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**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE**  
(Indian Council of Agricultural Research)  
P.B. No. 2704, Cochin 682 031, India

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# **PEARL CULTURE**

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## TRAINING PROGRAMMES IN PEARL CULTURE

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### INTRODUCTION

At the Group Discussion on Pearl culture held at Tuticorin in January 1974, an important decision was taken that the Central Marine Fisheries Research Institute, which had developed the indigenous technology for pearl culture should also organise training courses in this specialised area for the benefit of the development programmes in the country (Swaminathan, 1974; Alagarswami, 1974a). India is one of the few countries in the world known for production of natural pearls from time immemorial and had developed a sizable export trade to countries such as Greece and Rome about 2,000 years ago. Realising that the pearl oyster resource of the Gulf of Mannar was of a highly fluctuating nature with several 'barren' years between sporadic fisheries, Hornell (1916) had concluded that cultivation of pearl oysters and inducing them to produce pearls would be a sound way of making the Indian and Ceylon (now Sri Lanka) pearl fisheries consistently remunerative. This was the period when Japan had just developed the technology of pearl culture and was attempting to put the product in the markets in Europe. Since 1933 conscientious efforts were made by the Department of Fisheries, Government of Tamil Nadu (then Madras), over a period of more than three decades, to develop the technology of pearl culture at Krusadai (Alagarswami and Qasim, 1973). However, success was achieved only in 1973 when the Central Marine Fisheries Research Institute took up an experimental project on pearl culture at Veppalodai near Tuticorin (Alagarswami, 1974b).

At that point of time, the pearl oyster beds in the Gulf of Mannar were in the midst of a most unproductive phase, having been heavily exploited from 1955 to 1961. Even though the technology for pearl oyster

farming and production of cultured pearl became available indigenously, the natural beds of pearl oysters were 'barren' and there were apprehensions in several quarters that the technology could not be put to use as there were no oysters (Tamilnadu Fisheries Dept., 1974). The situation of pearl oyster resource in the Gulf of Kutch was no better (Pandya, 1974).

Not losing hope, the Central Marine Fisheries Research Institute developed another research project for the hatchery production of pearl oyster which resulted in a breakthrough in 1981 (Alagarswami *et al.*, 1983). Production through breeding, larval culture and spat rearing became a reality and, subsequently, the technology was scaled up to produce over a million spat in one rearing. This gave the answer to the critical situation of paucity of resource.

Thus the Central Marine Fisheries Research Institute became the nucleus of pearl culture R & D in India. In consonance with the policy of transfer of technology of the Indian Council of Agricultural Research, the Institute developed training courses in the areas of (1) technology of pearl culture and (2) technology of hatchery production of pearl oyster and implemented such training programmes, beginning from 1976.

### TRAINING PROGRAMMES IN PEARL CULTURE

Ever since Japan developed the technology of pearl culture and captured the world market for cultured pearls, the industry was operating on certain principles to guard the technology, with provisions for joint ventures abroad (Alagarswami, 1970; Ward, 1985). The pearl culture industry of Australia, Burma, Indonesia, Malaysia, Philippines and Thailand was developed under this provision but the technology was

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never made available to the host countries. After the World War II, Cahn (1949) published information on Japanese pearl culture which was perhaps the first document in English which gave the details to the rest of the world. Two decades later, Alagaraswami (1970) updated the information. With indigenous developments in technology (Alagaraswami, 1974b; Alagaraswami *et al.*, 1983), the CMFRI adopted an open policy of training. Possibly this is the only centre which offers such training in pearl culture not only for Indian nationals but also to foreign technicians who are sponsored through the Governments.

#### *Long-term course*

CMFRI (1977) gives the details of the two types of training courses offered in pearl culture technology. The 'Manual on Pearl Culture Techniques' is a helpful guide for the trainees in practical exercises (Alagaraswami and Dharmaraj, 1984). The first training course was a long-term course of six months duration which was held from 24 September 1976 to 23 March 1977. This was a comprehensive course for managerial and supervisory personnel dealing with pearl oyster resources, biology, ecology, farming, surgery, production and management. The long-term course was not repeated due to practical problem of taking time off for six months from the trainers' and trainees' jobs in their respective organisations. The detailed curriculum of the long-term course was as follows:

#### *Introduction*

*Theory:* Origin of pearls, molluscs producing pearls; pearl oysters of the world; pearl fishing in the world; development of cultured pearls; pearl culture in Japan and other countries; ecology of pearl culture; modern trends in pearl culture; developments in India.

#### *Pearl oyster-its biology*

*Theory:* Morphology; dimensional relationship; anatomy; systems and functions; histology of mantle; pearl-sac formation; development and growth; age; feeding; maturation and spawning.

*Practical:* Examination of specimens for morphological features; dissection and display of systems; observation of maturity conditions; location of potential sites for pearl production.

#### *Pearl oyster resources*

*Theory:* Habitats of pearl oysters; history of pearl fisheries of the Gulf of Mannar and Gulf of

Kutch; production of oysters in recent years; fishing techniques; SCUBA-diving; spat settlement in new areas and its development.

*Practical:* Sea trips to pearl banks to observe and collect pearl oysters; collection trips to other areas; observations on spatfall; collection of spat and rearing.

