

KADALEKUM KANIVUKAL

(Bounties of the Sea)

Farm School Series on marine fisheries
broadcast by All India Radio, Thrissur

Edited by

**K. RAVINDRAN
KRISHNA SRINATH
K.K. KUNJIPALU
V. SASIKUMAR**

Published by



CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY
Matsyapuri P.O., Cochin - 682 029

&



ALL INDIA RADIO
Ramavarmapuram, Thrissur - 680 631

MARINE PEARL PRODUCTION IN INDIA

T.S. Velayudhan

*Central Marine Fisheries Research Institute
Cochin - 682 014*

Pearl is a valuable and beautiful gift of the sea. The pearl is formed inside a pearl oyster as a result of secretion of the mantle tissue.

Natural pearl

The pearl oyster filters seawater for food and oxygen. The formation of natural pearl is influenced by inorganic or organic origin such as parasites, dust, larvae, molluscan eggs, decaying parts of plants, sand particles, epithelium or cells of the same animal that enter the body of the animal and become embedded between the shell and mantle. In response to this stimulus the foreign body is invaginated by the outer epithelium of the mantle and a pearly substance called 'nacre' is deposited over the foreign body. In course of time, this turns into small size pearl which is irregular in shape. This occurs very rarely.

Production of cultured pearl

The same process has been adopted in the production of cultured pearls. The host oysters are selected, conditioned and fixed on the oyster stand. The small graft tissue prepared from the pallial zone of the mantle of the donor pearl oyster is implanted into the gonad of the host pearl oyster along with a shell bead nucleus by a skilful surgery. The implanted animals are reared in tanks filled with seawater constructed in the onshore areas. The animals are fed with microalgae and diatoms cultured in the open tanks. The pearl formation takes place within 6-18 months according to the size of the nuclei implanted. In seafarming, feeding is not required for rearing the pearl oysters and production of pearls.

Tissue culture pearl

Tissue culture of pearl oyster mantle has been pursued for many years with the objective of isolating and culturing the outer epithelial cells responsible for the secretion of fine aragonite crystals. As a result of the tissue culture experiments,

it has now been found possible to produce pearls by injecting around the implanted nucleus a fraction of the cell-suspending liquid resulting from mantle epithelial cell culture. The cells in suspension would form the pearl-sac which would secrete nacre leading to pearl formation. In India, pearl oyster mantle tissue culture laboratory set up at Tuticorin Research Centre of CMFRI, has already initiated work on this line.

Artificial or imitation pearl

Artificial pearls are produced by coating iridescent 'guanine' extracted from fish scales, on different types of spherical beads. These coatings remain for short duration and hence these pearls fetch comparatively very low value.

In India, Central Marine Fisheries Research Institute has conducted a series of experiments and developed several methods of pearl production. The present methods of farming by floating rafts, longline, rack and ren method are suited for several areas in India. In the seafarming system, two crops can be taken in a season. The expected mortality is 11 % of the operated oysters for 6 months period. The pearl production is 25 % of the surviving oysters providing 82 % quality pearls for marketing. India now produces about 20 kg of pearls. Recently 5 kg was produced by private entrepreneurs.

Candidate species and distribution

Species suitable for pearl production and availability of the species in the country are shown below.

- a) There are six species of marine pearl oysters in the Indian seas. (1) *Pinctada fucata* (Gould)-Indian pearl oyster used for large scale pearl production, (2) *P. margaritifera* (Linnaeus)-Black-lip pearl oyster (producing black pearls), (3) *P. sugillata* (Reeve)-flat oyster that die immediately after operation; hence pearl production impossible (4) *P. chemnitzii* (Philippi)-they are available in the mouth of estuaries but not widely used for pearl production. (5) *P. atropurpurea* (Dunker)-very rare and small, copper red and (6) *P. anomioides* (Reeve)-yellowish and transparent.
- b) Distribution

In Indian waters, pearl oysters are available in six regions namely the Gulf of Mannar, Palk Bay, off

Trivandrum, off Cochin, off Calicut the Andaman and Lakshadweep islands and the Gulf of Kutch. Of these, the Gulf of Mannar and Gulf of Kutch are the most productive regions where pearl oysters occur in large numbers.

c) Locations suitable for culture

Tuticorin, Mandapam, Chennai, Visakhapatnam, Kakinada, Vizhinjam, Cochin, Calicut, Gujarat, Andaman and Nicobar Islands and Lakshadweep are the suitable areas for pearl culture.

