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Sarputi, *Puntius sarana sarana* (Hamilton): A Promising Candidate Species for Introduction into the Grow-out Carp Polyculture System of Tripura

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Authors' contributions

This work was carried out in collaboration between all authors. Author RC designed the study, performed the statistical analysis, wrote the protocol and first draft of the manuscript. Authors PB and HS managed the analyses of the study. Author HS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Puntius sarana sarana (Hamilton, 1822) is a tropical freshwater fish belonging to the *Puntius* genus of the minnow family. This species is commonly called as Sarputi or Olive barb. The species has both ornamental and food value. The species is found abundantly in the north-eastern region and has high market value as compared to the Indian major carps. Thus, the species has the potentiality to be used as candidate species in aquaculture production for multiplying farmers' income. Keeping the information in view, the present study was conducted to evaluate the possibilities of using the species in the polyculture system of Tripura for better income to the fish farmers. Based on the different combination of fish species, four experimental groups (T1, T2, T3) including control (C) was set up at the farmers' pond of Tripura. Total ten farmers were selected from the Dhalai district of Tripura. The study revealed that the introduction of *P. sarana* in the culture system produces more

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biomass or yield as compared to the conventional system. However, T1 showed the maximum yield. Furthermore, the species have shown lower specific growth rate as compared to the Indian major carps as well as silver carp. On the other hand, the *P. sarana* were more successful in the present climatic condition of Tripura and had higher survival percentage as compared to the other fishes. Replacement of either *Labeo rohita* or *Cirrhinus mrigala* with the olive barb gives the better yield as compared to traditional practice. Economic analysis revealed that the maximum revenue could be earned by replacing any species with the olive barb. However, among the *P. sarana* based polyculture system, the maximum revenue was earned in T1 group.

Keywords: Puntius sarana; polyculture; grow out; Tripura; candidate species, Indian major carps.

1. INTRODUCTION

Puntius sarana sarana is a tropical freshwater fish belonging to the *Puntius* genus of the minnow family. This species is commonly called as Sarputi or Olive barb which has both food and ornamental value. Moderately compressed deep body, elevated dorsal profile, anterior half of the head with large eyes, round snout, silvery back, golden opercula, yellowish white abdomen are few of the identifying characteristics of the fish [1-3]. This barb is very widely distributed all over India in rivers and tanks. Once distributed widely in the natural waters in the South East Asian countries, however, the poor seed survival [4] and over-exploitation over the years have reduced its natural population to the extent of placing it under vulnerable group [5-7]. In India, this species is widespread (except peninsular India - South of Krishna River), and is also found in Nepal, Bangladesh, Bhutan, Afghanistan and Pakistan [8]. It attains the sexual maturity in the 1st year of its life and prefers shallow water of floodplain areas for the purpose of breeding [9]. They breed in the lotic system during the monsoon time and prefer submerged boulders and vegetation [8]. They can breed multiple time, however, mainly in two occasions they spawn predominantly, 1st between May to mid-September and next between August and September [10]. The technique of induced breeding using synthetic inducing agents like Ovaprim and mass scale seed rearing of the species has already been standardised [11]. Histological study helps in detecting the breeding season and in establishing phenotype characters of fully mature breeders for successful artificial propagation. According to Mookerjee et al. [12], food of *P. sarana* is 27% algae, 45% higher plants, 20% protozoan, 8% mud and sand. It can live in a sandy bed mixed with mud and in a fairly swift current [13]. It is very widely distributed in all the northern and north-eastern rivers of India including Tripura. Keeping the information in mind, the present study was conducted to evaluate the production performance of the *P. sarana* in the polyculture system of Tripura.

2. MATERIALS AND METHODOLOGY

The present study was conducted by Krishi Vigyan Kendra, Dhalai in collaboration with College of Fisheries, Central Agricultural University (Imphal), Tripura. The concept of the On-Farm Trial (OFT) was conceptualised based on the work carried out by Jena et al., 2008 in India. The farm trials were set up at the Kamalpur and Salema Village under the Dhalai district of Tripura. A purposive survey was conducted on 150 fish farmers in the villages, out of which, 10 farmers were selected based on their pond area, interest as well as experience in fish culture system.

