

Fish Seed Producing Hatcheries in Southern Bangladesh: An Overview

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Abstract: An investigation was conducted to measure the present status and problems of fish seed producing hatcheries by interviewing hatchery owners, hatchery operators and fish farmers during the period of January to December, 2016 at the Patuakhali Region, Southern Bangladesh. Study revealed that most of the hatchery owner (40%) collected brood fish from the WorldFish, Halda River and Kuakata Sea contributed 20%, Padma and Meghna River contributed 10% respectively. Different types of species such as *Labeo rohita*, *Gebalion catla*, *Cirrhinus cirrhosis*, *Hypophthalmichthys molitrix*, *Cyprinus carpio* *Pangusius hypophthalmus*, *Oreochromis mossambicus* were chosen for induced breeding by using Pituitary gland, Human chorionic gonadotrophin, Ovaprime, Ovitide, Ovaline, Flash for carp Species and 17 α , methyl testosterone. The main hatchery operator as technician was present in 70% hatchery where 30% had no technician. About 80% hatcheries were free from deformities where 20% faced some problem in their fry due to rickets, viral disease and some fungal disease of Pangas fry. Annual production was 3165 kg fry, 178.50 Lakh fingerling, 14.63 metric ton culture able fish and 3.63 metric ton was large size fish. The total cost ranged from USD 8333.33 to 128205.13 and profit ranked from USD 5128.21 to 192307.69. Majority buyers (50%) were farmer where 30% were Depot owner and 20% Fry trader. The highest percentages of problems were faced by Harun Fish Hatchery because of their lower management system where Chanchal Hatchery was well developed. During the period of study, it was observed that the production of fish seeds is not sufficient than production capacity due to various problems. Lack of brood pond and capital was identified as critical problem in the study area by likert scale technique. This creates insufficient brood stocking which increase the chance of mating of closely related individual. To improve management practices and regular replenishment of high-quality seed for brood stock, recommendation should be followed through participatory approaches with hatchery owner, farmers, traders, government agencies and NGO stakeholders.

Key words: Present status • Hatchery • Brood fish • Seed • Constraints • Patuakhali • Bangladesh

INTRODUCTION

Fisheries sector is one of the foremost components of agricultural activities in Bangladesh and plays a vital

role in nutrition, employment creation and income generation, particularly in the socio-economically weaker communities of fishermen, which represents the poorest sections of the society in many developing countries

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[1-9]. This sector directly contributes 3.57% in the national Gross Domestic Product- GDP [10]. Aquaculture is the part of fisheries which firstly started in Bangladesh with natural seed but now it is almost entirely (99.55%) replaced by hatchery produced seed [11]. Since 1975, artificial fish breeding techniques and low-cost hatchery designs have been successfully adjusted in Bangladesh [12, 13]. There are 926 (102 are government hatchery) fish hatchery in Bangladesh [10]. For good aquaculture practice (GAP), use of quality seed in fish farm plays vital role for higher production & good return. The demands of fish seeds for aquaculture are met up by Private hatcheries 98.42%, Govt. hatcheries 1.19% & Natural sources 0.40%. Aquaculture of Bangladesh absolutely depended on natural sources of fish seed during sixties and early seventies. By the time being, natural sources have been declined due to the climate change, habitat destruction and degradation of ecological balance [14-17]. So, hatchery is now the main source of fish seed production. Hatcheries in Bangladesh faces problems related to negative selection of brood stock, indiscriminate hybridization and inbreeding, but the problems and how they are specially related to seed quality and seed performance, have not been rigorously

and comprehensively investigated. For this reason, hatchery owners, nursery operators, fry traders and stakeholders face economic loss to some extent.

Patuakhali district is the main entrance for the beach of Kuakata adjacent to the Bay of Bengal which located in the South-western Bangladesh. Only one public hatchery and 9 private hatcheries are present in this district. But the present time few private hatcheries are closed due to Lack of effective regulation for quality control in hatchery operations and seed trade/distribution. As a result, reduced growth, high mortality, poor fecundity, disease susceptibility of seeds and breeds has been observed. Present investigation was conducted to know the production and hatchery management of hatcheries in Patuakhali District.

