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Present status of some selected hatcheries at Chanchra under Jashore district, Bangladesh: An overview

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Abstract:

The present study was conducted on 10 hatchery owners at Chanchra under Jashore district. The study period was May to August 2015. Data were collected through questionnaire interviews by using personal interviews and participatory rural appraisal (PRA) tools. In the study area, maximum spawn production of hatcheries was 2500 kg and minimum 800 kg. About 50% brood fishes were collected from own pond, 30% were collected from other's hatcheries and rest of 20% were collected from natural sources. The hatchery owners maintained

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proper age and weight of broods for spawning and followed the guideline of hatchery operation so that the quality of spawn and fry those produced by them were good in quality. It was found that the hatcheries produced fish seed of a variety of species like Indian major carps, carpio, sarpunti, silver carp, grass carp, magur, shing etc. The hatchery production activities took place starting February and continued up to September. The quantity of fish seed produce varied from 25 to 75 kg per hatchling cycle depending on size and facilities of hatcheries. The price of fry in Jashore was being fixed by the hatchery owners. However, the price variation was seen due to seasonal variation, species and demand. The average price of fish seed was maximum in monsoon and minimum in winter. In general skilled technicians were involved in hatchery operation. Some hatchery owners were well experienced and operated their own hatcheries. The hatcheries in Jashore district were viable. The hatchery owners had improved their social status though hatchery income.

Key words: hatcheries, Chanchra, Jashore district, Bangladesh

INTRODUCTION

At present Bangladeshi aquaculture contributes 4.43% to national GDP of Bangladesh at present (DoF, 2013). As Bangladesh achieved the fourth maximum position in total inland fish production of the world, this trend will greatly influence the aquaculture practices here (FAO, 2014). About 1.25crore people of our country depend directly or indirectly, on fishing and ancillary occupations (DoF, 2008). A vast amount of eggs and spawn were collected from major rivers such as the Hadla, the Jamuna, the Padma and their tributaries during the monsoon season. However, collection of seed from natural water has declined in recent years. As against an estimated collection of 12,533 kg fish seed during 1988, the fish seed collected during 2009 was only 1876 kg (Fisheries Statistical Yearbook of Bangladesh, 2008-2009). Nowadays, due to continuous

destruction of natural habitats the natural availability of fish seed has largely gone down and the aquaculture ventures are fully dependent on the hatchery-produced fry/fingerling. There is an increasing demand of substantial supply of quality fish spawn, fry and fingerlings. During 1980`s about 95% fish spawn used to be collected from natural sources. Currently more than 98.41% fish spawn is produced in the hatcheries. At present the total number of private fish hatcheries in Bangladesh is 892 and their total production is 459,804 kg hatchlings (Fisheries Statistical Yearbook of Bangladesh, 2008-2009). Aquaculture practices in Bangladesh started with fish seed collected from river but now it is almost entirely (98.41%) replaced by hatchery produced fish seed (Fisheries Statistical Yearbook of Bangladesh,2008-2009). During 1990s there were 5 large hatcheries and 106 fish seed multiplication farms established in public sector. A part of from Government hatcheries, a large number of carp hatcheries had been built in the private sector in different parts of Bangladesh. In 1980, the total hatchery produced carp fry was estimated at about 22 million (Chowdhury and Sumumari, 1996). In 1984, hatchery produced carp fry was estimated to be about 249 million, which is more than ten times of 1980 production. At present total number of private hatcheries in Bangladesh are and their total production are 629175.53 kg (DoF, 2013). The main source of fish seed in Bangladesh are spawn produced in public and private hatcheries and collected in the rivers. In view of this, DoF of Bangladesh is encouraging people to increase fish seed production by establishing hatcheries and nurseries. For this purpose, DoF established more than one hundred Fish Seed Multiplication Farm (FSMFs) covering almost all the districts of Bangladesh to supply spawn, fry and fingerling to the farmers. Many private entrepreneurs have also established the FSMs. They also have established fish seed and fingerling nursery. Day by day many private hatcheries were established

in our country. Most of the hatchery owners did not follow aquaculture code of conduct, breeding protocols, brood stock and hatchery management technology. They might use same age group brother and sister of male and female brood for induced breeding in their hatcheries. As a result, several problems such as inbreeding, growth stagnation, production of small fish happened and finally reduced aquaculture production occurred. The present study was undertaken with objectives to know the present status of hatchery management techniques and to know the breeding techniques which are followed in the hatchery.

