SUGPO FRY PRODUCTION AT MSU-IFRD

by

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INTRODUCTION

Status of Fry Production in the Philippines

Prawn culture has attracted the interest of various sectors of the country because of the ever-increasing demand for prawn and its by-products both in the local and foreign markets. At present, intensive cultivation of this crustacean is difficult to realize owing to the unavailability of fry seedlings that would supply the vast fishponds scattered throughout the archipelago in any time of the year. Thus, many fishpond operators could only content themselves of availing whatever fry seedlings may come into their fishponds the moment they open their gates to allow fresh tidal water. Moreover, this supply is not constant due to changes in the natural population from season after season and from year after year.

The picture is clear. For intensive cultivation of prawns in rearing ponds to be viable, steady supply of fry seedlings is an imperative. This could only be possible if seed banks could be established at strategic locations in the country where local fishpond operators could avail themselves of the needed fry.

The hatchery project being undertaken by the Mindanao State University through the Institute of Fisheries Research and Development in collaboration with the National Science Development Board and other agencies both public and private, is aimed to elevate the status of prawn culture to a level of stability where prawn seedlings may be made available in adequate quantities throughout the year. Hatchery technology is being developed and standardized with the hope of transferring this technology to the private sectors who may wish to put up such venture for commercialization.

This technology has already caught fire. With the establishment of the Naawan prawn hatchery, the Southeast Asian Fisheries Development Center at Tigbauan, Iloilo, followed suit. There are two private hatcheries existing in Luzon; one is in Batangas and the other one is in Quezon. In the Visayas there is one private hatchery laboratory in Roxas. In Mindanao, the province of Agusan is reported to have one. It is hoped that the results of this present Cooperator's Program will further stimulate the private sectors to engage in the seed production venture.

Spawner Collection and Transport-

Spawners are collected from Panguil and Iligan Bay area by fishermen who operate fish corrals, gill nets or trawling. The gravid females are segregated from the

non-gravid ones and packed for immediate transport to the Naawan Station. Gravid ones are recognized by the presence of big dark ovaries. Along the dorsal body axis which could be seen if viewed against the light.

Two methods could be employed in packing the spawners for transport. One is the dry method using chilled sawdust. The spawners are kept in suspended animation during transport and then revived in the laboratory by placing them in fresh seawater. Another is the chilled seawater method where spawners are placed inside plastic bags measuring about 50 x 96 cm. The bags are filled with 3 to 4 liters of fresh seawater, charged with oxygen and placed in styrofoam boxes. Crushed pieces of ice placed in small plastic bags and wrapped in old newspapers are placed in the box to lower the temperature of the water in the bags to approximately 18°C to 20°C. This condition lowers the metabolic rate of the spawners thereby reducing oxygen intake and minimizing mobility.

Hatchery Operation-

A. Preparation of Hatchery Tanks

The hatchery tanks are thoroughly scrubbed and rinsed with fresh seawater and dried for at least two days before being used. This will rid of possible harmful organisms that may be present in the tank during the previous operation. Filtered seawater is then pumped into the tanks to a height

of 1 meter and aerated sufficiently. Water is taken 130 meters from the shoreline via a series of culvert pipes. It then passes through a sedimentation and filter tank where it is filtered through layers of finely graded sand and gravel before it is sucked by the water pumps. Water is again refiltered before entering the hatchery tanks by a secondary filter or by a plankton net. The filtration set-up removes course particles and possible predator organisms but retains the tiny phytoplankton and zooplankton essentially needed as food by the sugpo larvae and post larvae. Roots Blowers are used to aerate the water through airstones or airfoams.

B. Stocking of Gravid Females

The MSU-IFRD hatchery tanks are varied in sizes and shapes, thus having different holding capacities. The small rectangular tanks have an individual holding capacity of 16 tons; the big rectangular tanks 60 tons and the circular tanks, 144 tons. The number of gravid females to be used in the hatching experiment would therefore depend on which tank will be used in the operation. By experience, the 16 ton tanks require from 2 to 4 spawners; the 60 ton tanks, from 6-10 spawners; and the 144 ton circular tanks, from 15-20 spawners.

C. Spawning, Hatching and Larval Development

Spawning usually takes place between 8:00 o'clock P.M. and 4:00 o'clock A.M. To get good spawning results aeration is

reduced to the minimum to avoid too much turbulence. Lights are shut off during the night to simulate darkness of the sea bottom where they naturally spawn. It is either complete or partial.Spawning is considered complete when all the eggs in the ovary from the anterior to the posterial lobes have been extruded, and partial, when there are some eggs left in any of the anterior, median or posterior lobes. Spent females are removed from the hatchery tanks the following morning.

