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OYSTER CULTURE—STATUS AND PROSPECTS

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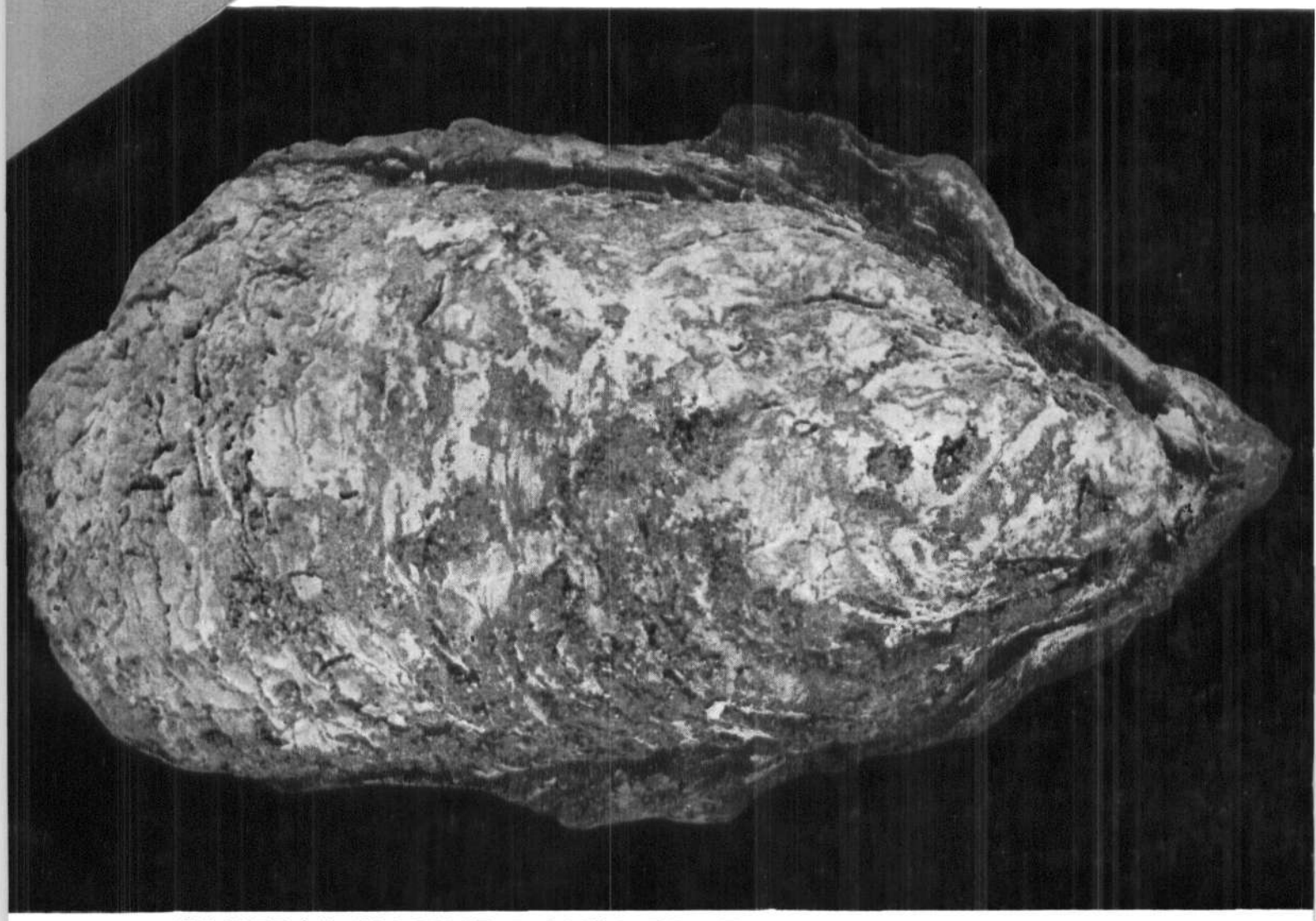

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TECHNOLOGY OF OYSTER FARMING

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INTRODUCTION

Among Hornell's (1910, 1916, 1918, 1922) suggestions for the future fisheries developmental programmes in the country was his indication about the vast scope in the realm of oyster farming in the Madras State. He initiated some experimental farming on the model of that in France. However, his attempt remained unaccomplished in the sense that there was no oyster production of significance, nor was there any organised effort in exploiting the natural resources due to the general disinterestedness of the public in oyster meat consumption. But the advancement of science and technology over the past three decades has brought about a reversal of the attitude of the public with greater awareness to utilise the protein rich marine organisms in their dietary needs. This is partly due to the realisation that agricultural production is reaching a stage where the human needs will find it difficult to meet their future requirements on account of population explosion. It is in this context oyster culture assumes special significance as the oysters are easy to grow in farms and plenty in natural abundance to supply the seed.

The technology of oyster farming is not simply collecting young oysters and stocking them in growing waters. Like scientific agriculture farming operations, it involves scientific information to achieve assured production which in turn means purposeful assessment of the prevalence and provision of adequate environmental conditions that govern healthy survival and growth. Fortunately for us in India where oyster farming is in a nascent stage, voluminous information on oyster farming, oyster biology, reproduction, larval development, growth and the role played by environmental parameters are already available in respect of countries like Japan, U.S.A., France, U.K. and Holland. Variations in these details are to be expected from one country to another. Modifications in approach to farming might become necessary while evolving suitable techniques. Governed by these considerations, the following prerequisites will have to be satisfied in the technology of oyster farming.

