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Rearing and Nursing of Local Sarpunti, *Puntius sarana,* (Hamilton) at Different Stocking Densities

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Abstract: Nursery rearing of *Puntius sarana* (Ham.) was studied in relation to varying stocking density for a period of 6 weeks in earthen ponds. The experiment was performed in randomized block design with 3 treatments and each treatment had 3 reapplications. The ponds were stocked at the density of 0.7 (T_1), 0.8 (T_2) and 0.9 (T_3) million individuals ha^{-1} and highest survival and growth performances of the fry was found in T_1 Treatment in terms of length (L) and weight (g), where stocking density was 0.7 million ha^{-1} and a mixture of rice bran 40%, mustard oil cake 50% and fishmeal 10% were supplied. In T_1 Treatment, the highest average growth was 1.50 mm day^{-1} (length) and 0.12±0.00 g day^{-1} (weight) and survival rate, specific growth rate and FCR were 62.9±1.69%, 17.65±0.02 and 1.05±0.04, respectively. Poor growth performance was observed in T_3 treatment, where stocking density was high (0.9 million ha^{-1}). The physico-chemical factors which included temperature, transparency, pH, dissolved oxygen, alkalinity, nitrate-nitrogen, nitrite-nitrogen, phosphate-phosphorus, ammonia-nitrogen, hardness and chlorophyll-a were found to be optimum level for fish culture. The physico-chemical factors, length and weight of fishes and plankton were recorded weekly.

Key words: Growth, food conversion ratio, specific growth rate, average daily gain survival rate, etc

Introduction

Sarpunti (*Puntius sarana*) is very well known for its taste. Once upon a time, this species was available in our open water system. But due to over-exploitation and various ecological changes in our natural ecosystem, this species is in the verge of extinction. International Union of Conservation of Nature (IUCN), Bangladesh (1998) has documented about 56 fresh water fish species as critically or somewhat endangered. Natural population of local sarpunti has been declining very fast. Nursery culture technique of *P. sarana* is not developed in Bangladesh. Therefore, an acceptable and suitable culture technique for nursery and rearing of larvae is very important to ensure reliable and regular supply of fingerlings. Successful controlled method of fry nursing depends on a good knowledge of nutritional and environmental requirement of the larvae in the open aquatic ecosystem (Mollah 1985). In proper care and lack of understanding about the biotic and abiotic factors in the rearing system may result in mass mortality of young fry (Jhingran and Pullin, 1985). Spawn to fry have high mortality and even hundred percent mortalities is not uncommon (Haque *et al.,* 1991).

The current production of fish and fisheries sector is 18.50 lakh ton. But this production could be increased 24.05 lakh ton by the year 2006-2007 (DoF, Shoronika Mathshya Pokkha-2002). Marr (1985) estimated that to obtain high production, 1350 million fry of 2.5-3.8 cm size and 660 million fingerlings of 12.5-15.0 cm size would be needed. Webber and Riordan (1976) stated that one of the main obstacles in the development of aquaculture is availability of fry / fingerlings. The life cycle of any species of fishes of fish, this stage i.e. spawn to fry have high mortality and even hundred percent mortalities is not uncommon.

A good quality of fry and fingerlings are needed to establish a successful fish culture package of *P. sarana*. The present experiment has been searched to develop a practical and economically viable methodology for mass rearing of *P. sarana* spawn in nursery ponds, to obtain optimum survival and growth of fry and fingerlings.

