



**CMFRI**  
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# **ARTIFICIAL REEFS AND SEAFARMING TECHNOLOGIES**

**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE**

INDIAN COUNCIL OF AGRICULTURAL RESEARCH  
DR. SALIM ALI ROAD, POST BOX No. 1603, TATAPURAM - P. O.,  
ERNAKULAM, COCHIN - 682 014, INDIA

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**DR. K. RENGARAJAN**

*Editor*

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## CONTINUOUS MASS CULTURE OF LIVE-FEED TO FEED DIFFERENT STAGES OF PRAWN AND FISHES

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### Introduction

Live feeds are important in the diets of prawns and fishes in the culture pond, particularly to the larval stages and juveniles of prawns and fishes. The important live feed organisms are *Artemia salina*, rotifer *Brachionus plicatilis* and the freshwater cladoceran *Moina* spp.

### Artemia

The dried *Artemia* cysts are introduced into the filtered seawater (salinity 30-35‰) at the rate of 1 gm/lt and provided with aeration and the light which stimulate the embryonic development. The free swimming nauplii are hatched out within 18-36 hrs after hydration in the seawater.



Fig. 1. *Artemia salina*.

The nauplii are collected and introduced into a plastic pool or cement tank at the rate of 1000 nauplii/lt. The salinity of the culture tank raised gradually upto 80‰ till that time the young ones became adult within 12-14 days.

In the case of heterosex strain, the II<sup>nd</sup> antennae of the male developed as the hooked claspers to hold on female in the uterus region during copulation and in the female II<sup>nd</sup> antennae degenerate into sensorid appendages.

Adult *Artemia* measures about 10-12 mm size with elongated body having 11 pairs of thoracic appendages and two eyes in the head region. The eggs are developed in the ovary and transferred to the brood-pouch through oviduct. The male mates with the female and fertilizes the eggs. The unfertilized eggs are disintegrated. The fertilized eggs develop into Nauplii (Ovoviviparous reproduction) in the brood-sac and released into the culture tank every 4-5 days.

In abnormal conditions such as high salinity (above 12‰ and low oxygen level, the eggs developed into dormant cysts due to the secretion of Chorion by the gland in the brood-pouch. The cysts released into the culture medium and adhered on the sides of the tank, can be collected, dried and stored in the closed container or in the saturated high saline water upto 6-8 months for future use.

In the case of parthenogenic strain the embryonic development starts as soon as the egg reached the brood-pouch from the ovary.

The released young ones in the culture tank become adult within 10-12 days. The adult may survive upto 3 months and release 100-180 young ones/batch in every 4-5 days, depending upon the culture environment. The continuous mass culture was maintained with partial water change and harvesting. The single cell algae such as *Chlorella*, *Tetraselmis*, yeast or bacteria culture are used to feed *Artemia*.

In 1982, the *Artemia* hybrid was developed by crossing low saline, heterosex Californian strain male and the high saline parthenogenic Bombay strain female. From F1 generation low saline parthenogenic females are isolated and the mass culture is maintained in the seawater after

sterilization with formalin to avoid the contamination like rotifers, copepods, etc.

In the heterosex strain, the female releases male about 50% in each batch and the unfertilized eggs are disintegrated so the duration to reach the maximum concentration is longer than the parthenogenic strain. Hence the parthenogenic strains are preferable to culture in the laboratory.

### Rotifers

A technique, for continuous mass culture of euryhaline rotifer *Brachionus plicatilis* has been developed and perfected in 1979-80 to feed the early level stages of prawn and fishes.

Stock culture of rotifers collected from the natural environment in the seawater or brackish-water pure culture is obtained by the sub-culture in the laboratory.

Filtered seawater is pumped in to a tank (50 tonne capacity) and fertilized with groundnut-oil cake (250 gms), urea (10 gms) and super-phosphate (5 gms). This medium is inoculated with *Chlorella* on the same day at the rate of 5-10 lt/tonne and the rotifers are introduced at the rate of 500 nos/lt on second day. Vigorous aeration is given from the start of the culture.



Fig. 2. A group of rotifers *Brachionus plicatilis*.