The average water holding area under the trial was 0.08 ha, which is the average pond area found in Tripura [14]. As the trial was in field condition, utmost care was taken to follow the standard research methodology. Out of 10 farms, 1 farms were selected randomly as a control pond (C), and the rest 9 farms were assigned under three different experimental groups (T1, T2 and T3) with three replicates each (Table 1).

Prior to the stocking of fishes, all the ponds were prepared following the standard protocols [15]. Fish were fed with a mixture of rice bran and mustard oil cake in 1:1 ratio (w/w) at 5, 3, 2% of biomass/day during the 1st month, 2nd-3rd months, and 4th-6th months, respectively. Periodical sampling was conducted on a monthly basis to check the growth and the survival of the experimental fishes. During the experimental period, the optimum water quality was maintained as per the FAO guidelines through applications of manures and fertilisers [16]. The biometric parameter of fish was calculated

Table 1. Farm level experimental design

Treatments	Species composition	Ration of species maintained	Stocking density (Fingerling ha^{-1})
Treatments 1 (T_1)	catla, silver carp, rohu and sarputi	0.5:0.5:1:1	7500
Treatments 2 (T_2)	catla, silver carp, mrigal and sarputi	0.5:0.5:1:1	7500
Treatments 3 (T_3)	catla, rohu, mrigal and sarputi	0.5:0.5:1:1	7500
Control (C)	catla, silver carp, rohu and mrigal	0.5:0.5:1:1	7500

following the standard formulae (Jena et al., 2008). The economic analysis was done based on the existing market prices of different experimental fishes in Tripura. The market price of fish (per kg) which were used for the study were Rs 220, 100, 200, 180 and 300 for *C. catla, H. molitrix, L. rohita, C. mrigala,* and *P. sarana,* respectively. Statistical analysis of the data was done using SPSS 16.0.

3. RESULTS AND DISCUSSION

The production attributes of different experimental groups have been presented in the Table 2. In the six months long present study, it has been observed that the weight gain of *P. sarana* was maximal in T1 as compared to other groups where *C. mrigala* was replaced by *Puntius sarana*. The observation was may be due to the bottom-column dwelling habit of the species as reported from its natural habitat [8]. Furthermore, the biomass of *P. sarana* of the T1 was also found to be maximal as compared to the other experimental groups. A similar type of results was also reported by Jena et al. [15] with *P. sarana* in polyculture system. However, the study revealed that the specific growth rate of *P. sarana* is lower than the other experimental fishes of the same group. On the other hand, the survival percentage of *P. sarana* is also higher than the other competitive fish species of the same pond (T1 and T3). Thus, even if their SGR is lowest, their higher survival and higher stocking rates give the better yield from the production system. The study has also revealed that the total yield from a polyculture system has increased with the introduction of the *P. sarana*. However, the analysis reflected that the replacement of either *L. rohita* or *C. mrigala* with the olive barb gives the better yield as compared to traditional practice (Table 2). Economic analysis of the production system also revealed that the maximum revenue could be earned by replacing any species with the olive barb in the

