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Full Length Research Article

Present Status of the Fish Seed Producing Hatcheries in the Jessore Region, Bangladesh

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ABSTRACT

An investigation was conducted on the hatchery owners during the period from May to September, 2012 to know about the present condition and find out the problems of the fish seed producing hatcheries in the Jessore Region, Bangladesh. Training status of the hatchery owner's show that in maximum cases they had no training. Funding source was self and loan, land ownership was own and lease. In the study, the maximum number of brood ponds, segregation ponds, circular tank, rectangular tank and hatching tank used by the Rupali fish hatchery was 11, 4, 1, 20 and 30 respectively. Most of the hatchery provides a manager and some assistants but have no skilled person. During the period of survey, the major management problems found in Shamim fish hatchery. The hatchery owners did not keep the record of the history of origin of brood and not followed the proper sex ratio for artificial breeding. For these reason, the factors that are liable to create inbreeding or negative selection in the seed produced in the hatchery. The highest seed production was found in Rupali fish hatchery (1500 kg/year) and the lowest production was in Shamim fish hatchery (600 kg/year). As Jessore contributes fifty percent of total fry and fingerling production in Bangladesh, therefore, the stakeholders should focus on the trade issues, fish fry production; otherwise fish supply would be interrupted as a whole.

Key words: Present status, Hatchery, Fish seed production, Jessore and Bangladesh.

INTRODUCTION

Bangladesh is an agricultural country (Banglapedia, 2012). Fisheries sector is one of the major components of agricultural activities and plays a vigorous role in nutrition, employment, income generation and foreign exchange earnings. It is also well recognized for nutrition supply and employment generation of rural population as well as for foreign exchange earning in Bangladesh (Ali *et al.,* 2014). This sector directly contribute approximately 4.37% of the country's Gross Domestic Product (GDP), however, the indirect contributions from gross agricultural income are estimated at 23.37% (DoF, 2013). The availability of fish seed is an essential prerequisite for fish culture. The main sources of fish seeds in Bangladesh are spawn produced in government and private hatcheries, and some collected from rivers. In 2012-2013, the number of government fish hatcheries or fry production farms was 936 but most of them are private fish hatcheries (DoF, 2013). Jessore is one of the richest districts of Bangladesh in respect of its vast, diverse and unique fisheries resources in the form of physical, biological and others.

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In Jessore district the numbers of public and private hatcheries are present. But now few private hatcheries are closed. Nowadays due to the degradation of ecological balance, natural resources of fish seeds are destroyed. So, hatchery is now the main source of fish seed production. The term "Hatchery" is considered in broadest sense as a facility where fish fry and fingerlings suitable for stocking in growth ponds are produced in artificial manner by the process of induced breeding technique. Induced breeding is a technique whereby ripe brood fishes are stimulated by treating them with inducing agents to breed in captivity. The stimulation promotes a timely release of eggs and milt from ripe breeders. It is now used as a widely accepted means of artificial propagation to overcome constraints in fish seed supply particularly for species that do not breed in captivity. With the success of fish seed production through induced breeding and the increasing demand for quality fish seed for aquaculture practices, the government of Bangladesh established a number of hatcheries in public sector in different parts of the country. In addition to production of fish seed, these public sector fish seed farms acted as centers of technology transfer and trained a large number of private entrepreneurs who were interested in establishing hatcheries on their own initiatives. Since 1980, the technology for production of Indian major carps and some other commercially important fish species has been transferred to

private sector from public sector and due to its simplicity a large number of hatcheries have been established in both sectors. About 936 private hatcheries and public nursery produced 0.49 million fry (DoF, 2013). Aquaculture production has been significantly increased in recent years in Bangladesh because of adoption of various improved aquaculture technologies. But the most stumbling blocks to hinder the increasing trend of aquaculture production in Bangladesh are the lacking of good quality hatchery-produced seeds of various farmed fish species.

The quality of seeds has been deteriorated over the years due to technical inefficiencies of the hatchery owners related to improper Broodstock management, unplanned interspecific hybridization and mating of closely related breeders in the hatcheries. As a result, reduced growth, high mortality, poor fecundity, disease susceptibility of seeds and breeds has been observed. It is essential to formulate policies and interventions to produce high quality fish seeds in the hatcheries for supporting the sustainable aquaculture production in Bangladesh. Therefore, this study was aimed to get up-to-date overview of the current characteristics and management practices of the fish seed production farms, socio-economic aspects and technical capabilities of the owners and implications of the good quality supply system in the Jessore region, Bangladesh.