MATERIALS AND METHODS

Study area and periods

The present study was conducted on chanchra sader upazilla in Jashore district. Jashore sader upazilla is the most pioneer and popular for finfish production in our country. The locations of the hatcheries were in Jashore sader. Data were collected from May to August 2016 (Figure 1).

Fig. 1: Map of Jashore district showing the study area

Target group

To achieve the objectives of the study the following of the people was selected:

>hatchery owners

Sample size

A total 0f 10 hatcheries were randomly selected for the collection of data.

Data collection

Primary data

The primary data were collected through interviewing different hatchery owners involved in hatchery operation.

Secondary sources

The secondary data were collected from central library,Jashore University of Science and Technology ,Jashore; different website of Journals; district Fisheries Office, Jashore; an upazilla Fisheries Office, Jashore.

Data processing and analysis

After collection of data from the hatchery, data were verified to eliminate errors and inconsistencies. Then the data were entered into computer. The qualitative data were categorized and analysis mainly based on descriptive statistical analysis by MS excel and Statistical Package for the Social Sciences (SPSS). All the collected data were processed and analyzed to extract the findings of the study following careful accumulation.

RESULTS

Hatchery status

Types of hatchery

Among the hatcheries, maximum was carp and catfish hatcheries where some of them produced other spawn such as tilapia, prawn etc. among the 10 hatcheries seven hatcheries produced only carp, two hatcheries produced carp with catfish and one hatchery produced carp, catfish and tilapia. Yearly

productions of the selected hatcheries were about 13200 kg (Figure 2).

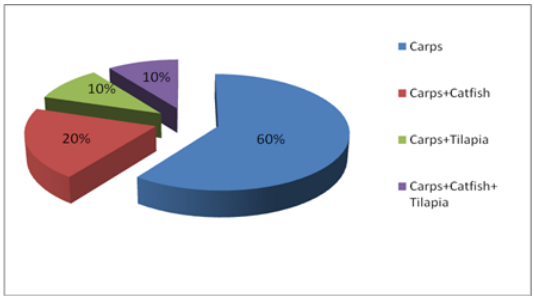

Fig. 2: Different types of hatcheries in Jashore district

Source of Broods

Among the visited 10 hatcheries, it was found that six hatchery owners collected brood from their own ponds, three hatchery owners collected brood from the other hatcheries and one hatchery owners collected broods from the natural sources like the Padma and the Halda river (Figure 3).

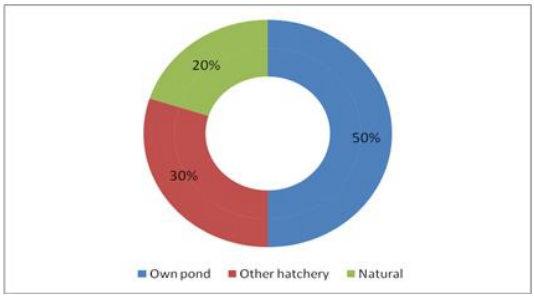

Fig. 3: Source of brood in Jashore district

Production of hatchling in the year 2015

It was observed that there were around 10 hatcheries in the study area. The total productions of 10 hatcheries were about 13200 kg and average production 1320 kg (Table 1).

Table 1: Production hatchlings at different hatcheries in Jashore district.

Sereial No	Name of hatchery	Annual production (Kg)	Average production (Kg)
1	Kapotakkho fish hatchery	1000	1320
2	Madhumoti fish hatchery	2500	
3	Rupali fish hatchery	1500	
4	Sonali fish hatchery	2000	
5	Rita fish hatchery	1000	
6	Rahman fish hatchery	900	
7	Shamim fish hatchery	800	
8	Suvo fish hatchery	1000	
9	Chowdhury fish hatchery	1000	
10	Maa Fatema fish hatchery	1500	

