

MARINE PEARL PRODUCTION

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INTRODUCTION

The pearl is a gem and has been in high esteem from time immemorial. The Central Marine Fisheries Research Institute (CMFRI) at its Tuticorin Research Centre has taken up production of cultured pearls in 70's and is now the prime centre in the country for R & D on pearl culture. The advances achieved in the seed production, farming and pearl production have received world wide acclaim. This centre, at present is engaged in the expansion of this technology to distant areas where the pearl oysters do not occur.

PEARL OYSTER DISTRIBUTION

Of the 28 species of pearl oysters occurring almost in all the seas of tropical and subtropical belt only 3 species produce pearls of commercial value. Of these *Pinctada fucata* and *P.margaritifera* are available in the Indian waters.

In India, they occur in the Gulf of Kutch, Gulf of Mannar, Palk Bay, Vizhinjam Bay, Andamans and Lakshadweep Islands. The pearl oyster beds in the Gulf of Mannar extend from Pamban in the North to Kanyakumari in the South. The Tuticorin region had the most productive beds and the pearl fisheries of earlier days were conducted mostly from this region. The oysters are found attached to hard / rocky substratum which lie at a depth ranging from 12 to 25 meters and 12-15 km away and parallel to the coast. They are collected from the beds by diving.

PEARL OYSTER FARMING

Spat, mother oysters and nucleated oysters are farmed by raft and rack methods, the former employed when the water depth exceeds 5m and the latter when it is less than 5m. Culture of oysters from raft is one of the suitable farming methods in sheltered bays. A raft of the size 6m x 5m constructed with teak poles and floated with 4 buoys of 200 l capacity can hold about 100 culture cages.

In the rack culture method, teak poles are driven into the seabottom at equal intervals of 1m and horizontal poles are lashed with coir ropes above the seasurface level. Culture cages are suspended from the horizontal poles. The rack can be extended as per the requirement.

Large concrete tanks having the capacity of 75-150 tonnes of water are used for onshore pearl oyster farming. The spat/mother oysters/nucleated oysters cultured in these tanks are fed with suitable cultures of phytoplankters. Different culture methods like long-line culture and on bottom culture can also be employed according to the condition of the sea and seabottom.

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Juveniles of oysters are reared in net cages made of synthetic fibre of velon screen (mesh size : 1-10mm) till they reach a size of 20mm. Mother oysters are reared in box cages with mesh of 10-15 mm. In the initial period of 1-2 months, the nucleated oysters are reared in box cages having a mesh of 1mm. This is to recover the nucleus in case of rejection.

During the farming period many bio-fouling organisms which settle and grow on the oysters, can cause problems. Being filter feeders, they are competitors to the oysters. The increase of the fouling load on the shells can also press down the animals from opening their valves. Periodic removal of these fouling organisms will enhance the oyster growth and thereby the pearl growth and its quality.

Technology of pearl production

For the formation of a culture pearl, two things are required, the outer epithelium of the mantle lobe and the core substance or the nucleus. A cut piece of the mantle epithelium will provide the pearl secreting cells whose secretion is deposited on the processed shell bead which is treated by the oyster as a foreign body. To achieve this, the following steps are required.

Graft tissue preparation

Healthy oyster free from boring organisms is used as donor oyster for the preparation of graft tissue. The donor oyster is cut open and the mantle of one side is removed. The mantle is gently wiped and cleaned with a wet sponge and the inner muscular portion and the outer marginal pigmented mantle are cut into bits of 2-3 mm.

Nucleus implantation

Oyster with partially or fully spent gonads are used for nucleus implantation. They are narcotised by arranging them tightly in troughs with seawater. A little amount of powdered menthol crystal is sprinkled in the water. In about 30-45 minutes, the oysters get narcotised. After cleaning in sea water, the oyster is mounted on the clamp after inserting the speculum through the postero-ventral corner of the oyster. The foot is hooked and a shallow, sharp opening is made at the base of the foot with the incision-cum-grafting needle. A passage is made upto the implantation site, ie. the gonad. A piece of graft tissue is picked up and inserted through the passage and placed at the implantation site. The nucleus is then implanted in the same manner, in contact with the graft.

