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Studies on the induced breeding and post-larval rearing of shing (*Heteropneustes fossilis* Bloch)

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Abstract

An experiment was conducted on induced breeding and fry rearing of shing ,*Heteropneustes fossilis* (Bloch) in the Department of Aquaculture, Bangladesh Agricultural University for a period of four months from April to July 1994. Hatching rate was calculated at 21.50 hrs and was found to be 45 to 55 % and the survival rate of larvae was 30 to 40 % at 26 to 29^{0}C. Survival rate and growth rate of post larvae were found to be 50 to 60 % and 96.6 to 117.2 % respectively. Feed-3 (F_3) showed the highest survival rate and growth rate of post larvae.

Key words : *H. fossilis*, Induced breeding, Larvae rearing

Introduction

The technique of induced fish breeding found its application in fish culture where it turned out to be very promising. Induced breeding is currently gaining importance in composite fish culture (Saha 1995). *Heteropneustes fossilis* (Bloch) locally known as "shing" is an important air breathing catfish in Bangladesh. The nutritive and medicinal value of this fish has been recognized from time immemorial. Shing is a popular fish in Bangladesh and generally grows in pond, lake, baor, beels, and floodplains with natural care. It has been drawing the attention of more and more fish farmers in Bangladesh day by day due to its high market values, profitable culture and hardy nature. Shing breeds in natural waterbodies but natural habitats have alarmingly declined due to ecological changes. So collection of shing fry from natural source is difficult for fish culturist.

Recently scientists have started to breed the fish artificially by using HCG (Human Chorionic Gonadotropin and Pituitary gland (Rahamatullah *et al.* 1983, Islam *et al.* 1986, Mollah 1987, Naser *et al.* 1990). However, induced breeding and rearing of larvae of shing are facing various problem for the expansion of its culture. So we should take proper initiative to meet the demand of fry requirement for its culture by induced breeding through HCG. HCG was used because it is more economical than carp pituitary gland extract (Naser *et al.*

1990). The main problem in larval rearing in the lack of suitable feed of appropriate size and quality particularly at the stage of first feeding just after utilization of yolk-mass. The present studies were undertaken with the following objectives : a) to develop an appropriate technique of induced breeding of *H. fossilis* and b) to formulate an artificial feed from the indigenous ingredients for fry rearing of shing.

Materials and method

Brood fish maintenance

Male and female brood fishes of shing (*H. fossilis*) were stocked in the ponds of the Department of Aquaculture and Management in March 1994.The size of the stocking ponds were 60 m^2 and fishes were kept at a density of 20,000 fish/ha. The broods were given artificial feed (10% fish meal + 10% soya meal + 80% wheat bran) at the rate of 12 to 15% body weight twice a day. The water depth of the ponds were 1.22 to 1.53 m in the rainy season and 0.46 to 0.61 m in the winter. Ponds have outlet to prevent the overflow of the water in the rainy season. The ponds were treated with lime (at the rate of 100kg/ha) twice a year first in May and second in November and subsequently fertilized with urea (30 kg/ha), triple super phosphate (30 kg/ha), cowdung (4,000 kg/ha) and mustered oil cake (20 kg/ha) twice a year first in May and Second in November. In the rainy season, ponds were surrounded by net as a precaution of escaping of fish from the ponds. The fishes were collected by seine net and carried to the laboratory and kept in the trays (30.48 cm x 60.96 cm x 15.24 cm).

Induced breeding and post-larval rearing

Properly ripe males and females shing (milt and eggs come out with very gentle pressure on the abdomen respectively) were selected from the brood stock. Fish were injected intramuscularly with HCG extract at a dose of 500 I.U./100g body weight. The total dose was divided into two equal doses and was injected to males and females at 6 hours interval. Male and female of a pair were kept together after each injection and aeration of water was maintained in aquaria. Care was taken to prevent fish loss by jumping. After 4 to 5 hours of 2nd injection natural ovulation was noted. Brood fish were separated from the aquaria. Fertilized eggs were incubated in trays in three replications at room temperature (26-29^{0}C) and the aeration of water was maintained. About half of the water of each trays was changed after every six hours during incubation. The hatchling came out after 20-22 hours and dead eggs ,egg shells were picked up by means of a dropper. After the completion of hatching, spawn was transferred to other trays and kept there for 4 days until the larval period was completed without feeding. After completion of the larval period, the post larvae were transferred to the polythene covered trays (30.48 cm x60.96cm x15.24cm) at two densities of 10 post larvae/tray and 20 post larvae/tray in three replication. Three different kinds of feeds were provided to post larvae of two different densities. Therefore, a total of eighteen trays were used for the rearing of post larvae. Three different types of foods were regarded as F_1, F_2 and F_3.

Feed composition

F_1	F_2	F_3
100g, powdered milk	100g, powdered milk	100g, powdered milk
One egg	One egg	One egg
100g, boiled potato	100g, boiled potato	100g, boiled potato
100g, raw fish muscle without skin	100g, raw fish muscle with skin	100g, boiled fish with skin, viscera and bone

The feed was prepared in paste form. Feeds were given twice a day in the form of dough of paste at 10% of body weight. Excess feeds and wastes were removed by dropper after one hour of feeding. Half of the water along with faecal wastes from each tray was changed daily and aeration was maintained by air stones. Growth rate of post larvae was studied for two weeks, for which the length of fish were measured to nearest mm after each week and side by side mortality was recorded.

