

## PRESENT STATUS OF MARINE PRAWN HATCHERY TECHNOLOGY IN INDIA

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### Introduction

One of the reasons for the rather slow growth of the prawn culture industry in India is the non-availability of the seed of desirable species of prawns at the proper time in adequate quantities to stock the grow-out ponds. At present, there are approximately 30,000 ha of traditional prawn culture fields existing in the country mainly in West Bengal, Kerala and Karnataka. If 2-3 crops of prawns per year are to be cultivated in these fields on scientific lines at a stocking density of 40,000 *P. Indicus* seed/ha/crop or 15,000 *P. monodon* seed/ha/crop, we need 2400-3600 million seed of *P. Indicus* or 900-1350 million seed of *P. monodon* per year. The natural prawn seed resources available in the surf and estuarine regions are totally inadequate to meet these requirements. Their occurrence in nature is also seasonal and sporadic and does not necessarily synchronize with the good growing seasons. Therefore, for ensuring a steady supply of quality prawn seed to the prawn culturists at appropriate times we should establish more prawn hatcheries all along our east and west coasts. To supply prawn seed for growing at least 2 crops in the existing 30,000 ha, we need 48

hatcheries of *P. Indicus* or 18 hatcheries of *P. monodon*, each hatchery capable of producing 50 million prawn seed per year. It is evident that there is an urgent need to establish large scale hatcheries in the maritime states to cater to this colossal demand for prawn seed.

### Prawn hatchery work at the Central Institutes

The Central Marine Fisheries Research Institute (CMFRI), Cochin realising the importance of developing indigenous technology for hatchery production of prawn seed, initiated work in late 1975 at its Narakkal Prawn Hatchery Laboratory (NPHL) on breeding of penaeid prawns in captivity and rearing the spawned eggs through the various larval stages to the postlarval stage on a large scale. Intensive and directed research on factors that affect maturation and spawning of marine prawns in captivity and on the morphology, behaviour, feeding habits and nutrition of the larvae of commercially important penaeid prawns was undertaken. The accent was on developing a low-cost technology utilizing locally available raw materials for hatchery production of prawn seed. The capital intensive Japanese, American and French systems of larval rearing involving the

use of pure cultures of phytoplankton and freshly hatched naupli of brine shrimp for feeding the various stages of larvae were discarded and totally indigenous systems of rearing were developed. The techniques were refined and modified over the past 10 years to increase the survival rates and to simplify the procedures to make the technology economically viable under Indian conditions. The hatchery technology evolved is in fact a package of practices involving the following components. (1) Inducing farm-grown broodstock prawns to mature and spawn in land-based maturation facility through unilateral eyestalk ablation and control of environmental factors. (2) Production of mixed cultures of diatoms in 1 tonne capacity fibreglass tanks by fertilizing raw seawater with inorganic nutrients and exposing it to sunlight. The diatom bloom develops within 15-20 hrs and is used for feeding the protozoa and mysis stages. The larvae are raised on an exclusive diet of phytoplankton upto the last mysis stage. (3) Development of a dry particulate diet based on readily available inexpensive raw materials such as prawn waste, mantis shrimp, fish meal, groundnut oil cake and tapioca powder for feeding the postlarval stages.

Using these techniques over 500 females of *Penaeus indicus* have been made to mature and spawn at the Narakkal Prawn Hatchery Laboratory during the past two years. About 70% of the eye ablated females (145-155 mm in total length) kept in the maturation pools mature and spawn predictably, 4-5 days after unilateral eye stalk removal. The average number of eggs produced is 80,000 per female

and the average hatching rate is 87.5%. The larval rearing system in which 75,000 nauplii are stocked in one m<sup>3</sup> of sea water results in an average survival rate of 50% from the nauplius (N 1) to the 5th postlarval (PL 5) stage. Over 5 million PL 5 per season (5 months) have been produced at the Narakkal Prawn Hatchery Laboratory during the last two years. The NPHL has the distinction of being the only hatchery in India where *P. indicus* has been practically "domesticated". The entire life cycle of the prawn is completed in the farm itself without the prawn going back to the sea for maturation and spawning. *P. indicus* has been maintained for five continuous generations at the NPHL.