The oyster is removed and is kept in a container with a gentle flow of filtered seawater. The oyster slowly resumes its normal functions. The implanted oysters are kept in the laboratory for 3-4 days before taking them to the farm for further rearing. The epithelial cells of the graft tissue proliferate and arrange themselves over the shell bead nucleus forming a pearl sac. This secretes the nacre (mother of pearl) and is deposited over the nucleus in the form of concentric micro layers resulting in the formation of a cultured pearl. The quality of the pearl is influenced by several hydro-biological factors.

PEARL HARVEST

Pearls are harvested manually. Oyster are opened and pearls are squeezed out. In case of reuse, the pearls are removed carefully by opening the pearl - sac through the gonad without damaging it. The harvested pearls are washed in distilled water, polished in refined sand and again washed in distilled water. They are stored according to size, colour, shape, lustre and other external characters.

TRAINING PROGRAMME

As a mandatory to extend the proven technologies developed by the Institute, training programmes are organised as per the demand. Long-term and short-term courses for periods ranging from 4 to 20 weeks are conducted. The former course is a comprehensive one useful for managerial and supervisory personnel and the latter for technicians dealing with mother oyster culture, surgery and pearl production. A short technician course is also conducted for a period of 10 days in which intensive practical training is given on nucleus implantation and surgery. Entrepreneurship development courses comprising pearl oyster seed production, farming and pearl production are also organised and conducted for a period of eight weeks.

ECONOMICS

Pearl oyster farming in terms of value is one of the world's leading aquaculture industry. In 1993, the world production of marine pearls was around 77,400 Kg with a value of over U.S.\$ 1043 million. India is importing pearls worth about 29 million dollars per year. Pearl culture is a long-term investment and huge profits can be made by successful operations.

In a recent field study conducted at Valinokkam, a coastal bay in the district of Ramanathapuram, Tamil Nadu, by employing near shore raft culture method a rate of return of 55.7% was obtained, which is the highest gross income per unit area when compared to various production systems in aquaculture.

In a raft of the size 6m x 6m, 10355 oysters in 100 box cages were cultured. A total of 9414 oysters were subjected to single implantation with nuclei of 3-5mm and for this operation 941 oysters were used for graft tissue preparation. In the post operative period of one year 2108 oysters died. Out of 7306 oysters, 1849 pearls valued at Rs. 85,633 were obtained.

EXPENDITURE

1. Cost of teak poles, floats and anchors	Rs. 13,000
2. Box cages 100 Nos.	10,000
3. Oysters 10355 @ Rs.1.40 per number	14,500

4. Shell bead nuclei (9414 Nos)	Rs. 9,500
5. Instrument, Chemical, Glassware and Plastic Wares	5,000
6. Labour Charges	3,000
Total	55,000
First item can be used for 2 years	

REVENUE

Value of 1849 pearls produced	85,633
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PROSPECTS

Pearl culture is unique and location specific. The culture site should provide congenial conditions in the form of protection, water clarity, optimum salinity, temperature, seabottom and adequate amount of phytoplankton. The farm should be free from any form of pollution. Mother oysters need continuous farming and they have to be reared in rafts, racks, long lines or on the sea bottom. These conditions exist only in a few places in the southeast coast bordering the Gulf of Mannar.

Attempts to culture pearl oysters in large onshore tanks, feeding them with cultured phytoplankton have given good results. Making use of this advantage, trial production of pearls has been attempted in some of the prawn hatcheries in Tamil Nadu and Andhra Pradesh. Initial success in pearl formation in onshore tanks has been achieved. This will go a long way in the history of pearl culture in India.