Materials and Methods

The experiment was conducted in 9 earthen ponds of Fields Research Complex ponds of Bangladesh Agricultural University, Mymensingh. The area of the selected every nursery ponds were of .0081 ha for the study. The ponds were rectangular and average depth was 0.76 m. All the ponds were dewatered, freed from aquatic vegetation and limed (250 Kg ha^{-1}). After liming the ponds were allowed to dry for about seven days. Then the ponds were filled up with water up to 1.0 m depth. The cowdung (2500 Kg ha^{-1}) was added in the water. Five days after manuring both urea and TSP were applied to the ponds at the rate of 24.7 Kg ha^{-1} each to stimulate the primary production. Dipterex (0.5 ppm) was used to control predatory zooplankton and harmful insects 24 h before stocking the spawn. The ponds were stocked with 4 days old *P. sarana* having an initial length of 6.1 mm and weight of 0.003 g, respectively. The experiment was planned with 3 Treatments designated as T_1, T_2 and T_3, where every Treatment was designed with 3 reapplications. The stocking densities of the every treatment were 0.7, 0.8 and 0.9 million^{-1} ha^{-1}, respectively. Supplementary feeds rice bran (40%), mustard oil cake (60%) and fish meal (10%) were supplied in the nursery ponds. The fishes were fed with finely powdered food twice daily (1:1 by weight) @ 8 kg/0.1 million fry for the first and second week, which was increased by 2 kg/0.1 million fry/week there after. The Physico-chemical parameters were determined weekly measured with the help of different water testing HACH Kit. Plankton samples were collected every week using 0.55 bolting silk plankton net and later analyzed in the laboratory for qualitative and quantities estimation of plankton under a compound microscope.

The fishes were sampled at weekly interval to determine the change in their length and weight. The experiment was terminated at 6th week and the fry were harvested by repeated netting, followed by drying of ponds and the final growth and survival of fry were estimated.

Results and Discussion

The results of the physico-chemical parameters of the ponds are given in Table 1. The physico-chemical parameters, which included temperature, transparency, pH, oxygen alkalinity, nitrate-nitrogen, nitrite-nitrogen, phosphate-phosphorus, ammonia-nitrogen, hardness and chlorophyll-a of water, were found to be in suitable range for this minor carp. The phytoplankton and zooplankton were numerously present in all the experimental ponds (Table 2). The ponds of T_3 treatment contained lesser amount of phytoplankton and zooplankton. But there was no significant difference in the abundance of phytoplankton and zooplankton among different treatments.

The fish in T_1 treatment showed the highest gain in both length and weight over T_2 and T_3 treatment, where stocking density of spawn was 0.7 million ha^{-1}. Fish from T_1 treatment (Table 4) had the highest average daily gain (0.12±0.00 g), specific growth rate (16.65±0.02 g), highest survival rate (62.9±1.69 %) and FCR (1.05±0.04 g), respectively. The present observation agrees well with the finding of Saha *et al.* (1988) who observed increased growth of rohu fry by feeding rice bran and mustard oil cake. However, much higher stocking densities at the Pond Culture Substation of the CIFRI, 10 to 20 lakh spawn ha^{-1} have been stocked with satisfactory results in well manured nurseries, with the provision of artificial feed (Jhingran, 1982).

The stocking density had significant effect (P<0.010) on the growth and survival of *P. sarana* fry. The highest gain in both length and weight was observed in T_1 Treatment, the lowest one was recorded in T_3 (Table 3). There was a significant variation (P<0.010) in the survival rate in *P. sarana* fry among different treatments. The *P. sarana* fry had highest survival (62.9±1.69%) in T_1 Treatment, where the stocking density was 0.7 million ha^{-1} (Table 3). Survival rate was relatively lower in T_3, which was stocked spawn 0.9 million ha^{-1} (Table 3). The reason for reduced survival rate of fry in this treatment was accounted for higher stocking density of fry, food competition and space of experimental ponds. Due to competition of food the mortality rate was higher than to T_1 treatment. Poor survival (49.19±0.89%) of fry as observed in T_3 treatment seemed to be due to feeding and space. Shigur *et al.* (1974) obtained 71% survival from carp spawn stocked at 6.0-7.5 million ha^{-1}. Tripathi *et al.* (1979) stocked rohu spawn at an average rate of 10 million ha^{-1} and obtained on an average survival of 80.73%. Shahab uddin *et al.* (1988) obtained maximum survival of 73.3% of rohu spawn after 21 days rearing at 3 million ha^{-1}.