MATERIALS AND METHODS

Study area

The study area was conducted on Sadar Upazila in Jessore region since July 2012. Jessore Sadar Upazila is the most pioneer and popular for finfish production in our country (Fig. 1). There were eighty two (82) hatcheries in Jessore Sadar Upazila and most of the hatcheries are situated at Chanchra region. At present 34 hatcheries are running there. Among them 12 hatcheries were surveyed for comparative study. The full name of these hatcheries Acota Fish Hatchery (AFH), Al Amin Fish Hatchery (AMFH), Chowdhury Fish Hatchery (CFH), Kapotakkho Fish Hatchery (KFH), Madhumoti Fish Hatchery (MFH), Maa Fatema Fish Hatchery (MFFH), Rita Fish Hatchery (RIFH), Rupali Fish Hatchery (RUFH), Sonali Fish Hatchery (SOFH), Suvro Fish Hatchery (SUFH), Shamim Fish Hatchery (SHFH), Rahman Fish Hatchery (RFH).

Data collection

The present information was collected by direct survey and observation method. Data were collected by direct interviewing of the hatchery owners or managers. Several visits were made to the study area to collect accurate data. Data were assembled through field survey at the area by using a structural questionnaire based on the methods of FGD (Focus Group Discussion), PRA (participatory Rural Appraisal), RRA (Rapid Rural Appraisal).Secondary data were also collected from Fisheries and Marine Resource Technology, Khulna University and also collected from internet browsing.

Data Analysis

The results obtained in the experiment were subjected to statistical analysis. Qualitative and quantitative analysis of all kinds of data were carried out. MS Excel was used to store all the data. MS Excel was also used for presentation of the tables and graphs obtained from different types of data.

RESULTS AND DISCUSSION

Existing Facilities of the Hatchery

From the surveyed data (Table 1), it was found that the total number of brood ponds used by Rupali fish hatchery for

