

## CAGE CULTURE OF INDIAN WHITE PRAWN *PENAEUS INDICUS* IN VELLAR ESTUARY

A. SHANMUGAM, S. RAJAMANICKAM AND T. KANNUPANDI  
*CAS in Marine Biology, Parangipettai-608 502*

### ABSTRACT

Cage culture of *Penaeus indicus* in Vellar Estuary was carried out by feeding the prawns with M/S Ruminant pelleted feed at the rate of 10% of body weight in the first month and 15% of body weight in the remaining culture period. The environmental parameters viz. temperature, salinity, dissolved oxygen and hydrogen ion concentration were monitored and were found to be ranged from 27-30°C, 2.1 - 34.1‰, 3.0 - 4.5 ml/l and 8.0-8.7 respectively. The prawn seeds of 39.0 to 41.0 mm length and 0.41 to 0.52 gm weight were stocked at the rate of 240 seeds/20 m<sup>2</sup>. The final length and weight of the prawns were ranging from 120 to 125 mm and 13.0 to 13.5 gm respectively. The growth rate was calculated and it was 1.76 mm/day and 0.279 gm/day in terms of length and weight respectively. The length-weight relationship has been studied and was found that the result is obeying the cube law and the correlation coefficient was 0.98 which is highly significant at 5% level. The total harvest was 3.7 kg/20 m<sup>2</sup>/90 days and (1975 kg/ha/90 days) with 100% survival. The autoentrants (*Penaeus indicus*, *Penaeus monodon*, *Metapenaeus* spp., *Macrobrachium* sp., *Gerres* sp. and *Terapon* sp.) contributed 0.25 kg in the total harvest.

### INTRODUCTION

AMONG the various intensive culture practices, cage culture is equally important and interesting like pond, pen and race ways systems. Since it is a three dimensional culture, it gives enough room for optimum utilization of its potential. Thus it offers a proper technology to maximize the sustainable biomass production in an unit area. Though it is being practiced extensively in Thailand, Indonesia, Singapore, Japan, Malaysia and Philippines (Coche, 1979; Pantulu, 1979; Reksalegora, 1979) only few works are available in India (Subramanian 1972; Sampath and Ramachandra Menon, 1975; Venkatasamy, 1984; Victor Chandra Bose, 1985; Maruthupandian, 1987; Srikrishnadas and Sundararaj, 1990) and no such work is available from Vellar Estuary except that of Carmel Gerald (1991) which is

on the polyculture of penaeid prawns. Therefore, the present study has been carried out in Vellar Estuary on the monoculture of *Penaeus indicus* using a commercial feed.

The authors are thankful to the Director for encouragement and providing all facilities to do this work.

### MATERIALS AND METHODS

A fixed cage of the size of 5 × 4 × 1 m was erected in Vellar Estuary, keeping two third of the cage inside the water and the bottom 30 cm above the bottom sediment. In order to give hiding place for the prawns just after moulting, stripes of polythene sheets were placed at four corners of the cage.

The seeds of *P. indicus* were collected in the Vellar Estuary using a push net. Healthy uniform size (39 to 41 mm length and 0.41 to

0.53 gm weight) seeds were kept for 2 to 3 days in floating hapa in the estuary itself for acclimatization. Then the most active uniform sized seeds were introduced into different places of the cage to avoid aggregation at the stocking rate of 1,20,000 PL/ha and were grown for a period of 90 days (from 20th August to 17th November, 1990).

The prawns were fed daily at dawn and dusk in two instalments with 10% of their biomass for the first month and then the rate was increased to 15% of biomass until the 90th day of culture. The M/S Ruminant feed with 37% protein was used in the present study.

Fortnightly samplings were analysed for the growth in terms of increase in length and weight.

The environmental parameters viz. dissolved oxygen, salinity, temperature and hydrogen ion concentration (pH) were estimated using winkler's method, silver nitrate titration method, celsius thermometer and Elico pH meter respectively. The rainfall data was obtained from the meteorological unit at the Centre of Advanced Study in Marine Biology, Parangipettai.

The total length in mm (from tip of rostrum to the tip of the telson) and the total body weight in grams were taken by using a measuring board and electrical single pan balance respectively.

At the end of 90 days, during the low tide a sample of feed was tossed into the cage to attract the shrimps and a hand net was used to collect the prawns. The left outs were collected after the cage has been brought to the bank of the estuary.

The autoentrants were also weighed and recorded.

## RESULTS

### *Environmental parameters*

The surface water temperature in the cage varied between 26.5 and 30.3°C. The surface water salinity ranged from 1.2 to 34.1 ‰. A sudden drop in salinity (1.2 ‰) was observed during middle of October to 5th November which might be attributed to the heavy rainfall. The pH in the cage fluctuated from 7.8 to 9.1. Generally the water was slightly alkaline and the mean pH was 8.1. The dissolved oxygen concentration of the surface water varied between 3.2 and 5.0 ml/l. However the mean oxygen value throughout the culture period was around 4.02 ml/l.

