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Limited Circulation

PROSPECTS OF TIGER PRAWN CULTURE IN KERALA

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ABSTRACT

Results of the experiments conducted on the culture of tiger prawn, *Penaeus monodon*, in Vyttila Fish Farm, Cochin during the period 1981-83 are presented in the paper. Prawn production rates in these experiments ranged from 71 kg/ha/45 days to 615 kg/ha/3 months, with retrieval rates varying from 41.4 to 80.5%. Important ecological conditions of the culture ponds during the experimental period are also mentioned in the paper. The main problems in the development of tiger prawn culture in this region and the probable solutions to these are discussed.

INTRODUCTION

Kerala has got an estimated 1.21 lakh hectares of brackishwater area amendable for fish and prawn culture. But for the traditional prawn culture prevalent in about 5,000 hectares of pokkali paddy fields, virtually this entire area is presently left unutilised for fish or prawn culture. Although prawn accounts for the lion's share of our export earnings from the aquatic products, a close study of the production scene shows that the quantity of prawn harvested from Kerala coast is gradually declining. Thus, to support the export industry it is imperative to think in terms of increasing the prawn production through culture.

The tiger prawn, *Penaeus monodon* is considered to be the best species of prawn suitable for culture in brackishwater ponds, because of its fast growth and hardy nature. Blessed with the natural abundance of seed, its culture is extensively practiced along the east coast of India, particularly in the brakishwater area of West Bengal. In the west coast, on the other hand, its culture has not yet reached any commercial status.

In Kerala, where the white prawn, *Penaeus indicus* is the principal species presently cultured, the tiger prawn holds a special advantage in that it can withstand a wider range of salinity fluctuations and can attain a much higher size compared with that of *P. indicus*. In the peculiar climatic conditions of Kerala, culture of *P. indicus* has to be restricted to the period December-May, when the salinity is high. By adopting the culture of tiger prawn which can grow well in low-saline conditions the prawn culture period can easily be extended and atleast one additional crop can be taken in this region.

MATERIAL AND METHODS

With a view to develop a suitable technology for the culture of *Penaeus monodon* in this region, experiments were conducted at Vyttila Fish Farm of Kerala Agricultural university. Results of three experiments conducted during the period 1981-83 are presented in the paper.

Vyttila Fish Farm is situated in the north eastern part of the Vembanad lake, about 10 km from the Cochin barmouth. Water exchange in the farm is effected through a feeder canal from the Kaniampuzha which is connected with Vembanad lake. The annual rainfall in this area is about 3.0 m which shows considerable fluctuations. More than 75% of the rainfall is recorded during the south-west monsoon, which occurs during June-September, while the rest during the north-east monsoon in October and November. The tidal amplitude in the farm is 75 cm.

The present experiments were conducted in ponds of 0.10-0.15 ha water-spread area. The pond bottom soil consisted of sandy clay.

The water level in the ponds fluctuated between 40 and 75 cm. Each of the pond was provided with a wooden sluice for water feeding and draining. Water exchange was done through a fine mesh velon net screen fixed in the sluice. The sluice also had provisions to control the water flow as and when required. Before each experiment the ponds were drained off during the low tide and then mahua oil cake was applied @ 250 ppm in the remaining water to ensure complete elimination of unwanted fishes. After this, lime was applied @ 500 kg/ha in a single dose and water was taken into the ponds through the velon screen. No liming or manuring was done during the second experiment. During the first experiment cowdung and urea were applied in single doses in the beginning respectively @ 1250 kg and 60 kg/ha. In the third experiment, while no organic manure was used, inorganic manures like urea and rockphosphate were applied as a single dose in the beginning respectively @ 20 and 50 kg/ha. Supplementary feeding was not done in the first and second experiments, while it was done for a limited period in the third experiment. Daily water exchange was allowed in the experimental ponds taking advantage of the tides.

Fortnightly observations on the important physico-chemical parameters of water were made during the experimental period in all the three cases.