Criteria for site selection - technical aspects

Site selection for pearl farming requires the following features.

a) Sea farming

- i) Sheltered area with calm water, site must be away from harbour and river mouths and bottom must be without clay materials.
- ii) Availability of good quality pollution free seawater
- iii) Optimum salinity (30-35ppt) and pH range (7.0 to 8.9) with less silt
- iv) Protection from wind and wave action
- v) Rich quantity of phyto and zooplankton detritus and nutrients in the water
- vi) Avoidance of oil installation areas and oil berths

b) On shore pearl culture

- i) Coastal and inland area away from harbour and river mouths opening into the sea
- ii) Sea bottom without clay or heavy silting
- iii) Quality seawater devoid of pollutants
- iv) pH and salinity as mentioned earlier
- v) Facility to reach the site by water and road
- vi) Elevated site unaffected by rain, flood and heavy wind action
- vii) Avoidance of oil installation and fisheries harbours, processing areas etc.

Nursery rearing

The spat are allowed to settle on the sides and bottom of the tank. Aeration is provided and feeding given twice a day. The spat reach 2-3mm size on diatom culture alone. When the spat attain 3-5mm they are transferred to the farm or sold to the entrepreneurs or sea ranches.

Farming methods

Raft culture: A unit raft of size 6x6 m constructed with logs of teak or bamboo, casuarina or sealed PVC pipes lashed with coir rope and floated with 4 buoys is used in moderate sea conditions. This raft can hold 100 cages, each with 100 adult pearl oysters. The ideal depth is 5-10 m depth with appreciable distance and view from the sea shore.

Rack culture: If the water depth is less than 5 m the rack system can be followed in suitable areas where the wave action and current is less. Teak, bamboo, casuarina or steel poles are driven into the sea bottom at intervals of 1 to 1.5 m and horizontal poles are lashed to these with nylon ropes above the seawater level. The oysters are kept in the cages attached to the racks.

Long-line and onshore culture are other methods followed according to the condition of the sea bottom and the environment. The long-line system can be adopted in slightly wavy seas.

Long-line culture: Floats are tied to synthetic or nylon ropes stretched to lengths of 20-100m and anchored at proper depths. The cages are suspended from the long-line.

Onshore tank culture (land based culture): Large concrete tanks are constructed on shore with holding capacity 25-150 ltr. of seawater for rearing the pearl oysters. The depth of the water varies from 1m to 30m or more. In this system, energy cost on pumping of seawater and preparation of algal feed for juveniles/adult oysters is involved. Boring, fouling and predation leading to mortality of spat and adults are minimised in this system.

Harvest and grading

Harvesting of cultured pearl is usually done manually. The pearls are extracted by cutting and separating the two

valves, making an incision in the gonad and squeezing the pearl out in case the oysters are to be reused. The pearls are carefully removed by opening the pearl sac through the gonad without any damage or stress to the oyster. Afterwards these oysters can be used for production of pearl a second time.

Processing

The harvested pearls are washed in distilled water, polished with refined salt and again washed in distilled water. They are sorted according to size, colour, shape, lustre, iridescence and other external characteristics and processed according to necessity. It is reported that 60% of the natural pearls have a density of less than 2.70, whereas 85% of the cultured pearls have a density of 2.70 or more.

Marketing

India is importing pearl worth Rs. 29 crore every year. The major countries involved are Bahrain, Hongkong, Japan, the U.A.E. and the U.K. In the present condition, in India, the pearls produced are sold internally and exported.

Training

Based on the packages developed, the CMFRI has been offering regular training courses to officials from state government, universities, research institutes, Krishi Vigyan Kendras, industry and progressive farmers on pearl oyster hatchery, pearl culture and 'SCUBA' diving for studying underwater ecology of pearl oyster beds and resources. In collaboration with the FAO-UNDP Regional Seafarming Development and Demonstration Project of the Network of Aquaculture Centres of Asia (NACA), Bangkok, the Institute conducted a training programme on pearl oyster farming and pearl culture during February 1991 in which 26 candidates from ten countries participated. Presently CMFRI is charging Rs. 3000/- as training fee for one month.