

# SEA CUCUMBER HATCHERY AND CULTURE PROSPECTS

D.B. JAMES \*

*Central Marine Fisheries Research Institute, Kochi - 682014.*

## INTRODUCTION

Sea cucumbers are a delicacy, very nutritive and free from fat. The Japanese and Koreans consume some species in fresh condition and the Chinese prefer processed ones. The processing of sea cucumbers was introduced in India by the Chinese more than thousand years ago. Commercially important species of sea cucumbers are distributed in the Gulf of Mannar, Palk Bay, the Andaman and Nicobar Islands and Lakshwadeep. Of the 650 species known, 200 species occur in the seas around India and only a dozen of them are commercially important. At present processing of sea cucumbers is restricted to the areas along the Gulf of Mannar and Palk Bay. In Lakshwadeep, processing is permitted subject to certain conditions and in Andamans fishing is banned.

The Chinese and the Japanese are the pioneers in sea cucumber seed production and in recent years the Koreans and the Russians have also succeeded in seed production. In India, a breakthrough was achieved in the hatchery seed production technology in 1988 at the Tuticorin Research Centre of Central Marine Fisheries Research Institute (CMFRI) for the species *Holothuria scabra*.

## HATCHERY

The basic facilities required for the sea cucumber hatchery are a building of 30 x 10m area; seawater supply system with a draw well, sedimentation tanks, filter beds, sump, overhead tank and delivery lines; drainage facilities; aeration system with storage compressors, filters, air grids and diffuser stones; perspex tanks (100 l) for spawning purpose; one tonne FRP tanks for larval and juvenile rearing and algal culture; and other items such as immersion water heaters, sieves with different mesh sizes and glasswares.

## Broodstock

The broodstock is collected from the commercial catches during the spawning season since most of the animals will be ripe and ready for immediate use. *H.scabra* has two spawning seasons, one in March-May and the other in October-December. Only large and healthy animals are selected and those which are injured or eviscerated are to be discarded. 20-30 animals are stocked in one tonne tanks with sand (6" depth) brought from the natural grounds to enable the animals to bury.

The water in the tank is changed every day and the sand every fortnight. If the water

---

Present address : Tuticorin Research Centre of CMFRI, Tuticorin - 628001



quality goes bad the animals will eviscerate and become useless for spawning purpose. Fresh algae brought from sea, ground to fine paste, are offered to the stock once a week. Care should be taken not to add excess quantity of the paste as it will change the water quality. The sea cucumbers feed on this algal matter which settles on the sand bottom. If proper nourishment is not provided, the animals shrink and the gonad gets reabsorbed.

### **Spawning**

Spawning induced by thermal stimulation is the best method. The water temperature in the tank is raised by 3 -5 °C by the addition of heated sea water slowly.

In sea cucumbers, the sexes are separate and it is not possible to distinguish them externally. The sex can be determined only by examining the gonadial products under microscope. Ripe ovary is translucent and the ripe testes is milky white. It is also possible to distinguish the males and females by their spawning behaviours. The males always liberate the milt first and females follow. In the case of *H.scabra*, the male first lifts the anterior end like the hood of a snake and exhibits swaying movements followed by release of sperms. The males release sperms for one to two hours. This induces the females whose front portion gets bulged due to the pressure built inside the body and the eggs are released in one or two spurts. After the gametes are released, the breeders are removed from the spawning tank.

### **Fertilization**

Fertilization is external. As soon as the eggs are released, they are fertilized by the sperms. The eggs are washed several times to remove excess sperms. The female usually releases about one million eggs. The eggs are white, spherical and visible to the naked eye. Soon after fertilization, the cell division starts and dipleurula larva is formed on the next day. It floats and exhibits slight movements with the formation of a single band of cilia.

On the third day auricula larva is formed. It is slipper shaped, transparent and pelagic in habit. It transforms into doliolaria larva on the tenth day. This larva is barrel shaped and lasts for two to three days before changing into pentactula larva which is tubular with five tentacles in the front and a tube-foot in the back. If properly fed they reach a length of 10mm in a month's time and become juveniles.

The water in the rearing tanks is changed everyday to avoid infection with ciliates and bacteria. While cleaning, care should be taken so that larvae are not lost. The larvae can be reared either in still waters or in running water system. The rearing density is 300-700 per litre and in one tonne tank with 750 l water, 3,75,000 larvae can be stocked. If excess numbers are stocked, they form into a ball and sink to the bottom and collapse in the end.

*Isochrysis galbana* is the chief food for the larvae, especially for the first few days after hatching. Thereafter they can be fed with mixed diatoms. The larvae require different quantities of diet during different stages of development. In general 20, 000 - 30,000 cells per ml should be maintained in the rearing tanks. The quantity of the



food to be supplied should be regulated according to the quantity of the food in the stomach of larva which can be visually checked.

The quality of the water is of paramount importance since the larvae and seeds are sensitive to environmental changes. The ideal environmental parameters are: temperature 27 -29 °C; salinity 26.2 - 32.7‰ dissolved oxygen 5-6 ml/l; pH 6-9; and ammonia 70 to 430 mg/m<sup>3</sup>.

### Juvenile rearing

The seed should be maintained in the hatchery for about two months before they are transferred to the sea. When the larvae develop into juveniles, they begin to crawl. They stay at the bottom and are visible to the naked eye after 15 days. At this stage the number of juveniles are estimated by random sampling. The optimum density is estimated as 200-500 numbers per m<sup>2</sup>. The juveniles have weak movements and they are fed on algal extract made from *Sargassum* spp. The sea weed are cut into small bits, washed thoroughly with sea water, ground to a paste, mixed with sea water and filtered with 40 micron sieve. This extract is given twice daily. After a month, juveniles do not grow at uniform rate. Some grow very fast and they are called shooters. These are removed periodically to a separate tank. In two months, the shooters grow to 20 mm size.

### CULTURE PROSPECTS

In China and Japan, seeds of *Apostichopus japonicus* are produced but there is no culture practice. The seeds are sea ranches in suitable locations. The growth rate of *H.scabra* is faster than that of *A.japonicus*. The seed produced in the hatchery could be grown in tanks/cages made of velon screens/in concrete rings on the sea bottom.

Old FRP tanks of one tonne capacity (2mx1mx0.5m) are fixed at the sea bottom; mud is provided in the bottom of the tank for a height of 10 cm and the tank is covered with a velon screen to prevent predators. No supplementary food is given. The juveniles grew from 0.54 to 5.90 g in 97 days in the experiment conducted at Karapad Bay. In the two experiments conducted in cages, the weight increased from 2.8 to 11.6 g in 233 days.