MATERIALS AND METHODS

Study Area: The study was conducted at different hatcheries (carps and prawns) in Patuakhali district (Fig. 1) since January 2016. There were 10 hatcheries in Patuakhali district and the study was investigated from the all existing hatchery. The full name of these hatcheries with owner name and locations are given in Table 1.

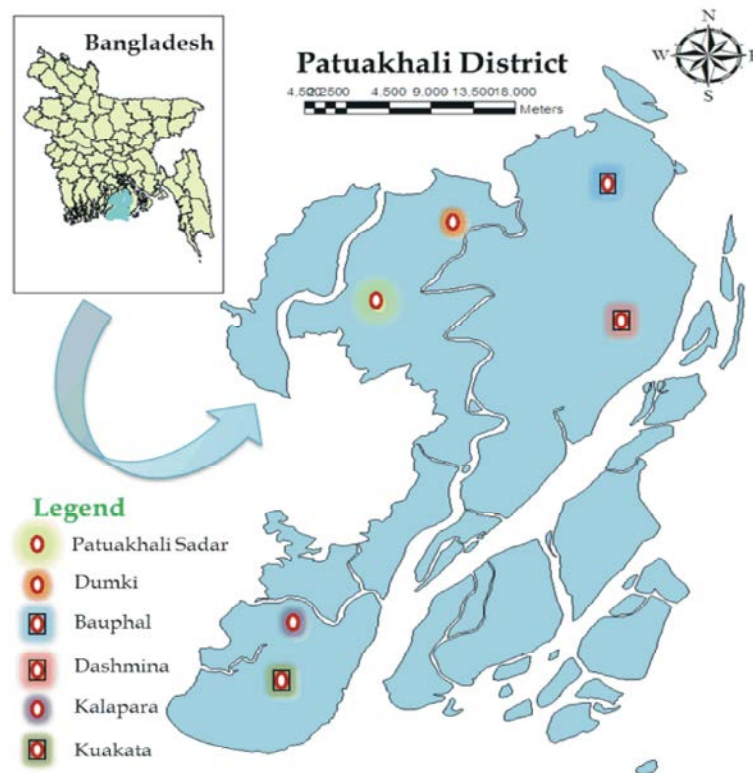


Fig. 1: Geographical location of the hatcheries in Patuakhali District, Bangladesh

Table 1: Name and address of the hatcheries in Patuakhali district

Name of Hatchery	Name of Hatchery owner	Address
1. Government Hatchery (GH)	Matshobez Uthpadhon khamar (In charge)	Durgapur, Patuakhali Sadar
2. Bay of Bengal Hatchery (BBH)	Md. Abdus Salam	Baliatali, Kalapara
3. Harun Fish Hatchery (HFH)	Harun Maghi	Nizampur, Kalapara
4. Kuakata Galda Hatchery (KGH)	Md. Siddiqur Rahman	Kuakata, Kalapara
5. Ananda Barir Galda Hatchery (ABGH)	Md. kholilur Rahman	Kuakata, Kalapara
6. Alipur Galda Hatchery (AGH)	Hazi Abdul Hossain	Alipur, Kalapara
7. Chanchal Fish Hatchery (CFH)	Chanchal Biswas	Madhabpura, Bauphal
8. Mehedi Fish Hatchery (MFH)	Md. Mehedi	Dhulia, Bauphal
9. Paritosh Mandal Fish Hatchery (PMFH)	Paritosh Mandal	Laxmipur, Dashmina
10. Pacific Aqua Farm (PAF)	Baker Gazi	Pungasia, Dumki

Data Collection: Present investigation was conducted by primary data collection through personal interview and focus group discussion. Data were assembled through field survey at the area by using a structural questionnaire based on the methods of Focus Group Discussion (FGD), Participatory Rural Appraisal (PRA). Key Informant Interviews (KIIs) was conducted with the personnel from DoF; Senior Upazila Fisheries Officer and district Fisheries Officer.