Brood stock management

The management techniques adopted by different hatcheries were varied from one another. Brood fishes were reared in ponds having the area of 0.5 to 1.0 acre and water depth in between 1.5-1.8 m. During preparation of brood fish ponds the usual practice was to eradicate the predators and weed fishes by dewatering and dying. Sometimes toxins such as rotenone, phostoxin etc. were applied to kill the unwanted fish species. Aquatic weeds removed manually. After cleaning the pond, lime was applied at the rate of 1-2 kg/dec. and five to seven days after liming cow dung used at the rate of 5-7 kg/dec. or 3-4 kg/dec. of poultry droplets as organic fertilizer. Inorganic fertilizers such as urea, tsp were also used at the rate of 150 g, 75-100 g per decimal respectively. The brood fish were first reared in the rearing pond with special care. In this case 25 % protein level was maintained in the feed.

Brood transportation

The hatchery owners used cloth bag, aluminum pots, drums etc. to carry the brood fish from rearing pond to hatchery. Among 10 hatcheries, it was found that seven hatchery owners used oxynated drum, 2 hatchery owners used aluminum pot and one

hatchery owner used cloth bag to carry the brood from rearing pond to hatchery. An individual brood fish usually used for 4-5 years for breeding and after that it was sold in the market, because the amount of eggs lying by them after five years was comparatively less (Table 2).

Table 2: Brood transportation materials used at hatcheries in Jashore district.

Brood transportation materials	No. of brood	Percentages (%)
Drum	7	70
Aluminum pot	2	20
Cloth bag	1	10
Total	10	100

Age and weight of brood

Age and weight of broods varied from species to species. In Jashore district the hatchery owners used the same brood for 1-6 years. Minimum age and weight of the brood for successful spawning is shown in table 3.

Table 3: Minimum age and weight of the broods used in breeding.

Name of species	Minimum age(years)		Minimum weight (kg)	
	Male	Female	Male	Female
Rui	2	2	1.5	1.5
Catla	3	3	4	4
Mrigal	2	2	1.5	1.5
Calibasu	2	2	1.5	1.5
Silver carp	2	2	1.5	1.5
Common carp	2	2	1.5	1.5
Grass carp	2	2	3	3
Tilapia	1.5	1.5	0.4	0.5
Magur	1	1	0.2	0.3
Singh	1	1	0.1	0.15
Thai sharpunti	1	1	0.3-0.4	0.5
Pangus	3	3	4	4

Hatchery equipment

Hatchery equipment are observed during study period in these selected hatcheries are, overhead tank; hatching; brood and fry

holing; egg collection; hatching jar/incubator; shallow/deep tube well; generator; pump; and shed.

Sources of hormone

Hormone is an important factor for induced breeding in any hatchery. In the study area, maximum hatchery owners used local hormone which is commercially available by the company like, ACI Animal Health, SKF and Square veterinary health division as well as some used imported hormone which were introduced from different countries.

Induced breeding

The hatchery owners mainly practiced induced breeding and used stimulants to enhance breeding. Eventually, hatchery used PG and S-GnRHa/Ovaprim™ (China) for carp species and also used 17a methyl testosterone (sex reversal hormone) to produce mono-sex tilapia. The optimum female and male doses for the artificial propagation of different carps are shown in table 4.

Table 4: The optimum female and male doses (PG) of different carps

Name of species	First dose(mg/kg)	Interval(hrs)	Final dose(mg/kg)	Ovulation(hrs after final dose)
Labeo rohita	Female=1.5 Male=---	6 ---	6 1.5	6-8
Catla catla	Female=2 Male=---	6 ---	7 2	6-8
Cirrhinus cirrhosus	Female=1 Male=---	6 ---	5 1	6-7
Labeo calbasu	Female=1.5 Male=---	6 ---	6 1.5	6-8
Ctenopharyngodon idella	Female=1.5 Male=---	8 ---	4.5 1.5	6-8
Cyprinus carpio var. communis	Female=1.5 Male=---	6 ---	7 1.5	5-6

Technicians involved in hatchery operation

Among the surveyed 10 hatcheries, it was found that six hatcheries had involvement with skilled technicians but four hatcheries had no involvement with skilled technician rather they were engaged themselves in hatchery activities.