#### *Mother-oyster culture*

*Theory:* Site selection; raft culture of pearl oysters; collapsible and rigid rafts; designs and construction of rafts; buoying and mooring; holding nets; baskets; boxes; depth of suspension; farm maintenance.

Growth of oysters in the farm; fouling and boring organisms; shell-cleaning operations; effect of fouling on the well-being of oysters; mortality of oysters.

Spat collectors; collection and rearing of spat.

*Practical:* Construction of rafts; floating and mooring; farm work including cleaning of oysters, measurement of oysters, rearing of oysters to suitable size and maintenance of rafts.

#### *Pearl-oyster surgery*

*Practical:* Selection of oysters for operation; acclimatisation; conditioning of oysters.

Selection of donor oysters; use of special instruments; graft-tissue preparation.

Selection of nucleus according to size and physiological condition of oysters and nature of seeding.

Operation on oysters; fixing sites of implantation; single and multiple implantation; use of special instruments; insertion of graft tissue; implantation of nuclei.

Convalescence of operated oysters; rate of rejection of nuclei; rate of mortality; returning the oysters to farm for post-operative culture.

#### *Post-operative culture*

*Practical:* Post-operative culture; observations on pearl-sac formation and nacre deposition; limiting duration to the requirement of maturity of cultured pearls. Rearing of oysters according to size of nucleus and nucleus load.

### *Pearl collection*

*Practical:* Beaching of oysters for harvest of pearls; opening oysters without injury to the pearls; collection and cleaning of pearls; decision-making on re-use of oysters and proper care of oysters selected for re-use. Estimation of yield of pearls in relation to the culture techniques. Retrieving unsuccessful nuclei for further use.

Sorting of pearls, shape, size, colour and lustre; standards of grading; storage of pearls.

By-products of pearl culture; seed pearls, edible meat and shells.

### *Management*

*Theory:* Scale of operation in other countries: family scale—cooperative—big business; preparation of projects; farm management; personnel management; relationship between inputs and outputs; adjusting inputs; evaluation; marketability; profitability; constraints and possible methods of overcoming them; pearl trade in India; imports and exports; consumer preference in India and abroad; scope of pearl culture in India.

### *Short-term course*

The course content for the short-term programme was developed with a view to impart training at the technician's level. This is of 4-6 weeks duration. The course is more popular among the interested organisations. Four short-term courses have been held so far: (1) 22 August 1977 to 24 September 1977; (2) 9 July 1979 to 18 August 1979; (3) 8 October 1984 to 2 November 1984; (4) 8 September 1986 to 4 October 1986. The curriculum of short-term course is as follows:

#### *Introduction*

*Theory:* Morphology and anatomy of pearl oyster; functions of mantle; pearl-sac formation; mechanism of production of cultured pearls.

#### *Mother-oyster culture*

*Practical:* Raft culture of oysters; construction of rafts and holding baskets; pearl-oyster collection and farming; farm maintenance; care of oysters.

### *Pearl-oyster surgery*

*Practical:* Handling of surgical instruments; selection and conditioning of oysters; graft-tissue preparation; nucleus implantation; post-operative care of oysters.

### *Pearl collection*

*Practical:* Beaching; collection of pearls; cleaning of pearls; sorting of pearls.

## TRAINING PROGRAMME IN PEARL OYSTER HATCHERY

The course which is of four weeks duration is not only useful to those concerned with pearl culture but can benefit any molluscan aquaculturist wishing to raise marine bivalve stocks in hatchery. The first training programme in hatchery technology was organised from 27 October 1986 to 22 November 1986. The course curriculum includes shellfish hatchery, breeding of pearl oyster, induced maturation and spawning, larval rearing, water quality management, microalgal production and larval feeding, disease control, spat settlement and collection, and juvenile rearing.

### IMPACT OF TRAINING

The main objective of the training courses on pearl culture and pearl oyster hatchery has been to help the development effort of the country in establishing cultured pearl production projects and also to aid research effort in certain centres on location- and species-specific problems. Naturally the participants were drawn from the fisheries organisations of the maritime States and Union Territories. Tamil Nadu and Gujarat are the two States in India which have pearl oyster beds exploited for several centuries. They had the maximum participation in the training courses. Tamil Nadu has a commercial project in pearl culture as a joint venture. Gujarat has an R & D programme in pearl culture at the Department of Fisheries.

Lakshadweep has responded to the programme very favourably, after realising the potential for pearl culture in the islands. The Union Territory has an R & D project in Bangaram based on the local resource of pearl oysters. Andaman & Nicobar Islands has even a greater potential for pearl culture (Alagaraswami, 1983). The Central Agricultural Research Institute of Indian Council of Agricultural Research is implementing a research project on the black-lip pearl oyster. Kerala had a pilot project in pearl culture based on the

pearl oyster spat settlement in the Vizhinjam Bay which was identified and developed by this Institute (Achari, 1982). Besides, training was given to officials of Department of Fisheries, Karnataka, a scientist of the Konkan Krishi Vidyapeeth and a candidate sponsored by the Department of Fisheries, West Bengal. A Fisheries Technician from South-East Asian Fisheries

Development Centre, Iloilo, Philippines attended one of the short-term training courses.

The training programme organised have had positive impact in the country and it is hoped that it will generate and sustain further interest both in terms of research and development.

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