Data Analysis: After collection of data from the field, data were verified to eliminate errors and inconsistencies then the data were tabulated into computer. MS Excel 2010 was used to store and graphs obtained from different types of data.

Likert scale¹⁷ with values of 4, 3, 2 and 1 was stable to determine constraints faced by hatchery owner in the study area. In this way, the hatchery owner was enquired to rate their constraint as “very critical” “critical” “to some extent critical” and not “critical”. The variable mean score of 2.5 was used to ascertain whether the factor in question was critical or not. The variables with mean score of 2.5 and above were considered critical while variable with less than 2.5 were not.

RESULT AND DISCUSSION

Hatchery Status: There were 10 hatcheries in Patuakhali district including 7 carp hatcheries and 3 prawn hatcheries (Table 1). It was found that 4 hatcheries produced only carp, 1 hatchery produced carp with Thai Pangas, 2 hatcheries produced carp with tilapia and 3 hatcheries produced prawn PL (Fig. 2). Study revealed that technician was involved with 7 hatcheries where 3 had no technician (Fig. 3).

Existing Facilities: Present study recorded maximum number of brood stock pond (4), Circular tank (2), Rectangular tank (12), Overhead tank (3) and Nursery

Pond (7) from Chanchal Fish Hatchery followed by another hatchery (Table 2). Comparatively Harun Hatchery (1), Mehedi Fish Hatchery (2), Paritosh Mandal Hatchery (2) and Pacific Aqua Farm (2) were used very poor number of brood stock pond. Present findings showed more or less similarity with findings of Sabuj *et al.* [18]. These numbers of ponds are not satisfactory for stocking large number of broods. This inadequate brood stocking facilities increase the chance of mating between closely related individual in the brood stock ponds [19]. Others proper were also not satisfactory in the studied area like Circular tank (0-2), Rectangular tank (2-12), Hatching jar (8-16), Overhead tank (1-3) and Nursery Pond (2-7). In case of prawn hatchery maximum number of holding tank (6), hatching tank (24), larvae rearing tank (20), artemia incubation tank (6), brine Storage tank (4), mixing tank (4) and overhead tank (4) were recorded from Alipur Galda Hatchery followed by Kuakata Galda Hatchery and Ananda Barir Galda Hatchery (Table 3).

Sources of Brood Fish: For successful breeding it is necessary to select proper brood fish [20-21]. Hatchery owner collected brood fish from distinct sources like Halda River (20%), Padma River (10%), Meghna River (10%), Kuakata Sea (20%) and World fish (40%) to ensure good quality seed (Fig 4).

Age, Weight and Operation Season of Selected Brood Fish: Age and Weight of broods vary from species to species. In Patuakhali the hatchery owners used the same brood for 3-5 years. Minimum age and weight of the broods for successful spawning is shown in (Table 4). Age of fishes were ranges between 1-6 for male and 1-3 for female where weight of fishes was ranges between 50 gm - 4 kg for male and 50 gm - 5 kg for female which collaborate with Bhuiyan *et al.*, findings [22]. Operation season differ from species to species, native carp spawn March to August where catfish spawn April to July (Table 4).

