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Preliminary Observations on Freshwater Prawn Farming of *Macrobrachium rosenbergii* (De Man) in Tamil Nadu*

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Abstract: The freshwater prawn, *Macrobrachium rosenbergii* is more consumer preference because of its delicious nature and export potential. Monoculture and ploycultur trials of freshwater prawn *Macrobrachium rosenbergii* were attempted. Production under monoculture was 561 kg ha^{-1} and in polyculture it ranged from 361 to 381 kg ha^{-1}. The present study inferred that low stocking density; proper feed management and use of aerators are essential for better survival and production.

Key words: *Macrobrachium rosenbergii*, monoculture, polyculture, nursery pond, growout pond

INTRODUCTION

The freshwater prawns coming under genus *Macrobrachium* are commercially important. There are about 150 species of *Macrobrachium* identified from various parts of the world, of which about 25 species are found in India. The freshwater prawns *Macrobrachium rosenbergii*, *M. malcolmsonii*, *M. birmanicum* and *M. gangiticum* attain sufficiently large size and are economically important. Of the three, *M. rosenbergii* is commouly known as scampi of immense popularity in commercial aquaculture (Reddy, 1996). It is largest among all freshwater prawns and is ouly species attaining growth of up to 300 mm length and weighs up to 750 g (Tripathi, 2000). In India it is found in all the major rivers and lakes, which are connected to sea. The adaptability of these prawns to low or medium saline waters indicates the possibility of their culture in brackishwater ponds (Soundarapandian and Kaunupandi, 1998). The freshwater prawn culture in Tamil Nadu is still at its infancy. This study was an attempt to evaluate the production performance of freshwater prawn, *M. rosenbergii* under monoculture and polyculture.

MATERIALS AND METHODS

A newly constructed experimental farm in Parangipettai, Tamil Nadu (Lat. 11° 42', Long. 79° 46'E) with three ponds of 1.0 ha each was used for the present study. The farm possessed all required facilities including good water source, iulet and outlet facilities for filling the ponds and draining the water. Each pond possessed 8" dia iulet, which was provided with No. 60 mesh nylon cloth for filling the incoming water.

In order to disinfect the ponds, bleaching powder was applied at the rate of 170 kg ha^{-1} in each pond with a water level of 30 cm. After flushing, the ponds were allowed to dry in open sunlight for 15 days. The upper layer of the pond bottom was scraped and the ponds were ploughed after drying. The bottom was smoothened with the slope towards the outlet.

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Two hundred kilogram of lime was applied in each pond followed by ploughing. After 1 week, water level in the pond was raised up to 1 foot and powdered cow dung was applied at the rate of 110 kg ha^{-1}. The water level was increased further to 70 cm after 2 days and inorganic fertilizers viz., urea (25 kg) and single phosphate (8 kg) were added in each pond.

The water level was raised further to 90 cm after 3 days and second dose of fertilizers (urea and single phosphate) was applied. The ponds were left unused for a week before stocking. The water level in the pond was then raised to 1.2-1.5 m.

The ponds were fertilized at the rate of 5 kg urea and 10 kg phosphate ha^{-1}. As the pond depth was 1 m and manured with 200-300 kg of organic manure (chicken manure ha^{-1}). The transparency was maintained between 35-50 cm before stocking.

To avoid cannibalism during moulting, nearly 2000 nos. of sand pipes were (2-4 diameter, 1 foot length) placed randomly as animal hideouts in each pond. In addition, discarded PVC pipes were also introduced.

Two types of culture were practiced.

- Nursery pond system.
- Grow out pond system.

Nursery Pond Management

The nursery pond size was 1 ha with a water depth of 1.5 m. The post-larvae were stocked with an average size of 35 mm and weight 250 mg. The stocking density of postlarvae was 85 m^{-2} and total duration in the nursery pond was 45 days.

Grow Out Pond Management

The juveniles of about 3 g size were transferred from the nursery ponds to the grow-out ponds (Table 1).

Feeding was done following broadcasting method in the nursery and grow-out ponds. The number of check trays used for one-hectare pond ranged from 4-6 (0.6×0.6 m) and in each check tray 0.5% of the total feed was used. The check tray was checked 2 h after feeding for the remaining feed. According to the amount of remaining feed in the tray subsequent feeding rate was adjusted. The environmental parameters were monitored every morning around 6 am during the entire culture period using a water analysis kit Model CK-711.

Water was changed often observing the color of the water. If the water became dark green in colour water was changed immediately. The rate of exchange was mainly depends upon physico-chemical parameters of pond water, stoking density and stage of culture.

Sampling was done weekly twice. A minimnm of 150-200 individuals were caught during sampling. Cast net was used for sampling. The survival and average body weight was noted in each sampling.

Partial harvest was started after three months of culture. Subsequently after every 15 days, larger sized and berried females were harvested. The prawns were harvested by draining the pond water through a bag net at the sluice and pnmping, followed by cast net operation and hand picking.

Table 1: Stocking density of fish and *M. rosenbergii* juveniles in grow-out ponds

Pond	Types of culture	Stocking density (No. m^{-2})	No. ha^{-1}
A1	Monoculture	3.3	33,000
A2	Polyculture	2.5	25,000
		1.0 (fish)	1,000
A3	Polyculture	2.5	25,000
		1.5 (fish)	1,500

RESULTS AND DISCUSSION

Total production and survival rate of *M. rosenbergii* and daily growth are shown in Table 2 and 3.

