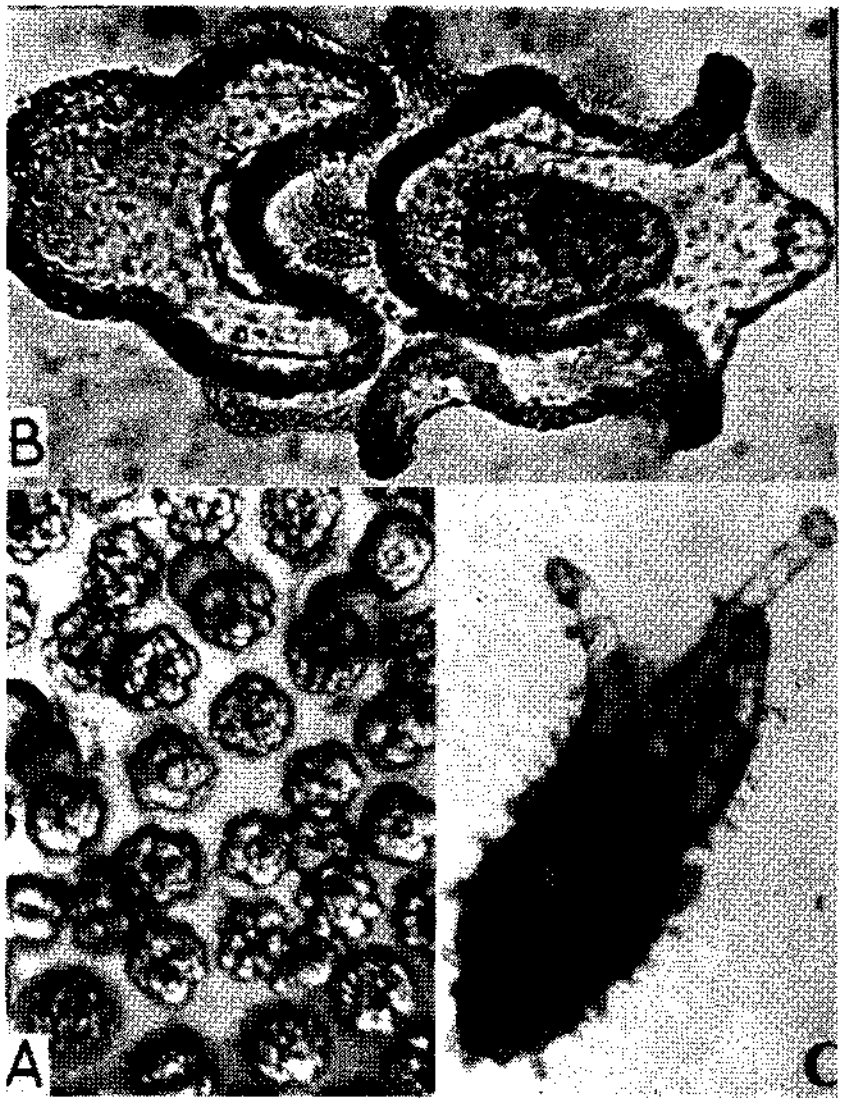
Advances in Sea Farming

The Central Marine Fisheries Research Institute, Cochin has achieved more breakthroughs in the field of seafarming. The Institute which has developed a number of techniques for culture of commercially important marine animals has also been concentrating on sea ranching programmes for replenishing the natural fishery resources. The research efforts in this direction have culminated in the success, for the first time in India, of laboratory breeding of sea cucumbers, top shell, great clam and the blood clam.

CMFRI has succeeded in the laboratory breeding of sea cucumbers, top shell, great clam and the blood clam, through temperature manipulation, for the first time in India at the Shellfish Hatchery Laboratory at Tuticorin Research Centre.

