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SEED PRODUCTION OF THE GREEN TIGER PRAWN *PENAEUS SEMISULCATUS* IN A NON-CIRCULATORY AND NON-AERATED OUTDOOR TANK

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ABSTRACT

The results of the experiments on rearing of the larvae and postlarvae of the Green Tiger Prawn *Penaeus semisulcatus* in outdoor cement tanks following the Community Culture Method are presented. 687,637 active nauplii obtained from five spawners (133 mm - 175 mm) were reared in the sea water fertilized with different chemicals and the larvae fed with mixed phytoplankton and compounded diet. The postlarvae attained a modal size of 16-20 mm (range 11-30 mm) in 33 days, 97,789 postlarvae were harvested and released into the Pillaimadam coastal salt water Lagoon at Mandapam. The overall survival rate from nauplius to PL 25 was 14.2%. No aeration was provided to the water in the rearing tanks.

INTRODUCTION

THE COMMUNITY culture or Japanese method in large outdoor tanks and monoculture or separate tank culture, also known as 'Galveston' method of culture, in indoor tanks are the two basic hatchery systems currently employed for the production of penaeid prawn seed. Similarly, the advantages and disadvantages of establishment of sophisticated hatcheries capable of producing several millions of seed and the small size, low-cost hatcheries to meet the requirements of smallscale culture operation are the two aspects which are being considered and discussed in the promotion and development of penaeid prawn culture in several of the developing countries including India. In the latter context, an experiment was conducted in an outdoor tank for rearing the larvae and postlarvae of the green tiger prawn *Penaeus semisulcatus*, an important species, supporting the commercial prawn fisheries of the southeast coast of India and a species having great potential for culture in the sea water fed grow-out systems. The experiment was carried out as one of the series of hatchery runs to produce seed for sea ranching the species at the Regional Centre of the Central

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Larval and Postlarval Rearing

A rectangular outdoor cement tank of 61t capacity in the marine aquarium complex of the Regional centre of CMFRI, was used for rearing the larvae and postlarvae. The tank was cleaned and sun-dried for two days. 26.5 t of unfiltered sea water stored in an overhead tank was pumped into the tank on 1-7-1988.

Five spawners ranging in size from 133 mm to 175 mm total length (weight 116 to 52 g), procured from the trawl net operated off Mandapam, were brought to the laboratory on 30-6-'88. Following the procedures developed by the Institute (Silas *et al.*, 1985) each of the spawners was kept in a conical bottom spawning tank of 250 l capacity containing 200 l of aerated sea water, to which EDTA was added to facilitate spawning.

All the five spawners liberated viable eggs during night time to produce a total of 6,87,637 active nauplii by the afternoon of 1-7-'88. These nauplii were collected from the spawning tanks and transferred into the already prepared cement tank. The details of the rearing strategy followed in the experiment from N 1 to PL 25 over a period of 33 days are given in Table 1.

On 2-7-'88, when the nauplii reached Nauplius VI sub-stage, the sea water in the tank was fertilised with 3.8 g of potassium nitrate (KNO_3) and 1.9 g each of potassium dihydrogen orthophosphate (KH_2PO_4), sodium silicate (Na_2SiO_3) and ethylene diamine tetra acetic acid (disodium salt) ($CH_2.N(CH_2.COOH).CH_2.COONa)_2.2H_2O$. Besides, 150 l of mixed phytoplankton culture dominated by *Chaetoceros* sp. was also added to facilitate phytoplankton bloom. The water level in the tank was raised from 26.5 t to 34.5 t. On the subsequent days of rearing between 3-7-'88 and 9-7-'88, when the Nauplius VI grew to postlarva I, the tank water was fertilised with the same dose of chemicals as above on 5-7-'88 and the phytoplankton culture varying from 60 l to 100 l was added on 3-7-'88, 4-7-'88, 6-7-'88 and 8-7-'88 (Table 1). The addition of phytoplankton culture was necessitated due to poor sun light on account of overcast climatic condition. During this period, the water quantity in the tank was also raised gradually to make up to 61 t by 9-7-'88.

The monitoring of phytoplankton growth in the tank during the first 9 days of rearing showed relatively good growth of phytoplankton, the cell count of the dominant species of *Chaetoceros* ranging from 1,160 to 31,160 cells/ml. An appreciable natural bloom of copepods also developed in the tank on 7-7-'88 and this bloom was maintained throughout the rearing period. The observation on the gut and the long faecal filaments extruded by the larvae indicated their feeding on the micro-organisms developed in the tank.

When the larvae attained the postlarva 1 stage (9-7-'88) the feeding strategy was changed from live-food to compounded wet diet. The chicken egg and the minced meat of the prawn *Metapenaeopsis stridulans* at the ratio of 1 : 5 were mixed, cooked and made to particulated size of about 100-200 μ. 60 g of this feed was given to the postlarval population in the tank twice a day in the forenoon and afternoon. As the postlarvae advanced to PL 6 stage (15-7-'88) another dry feed was prepared from prawn meat, squilla meat (each 30% dry weight) and groundnut oil cake (40% dry weight) using myda as binder. Each of these ingredients was mixed well and made into a paste, which was then extruded through a

TABLE 1. *Details of rearing of larvae and postlarvae (N to PL 25) of* Penaeus semisulcatus *in 61 t capacity outdoor cement tank by community culture method*