The maintenance of good water quality is essential for optimum growth and survival of shrimps. The levels of physical, chemical and biological parameters control the quality of pond waters. The level of metabolites in pond water can have an adverse effect on the growth. Good water quality is characterized by adequate oxygen and limited level of metabolites. Excess feed, faecal matter and metabolites will exert tremendous influence on the water quality of the prawn ponds. Hence critical water quality parameters are to be monitored carefully as adverse conditions may be disastrous effect on the growing shrimps (Ramanathan *et al*., 2005).

Water temperature is probably the most important enviroumental variables in prawn cultures, because it directly affects metabolism, oxygen consumption, growth, molting and survival. In general, a sudden change of temperature affects the prawn immune system. The optimum range of temperature for the present study was 27-31°C throughout culture period.

Dissolved oxygen plays an important role on growth and production through its direct effect on feed consumption and maturation. Oxygen affects the solubility and availability of many nutrients. Low levels of dissolved oxygen can cause damages in oxidation state of substances from the oxidized to the reduced form. Lack of dissolved oxygen can be directly harmful to prawns and cause a substantial increase in the level of toxic metabolites. Low-level of oxygen tension hampers metabolic performances in prawn and can reduce growth and molting and cause mortality (Gilles Le Molluae, 2001). The dissolved oxygen in all the culture ponds in the present study was ranging between 4.0-6.0 ppm.

The pH of pond water is influenced by many factors, including pH of source waters and acidity of bottom soil and prawn culture inputs and biological activity. The most common cause of low pH in water is acidic bottom soil, liming can be used to reduce soil acidity. In most common cause of high pH is high rate of photosynthesis by dense phytoplankton blooms. When pH is high water exchange will be better choice (Boyd, 2001). The pH of the present study ranges between 4.0-6.0 ppm.

Table 2: Total production and survival rate of *M. rosenbergii* in extensive culture for 193 days

	Monoculture	Polyculture	
Particular	Pond (A1)	Pond (A2)	Pond (A3)
Total feed used (kg)	1623.6	1231.84	1078.40
Total production (kg)	561.0	381.00	360.75
Survival (%)	40.0	38.00	37.00
FCR	1:2.8	1:3.20	1:2.90

Table 3: Average body weight and feeding of *M. rosenbergii*

DOC (days of culture) duration	Monoculture (A1) ABW	Polyculture (A2) ABW	Polyculture (A3) ABW
1-25	2.50	2.00	2.00
25-40	4.10	3.50	3.75
40-55	6.50	5.95	5.60
55-70	9.50	8.75	8.15
70-85	13.25	12.00	11.35
85-100	17.50	15.50	15.00
100-115	20.95	19.65	19.00
115-130	24.75	23.50	22.25
130-145	28.50	27.45	27.00
145-160	33.00	31.75	30.95
160-175	37.75	36.25	35.25
175-190	43.00	40.90	39.75

ABW: Average Body Weight

Subramanyam (1984) obtained a production of 280 to 700 kg ha^{-1} of *M. rosenbergii* in 6 months with a stocking density of 30,000 ha^{-1} in monoculture. Similarly, Durairaj *et al*. (1992) obtained a yield of 630 kg ha^{-1} in 6 months with a stocking density of 30,000 ha^{-1}. Kannupandi (1995) also harvested 937.5 kg ha^{-1} with a stocking density of 25,000 ha^{-1}. In the present study the production was found to be 561 kg ha^{-1} from the stocking density of 33,000 ha^{-1} in pond A1 (Table 1). The production was low when compared to the previous studies. Slightly higher stocking density and smaller size of the juveniles at the time of stocking may be the reason for lower production.

Rama Rao *et al*. (1992) reported that high stocking density of 45,000 ha^{-1} decreased the survival rate. Increasing stocking density will lead to crowding resulting in high degree of cannibalism due to their closeness with each other. If the surface area increases, crowding can be avoided and this reduces fighting and cannibalism (Sampathkumar, 2000). Higher stocking density can be used if the pond has a higher water exchange and equipped with paddle wheel aeration (Tarlochan and Vijiarungum, 1992). In the present trials aerators were not used which may be one of the reasons for lower survival and production.

Second reason for lower production in monoculture may be due to cannibalism and also poor feed management (Fujimura, 1974; Peebles, 1978). Provision of nutritionally balanced formulated feed, better feed management and also regular health management will lead to high yield.

According to Durairaj *et al*. (1992), polyculture yields better production i.e., 411 kg ha^{-1} of prawn along with a fish production of 840 kg ha^{-1} in 180 days. Subramanyam (1984) obtained a yield of 654 kg ha^{-1} of prawns and 2,750 kg ha^{-1} of fish in a culture period of 270 days. In the present study, the production was 381 kg ha^{-1} of prawns and 500 kg ha^{-1} of fish in pond A2 and 361 kg ha^{-1} of prawns and 500 kg ha^{-1} of fish in pond A3 (Table 1).

In the present study, the stocking density was 25,000 ha^{-1} for prawns and 1000 ha^{-1} for fishes in the ponds A2 and A3. This appears to be the ideal stocking density for polyculture as stated by many authors. However low production was obtained when compared to those of others. This may be due to cannibalism and poor feed management. The poor production of fish in polyculture might be due to the short rearing period and carps normally require longer culture period for better growth (Natarajan *et al*., 1989).

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