https://doi.org/10.29321/MAJ.10.A02969

Madras agric. J. 66 (6) : 388 – 391, June 1979

Studies on Composite Fish Culture in Different Densities

V. SUNDARARAJ[1], S. R. SREE RANGASAMY[2] and V. SELVAN[3]

Studies were carried out on composite fish culture in two earthern ponds of 100 m² each in size using *Catla*, *Rohu*, *Migral* and *Common Carp* at 15% 40% 25% and 20% ratio, respectively. Fish population density was maintained at 5,000/ha in one pond and 7,000/ha in the other. The annual net production in these ponds was 2,005 kg/ha and 2,160 kg/ha respectively. The growth rate of the individual species was found to be inversely proportionate to the species ratios. *Catla* with the minimum species ratio (25%) gained the minimum weight. High population density exerted stress in reducing the size of fishes in 7,000/ha density pond compared to those in 5,000/ha density pond. The cost of production and cost benefit were computed from the studies and presented.

Composite fish culture is the combined farming of compatible fish species, which occupy different zones of the pond and hence completely utilise the pond. This type of farming practice brings higher fish production compared to the yield through mono-culture. Studies on composite fish culture have been carried out in India since 1950. Recently, progress is being made in the selection of fast growing variety of fishes, high density stocking and better survival rate which are the deciding factors for maximum yield in composite cultures. Various aspects like effect of manures, number of species, species ratios and population density have also been studied in composite fish culture. The present paper deals with the preliminary studies on composite fish culture in the Krishi Vigyan Kendra, Pondicherry.

MATERIAL AND METHODS

The present study was carried out in two dug-out earthern ponds of 100 square metre each using four species of fish namely, *Catla catla*, (CATLA), *Labeo rohita* (ROHU), *Cirrhina mrigala* (MRIGAL), and *Cyprinus carpio* (COMMON CARP) in the ratios of 15%, 40%, 25% and 20%, respectively. The population density was maintained at 5,000/ha at one pond and 7,000/ha in the other pond. The carps were fed with equal mixture of rice bran and groundnut cake at the rate of 2% of the body weight of the fish. The ponds were manured at the rate of 200 kg urea, 250 kg superphosphate, 40 kg muriate of potash and 6,000 kg cow dung per hectare per year. One sixth of the manure was given as 'basal' and the rest was equally divided and applied

1 Instructor (Fisheries)
2 Principal
3 Instructor (Agrl. Economics)
} Krishi Vigyan Kendra, Pondicherry-605 010, India.

fortnightly. The length and weight of the fishes were measured monthly. Each time, atleast 50% of the different fishes were sampled for the data collection. Data on environmental features like temperature, pH, dissolved oxygen, light penetration and plankton density of the pond water were also collected by standard methods used by Krishnamurthy and Sundararaj (1973). The present study was carried out for a period of nine months, from January to October 1977.

RESULTS AND DISCUSSION

In this study, *Catla* was found to attain the maximum weight and *Rohu* gained the minimum weight in both the densities (Table I). There was not much difference in the mean weight of the rest two species viz., *Mrigal* and *Common carp*. The initial and final weights of the four species varied as shown in Table I in both the densities. The gross production in the two ponds at 5,000 and 7,000/ha densities for the period of nine months was 15.25 kg and 16.49 kg respectively and their corresponding net production for the above was 15.04 kg and 16.19 kg. The estimated annual net production at 5,000 and 7,000/ha density was 2,005 kg/ha and 2,160 kg/ha over a period of nine months. The minimum and the maximum values of the various environmental parameters during this study are given in Table II.

The average fish production on our national basis is only 600 kg/ hectare/year (Murthy, 1971). Through recent researches and advancements of the fish culture practices, the production rate or productivity has been increased to 9,000 kg / ha / year in experimental ponds of Central Inland Fisheries Research Institute, Barrackpore (Jhingran, 1975). It has been possible to make a breakthrough in fish production by super intensive fish culture methods in Israel, where the population density is maintained as high as 25,000/ha providing all necessary requirements like quality food, quality water, ration of sewage and adequate supply of air (Anon. 1976). Thus, an yield of 25,000 kg/ ha/year is harvested, indicating the perfection in culture techniques. The low rate of production encountered in this study could be attributed mainly to the type of feed, lack of sewage supply and lack of good drainage system. However, the yield was comparable to that reported from Coimbatore by Natarajan *et al.* (1977).