Rotifers reproduce rapidly by feeding on *Chlorella* bloom. The eggs developed in the ovary and reach the brood-pouch are released as young ones within 8-10 hrs. The young ones become adult in 16-18 hrs and begin to reproduce. The adult bear six eggs at a time and release one by one. So the culture attains the maximum concentration of  $4-5 \times 10^5$  rotifers/lt in 5-7 days depending

upon the culture conditions. They flourish in salinity range from 25 to 40‰ and the temperature between 26-34°C.

Harvesting of rotifers is done with the hand net of 60 micron mesh size in the morning hours when they swarm at the surface. The harvested rotifers are concentrated, washed with filtered seawater and mixed with equal volume of 10% glycerin and frozen into blocks, in a deep-freezer. This ensures a ready supply for use at any time or feed immediately after washing in the seawater.

During unfavourable conditions like the maximum concentration of rotifers, low oxygen level and during the scarcity of feed, the rotifers release the male. By the sexual reproduction it produces dormant cyst and the cysts settle at the bottom of the culture tank. This cyst is collected along with the sediments, dried, stored upto 3-4 months for future use or transportation without any risk. The dried cysts hatch out within 36-48 hrs after hydration in the seawater.

The continuous culture is maintained by changing 1/3 volume of water after harvesting and the medium is enriched with organic fertilizer to stimulate the algal bloom.

### Cladocerans

A low cost technique for the mass culture of *Moina* spp. (Cladoceran) in fresh water has been developed to feed the prawn postlarvae (PL 5 to PL 20) and the 10-20 days old fish fry in frozen condition.



Fig. 3. A collection of freshwater cladocerans.

The filtered freshwater is pumped into a tank and fertilized with groundnut oil cake

(250 gms), urea (10 gms) and the superphosphate (5 gms). *Chlorella* is inoculated at the rate of 5-10 lt/tonne on the same day and vigorously aerated. The next day the *Moina* from the stock culture in the laboratory is introduced at a stocking rate of 1-5 animal/lt.

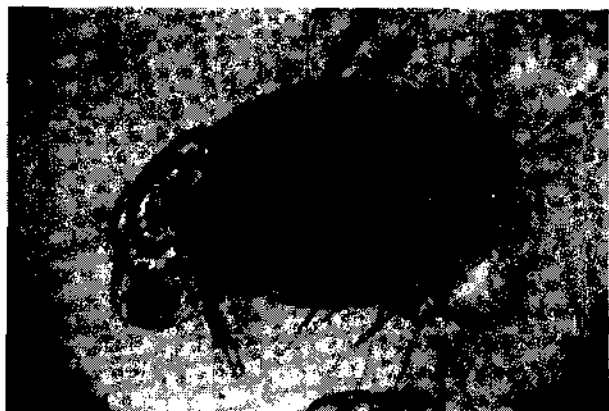


Fig. 4. A cladoceran *Moina* sp.

The *Moina* population grows rapidly feeding *Chlorella* bloom which multiplies utilizing the fertilizers and the natural sunlight. The temperature ranges between 27°C and 34°C and the pH from 6.8 to 9.5. The adult *Moina* releases 10-12 of young ones daily. The young ones become adult within 20-24 hrs and begins to reproduce from the following day. So the maximum concentration of *Moina* (about 35,000 to 40,000/lt)

reaches in 5-7 days depending upon the culture conditions. Thereafter the *Moina* are harvested every day morning or evening when they swarm at the surface. Harvesting is carried out by skimming the surface water with a zooplankton net after stopping the aeration. They are washed in fresh water, mixed with equal volume of 10% glycerin and frozen in a deep-freezer into blocks.

During the unfavourable conditions like high concentration of *Moina*, less oxygen level and the scarcity of feed, the *Moina* releases the male and female young ones. After mating, the female produces 4-6 dormant cysts in the brood-pouch and the released cysts settle at the bottom of the culture tank. The cysts collected along with sediments, dried and preserved upto 4-5 months in a closed container to restart or transport to the long distance without any risk. The dried cyst when hydrated with fresh water, the embryonic development starts and hatches out in 24-36 hrs.

In the event of decline in *Moina* population due to the continued harvest, half the volume of water is replaced by fresh water and enriched with organic fertilizer to stimulate *Chlorella* bloom. So, again the *Moina* population coming up within 3-5 days and the continuity of culture is maintained for over 3 months.