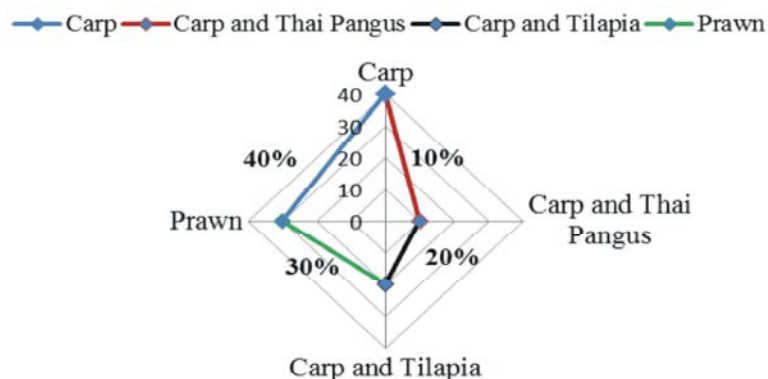


Fig. 2: Percent value of hatchery status in Patuakhali district

Table 2: The present situation of Carp hatchery in Patuakhali district

Sl.No.	Name of hatchery	Carp hatchery proper (Number)					
		Brood ponds	Circular tank	Rectangular tank	Hatching jar	Overhead tank	Nursery Pond
1	GH	3	1	6	10	1	2
2	BBH	3	1	5	8	1	3
3	HFH	1	0	2	8	1	2
4	CFH	4	2	12	12	3	7
5	MFH	2	1	7	9	1	2
6	PMFH	2	0	5	12	1	3
7	PAF	2	1	2	16	1	3

Table 3: The present situation of Prawn hatchery in Patuakhali district

Sl.No.	Name of hatchery	Prawn hatchery proper (Number)						
		Holding tank	Hatching tank	Larvae rearing tank	Artemia incubation tank	Brine Storage tank	Mixing tank	Overhead tank
1	KGH	4	20	10	5	4	4	3
2	ABGH	2	8	6	3	3	2	2
3	AGH	6	24	20	6	4	4	4

Table 4: Age, Weight and Operation season of selected brood fish in Patuakhali district

Type	Name of the species	Season	Age (Years) (Minimum)		Weight (kg) (Minimum)	
			Male	Female	Male	Female
Native	Rui	March to August	2	2	2.5	4
	Catla	March to August	3	3	4	5
	Mrigal	March to August	2	2	2.5	3.5
	Tilapia	March to September	1	1	300 gm	300 gm
	Koi	March to June	2	2	300 gm	200 gm
	Shing	April to July	2	2	50 gm	100 gm
	Magur	April to July	3	3	300 gm	400 gm
	Pabda	April to July	2	3	50 gm	50 gm
	Gulsa	April to July	2	2	90 gm	150 gm
Exotic	Pangus	April to July	2	2	4	5
	Silver carp	May to August	2	2	2.5	4
	Mirror carp	January to October	2	2	2.5	2
	Grass carp	March to October	2	2	3	5
	Thai Puti	March to June	6	1	300 gm	400 gm

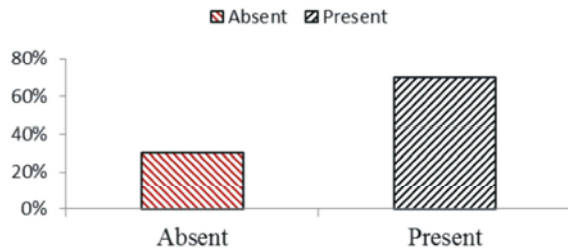


Fig. 3: Percent value of technician involved in hatchery operation

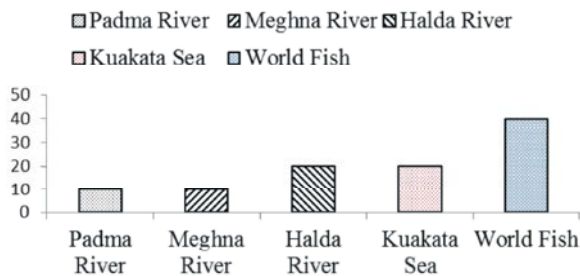


Fig. 4: Sources of brood fish in the hatchery

Inducing Agents for Induced Breeding: The hatchery owners mainly practiced induce breeding. They used stimulants to enhance breeding. They used PG (Pituitary gland), HCG (Human chorionic gonadotrophin), Ovaprime, Ovitide, Ovaline and Flash for carp Species. They also used 17α , methyl testosterone (sex reversal hormone) to produce mono-sex tilapia. At first the broods were kept in rearing tanks for 4-7 hours. After completing the first dose the broods were kept rest again for 3-6 hours. Then the second dose was administrated. After 6-8 hours of the second dose, the broods become ready to spawn. Then the eggs and sperm were collected and mixed. The fertilized eggs were kept in hatching tank for hatchling. After 18-24 hours the fertilized eggs were hatched. The hatchery owners reared the new hatchling for 70-72 hours. They fed the hatchling nothing at the time. The total activities were performed with the involvement of skilled technicians in the hatchery. Doses of PG with interval time and ovulation period are given in 5 which were maintained in the hatchery of Patuakhali district. The findings of the present study are thus almost in similar with the results of the other districts in Bangladesh [23-30].

