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Production Potential of Sophore Barb (*Puntius sophore*) in Polyculture - A Field Trial in Tripura

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Abstract

An experiment was conducted on the polyculture of sophore barb with carps in the farmers' pond of Dhalai Tripura to evaluate the production performance and feasibility of carp-barb culture. Two treatments were tried with three replicates for each kind. *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* were stocked solely at the rate of 9500 fingerlings ha^{-1} in the treatment-1 as control, whereas in treatment-2, *Puntius sophore* was stocked at the rate of 25 000 ha^{-1} in addition to carps. The stocking size was 9.23, 9.06, 6.63 and 3.26 respectively for catla, rohu, mrigal and barb. The average fish production over a period of 210 days was recorded as 2132 and 2115 kg ha^{-1} in treatment-1 and treatment-2 ponds, respectively. The overall fish production was found to be same without significant difference between the treatments. Apparently the growth of carps was lowered in the presence of barb, but the overall production can be improved by following better management practices. Partial harvesting of barb is a prerequisite to maintain compatible existence among carps and small fish.

Keywords: Indian major carps; Sophore Barb; polyculture

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Introduction

Small native fishes occupy an enviable position and an inseparable link in the life, livelihood, health and the general well being of rural people of Tripura. Their presence in the pond can be stimulated and manipulated to optimize the production, rather using resources to eliminate them which is a common practice in nowadays aquaculture. They utilize the under-utilized niches of the pond ecosystem for space and food resources (Roos, 2001) and improve the fish production (Kohinoor et al., 2005). Eating small fishes is very good due to their deliciousness and richness in protein and micronutrients (Roos et al., 2003). *Puntius sophore* is a small indigenous fish with huge demand for its taste and price. It is highly considered for its calcium content, 100 g of raw flesh contains 784 mg Ca (Gupta & Rai, 2011). Considerable work has been done on the culture and breeding of major carps, but no serious attempt has yet been made to culture them with small fish in polyculture management. The culture of these small fish with major carps may contribute to the livelihood of the rural poor. In view of the aforesaid context, the aim of this study was to assess the production potential and feasibility of rearing sophore barb (*Puntius sophore*) with carps in polyculture under low cost management system of Tripura.

Materials and Methods

The experiment was conducted in the farmers' ponds of Dhalai Tripura during June to December 2011 in six earthen ponds, each of 0.10 ha and water depth of 1.5 m. The selected ponds were of perennial type, well exposed to sunlight with inlet or outlet facilities. The trial was consisted of two treatments with three replications for each treatment. Ponds were dried before the onset of monsoon and all sorts of unwanted fishes were removed. Lime was applied @ 500 kg ha^{-1}. After rain water harvest, ponds were fertilized with cattle manure @ 10000 kg ha^{-1}, urea @ 12.5 kg ha^{-1} and SSP @ 50 kg ha^{-1}. After seven days of fertilization, the fingerlings of Indian major carps, rohu (*Labeo rohita)*, catla (*Catla catla)* and mrigal (*Cirrhinus mrigala)*, procured from the state govt. farm and *P. sophore*, procured from ICAR, Lembucherra were stocked. Treatment-1 was stocked with carps at the ratio of 1:1:1 (Catla: Rohu: Mrigal) at a stocking density of 9500 nos ha^{-1} and served as control. In treatment-2, barb was stocked @ 25000 nos ha^{-1} in addition to carps. Both the treatments were subjected to same feed and fertilization regime. Rice bran and mustard oil cake were used as supplementary feed in equal proportion (1:1) at the rate of 3% of standing biomass. Fishes were sampled at monthly intervals to assess the growth and survival rate. Feeding was adjusted on the basis of estimated fish biomass. All the ponds were fertilized with split doses of fertilizers at fortnight intervals. Water quality parameters such as water temperature, pH, dissolved oxygen and alkalinity were estimated at weekly intervals following standard methods (APHA, 1992). Plankton was identified and enumerated according to Dewan et al. (1991) and Bellinger (1992). Thinning of barbs was started on three months post-stocking and continued at monthly intervals till the end of harvest. After seven months, all fishes were harvested using a drag net followed by dewatering of ponds. Harvested fishes were counted and survival rate was calculated. Ten percent of the biomass was weighed to estimate the growth and production following standard references. Data were analyzed using SAS, 9.2 and differences were compared using the Duncan's multiple range tests after analysis of variances. Differences considered significant at a level of $p<0.05$. Data expressed as mean ± standard error (S.E.).