Marketing channel of fish fry

Marketing of hatcheries in Jashore district included fish hatchery, nursery, wholesalers, fry traders and fish farmers. Fish fry and fingerling marketing channel was observed during the study period is shown in diagram (Figure 4).

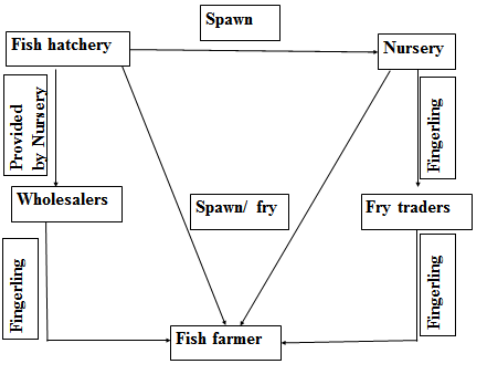

Fig. 4: Fish fry marketing channel from hatchery to fish farmer in Jashore district

Packaging and transportation

About 250-300g of fry was packed in oxygenated polythene bag of 99.44 cm length and 45.72 cm breadth with two third of water and rest of oxygen.

Problems associated with hatcheries

The main problem identified during study were, different types of bacterial and fungual disease as well as operational technical problems.

DISCUSSION

Among the 10 hatcheries seven hatcheries produced only carp, two hatcheries produced carp with catfish and one hatchery produced carp, catfish and tilapia similar carps, catfish and tilapia hatcheries are found by the study of Asif *et al.* (2014); Asif *et al.* (2015); and Sharif and Asif, (2015); Hossain *et al.* (2016); Rahman *et al.* (2015); Shabuj et al. (2016a); Islam *et al.* (2016); Ali *et al.* (2016a); and Ali *et al.* (2016b). It was found that six hatchery owners collected brood from their own ponds, three hatchery owners collected brood from the other hatcheries and one hatchery owners collected broods from the natural sources like the Padma and the Halda River which is linked with Samad et al. (2013); Hossain *et al.* (2016); Shabuj et al. (2016a); Islam *et al.* (2016) and. Islam *et al.* (2017) study. The present findings showed that the maximum and minimum number of fish seed production was 2500 kg and 800 kg in Madhumoti and Shamim fish hatchery, respectively. Islam *et al.* (2002), reported that annual fish seed production capacity (kg) of the private hatcheries ranged from minimum 350 to maximum 200 kg. Sharif and Asif, (2015) stated, Fry production of indian major carps was 399596 kg, Exotic carps were 391272 kg, and other species were 41625 kg. Asif et al. (2014) found that approximately 4689653 kg fry were produced from 477 hatcheries during the year 2013. Parvez *et al.* (2018) found 3165 kg of fry produced over 10 hatcherries. The broodstock was managed by the hatchery, sometime follow the standard procedure or sometime the negative procedure which led to inbreeding problem. Proper care of brood stock is essential for good quality egg, larvae and juvenile production. Methods differ from one species to another, but the hatchery operations must provide optimum conditions for maturation and spawning. Factors to be considered include pond management, water quality and temperature, disease control,

food supply, brood stock age, density and sex ratios. Dwivedi and Zaidi (1983) reported that brood stock management which led to better breeding responses and increased fecundity, fertilization, hatchlings and larval survival rates and more viable fish seed. In the present study, it was found that the hatchery owners had sufficient broods and they followed proper brood stock management. So the spawning performance (fecundity, fertilization rate, survival rate of fry) of the broods were satisfactory. The broodstock management described by Rahman *et al.* (2015); Shabuj et al. (2016a); Islam *et al.* (2016); Hossain *et al.* (2016); Islam *et al.* (2017) and Halim *et al.* (2018) which followed the standard procedure of hatchery and brood management. Among 10 hatcheries, it was found that seven hatchery owners used oxynated drum, 2 hatchery owners used aluminum pot and one hatchery owner used cloth bag to carry the brood from rearing pond to hatchery which is similar transport study with the Asif *et al.* (2014); Sharif and Asif, (2015). In the survey study area, it has been found that most of the hatchery owners used oxynated drum for long distance fry were transported by pick up or truck(large quantity) and locally for small fry traders, they were transported cloth bag by van, rickshaw. Haque *et al.* (1991) reported that transportation is essential for live product like fish fry. Oxygenated bag is used for transportation of hatchlings. An oxygenated bag is contains 250-300 g hatchlings for the best use within 24 hrs. For carrying fry or fingerlings they use pot or plastic barrel. Traders are aware of the requirements of oxygen for fry, so they continuously agitate the water in the pot during transportation. Age and weight of broods varied from species to species. In Jashore district the hatchery owners used the same brood for 1-6 years. Similar broodstock age study was conducted by the, Rahman *et al.* (2015); Shabuj et al. (2016a); Islam *et al.* (2016); Hossain *et al.* (2016); Islam *et al.* (2017); Ali *et al.* (2016a); Ali *et al.* (2016b); Shabuj et al. (2016a) and Islam *et al.* (2017).