RESULTS

Physico-chemical conditions of water

The range of important physico-chemical parameters during the experimental period are show in Table-1.

Prawn growth and production

In the first experiment when monoculture of *P. monodon* was conducted with post-larvae of 15 mm/66 mg @ 10,000/ha during the period 12-5-1981 to 26-6-1981 a production of 71 kg/ha/45 days was obtained with a retrieval rate of 47.5% and a final average size of 110 mm and 15.0 g.

In the second experiment *P. monodon* post-larvae of 15 mm/70 mg was stocked @ 24,000/ha on 25-4-1981 in a pond where the fish, *Mugil cephalus* of 285mm/215 g size was stocked @ 800/ha on 16-3-1981. Later *Etroplus suratensis* of 135mm/50g was also stocked in the pond @ 400/ha on 12-5-1981. The prawn was harvested on 13-8-1981 after 110 days' rearing. The final average size of the prawn was 41 mm and 26.65 g, with a retrieval rate of 41.42%. From this experiment prawn production of 265 kg/ha was obtained in 110 days. In addition, fish production of 580 kg/ha was also obtained from the pond. The final average size of *M. cephalus* was 376 mm/500g, while it was 170 mm/129 g for *E. suratensis*.

In the third experiment, monoculture of *P. monodon* was carried out in a pond, where stocking was done with juveniles of 62 mm/2.0 g @ 20,000/ha on 20-3-1983. Fifteen days after stocking brakishwater fishes, *Chanos chanos*, *Mugil cephalus* and *Etroplus surantensis* in the ratio 2:1:3 were introduced into the pond at the rate of 600/ha to control algal blooms. The initial average weights of the three species were 250 g, 200 g and 67 g respectively. Supplementary feed prepared locally with fish meal, ground nut oil cake and ricebran as the chief ingredients, with an approximate protein

TABLE 1. *Range of physico - chemical paremeters in the experimental ponds.*

Expt. No. Parameter	I	II	III
Water temp. (°C)	30 — 35	29 — 35	30 — 32
pH	6.4 — 7.0	6.3 — 7.5	7.08 — 7.67
Salinity (ppt)	0.4 — 14.0	0.4 — 15.9	26.0 — 30.0
Dissolved oxygen (ppm)	4.2 — 12.3	5.0 — 12.6	2.76 — 16.10

content of 42% was given to the prawn daily @ 2.5% body weight of the standing crop estimated at 50% survival during the period 20/5 to 31/5 and @ 5% during the period 1/6 to 13/6, while no feed was given during rest of the rearing period. The total quantity of feed given during the experiment was 16.2 kg. The mean weight of the prawn observed on the 19th, 33rd, 47th, 63rd, 78th and 90th day were respectively 5.0, 10.0, 18.0, 25.0, 30.0 and 38.5 g. The prawn was harvested on 20-6-1983 after 90 days rearing. The final average size of the prawn was 172 mm and 38.5 g with a retrieval rate of 80.5%. Gross production rate of *P. monodon* was 615.5kg/ha/3 months, while the net production was 575.5 kg. In addition to *P. monodon*, a net weight of 193 kg/ha of other prawns and fishes were also harvested from the pond. The final average weight of *C. chanos*, *M. cephalus* and *E. suratensis* were respectively 450, 380 and 107 g.

DISCUSSION

Yield of *P. monodon* obtained from semi-intensive culture so far in the country shows a wide range from 57.9 kg/ha/crop (Anon, 1983 a) to 514 kg/ha/ crop (Sunderarajan *et. al*, 1979). From a set of experiments conducted in the Sunderban area of West Bengal during 1984-85 production of *P. monodon* obtained varied from 322 kg/ha/8 months to 400 kg/ha/4 months (Anon, 1985). Bhowmik *et. al*. (1984) reported that when *P. monodon* post-larvae were stocked @ 30,000 to 50,000/ha production ranged from 275 kg/ha/120 days to 250-318 kg/ha/150 days with survival ranging from 30.0 to 57.3%. Subsequently they have reported a prodnction rate of 224 to 250 kg/ha when prawn was harvested after 2 months and 350-400 kg/ha when harvested after 4 months (Anon, 1985). They also found that better survival and production was obtained when culture period was 60 days, irrespective of the stocking density.