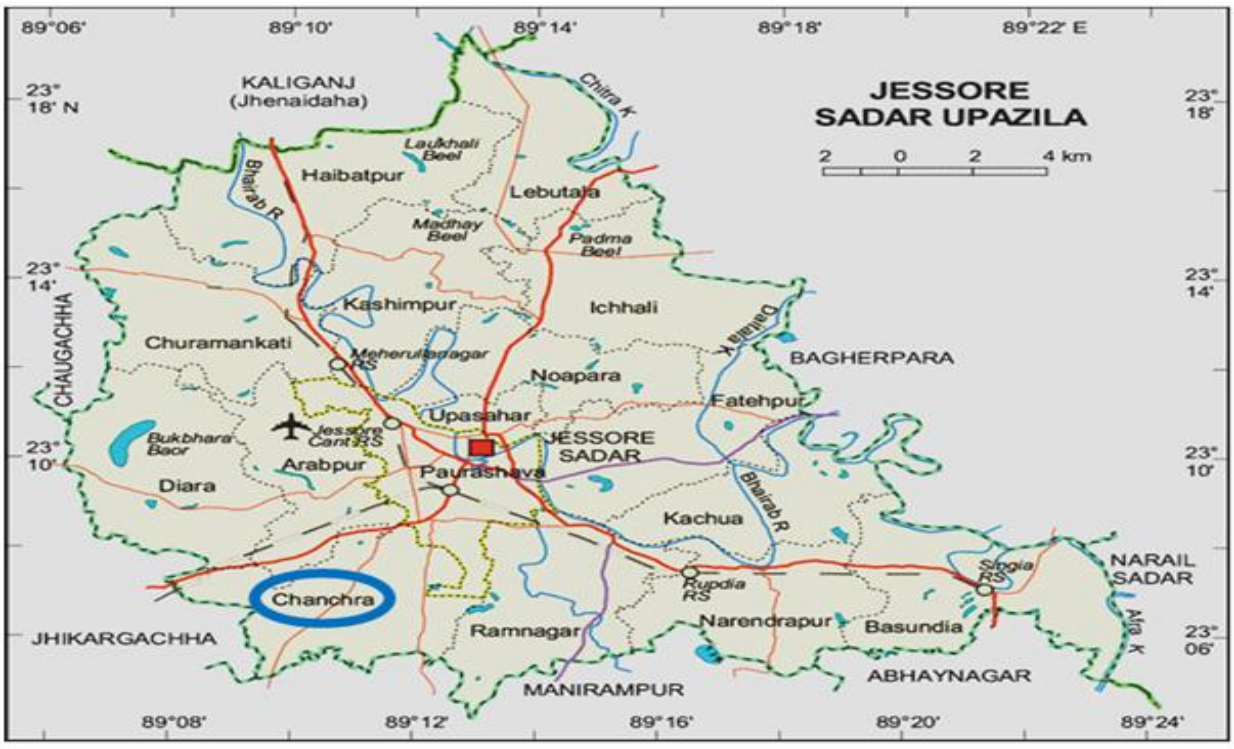

Fig. 1. Map showing the study area

holding broods was 11 which compared with other hatcheries, they only used maximum 7 to minimum 6 brood ponds for holding broods. In comparatively, Shamim fish hatchery used only 4 brood ponds for holding broods. These numbers of ponds are not sufficient for stocking large number of brood. This insufficient brood stocking increase the chance of mating of closely related individual. That is the chance of inbreeding (Shah, 2004). In comparatively among the hatchery, average number of circular tank, rectangular tank and hatching jar were 1, 20 and 30 are present in RUFH. Most of the hatchery provides have no circular tank, rectangular tank ranges from maximum 16 to minimum 12 and the number of jars ranges from maximum 20 to minimum 14 (Table 1). Most of the hatchery provides a manager and some assistants but have no skilled person. But in RUFH the manpower in different categories was 1 manager, 5 hatcheries assistants and 2 skilled persons (Table 1).

Water quality parameter

Water quality parameter is the most important factor for brood fish health, growth, survival rate and reproduction. In brood fish ponds suitable temperature, DO, p^H and transparency are needed for their survival. In comparatively, the average DO, p^H and transparency was obtained to be 6 mg/l, 7.5 and 27.5 cm (Table 2). In the comparative study showing the values of parameters DO, p^H and transparency. In RUFH the value of this three factors are good but in SHFH this value is poorer among all the hatcheries because of their water quality is deteriorated by over feeding and also producing huge algal bloom. Finally the DO decreases with increasing p^H from desired level.

Table 1. The present situation of surveyed hatchery in Jessore region, Bangladesh

Sl.No.	Name of Hatchery	General hatchery proper (Number)								
		Brood ponds	Circular tank	Rectangular tank	Hatching jar	Skilled person	Staff	Overhead tank	Nursery pond	Segregation pond
01	AFFH	6	0	16	20	0	04	01	02	0
02	AMFH	5	0	12	15	0	03	01	03	1
03	CFH	5	0	16	20	0	07	01	04	2
04	KFH	6	0	12	20	0	06	01	02	0
05	MFH	8	0	10	15	0	04	01	02	0
06	MFFH	7	0	12	20	0	06	01	02	1
07	RIFH	6	0	12	14	0	04	01	03	0
08	RUFH	11	1	20	30	2	07	02	04	4
09	SOFH	7	0	12	20	0	06	01	03	2
10	SUFH	6	0	16	20	0	05	01	04	1
11	SHFH	4	0	12	14	0	04	01	02	0
12	RFH	5	0	16	18	o	O5	01	03	1

Table 2. The water quality parameters of brood stock ponds in the surveyed hatchery in Jessore region

Sl. No	*Name of hatchery*	*Temperature (^{0}c)*	*DO (mg/l)*	*pH*	*Transparency (cm)*
01	AFH	25	4.25	6.25	22
02	AMFH	25.5	4	6.5	17
03	CFH	24.5	4.25	6.75	19
04	KFH	26	4.75	5.75	20.5
05	MFH	27	4.25	5.25	19.5
06	MFFH	27.5	4.5	6	19.5
07	RIFH	24.5	5.25	6.25	20.5
08	RUFH	27.5	6	7.5	27.5
09	SOFH	26	4.25	5.25	22.5
10	SUFH	26.5	4	6.25	18
11	SHFH	25.5	3	9	16
12	RFH	26	4.25	5.25	18.5

Table 3. Culture strategies and feeding management of brood fishes in surveyed hatcheries, Jessore region, Bangladesh

Name of hatchery	*Culture strategies*			*Stocking density/decimal*		*Types of feed*			*Feeding Frequency (Times)*
	Extensive	*Semi intensive*	*Intensive*	*<60*	*>60*	*Formulated feed*	*Commercial feed*	*Nature of feed*	
AFH		+		+			+	Floating	1-2
A MFH	+			+		+		Floating	01
CFH			+	+		+		Floating	01
KFH		+		+		+		Sinking	1-2
MFH			+		+	+		Sinking	1-2
MFFH	+				+		+	Sinking	02
RIFH		+			+		+	Sinking	1-2
RUFH			+	+			+	Floating	01
SOFH	+				+	+		Sinking	1-2
SUFH			+		+		+	Sinking	1-2
SHFH	+			+		+		Floating	02
RFH		+		+			+	Sinking	02