### *Growth and production*

The length and weight of *P. indicus* harvested at the end of the culture period of 90 days was found to be ranged from 120 - 125 mm and 13.0 - 13.5 gm respectively. In the present study 3.7 kg of prawn was harvested at the end. The growth rate obtained was 1.76 mm and 0.279 gm/day in terms of length and weight respectively. Thus the production rate of the stocked prawn was 1975 kg/ha.

### *Autoentry*

Since the autoentry is inevitable in cage culture practices, in the present study also out of 3.7 kg of total harvest 0.25 kg was contributed by the autoentered prawns like *P. indicus*, *P. monodon*, *Metapenaeus* spp. and *Macrobrachium* sp. and finfishes like *Ambassis* sp., *Gerres* sp. and *Terapon* sp. were the dominant species.

## DISCUSSION

The environmental parameters such as temperature, salinity, dissolved oxygen and pH are the major factors governing various abiotic and biotic processes in the estuary. The changes in the salinity follows the tidal rhythm with

high and low tide values during high and low tide respectively and the seasons also have their own effect on the environmental parameters. In the present study, a sudden drop in salinity (1.2 ‰) was noticed during the middle of October which might be due to the heavy rainfall (500 cm). However, the salinity fluctuation did not affect the growth and survival rate of *P. indicus* severely.

Subramanian (1972) reported greater growth rate of prawn in natural waters than in ponds. It seems that in the open sea, the surface

(1978). From the present experiment, it is inferred that the cage size of 5 × 4 × 1 m with a stocking density of 1,20,000 PL of *P. indicus*/ha was found ideal in terms of unit weight as well as rate of production. The growth rate of prawns has been reportedly low due to over crowding and lack of sufficient food (George, 1978; Muthu, 1978). But such conditions were not encountered in the present study.

The polyculture studies in the cages with *P. indicus*, *P. monodon* and *P. semisulcatus*

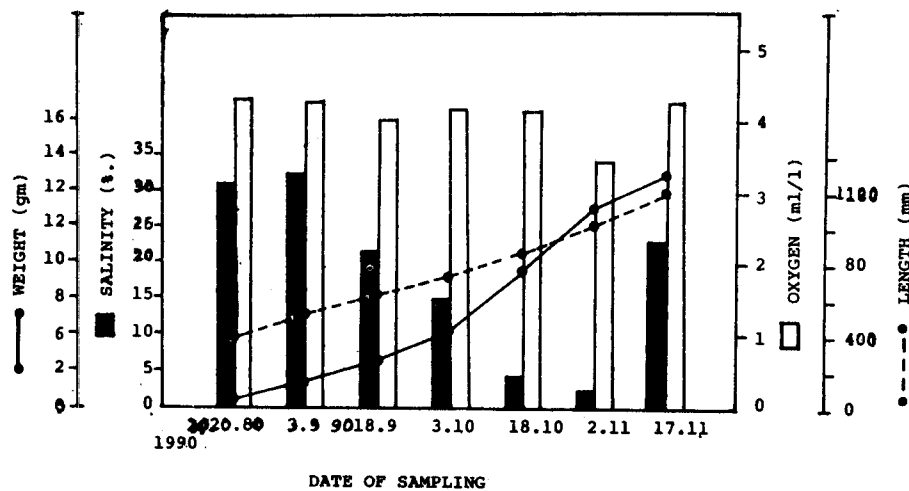


Fig. 1. Rate of increase in length (mm) and growth (gm) in *Penaeus indicus* in relation to salinity (‰) and oxygen (ml O<sub>2</sub>/l).

water currents, bring more food in the form of plankton which form the natural food for growing prawn. Further accumulated metabolites are also periodically washed out by the water currents. In the present study also this has been found to be the same. This is in agreement with the results of Krishnamurthy (1972).

Moreover, the density of population and availability of space for individual may have direct impact on the growth of prawns (Kunju,

showed differential survival rates. The work done by Srikrishnadas and Sundararaj (1990) in cage and floating pen in Tuticorin areas has shown a very low survival rate ranging from 20 to 37%. At the same time, in the work of Carmel Gerald (1991) in Vellar Estuary, the survival rate showed a differential trend. In that study the *P. indicus* and *P. monodon* showed 100% survival whereas *P. semisulcatus* showed 0% survival. So the above results could be compared with that of the present study.

The importance of supplementary feed in the prawn culture experiments is felt very much and was found to show high growth rate when compared to cage without feed (Subramanian, 1981). The prawn feed seems to have good conversion efficiency (1 : 7.5) (Sriraman and Ananthanarayanan, 1987). In the present study, it has been observed that the food conversion efficiency of *P. indicus* by using M/S Ruminant feed was found to be 1 : 3.79.