C.1 Egg Stage

The eggs are spherical and settle down to the bottom of the tanks after being extruded. Cell division soon follows forming the embryo within the egg membrane. About 8 to 10 hours after spawning, the embryo develops 3 pairs of appendages and exhibits slight convulsive movements which become progressively frequent just before hatching. About 12 to 13 hours after spawning the fully developed embryo emerge from its colorless and transparent egg membrane as a tiny nauplius larva.

C.2 Nauplius Stage

The nauplius larvae are capable of swimming by beating their three pairs of appendages in a paddling fashion, stopping momentarily for a while, then resume swimming at random in all directions. The larvae remain

in the nauplius stage for about 48 to 53 hours, molting six times throughout the duration of the stage. Each stage is differentiated from the rest by its own distinctive size and morphological features.

C.3 Zoea Stage

The larvae after passing the sixth nauplius stage metamorphose into the zoea stage. The body of the larvae is considerably elongated. The larvae possess the carapace which initially covers about one-half of the body length but gradually tend to reduce proportionally as the length of the segmented somites increases. They are three substages namely: Zoea I, zoea II, and zoea III, each stage being characterized by its own distinctive morphological features. After three moltings within 5 or 6 days the larvae metamorphose into the mysis stage.

C.4 Mysis Stage

The larvae in the mysis stage appear like tiny shrimps with their bodies oriented in a vertical position, their heads oriented downwards. They swim downward and upward by means by their periopods and may dart backward by bending their abdomen in successive jerks. During this stage buds appear from the ventral side of their bodies

which progressively grow and develop into the pleopods although they are non-functional during this stage. After 3 moltings within 4 to 5 days the larvae transform into the post larval stage.

C.5 Post Larval Stage

The post larvae appear like miniature adult prawns and measure about 0.5 cm during the first day. The pleopods or swimmerets which were non-functional during the mysis stage are now used for swimming. They remain planktonic during the first few days after which they settle to the bottom or crawl on the walls of the hatchery tanks. Twenty to twenty five days (P_{20}-P_{25}) after the first post larval stage the fry are now ready for harvest and stocking in the nursery or rearing ponds.

D. Hatchery Management

This implies the caring of the larvae from the time they are hatched from the eggs up to the time they are harvested for stocking into the rearing ponds. There are three main parts in the hatchery management namely: (1) maintenance of good water quality, (2) maintenance of an adequate supply of food in the hatchery tanks and (3) prevention of water pollution.

In operating the hatchery tanks clear seawater with high salinity (30-31 ppt) is preferred to assure good

environmental condition for the developing larvae. In case the source is turbid,water is pumped to the reservoir tank to allow tiny sand particles to settle down before delivering it to the hatchery tanks. Secondary filters or fine nyloon screens are fitted to the inlet pipes to trap whatever sand particles may be carried after the sedimentation period.

The larvæ in the nauplius stage require no feeding as they get their nourishment from the yolk contained within their bodies. Therefore no food is introduced into the hatchery tanks at this stage of larval development. However, when the larvae have reached the sixth nauplius stage, food is introduced into the tanks so they may be made available to the larvae when they transform into the zoea stage. It is during this stage and in later subsequent stages where the larvae start to derive their nourishment from external source.

There are a variety of food given to the larvae, a great majority of them constitute the cultured food organisms. Mixed diatoms, which are microscopic plants of the sea, constitute one important food in the diet of the zoea larvae. In the hatchery operation mixed diatoms are maintained in the hatchery tanks until harvest time. Bread yeast is another good substitute for diatoms especially when the diatoms fail to bloom in the hatchery tanks. In recent experiments a combination of mixed

diatoms and bread yeast diet proved to be very promising, bread yeast being introduced into the hatchery tanks from the zoea stage up to early post larval stage.

In a joint MSU-SEAFDEC research venture, various kinds of food have been tested and found promising. Among them are blended eelgrass juice, filamentous algae washings, sargassum washings and fermented minced clam juice. These juices and washings contain microorganisms (bacteria, protozoans, algae, diatoms) which are utilized by the larvae for their nourishment.