From the Table 1, it is evident that physico-chemical parameters were more or less same in all the ponds. Dissolved oxygen content were relatively lower (3.91±051 ppm) in the morning with higher stocking density, as compared to the ponds with lower stocking density (4.11±0.29 ppm) which was also observed earlier by Saha *et al.* (1988). Hardness and chlorophyll-a were 122.99±2.09 mg L^{-1} and 119.50±3.71 μg L^{-1} in T_1 treatment which were relatively higher than all other treatments.

From the Table 2, it was found that the quantity of phytoplankton and zooplankton found in T_1 (314.99 and 38.24) ml^{-1} stocked at 0.7 million spawn ha^{-1}, T_2 (298.81 and 35.13) ml^{-1} stocked at 0.8 million spawn ha^{-1} and T_3 (287.05 and 31.28) ml^{-1} stocked at 0.9 million spawn ha^{-1}, respectively. In the present study the quantity of both phytoplankton and zooplankton was inversely related with the stocking density of fry. The quantity of phytoplankton and zooplankton was higher in T_1 treatment where stocking density of spawn was low.

Saha *et al.* (1994) found 76% survival rate of *Labeo rohita* fry after 21 days when reared at 1.25 million ha^{-1} in earthen ponds. In case of *Puntius gonionotus* for four weeks rearing of spawn also found the highest survival and growth was found with lowest stocking density (Kohinoor *et al.*, 1994). Much higher stocking densities

Table 1: Physico-chemical characters of water in the earthen nursery ponds during the experimental period

	Treatment		
Parameter	T_1	T_2	T_3
Temperature(0^C)	31.22±0.61	31.36±0.66	31.32±061
Transparency(cm)	25.91±046	26.25±0.24	26.26±0.31
pH	7.84±0.17	7.70±.07	7.70±0.17
Dissolved oxygen (mg L^{-1})	4.11±0.29	4.14±0.20	3.91±051
Alkalinity (mg L^{-1})	129.56±1.80	127.28±3.33	127.39±1.41
Nitrate-nitrogen (mg L^{-1})	1.69±0.37	1.74±0.15	1.73±0.20
Nitrite-nitrogen (mg L^{-1})	0.03±0.02	0.03±0.008	0.03±0.07
Phosphate-phosphorus(mg L^{-1})	0.53±0.05	0.49±0.06	0.50±0.03
Ammonia- nitrogen (mg L^{-1})	0.50±0.030	0.49±0.03	0.48±0.03
Hardness (mg L^{-1})	122.99±2.09	121.39±1.54	121.65±1.30
Chlorophyll-a (μg L^{-1})	121.70±2.41	119.50±3.71	117.68±3.04

Table 2: Average variation of phytoplankton (No/ml) and zoolplankton (No/ml) population under different treatments

Group name	T_1	T_2	T_3
Phytoplankton			
Bacillariophyceae	101.95±0.65	98.81±1.07	95.52±0.98
Chlorophyceae	138.52±1.22	135.38±1.39	127.67±1.32
Cyanophyceae	64.71±0.45	51.48±1.14	54.24±0.94
Euglenophyceae	7.43±0.57	10.43±0.96	7.57±0.42
Others	2.38±0.13	2.71±0.45	2.05±0.71
Total	314.99	298.81	287.05
Zooplankton			
Rotifera	13.10±0.42	10.62±0.87	9.0±0.54
Cladocera	7.67±0.67	7.61±0.49	6.81±0.47
Copepoda	7.52±0.52	7.57±0.32	7.38±0.36
Protozoa	6.95±0.30	6.62±0.30	5.29±0.30
Others	3.0±0.27	2.71±0.45	2.81±0.33
Total	38.24	35.13	31.28

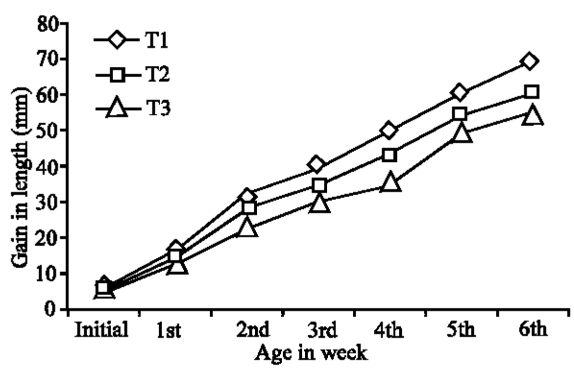

Fig. 1: The graph shows gain in length (mm) of *P. sarana* fry under different density

