CMFRI
bulletin 44
Part Two

MARCH 1990

NATIONAL SYMPOSIUM ON RESEARCH AND DEVELOPMENT IN MARINE FISHERIES

MANDAPAM CAMP
16-18 September 1987

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P. B. No. 2704, E. R. G. Road, Cochin-682 031, India

Central Marine Fisheries Research Institute
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Bulletins are issued periodically by Central Marine Fisheries Research Institute to interpret current knowledge in the various fields of research on marine fisheries and allied subjects in India.

Published by
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Director
Central Marine Fisheries Research Institute
E. R. G. Road
Cochin-682 031, India

Limited Circulation

Paper - 43

DEVELOPMENT OF A MINI PRAWN HATCHERY FOR FISHERMEN FAMILIES

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ABSTRACT

The Central Marine Fisheries Research Institute has developed a totally indigenous technology for hatchery production of penaeid prawn seed. This technology has been adopted by the States of Kerala and Karnataka to build large commercial hatcheries at Cannanore and Kumta Bay respectively.

The technology is so simple that it can be adapted by fishermen families living on the sea shore for producing prawn seed on a mini scale in their houses. The equipment needed for this mini hatchery and the economics of such operations are given in the paper. There is great scope for developing it into a cottage industry in the coastal areas.

INTRODUCTION

The Central Marine Fisheries Research Institute, Cochin, has developed a totally indigenous technology of prawn seed production (Silas *et al.*, 1985). Locally available equipment and material are used. The technology differs from those used in other parts of the world in two main respects: (1) Mixed diatom cultures developed by fertilizing raw sea water with plant nutrients are used to feed the larval stages, instead of pure algal

cultures and (2) Simple particulate feed is used for postlarvel stages, instead of brine shrimp nauplii. The larvel rearing procedures have been so simplified that even unskilled workers with some training can take up this work.

It is a modular type of hatchery so that the capacity of the hatchery could be increased or decreased by changing the size and number of larvel rearing containers to suit the financial resources available. The prawn hatchery technology developed by CMFRI has been taken up by the States of Kerala and Karnataka to set up large prawn hatcheries at Cannanore and Kumta Bay respectively. The technical know-how is being provided by CMFRI for these hatcheries.

OBJECTIVE

The objective is to encourage fishermen families living on the shore to make use of the limited facilities available in their houses to produce prawn seed and earn additional income in their leisure time. The fishermen who goes out for fishing every day can bring the spawners and the women and children in the family can take care of the larvae. The procedures are so simple that the family members can learn them by attending short training courses at the Krishi Vigyan Kendra of CMFRI at Narakkal.

REQUIREMENTS

The total investment for setting up a hatchery unit is only Rs. 3000. The equipment used are plastic bins, basins and buckets and aquarium aerators for aerating the water. These containers can be kept on the verandah of the fishermen's house. Electricity should be available to operate the aerators. Clear seawater with salinity of 28–34 ppt should be available for at least 8 months in a year. The seawater for rearing the larvae can be collected in plastic buckets from the nearby sea. The chemical used for developing diatom cultures for feeding the larvae are cheap and easily available. (Please see section on Economics for details of equipment needed).

OPERATIONAL PROCEDURES

A fully mature and impregnated female of the white prawn *Penaeus indicus* (Naran) is to be collected and used as spawner. When the animal is held against light, ovary can be seen through the cuticle on the dorsal side of the animal along its entire length. Fully ripe ovary is dark olive green in colour, and has a lateral expansion in the first abdominal segment. In an impregnated female, the sperm mass can be seen as a whitish substance below the transparent cuticle of the sperm storage organ called thelycum on the ventral side of the head (cephalothorax) between the 4th and 5th walking legs.