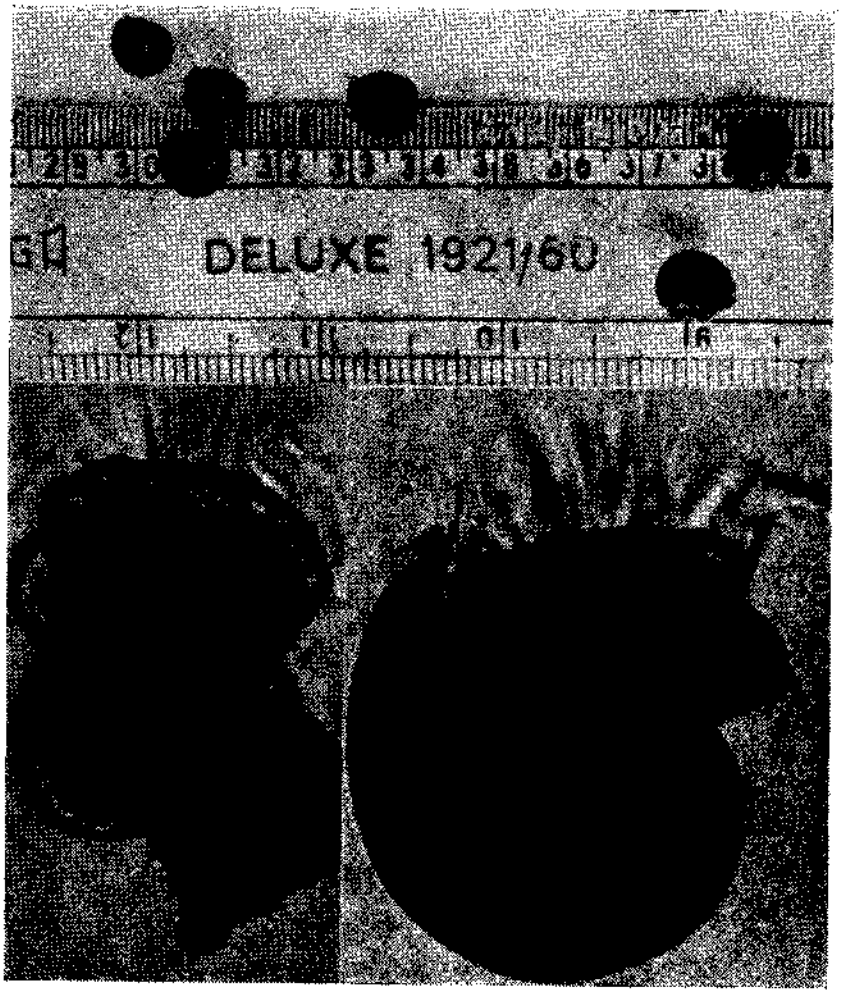
The beche-de-mer prepared from sea cucumber earns a foreign exchange of about Rs. 20 lakhs annually. The major markets for this product are Singapore and Hongkong. In India this commercially important resource is restricted to the Gulf of Mannar and Palk Bay region and there are evidences of over exploitation of the single species (*Holothuria scabra*) contributing to the fishery. Dr D. B. James, Shri M. E. Rajapandian and Dr C. P. Gopinathan, Scientists and Shri B. K. Baskar, Senior Research Fellow of the Institute, developed the technique for laboratory breeding of this animal by temperature manipulations. This achievement can pave way for large-scale culture of the sea cucumbers for further development of the industry and breeding of much larger and more valuable species occurring in the Lakshadweep islands for sea ranching and export.



SEA CUCUMBER (Holothuria)
A. Blastular stage; B. Auricularia stage; C. Pentactula stage

Large specimens of *Holothuria* (Metriatyla) *scabra* (300 - 350 mm in length and 500 - 600 g) were brought to the laboratory in the last week of January, and they were acclamatised to the laboratory conditions. The specimens were induced to spawn in the laboratory by slightly raising the

temperature of seawater. First the male spawned and this stimulated the females to release eggs. One female released nearly one million eggs. After fertilisation the eggs transformed, undergoing several changes into a stage known as auricularia on the second day. The eggs were sperical, white and were visible to the naked eye and they were floating. The auricularia transformed into another stage known as doliolaria. Doliolaria is barrel-shaped with five bands and with two tentacles projecting out. They move fast in the anterior direction. The posterior portion is slightly tapering. On each side there are five round structures with distinct opening at the posterior end. There are five groups of hair-like structures on either side. The larvae are fed on micro-algal cultures maintained at the Research Centre. On the thirteenth day some of the doliolaria transformed into pentactula stage. The body of pentactula is tubular with five tentacles at the anterior end and one short stumpy tubefoot at the posterior end. The colour is greenish-brown. The tentacles have a web in between them. Later one more tubefoot developes and they become elongated. The tentacles and tubefeet develop small calcareous particles known as spicules. These give rigidity to the body. The pentactula have the habit of moving to the edge of the tank and remaining just below the surface of the water. They settle down to the bottom of the tank as miniature *holothurians*. They are fed with algal powder mixed with sand or mud.