Date	Larval/postlarval stage	Rearing strategy
1-7-'88	N 1 and N 2	6,87,637 numbers of N 1 and N 2 nauplii introduced into the outdoor cement tank, containing 26.5 t of unfiltered and stored sea water pumped from an overhead tank.
2-7-'88	N 6	The tank water fertilised with potassium nitrate (3.8 g) potassium dihydrogen orthophosphate, sodium silicate and ethylene diamine tetra acetic aeid (each 1.9 g); 150 l of phytoplankton predominated by *Chaetoceros* sp. added; water quantity in the tank raised to 34.5 t.
3-7-'88	P 1	Water quantity increased to 40 t; 60 l phytoplankton culture added.
4-7-'88	P 2	Water quantity increased to 45.6 t; 100 l of phytoplankton added.
5-7-'88	P 2 and P 3	Water quantity raised to 47 t; water fertilised with the same dosage of chemicals as on 2-7-'88; overcast sky, poor sunlight.
6-7-'88	P 3 and M 1	Water level raised to 49 t; 60 l of phytoplankton added; overcast sky, poor sun light; rained during night.
7-7-'88	M 1 and M 2	Water level raised to 50 t; copepod bloom developed in the tank water.
8-7-'88	M 2 and M 3	Water quantity increased to 57 t; 80 l of phytoplankton added; rained during day time.
9-7-'88	M 3 and PL 1	Water quantity raised to 61 t.
10-7-'88 to 14-7-'88	PL 1 - PL 6	60 g of wet compounded diet given twice a day in the forenoon and afternoon; 10 t of water in the tank exchanged with an equal quantity of fresh sea water pumped from the overhead tank.
15-7-'88 to 19-7-'88	PL 6 - PL 11	50 g of dry compounded diet given twice a day in the forenoon and afternoon; water management as above.
20-7-'88 to 1-8-'88	PL 11 - PL 24	Feeding with dry compounded feed as above; 12 t of water in the tank exchanged with an equal quantity of fresh sea water pumped from the overhead tank.
2-8-'88	PL 24 - PL 25	Water drained from the tank and 97,789 numbers of postlarvae harvested and ranched into Pillaimadam coastal salt water lagoon. Total duration of rearing 33 days; survival rate from N 1 to PL 25 : 14.2%; no aeration provided throughout the rearing period nor the bottom sediment removed.

pelletizer, dried and powdered. From 15-7-'88 onwards, the wet diet was replaced by this dry diet and offered to the postlarvae at the rate of 50 g twice a day till the end of the rearing experiment. Throughout the larval and postlarval rearing period lasting over 33 days, the water in the tank was not aerated nor the bottom sediment was removed. However, the water quality was maintained by replacing 10 t of water from the tank every day with an equal quantity of fresh sea water pumped from the overhead tank between 10-7-'88 and 19-7-'88.

From 20-7-'88, the rate of exchange of sea water was increased to 12 t everyday till the end of the experiment. The salinity of the water in the tank varied from 30.0‰ to 35.37‰ during the period of the experiment and the temperature from 29.8°C to 33.5°C. When the larvae were in the mysis I and II stages (6-7-'88 - 8-7-'88) the salinity of the tank water decreased from 31.6‰ to 30.0‰ due to rain. However, no larval mortality was observed due to this reduction in the salinity.

After 33 days of rearing in the tank, the postlarvae attained a modal size of 16-20 mm (size range 11.0 mm to 30.0 mm). The water from the tank was then drained through an out let and a total of 97,789 postlarvae were harvested. These were released into the Pillaimadam coastal salt water lagoon at Mandapam as part of the ranching programme. The overall survival rate from N to PL 25 was 14.2%.

Remarks

The community culture method developed by Hudinaga and Kittaka (1967) is extensively followed in Japan, where the present annual production of juveniles by this method is of the order of 600-700 million. Concrete tanks of 100-250 m^3 are used in this system to produce 10,000 to 15,000 PL 20/m^3 over a period of 30 to 45 days. The survival rate from nauplius to PL 20 is 25-60% (Liao and Chao, 1983). This method is relatively simple to operate, entails lower labour cost and manpower and needs no separate algal culture facilities. However, the production and survival rate in this system are found to fluctuate widely and depend largely on the fertilisation strategy of water to develop phytoplankton bloom, their appropriate maintenance and water quality management.

In the present experiment, although the survival rate from nauplius to PL 25 is only 14.2%, it is interesting that this was achieved by rearing the larvae and postlarvae in a non-circulatory and non-aerated water. In India, prawn culture is carried out at present in about 43,000 ha. It is being planned to expand it to over 10,000 more hectares. To meet the seed requirements for sustained culture in these areas, establishment of about 800 hatcheries have been envisaged. Besides the construction of large hatcheries, small size, low-cost hatcheries, indigenous to the region has been given greater emphasis (Imre Csavas, 1988). In this context, the results of the present experiment indicate the possibility of construction and operation of small hatcheries following simple methods, even without aeration and water circulation, to meet the seed requirement of farmers engaged in small or medium scale prawn culture operation. This hatchery system is of particular relevance in the southeast coast of India, where unpolluted and clean sea water is available and where the prawn culture is essentially based on pumped sea water to the growout ponds and the hatchery could be constructed and operated as an integrate part of the entire culture system for advantage.

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