When *P. monodon* post-larvae of initial size 13.2 mm/0.01 g was reared at a density of 35,000/ha in brackishwater ponds of Kakdwip fish farm with 3 types of supplementary feeds, the prawn production obtained varied from 109.7 to 239.0 kg/ha/110 days. The final size of the prawn ranged in the different ponds from 82.5 mm/3.5 g to 132.3 mm/19.5 g, with survival rates varying from 35.9 to 77.9%. The daily growth rate of prawn ranged from 0.6 mm/0.03 g to 1.2mm/ 0.18 g (Rajyalakshmi *et. al*, 1982). Out of the sixteen trials conducted at the different centres of All India Coordinated Research Project on Brackishwater Fish Farming, the average yield, growth and survival of *P. monodon* at Madras centre were 109.3 kg/ha/85 days, 20.0 g and 20.0%; at Kakdwip (W. B.) centre 223.2-332.5 kg/ha/4-5 months, 13.6-35.0g and 47.5-70.0%; at Keshpur (Orissa) centre 57.9-232.1 kg/4-6 months, 30.0-33.0g and 11.5-39.7% and at Kakinada centre (A. P.) 75.0-300.0 kg/ha/4-6 months, 15.0-40.0 g and 18.9-40.0%, respectively (Anon, 1983 b). Production rates of 171,317 and 382 kg/ha/120 days, with survival rates of 85,83 and 74% respectively, have been reported from Philippines when the post-larvae of 15 mm/90 mg were stocked @ 10,000, 20,000 and 40,000/ha. No supplementary feed was given in these experiments for the first two months, while feed was given @ 6% body weight during the 3rd month and 4% body weight during the 4th month. When the prawn stocked @ 20,000/ ha were transferred after 60 days' rearing to another well-prepared pond and reared for 60 more days production rate of 525 kg/ha was obtained (Tiro *et. al*, 1986).

Thus, the production rate of 615.5 kg/ha/ 3 months obtained at Vyttila is the highest ever reported for this prawn in semi-intensive culture systems. The growth, recovery and production rates obtained here in the third experiment compare well with that obtained by Sunderarajan *et. al* (1979) where the stocking rate was the same. Of course, production as high as 971.5 to 1129.0 kg/ha/ 90 days has been reported from the intensive culture of *P. monodon* stocked @ 1.5 lakhs/ ha with heavy feeding and artifical oxygen supply (Anon, 1985).

Growth of *P. monodon* has been reported as 31.5 to 43.0 g /135 days and 60.0 g/210 days (Anon, 1984) and 27.0 g/94 days at a low stocking density of 4900/ha (Anon, 1982). Monthly growth rate reported for this prawn varied from 38.4 to 41.0 mm (Sebastian et. al, 1980; Anon, 1983 and Chakraborti *et. al*, 1986). In the trials conducted at Kakdwip where the prawn was cultured at a density of 20,000/ha the prawn reached only 33.7 g in 120 days (Jhingran, 1977). Mean weights of 31.6 and 32.6 g. at a stocking density of 20,000/ha have been reported at harvest after 120 days of rearing (Tiro *et. al*, 1986). Kungvankiji *et. al* (1976) and Liao (1977) have also reported similar size atharvest in intensive culture systems at much higher stocking rates. In Taiwan at comparatively low stocking densities of 5,000 to 8,000/ha a higher growth rate of 40.0 g in 90 days was achieved in ponds where *Chanos chanos* and the prawn were grown together (Chen, 1976). In the culture trial conducted by Sunderarajan *et. al*, (1979), the prawn showed a growth of 1.59 mm and 0 39 g/day, thus attaining an average size of 169.5 mm and 32.26 g in 80 days of growth. In Vyttila farm the prawn when stocked @ 20,000/ha grew from 62 mm/2.0 g to 172 mm/ 38.5 g in 90 days, showing a net growth of 1.22 mm and 0.405 g/day. It is much higher than the growth rate of 0.11 to 0.27 g reported by Tiro *et. al* (1986).