The spawners can be collected from the trawlers/gill nets. Immediately on capture, can be kept alive in seawater in buckets and brought to the house. Only one good spawner is needed per run. It can be kept in 50 l of filtered, sediment-free seawater having a salinity of 30-34°/$_{oo}$ in a 100-l bin. EDTA (0.1 g) is added and good aeration is provided. The mouth of the bin is covered with velon screen to prevent the animal from jumping out. Throughout the night the spawner is kept in the dark free from disturbance. Usually the animal spawns the same night. Spawning takes place between 10 p.m.-2 a.m. The female is removed from the bin in the morning. Aeration is continued. An orange scum floating on the surface of the water at the side of the bin is an indication of spawning. Aeration may be stopped for one minute, and a sample can be collected from the bottom of the bin and examined for the presence of eggs. Eggs can be seen as small white round objects. Aeration is continued. Eggs start hatching into nauplii by about 9 a. m. About 3 p. m., nauplii are counted and distributed in the 100-l bins for further rearing.

If females with mature ovaries are not available, the fisherman can bring 14-15 cm long impregnated females of *P. indicus* either from the sea or from the backwaters and make them mature in the house by the following method With a fresh blade one of the eyes is incised and the contents of the eye gently squeezed out while holding the prawn underwater. The incised eye is smeared with antiseptic cream and the prawn kept in a 100-l bin with fresh seawater. The water in the bin is aerated well and the prawn is fed as much fresh clam meat as it would eat (usually 3-4 clams per day). The sediments and uneaten food are removed and the seawater completely changed every evening by siphoning, without handling the prawn. The bin is covered with a black cloth. Every morning the bin is observed for signs of spawning. The prawn usually spawns 4-5 days after the eye treatment.

For counting the nauplii, they are first dispersed in the water in the bin by mixing well. Then 2 samples using 100 ml beakers are taken. The nauplii in these beakers are counted using fillers and the total number of nauplii in the spawning bin is estimated as follows:

$$\frac{\text{Average number of nauplii in 100 ml}}{0.1} \times \text{Volume (in litres) of water in the spawning bin}$$

About 7500 nauplii are transferred to each of the four 100-l bins containing 50 l of sediment-free filtered seawater having a salinity of 30-34°/$_{oo}$.

The different larval stages and their duration are given below:

Nauplii (N1-N6)	—	40-48 hrs
Protozoea (P1-P3)	—	72-84 hrs
Mysis (M1-M3)	—	72-84 hrs
Postlarva (PL1-PL5)	—	5 days

The bins are managed as shown in Table 1. While removing water from the bin, aeration must be stopped and the siphon should be kept in a filter box covered with organdie cloth. Particulate feed is given when the larvae reach M3 stage. From then onwards sediments should be daily siphoned out after stopping the aeration. It should be remembered that Table 1 gives only guideline procedure. By paying careful attention to water quality and condition of the larvae, the volume of water exchanged and the amount of feed given should be judiciously varied to meet the exigencies of the situation. It could be learnt within a short time by experience.

Table 1. *Water management in larval rearing bin.*

Day	larval stage	Sea-water removed (l)	Sea-water added (l)	A'gal culture added (l)	Particulate feed (g)	Total volume of water (l)
1	N2	—	50	—	—	50
2	N5-6	—	45	5	—	100
3	P1	50	44	6	—	100
4	P2	50	44	6	—	100
5	P3	50	40	10	—	100
6	M1	50	40	10	—	100
7	M2	50	35	15	—	100
8	M3	50	35	15	0.5	100
9	PL1	50	40	10	1.0	100
10	PL2	50	45	5	1.5	100
11	PL3	50	48	2	1.5	100
12	PL4	50	49	1	1.5	100
13	PL5	50	49	1	1.5	100

Diatom culture to feed the larvae

Fifty liters of freshly collected filtered seawater (filtered through organdie cloth) having 30-34°/$_{oo}$ salinity is kept in a basin (preferably white in colour). The basin is placed in such a way that direct sunlight falls on it throughout the day. Water is continuously aerated. The seawater (50 l) is fertilsed with the following chemicals.