When the mysis stage is reached the larvae have the propensity of feeding on small animals or zooplankton. Hence, these food organisms are introduced into the tank at this stage of larval development. Brine shrimp nauplii fed at the rate of 5 gm/10,000 larvae/day (dry egg weight) give good results in terms of larval survival. Brachionus sp. a rotifer is also an ideal food for the mysis, but is introduced into the hatchery tank during the early zoea stage to allow its population to increase in time for the larvae to change into the mysis stage. Small copepods harvested from the sea by using water pump and light traps are eaten by the mysis larvae with relish.

All food organisms given to the mysis larvae are also fed to the post larvae. However, the introduction of brine shrimp nauplii is stopped during P_3 or P_4 stage to cut on the

cost of food. This is substituted by minced clam which will then constitute the main bulk of their diet until harvest time.

The success of each hatchery operation rests on forming an environmental or ecological balance in the hatchery tank. Inadequate food would lead to starvation that could exact heavy mortality on the population of the larvae. On the other hand, too much food would result to accumulation of sediments on the bottom of the tank and cause water pollution. To anticipate such problems, draining and addition of fresh seawater is carried on daily usually starting during late zoea or early mysis stage until harvest time. Periodic checks on the chemistry of the water are done to determine if critical factors related to water pollution are present. Phytoplankton and zooplankton counts are analyzed daily to give an appraisal on the status of food in the tank. Larval population is estimated daily to get the percentage survival trend at the same time give an index of estimating the food to be introduced into the hatchery tank. All these factors intricately interwoven in the hatchery tank are considered in order to have a good hatchery management.

D.1 Culture and Preparation of Food Organisms

1. Mixed diatoms - fresh seawater containing small quantity of diatoms is pumped into diatom culture tanks. They are fertilized daily with 2.0 ppm Na NO_3 (or KNO_3), 0.2 ppm $FeCl_3$, 0.2 ppm K_2HPO_4, 1.0 ppm

Na_2SiO_3 and 1.0 ppm Clewat until they attain blooming peaks usually from three to four days (without starter diatoms).

2. Brachionus culture - starter brachionus could be obtained from fishponds or by fermenting crushed crabs in suitable containers. The starter brachionus can now be allowed to propagate in big tanks by feeding them with chlorella or bread yeast (10 gm/ton/day) or both. Suitable aeration should be installed in the culture tanks.

3. Chlorella culture - starter chlorella stock could be obtained from mud pools. The water appears greenish if they are abundant in the water. This starter chlorella is subjected to gradual acclimatization until the stock becomes adjusted to pure seawater. This stock culture can then be mass-propagated in big tanks by fertilizing them with inorganic fertilizer. Fertilizers used are $Ca.(PO_4)_2$ (100.0ppm), Urea (2.0 ppm), $FeCl_3$ (0.2 ppm), K_2HPO_4 (0.2) and Clewat (1.0 ppm). Fertilization hastens the growth and reproduction of these unicellular plants making the water intensely green when they reach blooming peaks. When blooming peeks are reached they are harvested

and fed to the brachionus culture.

4. Brine Shrimp Culture - This requires a culture separator tank and utilizes the positive phototactic behavior of the brine shrimp nauplii. The culture-separator tank has a partition with holes about 2 inches from the bottom floor and plugged with rubber stoppers. The culture and separator compartments are filled with seawater and freshwater in a 2 to 1 proportion. Brine shrimp eggs are placed inside the culture compartment and aerated vigorously. The eggs hatched into nauplii in about 24 to 36 hours.

The aeration is shut off to allow the water to become still. Under this condition, the unhatched eggs and shells settle to the bottom and those non-viable and hitherto light eggs float and concentrate on the water surface. The culture compartment is then covered with black cloth to create a dark condition inside. Then the rubber stoppers are unplugged from the partition to allow the nauplii to swim to the other side by light attraction leaving the shells and unhatched eggs behind. When the nauplii are already separated

from the eggs the partition is resealed again and the nauplii harvested and concentrated. They are fed to the mysis and early post larvae in the hatchery tanks.

5. Bread yeast - The required dosage 2 gm/ton/feeding three times daily is weighed and fermented in fresh water for about 12 hours. This is then divided into three parts and feed to the larvae at a specific time interval.

6. Minced clam - The clam meat is thoroughly cleaned with fresh seawater to remove the slimy juices. It is fed to a blender to mascerate the tissues. This mascerated or minced clam meat is washed again several times until all the remaining juices are removed. Then it is stocked in the freezer.

In feeding the post larvae a weighed portion of the minced clam is reblended until the desired size of particles is attained. The time for reblending depends on the size and stage of the post larvae.