On the basis of the results obtained at the NPHL, the capital investment for starting a commercial hatchery for produce 35 million PL 5 of *P. Indicus* per year is estimated to be around Rs. 11 lakhs. The recurring expenditure (including interest on loan, depreciation, salaries, contingencies etc.) will be about 3.8 lakhs. The cost of production of 1000 PL 5 is estimated as Rs 10.9 if interest on loan and depreciation are included in the recurring expenditure. The production cost is just Rs 4.18 per 1000 PL 5 if only the salaries, operating costs, contingencies and maintenance costs are included in the recurring expenditure. If the PL 5s are sold @ Rs 16 per 1000 the net profit after repayment of loan instalments, works out to be 9.55%, 13.55% and 19.1% (of the capital investment) at the end of the 1st, 2nd and 3rd year of hatchery operations.

Using the techniques developed at the NPHL the CMFRI has successfully produced over 10 lakh postlarvae of the tiger prawn *P. monodon* about 1 lakh postlarvae of the Japanese Kuruma prawn *P. japonicus* at their field station in Kovalam near Madras and about 5 lakh postlarvae of *P. semisulcatus* at their field station in Tuticorin. The eyestalk ablation technique induced maturation has been successful with all these 3 species of prawns as well.

The CMFRI has also been conducting 3-4 week training courses and Summer Institutes to transfer the prawn hatchery techniques, as and when they were developed, to the State Government officials and the teaching and research staff of Universities and Agriculture Universities. Under this transfer of technology programme the CMFRI has conducted 2 Summer Institutes and 4 training courses on prawn breeding and rearing at the Narakkal prawn Hatchery Laboratory between 1977 and 1985.

The technology package developed by the CMFRI for hatchery production of penaeid prawn seed has been published in the form of a manual giving complete details about the technique of induced maturation and spawning by eyestalk ablation, larval rearing procedures, culture of phytoplankton to feed the larvae and preparation of particulate feed for the postlarvae. Criteria for selecting a site for the hatchery, infrastructure facilities (including buildings and equipment) needed for a hatchery and the economics of production of prawn seed are also discussed in the manual.

The Central Inland Fisheries Research Institute (CIFRI) has been trying to rear *P. monodon* at Puri without much success. Recently the CIFRI has been able to rear one brood of *P. monodon* larvae to the postlarval stage at its newly set up facility at Ennore near Madras. However, the details of the experiments are not yet available.

The Central Institute of Fisheries Education (CIFE) is said to have developed a larval rearing method using yeast, egg-custard, *Acetes* and zooplankton to feed the larvae. A demonstration unit is situated at its farm in Kakinada. However no details are available about the procedures followed and the survival rates obtained.

The Marine Products Export Development Authority (MPEDA) is setting up a prawn hatchery with foreign collaboration at Vallarpadam near Cochin. It has not yet been commissioned.

### Commercial Prawn Hatcheries

The Regional Shrimp Hatchery of the Kerala State Fisheries Department at Azhikode and the private Crecent Hatchery at Eriad are producing prawn seed on a commercial basis. The Regional Shrimp Hatchery produces about 4-5 million seed of *P. indicus* and *P. monodon* every year. *P. indicus* postlarvae (PL 8 - PL 10) are sold @ Rs 25/- per thousand and those of *P. monodon* are sold @ Rs 35-50 per thousand. These two hatcheries use crustacean tissue suspension to rear the larvae in 2 to 15 ton capacity outdoor tanks and depend on wild spawners collected from the sea to obtain the eggs for

rearing. We have no information about the economics of these hatchery operations.

### Other efforts at the State Level

The State Fisheries Departments of Gujarat and Orissa have started small experimental prawn hatcheries at Okha and Paradeep respectively. These hatcheries are manned by staff who have been trained at the Narakkal Prawn Hatchery Laboratory of the CMFRI. At Okha some success has been achieved in rearing *P. merguensis* to postlarval size while the emphasis at Paradeep is on *P. monodon*. The infrastructure facilities of these two centres should be improved to achieve better results.

### Remarks

It is clear that indigenous technology is available in India for hatchery production of penaeid prawn seed. In the face of these recent developments outlined above the search for foreign technology in certain quarters for establishing prawn hatcheries is unwarranted. Foreign technology is capital intensive and requires sophisticated equipment and highly skilled technicians to operate the hatchery. It should also be remembered that technology developed in other countries may not work under Indian conditions unless they are suitably modified. What we need is a simple, low-cost technology suited to Indian conditions and one which can be adopted even by small entrepreneurs. We should be happy that Indian scientists have developed just such a technology.