Seed Production and Cost-Profit of the Hatchery: At present, aquaculture is fully dependent on hatchery produced fry. Hatchery produced fry and fingerlings are supplied to the different parts of Bangladesh from the

Patuakhali region. In comparatively among all the carp hatcheries, Chanchal hatchery produced highest amount of fry (1000 kg/ year) and the Pacific aqua farm produced lowest amount of fry (25 kg/year) in Patuakhali region. The Kuakata Galda hatchery produced highest amount of PL (100 lakh /year), the Alipur Galda hatchery produced lowest amount of PL (38 lakh/year) (Table 6). More or less similar observation was found in the study of Islam *et al.* [31]. In aspect of Patuakhali, Fish fry production in the hatcheries is a profitable business. The cost of production was the major determining factor for net earnings in fish fry production. Among surveyed 10 hatcheries the total cost ranged from USD 8333.33 to 128205.13 and profit ranked from USD 5128.21 to 192307.69 (Table 6).

Buyer of the Fry from Hatchery: Present Study represented that 50% buyer was farmer (Fig. 5) followed by depot owner (30%) and fry trader (20%).

Status of Deformities and Disease of Fry: The hatchery owner was very much careful to avoid inbreeding. They used the brood from different sources for spawning purpose. Among the visited 10 hatcheries, it was found that 8 hatcheries were free from deformities and disease in their fry and 2 hatcheries faced some problem in their fry due to rickets, viral disease and some fungal disease of Pangas fry (Fig. 6).

Problems Faced by the Hatchery Owners: Practice of health management is the key to success in any types of hatchery operations. Present study sorted various types of problem related to hatchery management from the Patuakhali district. Most of the hatchery owners faced some technical, economic and social problems. Hanif Fish Hatchery was faced the highest percentages of problems because of their poor facilities and lower management system. The problems faced by the hatchery owners were lack of skilled person, lack of brood ponds, Insufficient water in dry season, Drainage system, lack of credit, lack of marketing facility, theft, joint partnership, taking lease of pond and flood. Present investigation revealed that the hatcheries were insufficient number of circular tanks, rectangular tank and hatching jar. In hatchery, a minimum number of rectangular tank and hatching jar are essential and one circular tank must be needed for quality seed production. Fewer numbers of tanks and jars directs the lower optima which are important with regard to creating genetic concerns.

Table 5: Hormonal doses and ovulation period for different types of fish in Patuakhali district

Species	First dose of PG (mg/kg)	Interval (hrs)	Final dose of PG (mg/kg)	Ovulation (hrs after final dose)
<i>Labeo rohita</i>	Female	1	3	4
	Male	-	-	1
<i>Catla catla</i>	Female	2	3	4
	Male	-	-	2
<i>Cirrhinus cirrhosus</i>	Female	1	3	5
	Male	-	-	1
<i>Hypophthalmichthys molitrix</i>	Female	1	3	4
	Male	-	-	1
<i>Cyprinus carpio</i>	Female	1	3	4
	Male	-	-	1
<i>Pangusius hypophthalmus</i>	Female	2	6	5
	Male	-	-	1