Seed production 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 our country from the Jessore region. A small part of fry are supplied outside the area of Jessore Sadar and fulfill the total demand of fry for aquaculture and fulfill the demand of food supply in our area and also contribute to the national economy of our country. Many feed produced company are directly involved in this sector. In aspects of our country especially Jessore region hatchery produced one third of the fry and fingerlings. In comparatively among all the hatcheries, RUFH produced highest amount of fry in Jessore area (1500 kg/ year).

During the period of study, it was observed that the production of fish seeds are not sufficient than production capacity. More or less similar observation was found in the study of Islam *et al.* (2002), Hossain and Siddique (2009). The annual production capacity (Kg) of some of the surveyed private hatcheries ranged from minimum 350 to maximum 2000 kg. The total productions of fry of some surveyed hatcheries were lowest 600 to highest 1500 kg. In the Fig. 2 showing the fry production per year among all the hatcheries. Here in RUFH production is highest and in SHFH fry production is lowest.

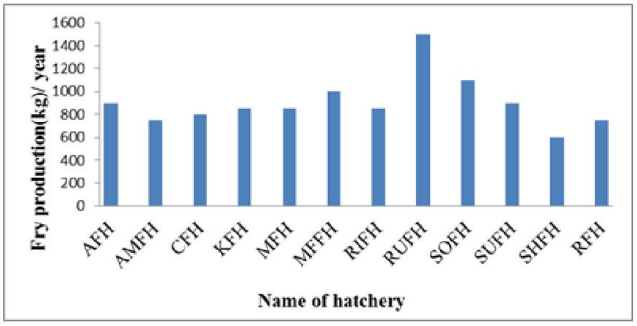

Fig. 2. Comparative study on present seed production of surveyed hatchery in Jessore region

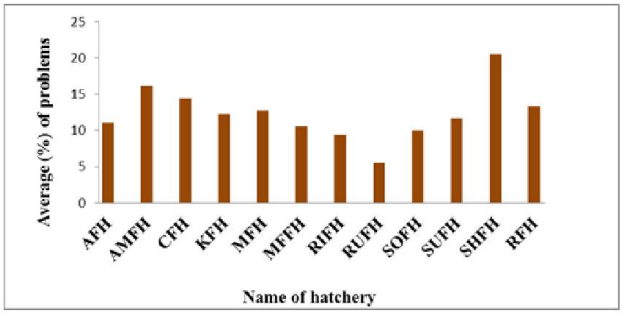

Fig. 3. Comparative study on the problems faced by the private hatchery owners

In comparatively among all the hatcheries, it can be said that RUFH showing the good DO, p^H and transparency value (Table 2) and it contains lowest amount of problems thus the disease cannot be destructive in it (showing Fig. 3). So, the production of RUFH is higher (Fig. 2). But in SHFH they can't monitor their water quality parameter and also faced a lot of problems because their hatchery management is not well managed and they have no skilled person for monitoring and maintaining breeding protocol. So, their production is lowest among all the hatcheries (Fig. 2).

Table 4. The present seed production of surveyed hatchery in Jessore region, Bangladesh

Serial No	*Name of hatchery*	*Production (kg)/year*
1	AFH	900
2	AMFH	750
3	CFH	800
4	KFH	850
5	MFH	850
6	MFFH	1000
7	RIFH	850
8	RUFH	1500
9	SOFH	1100
10	SUFH	900
11	SHFH	600
12	RFH	750

Problems faced by the hatchery owners

Sound health management practice is a key to success in any hatchery operation. In the study areas, hatchery operators mentioned several problems they encountered in their operations. Most of the hatchery owners faced some technical, economic and social problems. In the comparative study, the highest percentages of problems are faced by SHFH because of their lower management system and their hatchery facilities are not well managed. In case of RUFH, their management systems are well prepared. So, they faced some minor problems. The problems faced by the hatchery owners are lack of skilled person, Insufficient water in dry season, Drainage system, lack of credit, lack of marketing facility, theft, joint partnership, taking lease of pond and flood. After conducting the survey, it has been found that the highest number of ponds provided by the RUFH was 11and others hatchery were provided maximum 07 to minimum 04 numbers of brood ponds. These numbers of ponds are not sufficient for stocking large number of brood. This insufficient brood stocking increase the chance of mating of closely related individual. That is the chance of inbreeding (Shah, 2004). In the study area, major management problems and constraints faced by the hatchery owners are lack of technological knowledge, lack of credit, joint partnership, taking lease of pond, flood and insufficient water in dry season.