Quality seed production is the prerequisite for sustainable aquaculture. In Bangladesh, production of fish seed was not a problem but the crucial factor was to maintain its quality. Over the last two decades Bangladesh became self sufficient to produce and distribute fry to the users but the quality of fish seed had been deteriorating day by day. Inbreeding, inter specific hybridization, negative selection of broods, improper brood stock management were common phenomena in hatcheries especially in the private hatcheries. These factors resulted in low growth rate, high mortality, deformities, less fecundity and so on. Hussain and Mazid (1997) reported reduced growth, physical deformities, disease and high mortality in hatchery produced carp fish seed and they identified improper management of brood stock, unconscious negative selection of broods, unplanned hybridization and inbreeding as probable reasons behind these reduced performances. Poor quality seed, perceived as a major constraint to expansion of fish culture, could have deleterious effect on fish production and brood stock development. Overhead tank; hatching; brood and fry holing; egg collection; hatching jar/incubator; shallow/deep tube well; generator; pump; and shed were the main hatchery component in this present study which is describe by Islam *et al.* (2017). Islam *et al.* (2017) and Chowdhury *et al.* (2015) also reveal the sources of hormone which led to administrated to induce the fish. Ali *et al.* (2016a) and Ali *et al.* (2016b) also reveal the hormone study like flush hormone used in Norshingdi, district. In the study area, maximum hatchery owners used local hormone which is commercially available by the company like, ACI Animal Health, SKF and Square veterinary health division as well as some used imported hormone which were introduced from different countries. In the study area, it was found that mature brood fishes of selected fishes were selected for seed production by some sign or body parameter such as swollen abdomen,

protruded reddish vent etc; the male was 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. Chudhury (1959) reported that mature male and female brood fishes were selected by their external characteristics and healthy, disease free, uninjured broods were selected for the induced spawning. Which were similar to that of present study. The optimum female and male doses for the artificial propagation of different carps are similar with the present study of Ali *et al.* (2016a); Ali *et al.* (2016b); Shabuj et al. (2016a); Islam *et al.* (2017); Islam *et al.* (2016). Marketing of hatcheries in Jashore district included fish hatchery, nursery, wholesalers, fry traders and fish farmers and similar marketing level were identified by the study of, Asif *et al.* (2014); Hossain *et al.* (2015); Rahaman *et al.* (2015); Hossain *et al.* (2017) and Islam *et al.* (2017). The main problem identified during study were, different types of bacterial and fungual disease as well as operational technical problems. Hasan and Ahmed (2002) 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 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 which were relevant to that of present findings. The study of disease which occurred in hatchery is described by Yeasmin *et al.* (2016); Rahman *et al.* (2017); Shabuj *et al.* (2016b); and Neowajh *et al.* (2017) and other problems are described by the study of Sharif and Asif, (2015); Vaumik *et al.* (2017) and Zaman *et al.* (2017).

CONCLUSIONS

Aquaculture principally relies on the availability of fry and fingerlings from hatcheries. Based on the market demand, the business has been well flourished and a lot of people were involved in this trade and improved their socio economic condition, but some problems were evident in the present study such as transportation system of fry and fingerlings, involvement of multiple middleman, high fry mortality, lack of technical knowledge etc. For this reason, hatchery owners faced economic loss to some extent. Unless decentralized fish seed production includes appropriate breeding strategies to maintain the genetic quality of brood stock, the performance of the production stocks will decline.

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