Table 6: Production of the hatcheries in Patuakhali district

Sl.No.	Name of hatchery	Annual Production				Cost-profit analysis (1 USD=78)		
		Fry (kg)	Fingerling (Lakh)	Fish (Metric ton)	Others (Metric ton)	Sales (USD)	Cost (USD)	Profit (USD)
01.	GH	9	10	11	12	21794.87	10256.41	11538.46
02.	BBH	620	5	-	-	26282.05	15948.72	10333.33
03.	HFH	520	2	-	-	17948.72	9282.05	8666.67
04.	KGH	-	100 PL	-	-	320512.05	128205.13	192307.69
05.	ABGH	-	40 PL	-	-	107692.31	56410.26	51282.05
06.	AGH	-	38 PL	-	-	97435.90	48717.95	48717.95
07.	CFH	1000	5	8.09	2.02	31025.64	21153.85	9871.79
08.	MFH	600	3	4.04	1.61	14897.44	8333.33	6564.10
09.	PMFH	400	0.50	1.50	-	15384.62	10256.41	5128.21
10.	PAF	25	25	1	-	42307.70	19230.77	23076.92
	Total	3165	178.50	14.63	3.63	695281.3	327794.88	367487.20

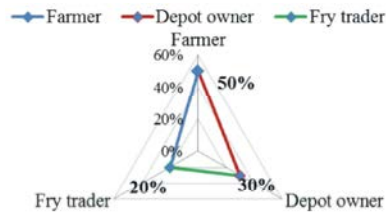


Fig. 5: Percent contribution of buyer from hatchery in Patuakhali district

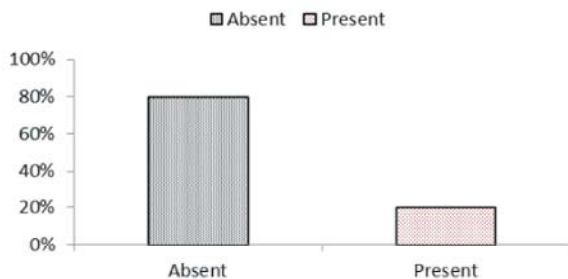


Fig. 6: Percent value of deformities in the hatchery

However, Present study documented lack of brood pond as the main problem where lack of credit was identified as second problem (Table 7). Islam *et al.* [31]

observed several types of problems like lack of technological knowledge, lack of credit, joint partnership, taking lease of pond, flood and insufficient water in dry season from Jessore district which support the present findings.

Prospectus of the Hatchery: Fish is considered as the essential food item for the people of Bangladesh and this demand for fish is increasing with the increasing of population. Aquaculture mainly depends on the availability of fry and fingerlings. People of Bangladesh enforced to aquaculture due to export value, employment opportunity and to get protein. Hatchery produced seeds fulfill this demand through supplying seeds in any month of the year. In the present time aquaculture is fully depended on hatchery produce seeds. But it has been claimed that, the hatchery produced fry are not of good quality. Considering this hatchery owner of Patuakhali district always tried to produce and supply good quality seeds.

There are the prospects of fish seed producing hatcheries in The Patuakhali district, Bangladesh as to satisfy the demand of fish for increasing population,

Table 7: Constraints faced by the hatchery owner in the Patuakhali district recorded during the present study

Constraints	To sum				Scores	Points	Remarks
	Very critical	Critical	Extinct critical	Not critical			
Lack of skilled person	2	2	3	3	23	2.3	Not critical
Flood	1	1	3	5	18	1.8	
Insufficient water in dry season	0	3	2	1	21	2.1	
Drainage system	0	1	3	6	15	1.5	
Lack of credit	1	5	2	2	25	2.5	Critical
Lack of marketing facility	0	0	2	8	12	1.2	
Theft	0	0	3	7	13	1.3	
Joint partnership	1	0	4	5	17	1.7	
Taking lease of pond	1	4	1	4	22	2.2	
Lack of brood pond	3	4	2	1	29	2.9	Critical

fish production should be developed through hatchery produced fry, fallow water body can be stocked by hatchery produced fry, hatchery will be developed through fisheries research, to protect endangered fish species, artificial breeding process should be operated in hatchery, Joblessness problem can be solve through hatchery development and Bangladesh can earn foreign exchange by exporting hatchery produced fry.

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Significance Statement: This study highlighted the present status of the fish seed producing hatcheries in the Patuakhali District, Bangladesh and the valuable measures for overcoming from the existing problems or limitations.

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