The present findings more or less similar from the result described by Salam *et al.* (2008) who mentioned that about 28.57% and 9.52% owners claimed that the production of farms hampered due to lack of technical knowledge and insufficient water in the dry season. In order to supply adequate water to the tanks or hatching jars, underground water from deep or shallow tube well is necessary. Also adequate temperate, DO, p^H and transparency should be maintained in brood fish pond. Most of the hatchery provides one overhead tank to supply water but in RUFH they have two overhead tanks for supplying water into the brood holding tanks and hatching jars. The success of the hatchery operations depends upon the skilled manpower and other manpower such as hatchery assistant, labor employed in netting and brood selection, brood carrying in the hatchery, brood feeding, pump driver, night guard etc. In RUFH had an average number of 8 people of which 1 was manager, 2 skilled person and 5 assistants. But most of the hatchery provides a manager and some assistants. The number of hatchery assistances varies to maximum 5 to minimum 2 including the night guard. The hatchery operations produce more success with the respect to

low genetic error when the broods are handled by more skilled person in the hatchery. During the investigational period, maximum number of circular tank, rectangular tank and hatching jar were 1, 20 and 30 are present in RUFH. But most of the hatchery provides have no circular tank, rectangular tank ranges from maximum 16 to minimum 12 and the number of jars ranges from maximum 20 to minimum 14. In hatchery, a minimum number of rectangular tank and hatching jar are needed and one circular tank must be needed for quality seed production. Fewer numbers of tanks and jars indicates the lower optima which are important with regard to creating genetic concerns (Shah, 2004). Sex ratio of the breeding individuals is not ideally followed in most hatcheries. The hatchery technicians depend on their experience in maintaining breeding protocol for artificial breeding. Sometimes the technicians use the milt of different species due to lack of milt of the species. This unplanned breeding results in generation of genetic underclass carp seeds and produces low quality seeds of slow growth rate, poor survival power etc. (Dutta, 2000). In the study area, it was recorded that, the occurrence of disease were the most common problems in hatchery.

While the major diseases reported in hatcheries were sudden spawn mortality, fish lice, gill rot, fin rot and anchor warm. This findings of the study differ from the study of Hasan and Ahmed (2002) who reported that diseases were less prevalent in hatcheries than in nurseries and the economic loss due to disease was about 7.6% of the profit. In the study area , it was found that mature brood fishes are selected for seed production by some sign or body parameter such as swollen abdomen, protruded reddish vent etc., the males are selected by checking roughness of the pectoral fins and presences of milt by sight pressure on the abdomen. Suitability quality of the brood fishes are the principal determinant of quality seed produced from a hatchery. These findings are similar to the study of Chaudhury (1959) who reported that mature male and female brood fishes are selected by their external characteristics and healthy, disease free, uninjured broods are selected for the induced spawning. During the period of study, it was observed that the production of fish seeds are not sufficient than production capacity. More or less similar observation was found in the study of Islam *et al.* (2002), Hossain and Siddique (2009). The annual production capacity (kg) of some of the surveyed private hatcheries ranged from minimum 350 to maximum 2000 kg. The total production of fry of some surveyed hatcheries were lowest 600 to highest 1500 kg.

Prospects of Hatchery

Fish is an essential daily food item for the people of Bangladesh and such demand for fish is increasing with the increasing of population. Aquaculture has been given importance in Bangladesh because of its potential for export earning, generation of employment for the rural sector and its contribution to the supply of animal protein for the population. With the decline of the natural fish production and increase of demand, aquaculture venture has been emerged as a most vital wing of fish production and aquaculture is now fully dependent on the hatchery produced seed.

For an effective development of aquaculture, good quality of fish seed is highly essential. But it has been claimed that, the hatchery produced fry are not of good quality. That is most of these are slow growth rate, poor survivability, poor disease resistance power etc. There are the prospects of fish seed producing hatcheries in the Jessore Region, Bangladesh as to fulfill the demand of fish for growing population, fish production should be developed through hatchery produced fry, unused water body can be stocked by hatchery produced fry, hatchery will be developed through fisheries research development, to protect endangered fish species, artificial breeding process should be operated in hatchery, Unemployment problem can be removed through hatchery development and our country can earn foreign exchange by exporting hatchery produced fry.

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