Sebastin *et. al* (1980) reported very fast growth for *P. monodon* during the first 30 days. Chakraborti *et. al* (1986) also found a fall in growth after 2 months. In this farm under the third experiment, while there was a decline in the rate of increase in total length after the second month, the weight showed a steady increase till the end of the rearing period. The retrieval rate of 80.5% observed here is very much similar to that obtained by Sunderarajan *et. al* (1979) who reported a retrieval rate of 79.77% and compares well with the 74.85% reported by Tiro *et. al* (1986). Krantz and Norris (1975) stated that survival rate of 60-80% is to be expected for *P. monodon* under suitable rearing conditions.

A comparative study of the growth of *P. monodon* under culture in three farms in Sunderban area of West Bengal by Chakraborti *et. al* (1984) showed that growth and yield of the prawn was better at low range of salinity (15-25 ppt) than at higher salinity (25-32 ppt). In the experiment conducted by Sunderarajan *et. al* (1979), where the growth rate and yield were much closer to that obtained in the third experiment at Vyttila. the salinity ranged between 10.9 and 22.4 ppt. The retrieval rates of 47.5 and 41.4% obtained respectively in the first and second experiments at Vyttila Farm with satisfactory growth rate, even when the salinity went as low as 0.4 ppt. show the suitability of this prawn for commercial culture in this region, where low-saline conditions prevail for almost six months in a year.

The introduction of fish in *P. monodon* culture ponds was found to be effective in controlling the algal blooms. Since the fishes introduced were essentially herbivores and detrivores there would have been no serious competition for food with the prawn. Eldami and Primavera (1981) have pointed out the mutual compatibility of *P. monodon* and *C. chanos* in brakishwater ponds. In the mixed culture of these two they have found that the main food of *C. chanos* was a mixture of diatoms, blue-green algae and a few filamentous algae and unidentified animal forms. In contrast food identified in the prawn stomach included small crustaceans, chironomid larvae, polychaetes and other annelids and detritus. Marte (1980) described *P. monodon* as more of a predator of slow moving benthic macro-invertebrates rather than a scavenger or detritus feeder. Thomas (1973) listed crustaceans, fishes, polychaetes and vegetable matter as the food of *P. monodon* in the order of importance.

The yield of 615.5 kg/ha obtained at Vyttila in 90 days shows that more than a tonne of *P. monodon* can be harvested from

the brackishwater ponds of Kerala from one hectare in 6 months in two crops. Taking into account the wide salinity tolerance of this prawn it may even be possible to take 3-4 crops in a year, thus harvesting 1.5 to 2.0 tonnes of high quality prawn from one hectare.

The main problem in taking up its culture in this region is the non-availability of the seed. Unlike in the east coast *P. monodon* seed is not abudant in this coast. Occurrence of the seed has of late been reported from the coast of Cochin (Sebastin *et. al*, 1980; Jose *et. al*, MS) and hatchery production of the seed is picking up fast. Considering its high yield potential, it will be worthy of transporting the seed from the east coast, where it is available in plenty, and expanding its culture in the brackishwater areas of Kerala. The unawareness among the farmers about its culture potential and culture techniques is yet another impediment in the development of the culture of this highly priced prawn and proper extention work alone can solve this problem. Further knowledge on the biology of this prawn is essential for the proper development of its culture. More studies on optimum stocking density, rearing period, managerial practices like pond fertilization, supplementary feeding etc. are also needed. Large-scale hatchery production of the seed is in fact the most urgent need of the time.

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