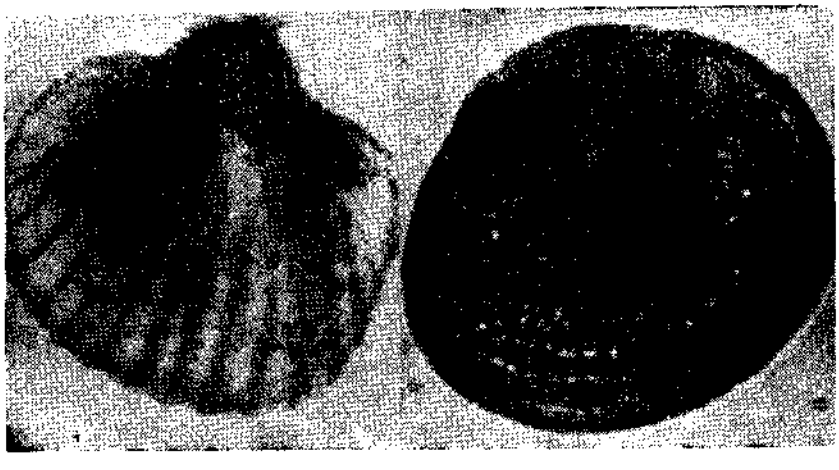


TOP SHELL (Trochus radiatus)
Top — 3 month-old shells
Bottom Left: *Late trochophore — 3 hours after fertilization (250 μ)* Right: *Typical veliger — 4 hours after fertilization (300 μ)*

The top shell (*Trochus niloticus*) is in great demand in shell craft industry. To establish techniques for breeding and larval rearing methods of this group of animals, experiments were conducted at the Shellfish Hatchery Laboratory of the Institute with the candidate species *Trochus radiatus*. The fully matured animals kept in clean filtered seawater spawned and hatched out and developed into young animals.

These animals attained full growth within three months. *Isochrysis* and soft agal filaments were given as feed. S/Shri K. Ramdoss and S. Mahadevan, Scientists and T. Rajan, Technical Assistant achieved this success. Based on these results commercially important species of top shells available in Andaman and Lakshadweep regions could also be bred using the same technique.

GREAT CLAM — Meretrix meretrix
Top: Adult clams; Bottom Left: Straight stage; 2 days old
Bottom Right: Spat 22 days (461 μ)



BLOOD CLAM — Anadara granosa
[redacted]: Spat — 27th day (417 μ); [redacted]: Umbo — 10th day (155 μ)

Clams which play a very important role in coastal rural economy belong to the group of animals which are suitable for farming. Clam is an efficient converter of primary production into food suitable for human consumption, thus contributing to low cost nutritious food material. The shell, rich in calcium carbonate is used in lime, cement, fertilizer, sugar and shell craft industries and as a feed for prawn and poultry. It also has a place in the export market and clam meat worth Rs. 1 crore is being exported annualy to Japan. The present breakthrough obtained in the laboratory breeding by temperature manipulation and production of seed of the great clam (*Meretrix meretrix*) and blood clam (*Anadara granosa*) would help in transplanting seed in suitable areas where a production of 40 tonnes per hactare can be obtained in a period of six months. This success was achieved by a team of scientists consisting of Dr K. A. Narasimham, Shri P. Muthiah and Dr C. P. Gopinathan. There is scope for taking up clam farming on a large scale in the coastal and brackish-water areas of the country for increasing production and employment opportunities.

A well established shell fish hatchery laboratory having running water and algal culture facilities with proper illumination, temperature control and dust-free atmosphere have contributed remarkably for achieving success in the induced breeding techniques.