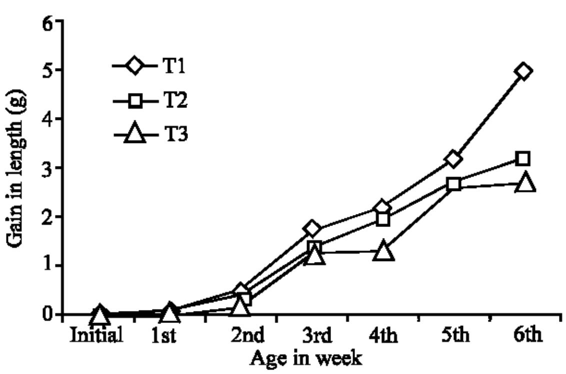

Fig. 2: The graph shows gain in weight (g) of *P. sarana* fry under different density

(7.8 million ha^{-1}) of major carp as mentioned by Hora and Pillay (1962) are known to be adopted by fish farmers. It is clear that the survival and growth of fry were inversely related to the higher stocking densities of spawn and qualities feed supply. Islam *et al.* (1999) found maximum growth (8.67 g) of mirror carp fry within four weeks study by applying mustard oil cake, rice bran and fish meal. Hossain (2001) stocked *Cirrhinus reba* spawn at the rate of 5 million ha^{-1} and obtained higher survival rate (53.50%) and maximum growth (47.0 mg) of within 12 days observation by applying mustard oil cake only, which is more or less similar to this experiment.

Fig. 1 and 2 shows the growth in length and weight of fry. The initial length and weight of spawn stocked in all the ponds was the same, 6.1 mm and 0.003 mg. It is evident from the data that the fry attained an average size of 69.23 mm in length and 4.98 g in weight (with a growth increment of 63.18 mm in length and 4.98 g in weight) in ponds with lowest stocking density of 0.7 million ha^{-1}, while the fry attained an average size of 64.28 mm in length, 3.21 g in weight (with a growth increment of 54.19 mm in length and 3.20 g in weight) in ponds with 0.8 million ha^{-1} density and 55.54 mm in length, 2.67 g in weight (with a growth increment of 49.47 mm in length and 2.67 g in weight) in ponds with 0.9 million ha^{-1} density (Table 3). This is clearly indicated that maximum growth in weight was attained at the lower stocking density of 0.07

Table 3: Growth in length and weight of *P. sarana* post-larvae/fry after 6 weeks rearing under different treatments

		Length (mm)			Weight (g)		
Treatment	Stocking density (million ha^{-1})	Initial	Final	Net gain	Initial	Final	Net gain
1	0.7	6.1	69.23	63.18±0.69	0.003	4.98	4.98±0.04
2	0.8	6.1	60.28	54.19±0.08	0.003	3.21	3.21±0.01
3	0.9	6.1	55.54	49.47±0.34	0.003	2.67	2.67±0.03

Table 4: Growth performance, survival rate and food conversion ratio (FCR) of *P. sarana* fry on different stocking density

	Treatment groups		
Parameters	T_1	T_2	T_3
Average daily gain(g)	0.12±0.00	0.08±0.00	0.06±0.00
Specific growth rate	16.65±0.02	16.61±0.01	16.17±0.02
Survival rate (%)	62.9±1.69	55.94±0.51	49.19±0.89
FCR	1.05±.04	1.05±.02	1.99±.05

million ha^{-1} with the growth gradually decreasing with increase in density, showing a negative correlation between density and growth.

In this experiment, it is clear that survivality and growth of fry were inversely related with the higher stocking densities of spawn. The nursery operators may use a stocking density of 0.7 million ha^{-1} to enhancement of the growth performance and survival rate of *P. sarana* larvae during nursing stage.

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