Catla, Rohu, Mrigal and Common carp as individual species gained higher weight at 5,000/ha than those at 7,000/ha density reflecting the retarding effect of high population density on their growth rate. Limited space, more share for oxygen, and the natural food could be the limitations in high density ponds. The maximum mean weight of *Catla* and minimum mean weight of *Rohu* reported herein was the result of the lowest and highest species ratio respectively (15% and

TABLE I Initial and the final mean values in length and weight of fishes - 5,000/ha Density Pond

Parameters	Catla		Rohu		Mrigal		C Carp	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Length (cm)	8.6	32.6	7.2	26.9	8.0	32.4	4.8	25.9
Weight (gm)	7.6	464.7	3.9	219.0	4.3	327.6	2.3	322.4
7000/ha Density Pond								
Length (cm)	8.6	28.4	6.7	25.3	8.2	31.2	4.7	24.1
Weight (gm)	7.8	287.5	3.2	175.4	5.3	268.6	1.9	275.0

TABLE II Range of values of the Environmental Features

Parameters	5,000/ha density pond		7,000/ha density pond	
	Min.	Max.	Min.	Max.
Atmospheric temperature (°C)	28.0	34.8	28.0	34.8
Water temperature (°C)	28.0	34.3	28.0	34.7
Oxygen level (ml/l)	5.0	6.5	4.8	6.2
pH	7.5	8.1	7.5	8.1
Plankton volume (C^3/M^3)	1.4	6.5	0.8	6.3
Light penetration (cm)	14.2	22.0	16.5	21.0

40%) in 5,000/ha pond. This was true in order towards the different fishes and their species rations in 7,000/ha density also (Table I).

Shang (1976) has reported that composite fish culture is recommended for a profitable yield, which is higher than in monoculture. The monoculture yields of Rohu, Mrigal and common carp, were 1310 kg, 878 kg and 1481 kg/ha per year respectively at 5,000/ha in the same study area (Sundararaj and Sree Rangaswamy, 1978). When compared to the yield through polyculture, the monoculture yields of *Rohu*, *Mrigal* and *Common carp* were only 65.33 per cent, 43.80 per cent and 73.86 per cent respectively. On an average, the yield in the monoculture was 1,223 kg/ha/year amounting to only 60.99 per cent of the yield with

polyculture. Still there is scope to increase the yield level in polyculture by increasing the number of component species. Inclusion of *Silver carp* and *Grass carp* in this study might have resulted in increased yield since the pond might have been completely utilised by the two species.

Computing cost-benefit also shows that composite fish culture is profitable. Pandy (1977) reported that studies in fish productivity are inadequate on cost-benefit ratio. But, in fact a plethora of literature is now available on economics of fish culture, consolidated on global basis by the Food and Agricultural Organisation (Anon. 1977). In a manurial experiment, Natarajan *et al.* (1977) estimated the cost of production of one kilogram of fish to be Rs. 2.20 and Rs. 3.25 for organic and inorganic manured ponds respectively. In the present study, the cost of production of one kilogram of fish was Rs. 2.96 in 5,000/ha density pond and Rs. 2.91 per kilogram of fish in 7,000/ha pond. According to Singh *et al.* (1977) for every one rupee of investment there would be a return of Rs. 2.17 for culture of fishes in irrigation tanks in Bengal and Orissa as it has been experimentally demonstrated at Cuttack. Under Pondicherry conditions, the cost-benefit ratios in the present study are 1.00 : 0.52 and 1.00 : 0.55 for 5,000 and 7,000 per hectare density ponds, respectively. It would be possible to increase the return by reducing cost of fertilisers and supplemental food by suitable management practices. It would be achieved when fish culture is integrated in the farming systems along with poultry, piggery and dairying.

REFERENCES

ANONYMOUS 1976. Report of the National Commission of Agriculture Part III. *Fisheries* pp. 270, Govt. of India Publication.

ANONYMOUS 1977. A selected bibliography on the economic aspects of Aquaculture, 1969-1977. pp. 20,. *FAO Fisheries Circular* No. 702.

ANONYMOUS 1976. Report of FAO technical conference on Aquaculture, *FAO Fisheries Report* No. 188, pp. 93.

JHINGRAN, V. G., 1975. Rural aquaculture. *Indian Fmg.*, **25**, 18-19 & 33.

KRISNAMURTHY. K. and V. SUNDARARAJ, 1973. A survey on environmental features in a section of the Vellar-Coleroon estuarine system, South India. *Mar. Biol.* **23**: 229-237.

PANDEY. K. N., 1977. Fish farming as an employment source. *Indian Express* Dec. 22 1977.

MURTHY, D. S., 1971. Harvest more fish through composite fish culture. *Indian Fmg.*, **21**: 44-43.

NATARAJAN. V., M.N. KUTTY and K. VENKATARAMANUJAM. 1977. 'Fish Production in small ponds' - *Uzhavar Thunaivan*, 6: 15-16

SHANG. 1976. Economics of various management techniques for culture of fin fish. - working paper published by the *South China Sea Fisheries Development and Co-ordinating Programme*, Manila, Phillipines, 37.

SINGH, R. P., A. K. NIGAM, and P. K. PATI, 1977. Fish Culture in Irrigation tanks. *Indian Fmg.*, **27**: 37 & 45.

SUNDARARAJ. V. and S.R. SREE RANGASAMY 1978. Studies on monoculture of carps in farm ponds. *Madras Agric. J.* (in press).