Statistical analysis

The experiment were conducted in Randomised Block Design (RBD) with three replication and two way analysis of variance (ANOVA) in RBD was done to study the effect of different feed and density on survival and growth rates. Duncun's Multiple Range Test (DMRT) was used for mean separation of 5% level of significance. The percentage data was arcsine transformed before statistical analysis. Data was analysed with a statistical package called stategraphic version 7.

Results and discussion

Hatching time and larval period of shing

Hatching time was found 21.50 hours and hatching rate was 45 to 55%, larval period was found 94 to 96 hours and survival rate of larvae was found to be 30 to 40% at 26-29^{0}C (Table 1). Hatching and yolk of fish eggs were reported to be temperature dependent (Margulies 1989 and Clarke 1989). Mukhopadhyay (1972) reported that hatching time of *H. fossilis* ranged from 20 to24 hours and larval period from 4 to 5 days at 25^{0}C. Thakur *et al.* (1974) noted the hatching period of shing to vary from 18 to 20 hours while the larval period was 96 hours at temperature ranging from 26 to 29^{0}C.

Table 1. Hatching time and rates, yolk absorption time and survival rates of larvae at room temperature (26-29^{0}C)

Replication No.	Time required for 50% hatching (hr)	Hatching rates (%)	Yolk absorption time (hr)	Survival rates (%)
1	22.00	45-55	94-96	30-40
2	21.30	45-55	94-96	30-40
3	20.00	45-55	94-96	30-40
Mean	21.50	45-55	94-96	30-40

Survival rates of post-larvae of shing

The different artificial feed (three different types) showed significant effect ($P<0.01$) upon the survival rates of *H. fossilis*. The highest survival rates recorded at F_3 (60%) and lowest survival rates recorded at F_1 (50%) are shown in Table 2. Findings of this experiment indicated that the F_3 gave better survival rate for shing larvae. Which might be due to the high mineral content of the F_3 than other feeds. As F_3 contained boiled fish including bone-masses. Mineral play vital role in metabolism and growth of fish (White *et al.* 1959). It was found that when fishes were fed a phosphorus deficient diet the growth is retarded and their mortality is increased (Andrews *et al.* 1973, Watanabe *et al.* 1980,Yone and Toshima 1979). Density 1 (10 post larvae/tray) and density 2 (20 post larvae/tray) indicated the similar survival rates 50 to 60% (Table 2). Survival rates of shing post larvae was perhaps not density dependent. Woiwode and Adelman (1989) noted that survival rates of channel catfish (*Ictalurus punctatus*) were not significantly influenced by fish density, same results were obtained in Atlantic salmon (Soderberg and Meade 1987, Soderberg *et al.* 1987). Karjalainen (1991) reported 60% survival rate of vendace (*Caregonus albula*) at all densities.

Table 2. Effects of feed and density on the survival rates and growth rates of post larvae of shing for two weeks

PL/tray	Feed	Survival rates (%)	Initial length (mm)	1st week growth (mm)	2nd week growth (mm)	Net growth (mm)	Growth rates (%)
	1	50.00^b	5.8	7.0^c	11.5^c	5.7^c	98.27
10	2	50.00^b	5.8	7.5^b	12.0^b	6.2^b	106.89
	3	60.00^a	5.8	8.2^a	12.6^a	6.8^a	117.24
Mean		53.33	5.8	7.57	12.03	6.23	107.46
	1	50.00^c	5.8	7.0^c	11.4^c	5.6^c	96.55
20	2	55.00^b	5.8	7.4^b	11.9^b	6.1^b	105.17
	3	60.00^a	5.8	8.2^a	12.6^a	6.8^a	117.24
Mean		55.00	5.8	7.53	12.0	6.17	106.32

Separation of mean was done within column at 5% level of DMRT

Growth rates of post-Larvae of shing

The different feed showed significant effect ($P<0.01$) upon the length of shing. The highest length increment was recorded in F_3 (6.8 mm) and the lowest length increment was 5.6 mm in F_1. However, significant differences in length was noted among the different feed. On the other hand highest growth rate (117.24%) was showed with F_3 and the lowest growth rate (96.55%) recorded with F_1 (Table 2). Growth data indicated that the F_3 was suitable feed for post larvae of *H. fossilis.* The highest growth was recorded in F_3 because it contained more fish fat, protein and fish bone which contain various minerals such as calcium and phosphorus. Fishes require mineral as essential factors in their metabolism and growth, however, it was also important from a nutritional point of view. Andrews *et al.* (1973) noted that dietary phosphorus requirement was 0.8% for maximum growth of channel catfish (*Ictalurus punctatus*). Cho and Schell (1980) reported that calcium and phosphorus requirement were 6g/kg dry diet and 7g/kg dry diet respectively for growth of fishes.

The different densities showed that there was no significant effect on the growth rate of shing. Similar growth rates (highest 117.24% and lowest 96.55 to 98.27%) were recorded at both densities (Table 2). The result of this study showed that the stocking density has no definite effect on the growth rate of *H. fossilis.* Same results was obtained in Atlantic salmon (Soderberg and Meade 1987, Soderberg *et al.* 1987). Karjalainen (1991) reported 60% survival rate of vends (*Caregonus albula*) at all densities.

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