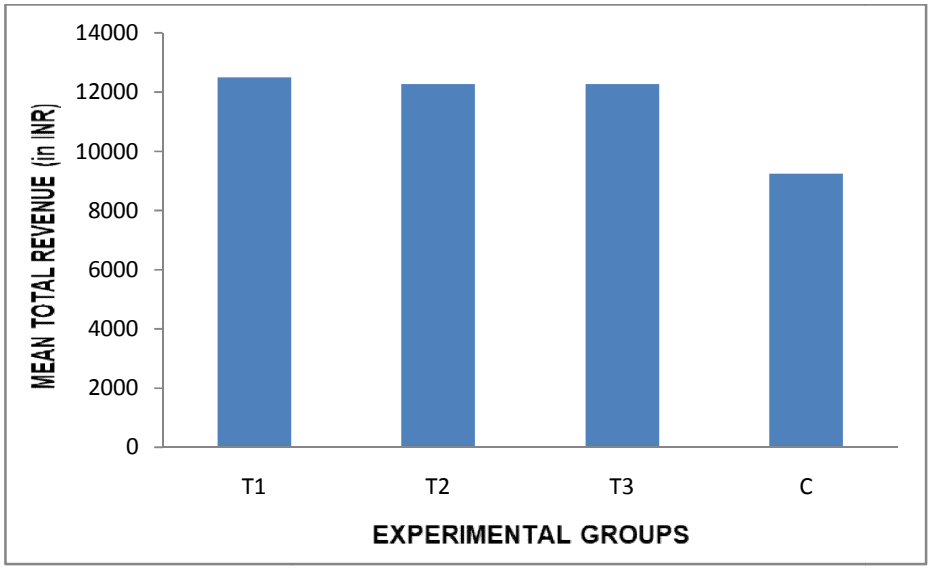

Fig. 1. Total revenue earned in different experimental group

Table 2. Production attributes of different experimental fishes in polyculture system

Experimental groups	Species	Initial weight (g)	Stocking number	Final weight (g)	Weight gain (g)	SGR (%)	Initial biomass (g)	Final biomass (g)	Survival (%)	Rate of fish in Tripura (in Rs)	Total revenue (in Rs)
T1	*C. catla*	6.97	100	190.40	183.43	1.69	696.67	12175.47	64.00	0.22	2678.603
	H. molitrix	6.43	100	217.07	210.63	1.65	643.33	13441.07	62.00	0.10	1344.107
	L. rohita	5.50	200	130.67	125.17	1.49	1100.00	16454.40	63.33	0.20	3290.88
	P. sarana	3.50	200	121.60	118.10	1.47	700.00	17315.20	71.33	0.30	5194.56
T2	*C. catla*	5.67	100	162.13	156.47	1.56	566.67	13842.67	85.33	0.22	3045.387
	H. molitrix	5.23	100	181.07	175.83	1.60	523.33	13289.33	73.67	0.10	1328.933
	C. mrigala	4.77	200	121.33	116.57	1.46	953.33	17530.67	70.67	0.18	3155.52
	P. sarana	3.27	200	113.87	110.60	1.44	653.33	15786.67	70.00	0.30	4736
T3	*C. catla*	6.20	100	185.60	179.40	1.60	620.00	12265.60	66.00	0.22	2698.432
	L. rohita	5.57	100	162.13	156.57	1.56	556.67	10277.33	63.33	0.20	2055.466667
	C. mrigala	4.93	200	127.20	122.27	1.48	986.67	16360.00	64.33	0.18	2944.8
	P. sarana	3.40	200	91.47	88.07	1.38	680.00	15221.87	83.33	0.30	4566.56
C	*C. catla*	4.80	100	200.00	195.20	1.63	480.00	10600.00	53.00	0.22	2332
	H. molitrix	4.10	100	216.00	211.90	1.65	410.00	13824.00	64.00	0.10	1382.4
	L. rohita	3.80	200	152.00	148.20	1.54	760.00	16112.00	53.00	0.20	3222.4
	C. mrigala	3.90	200	88.00	84.10	1.37	780.00	12848.00	73.00	0.18	2312.64

Data shown above are the mean values

present agro-climatic condition of Tripura (Fig. 1). Around 32-35% more revenue can be earned by replacing conventional fish with *P. sarana*. However, the maximum revenue was earned in T1 within the *P. sarana* based polyculture system.

4. CONCLUSION

In the present context, it can be concluded that there are very few data available for species diversification under production system. Thus, the search for the alternative species needs thorough field level study, and the present study was conducted to conclude the viability of using *P. sarana* as an alternative species in a fish production system without hampering the aquatic ecosystem of northeast India. In the present study, *P. sarana* is found to be suitable for aquaculture production with more revenue earning to the farmers. However, the potentiality of the species can be explored further in the future through adopting different on-farm trials.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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