in fish (Effect of administration of anterior lobe of pituitary gland). *Curr. Sci.* 7(5): 233-234.
- Khan HA. 1943. Observation on the spawning behaviour of carps in Panjab. *Proc. Nat. Inst. Sci. India* 11(3): 315-320.
- Khan HA, Gupta SD and Tania MS. 1992. A new method to induced spermiation, ovulation and spawning by hypophysation in the Indian major carp *Labeo rohita*. *J. Aquacult. Trop.* 7(2): 143-150.
- Mahanta PC, Rao KG and Pandev AK. 1998. Induced spawning of an Indian major carp, *Labeo rohita* in the same breeding season under the agroclimatic conditions of Assam. *J. Adv. Zool.* 19(2): 99-101.
- Mirza ZS, Naik IU and Bhatti MZ. 1993. Induced spawning of Indian major carps using carp pituitary homogenate and human chorionic gonadotropin in the Punjab (Pakistan). *Proc. Pak. Cong. Zool.* 12: 423-428.
- Moitra SK and Sarker SK. 1978. On the potency of the pituitary gland extract in relation to spawning in an Indian fresh water carp. *Cirrhina mrigala* (Ham.) *Zool. Anz. Jena. Zool.* 314: 275-282.
- Penman DJ and McAndrew BW. 1998. Practical aspects of selection and fitness of stocked fish. *FAO-Fisheries-Technical-Paper* No. 374: 223-233.
- Singh BN, Das RC, Sahu AK. and Pandey AK. 2000. Balanced diet for the brood stock of *Catla catla* and *Labeo rohita* and induced breeding performance using ovaprim. *J. Adv. Zool.* 21(2): 92-97.
- Verdia HK. 1994. Advancement of maturity with HCG in Indian major carps. *J. Aquat. Biol. Fish.* 1(1): 1922.

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