Results and Discussion

Temperature, pH, dissolved oxygen and total alkalinity contents of water in different treatment ponds are presented in Table 1. The variations in different water quality parameters were not significant ($p>0.05$) during the period of experiment. All the quality parameters of the experimental ponds remained within the acceptable ranges for aquaculture and there was no abrupt change in any parameters of the pond water. The mean abundance of plankton in different treatment ponds is shown in Table 2. The density of phytoplankton was higher than zooplankton. The variation of mean plankton density was found to be not significant ($p<0.05$) in different treatment groups. The trends of water and plankton quality parameters recorded, have similarity with earlier findings by Roy et al. (2002) and Kohinoor et al. (2005). The identical ranges of water properties can be attributed to the uniformity in size, shape and water depth of pond during the study (Murty et al., 1978) and polyculture adopted for fish farming in small ponds (Costa-pierce et al., 1985). According to New (1987) excessive feed and fertilization causes pond bottom sedimentation and eutrophication in water which affects the water. But no such incidence was occurred in this study indicating that the feed and fertilizer applied was either inadequate to affect the water quality or they were adjusted.

Table 1. Mean values of water quality parameters observed during the study period

Parameters	Treatment-1	Treatment-2
Temperature (^oC)	28.73±0.18^a	28.8±0.17^a
pH	7.66±0.08^a	7.10±0.11^a
Dissolved oxygen (mg l^{-1})	6.13±0.17^a	6.26±0.06^a
Alkalinity (mg l^{-1})	63.33±4.6^a	59.66±2.84^a

Table 2. Mean plankton numbers (x10^{3}cells l^{-1}) in water of different treatment ponds

Plankton group	Treatment-1	Treatment-2
Total phytoplankton	17.6±0.61^a	17.96±1.29^a
Total zooplankton	4.4±0.61^a	4.23±0.52^a
Total plankton	22.00±1.15^a	22.2±1.81^a

The details of fish growth and production are presented in Table 3. The growth of fish was better in treatment-1 pond compared to treatment-2 ponds. Among all species, growth of catla was better than rohu and mrigal in both the treatments. The percentage survival of fish was better ($p<0.05$) in treatment-1 ponds followed by treatment-2 ponds. The total production of fish was recorded higher ($p<0.05$) in treatment-1 as compared to treatment-2 ponds. The specific growth rate of fish did not vary significantly ($p<0.05$) between the treatment ponds. The harvested weight of individual barb was recorded lowered compared to their initial stocking size. The overall production level remained statistically same in both the treatments.

The probable reason for better weight gain by carps in treatment-1 compared to treatment-2 can be due to lack of competition for space and food in absence of barbs. Similar situation was also observed by Kohinoor et al. (2005). Chandra & Haq (1986) reported catla and rohu as plankton feeders and

Table 3. Growth, survival and production of fish under different treatment groups

	At stocking							Production (kg ha^{-1} 7 months^{-1})		
At harvesting	Fish species	Av. Initial wt. (g)	No stocked	No. of fish recovered	Av. final weight (g)	Total wt. (kg)	Survival (%)	Species wise	Total	SGR (% day^{-1})
Treatment-1	Catla	9.23	317	259	365.00^a	94.63	81.80^a	946.30	2132.19^a	2.04^a
	Rohu	9.06	317	263	237.66^a	62.55	83.07^a	625.51		1.81^a
	Mrigal	6.63	317	264	212.00^a	56.03	83.38^a	560.38		1.92^a
Treatment-2	Catla	9.23	317	258	360.33^a	92.98	81.38^a	929.8	2115.23^a	1.85^a
	Rohu	9.06	317	256	232.00^a	59.40	80.75^a	594.03		1.80^a
	Mrigal	6.63	317	262	199.33^b	45.24	82.86^a	452.42		1.89^a
	Barb	3.26	2500	7714	1.80	13.89	-	138.98		-

mrigal as omnivore and bottom feeder and it also prefers aquatic vegetation, as well as submerged grass and debris. The food items of *P. sophore* are also algae, desmids, diatoms and detritus (Natarajan et al., 1975). The size decrease of barb can be attributed to its profuse spawning in a season and rapid growth of the population, hence competition for food and space. The fairly high rate of survival was due to stocking of quality fingerlings, freedom from predators, regular feeding and favorable ecological conditions. The growth of carps is affected slightly in presence of barb but the total production is compensated by barb. In our study, the per hectare fish productivity was 2132 kg in presence of barbs and 2115 kg in absence of barbs. This is almost comparable with the productivity (2128 kg ha^{-1} 6 months^{-1}) reported by Kohinoor et al. (2005). In contrast to this, Gupta and Rai (2011) reported a very high productivity (4750 kg fish ha^{-1}12 months^{-1}). This can be due to size variations of ponds *viz.*, larger the ponds better the production (Ameen et al., 1986).

Thus, the study concluded that, *P. sophore* culture along with Indian major carps is viable in farmers' ponds with low-input management practices. Apparently the growth rate of carps reduced in presence of *Puntius*, but the total production may be compensated by the production of barbs. Better management practices can be adopted to minimize the growth effects of barb on carps. Moreover, the study revealed that, small ponds with good water depths can generously be used for barb culture. *P. sophore* can be an ideal alternative for species diversification in aquaculture. Being self- recruiting, even if poor farmers miss the stocking of cash crops in any season, they can still assure some production from this fish. This adds a great benefit to the poor with an opportunity to eat fish; they can use the small fish for household consumption and sale out the carps as 'cash crop'.

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