Sodium nitrate — 0.6 g (12 ppm)
Potassium orthophosphate—0.3 g (6 ppm)
Sodium silicate — 0.3 g (6 ppm)
EDTA disodium salt — 0.3 g (6 ppm)

PRODUCTION CAPACITY

1.	Nauplii stocked in 4 bins (each 100 litre capacity) @ 7500 nauplii per bin	30,000
2.	PL5 obtained after 13-15 days per run (Av. survival rate 50%)	15,000
3.	In 8 months of operation 15 runs can be made (15.000 x 15)	2.25 lakh PL5
	∴ Capacity of the hatchery per year	2.25 lakh PL5

ECONOMICS OF MINI PRAWN HATCHERY

Investment:

A. *Capital on hatchery equipments*:

100 l plastic bin (4 nos for larval rearing and 2 nos for seawater storage) 6 nos.	Rs. 1,380
50 l plastic bin (white colour) (for the transportation of spawners and culture of phytoplankton)—2 nos.	Rs. 210
25 l plastic bucket/pot (for seawater collection)—4 nos.	Rs. 120
Aquarium aerators—8 nos.	Rs. 440
Aeration tube (½ roll), aeration stones, connectors & regulators (1 doz. each), bolting silk-2m, sieve for water changing-siphoning tube (3 m)	Rs. 200
	Rs. 2,350

B. *Operational*: (Spread over 3 years)

Chemicals	Rs. 200
Artificial feed	Rs. 30
Electricity and miscellaneous . .	Rs. 420
Total for 3 years (A+B)	Rs. 650
= Rs. 3.000	

C. *Total recurring expenditure per annum*

Depreciation (1/3 of Rs. 3,000)	Rs. 1,000
Interest @ 12%	Rs. 360
	Rs. 1,360

Income

(1 run - 15,000 seed @ Rs. 15/- per 1000 seed	= Rs. 225
Income from 15 runs in 8 months	Rs. 3,375
Net profit per year Rs. 3,375-1,360	= Rs. 2,015
Profit rate on capital investment (Rs. 2015/3000)—68%	
Net income for 3 years : 2015 x 3	= Rs. 6,345

Sodium silicate must be dissolved first in fresh water and poured into the basin. When the temperature is between 20°-35°C and good sunlight is available a fairly good bloom of *Chaetoceros* sp. develops within 30-48 hours. From this culture 1½ l can be used as an inoculum to start a fresh culture. When this is used as an inoculum it takes 8-14 hours to develop a good culture when salinity, temperature and sunlight are optimal. Thereafter everyday, between 1000-1200 hours, a fresh diatom culture is started and this is maintained until the rearing is completed.

Particulate feed for postlarva

From last mysis onwards, along with diatoms, artificial feed must also be given. For this *M. dobsoni* or 'thelly' (head-on) can be sun-dried and finely powdered. The dried powder can be sieved using 250 micron mesh cloth and can be used to feed the postlarvae.

An average survival rate of 50% from nauplius to postlarva (PL5) is obtained using the above procedure.

REMARKS

The hatchery phase ends at postlarva-5 stage and the fishermen should sell them at this stage. The fishermen cannot keep the postlarvae for a longer period in the small containers. They needed more space for good survival.

He can sell the PL5 to the "Seed banks" being set up by the MPEDA in all the maritime states. These "Seed banks" can rear them in their facilities for about 15 days before selling them to the prawn farmers for stocking in ponds.

Alternatively, the fishermen can sell the postlarvae to marginal farmers with small brackishwater pond holdings (less than one acre) where they can be directly stocked if the ponds are cleared of all unwanted organisms by application of mahua oil cake, crushed seeds of *Croton twiglium* (Neervalam) or ammonia. The PL5 are quite sturdy and can withstand an abrupt change of salinity from 30 to 20 ppt.

ACKNOLEDGEMENT

The authors are grateful to Dr. P.S.B.R. James, Director, CMFRI, for the encouragement given in the preparation of this paper.

REFERENCE

SILAS, E.G., K.H. MOHAMED, M.S. MUTHU, N. N. PILLAI, A. LAXMINARAYANA, S. K. PANDIAN, A. R. THIRUNAVUKKARASU AND S. AHAMED ALI 1985. Hatchery production of penaeid prawn seed: *Penaeus indicus*. CMFRI Special Publication No. 23 pp 1-41.