The growth and total yield of *P. indicus* in the present study were found to be high when compared to that of the other works. In the growth studies in *P. indicus*, Venkatasamy (1984) found that the growth rate was 0.42 gm/day with a final weight of 7.5 gm when he stocked the seeds of 23-40 mm size at the stocking density of 12/m<sup>2</sup> and fed them at the rate of 10% of the body weight. But in the present study, the final weight and rate of increase per day were found to be 13 gm and 0.27 gm respectively. Maruthupandian (1987) when cultured *P. indicus* in pens in Killai Backwater has recorded an increase of 0.48 mm/

day in length and 0.10 gm/day in weight, whereas in the present study, the increase in length and weight were found to be 1.76 mm and 0.2 gm per day respectively.

The increase in the yield of *P. indicus* in the cage culture of the present study may also be attributed to the autoentry. The small juvenile prawns of the various species from the surrounding environment, enter into the cage through the mesh, the autoentry is assessed by the difference in size and weight at the time of harvest. Usually the autoentered organisms are less in size and weight than the actually stocked organisms. The autoentrants recorded in the present study were *P. indicus*, *P. monodon*, *Metapenaeus* spp., *Ambassis* sp. and *Gerres* sp. which weighed about 0.25 kg. But the problem created by the autoentrants are the excess density of prawns than expected in the cage, and the competition for food and shelter, resulting in the reduction in growth rate of culture species. Thus, it could be assumed that the autoentry is an ecological factor of paramount importance, but which is unavoidable in the cages and pens. Therefore, the farmers should pay more attention on this aspect and to minimize it in order to maintain the quality of stocked prawns.

## REFERENCES

- CARMEL GERALD 1991. Cage culture of penaeid prawns in Vellar Estuary. *M.Sc. Dissertation, Annamalai University*, pp. 41.
- COCHE, A. G. 1979. A general review of cage culture and its application in Africa. FAO Technical Conference on Aquaculture, Kyoto, Japan, 26 May-2 June 1976. *Tech. Pap.*, 71R : AQ/Conf/76/72, 33 pp.
- GEORGE, K. V. 1978. Prawn farming. *CMFRI Spl. Pub.*, 3 : 116-121.
- KRISHNAMURTHY, B. 1972. Some points of consideration on estuarine fish farming. *Sem. mar. and Mech. Fishing. Proc. Dept. Fish., Govt. India*.
- KUNJU, M. M. 1978. Taxonomy and distribution of cultivable prawns. *Summer Institute in Breeding and Rearing of Marine Prawns. CMFRI, Cochin*.
- MARUTHUPANDIAN, S. 1987. Pen culture of *Penaeus indicus* and *Penaeus monodon* in Killai Backwaters. *M.Phil. Thesis, Annamalai University*.
- MUTHU, M. S. 1978. The prospects of prawn culture in the brackishwater areas of Tamil Nadu. *Proc. Sem. mar. Mech. Fishing, Govt. Tamil Nadu*. pp. 27-30.
- PANTULU, V. R. 1990. Floating cage culture of fish in the lower Mekony River Basin. In : T. V. R. PILLAY AND W. A. DILL (Ed.) *Advances in Aquaculture*. Fishing News Books Ltd., Farnham Surrey. pp. 423-427.
- REKSALEGORA, O. 1979. Fish cage culture in the town of Jambi, Indonesia. In : *Proc. IDRC/SEAFDEC Int. Workshop on Pen and cage culture of Fish, Tigbauan, Iloilo, Philippines*. 11-22 Feb. 1979: SEAFDEC, Iloilo, pp. 51-53.

- SAMPATH, V. AND V. RAMACHANDRA MENON 1975. Preliminary experiments in the cage culture of prawn at Kovalam in Tamil Nadu. *Bull. Dept. Mar. Sci., Univ. Cochin*, 7 (3) : 467-476.
- SRIKRISHNADHAS, B. AND V. SUNDARARAJ 1990. Studies on the growth of marine shrimps in cages and floating pen. In: *Proc. Natl. Sem. on Aquaculture development in India, Thiruvananthapuram*. pp. 30-31.
- SRIRAMAN, K. AND R. ANANTHANARAYANAN 1987. Culture of *Penaeus indicus* (Milne - Edwards) with different stocking density. *Indian J. mar. Sci.*, 29 (1) : 108 - 114.
- VENKATASAMY, G. 1984. Studies on the culture of *Penaeus indicus* in cages. In: *Proc. Natl. Sem. on Cage and Pen Culture, Tuticorin*. pp. 99-102.
- SUBRAMANIAN, M. 1972. Experimental studies on the growth in *Penaeus monodon* Fabricius. *Sem. mar. and Mech. Fishing. Proc. Dept. Fisheries, Government of Tamil Nadu*.
- VICTOR CHANDRA BOSE, 1985. Pen culture of shrimp in the backwaters of Killai, Tamil Nadu. BOBP/WP/35, 44 pp.