(1) Resources availability.
(2) Study of the biological aspects, growth and reproductive cycle.
(3) Study of the environment : hydrological parameters and plankton food availability.
(4) Selection of suitable farm site.
(5) Experimentation in spat collection and standardization of techniques.
(6) Growing technique and standardization of methods which are suitable.
(7) Establishment of model farms and their management. (Fabrication of culture materials, predator and fouler control, avoidance of disease factors, labour and material management).
(8) Harvesting, post-harvest strategy, marketing and product development.
(9) Socio-economic feasibility and cost effectiveness.
(10) Extension and training.

Keeping these above in view, efforts to evolve the technology for oyster farming were started by Central Marine Fisheries Research Institute at Tuticorin which have yielded satisfactory results. The techniques have been repeatedly tested over a period of five years and found to give consistent results at the same time opening up possibilities for trying out alternate cheap and more effective methods. The standard techniques adopted

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are the first of their kind in our country and it is hoped to serve to inspire development of techniques in respect of other cultivable edible molluscs of our coastline.

Culture Methods

Two important aspects are involved in oyster culture i.e., production of seed and rearing of the seed oysters to marketable size. Nayar (1980) has given the description of the various methods i.e., raft method, rack and tray, stake method, long-line method and on bottom method by which oysters are cultured. In the on-bottom method, oyster seed are sown and allowed to grow on bottom in shallow coastal areas. The production is low but because of economic considerations it is still being followed in U.S.A. In the stake method, wooden stakes are planted in coastal waters and oyster spat set on these and are allowed to grow. In rack culture, oysters in rearing trays are placed on a platform constructed with wooden poles, in shallow and calm areas with depth ranging from 1-1½ metres. If the depth is more, oysters in strings can be reared by suspending from a raft. The long-line method is a modified form of the raft method. The long line unit consists of a series of wooden or styrofoam floats, to which two parallel synthetic ropes of 6 cm thickness are tied. From these paired horizontal ropes, rens are suspended and the length of the rens depends on the depth at the place. It was decided that the rack culture technique is suitable at Tuticorin because of the shallow nature of the bay where large scale operations of oyster culture could be carried out.

Location of farm

The oyster farm is situated in Tuticorin Bay on the southeast coast of India Lat. 48°N, Long. 78°11'E. The racks are erected in the bay, in the tidal zone where the water depth varies from 0.5 m to 1.5 m. Salinity of the bay ranges from 29.4 to 35.3‰. Rarely in monsoon season, due to heavy rainfall and discharge of freshwater from creeks in the area, the salinity may drop to 15‰. The temperature ranges from 25°C to 31°C. The water temperature is high during April-May which is the peak spawning season of *Crassostrea madrasensis*. During January-February, the water temperature is 25°-28°C.

Rack

Six vertical poles of 2.4 m length are driven to the bottom at an interval of 2 m apart and another set of six poles are driven parallel to the first row. These two rows of poles are connected by 2 m long cross poles. Above these cross poles, using 8 poles 5.5-6.5 m in length a platform for keeping oyster rearing trays is constructed. Coir and 3 mm synthetic ropes are used as the binding materials. Each rack occupies an area of 25 sq.m. and accommodates 20 rectangular trays with holding capacity of 3,000-4,000 oysters.

Seed collection

Eventhough various types of spat collectors were tested for their suitability in collection of oyster spat, for large scale collection, materials such as lime coated tiles and oyster shell rens were used. Thangavelu and Sundaram (1983) have given an account of lime coated tiles of size 24 × 15 cm used in spat collection. The lime coated tiles are arranged in trays at the rate of 50/tray in such a way that the concave side of the tiles faces downwards.

Oyster shell strings are prepared from 20-25 number of oyster shells centrally punctured and strung on 1½ metre long G.I. wire. Each unit is known as a 'Ren' and about 95-100 rens are placed horizontally on a rack for spat collection. The aspects of laying spat collectors, the number of spat per different spat collectors, the number of spat collected during different years are dealt in a separate chapter.

Rearing of seed oysters

The method of rearing seed oysters depends upon the type of spat collectors used. Those which had set on oyster shells could be allowed to grow upto marketable size on the spat collectors themselves. Fresh rens have to be prepared with the spat set shells giving sufficient interspaces to enable growth of oysters and the rens are hung from the racks. The shells with spat can be removed from the strings and individually they can be used for an on bottom culture in suitable shallow areas.

Spat set on limecoated tiles are allowed to grow on the tiles for a period of two months. When the spat attain a size of 25 mm, the layer of lime with spat it scraped off using a scraper. The scraped tiles are reutilised for spat collection, after giving a lime coating. The detached spat are reared in box-type cages of size 40 × 40 × 10 cm made of 6 mm. M.S. round rod knitted with 2 mm synthetic twine. The cages with oysterlings (150-200 numbers/cage) are suspended from racks using 4 mm thick and 1½ m long synthetic ropes. For suspending the box-type cages or the rens prepared with spat set shells, racks are constructed by erecting six vertical poles (2.4 m in length) at a distance

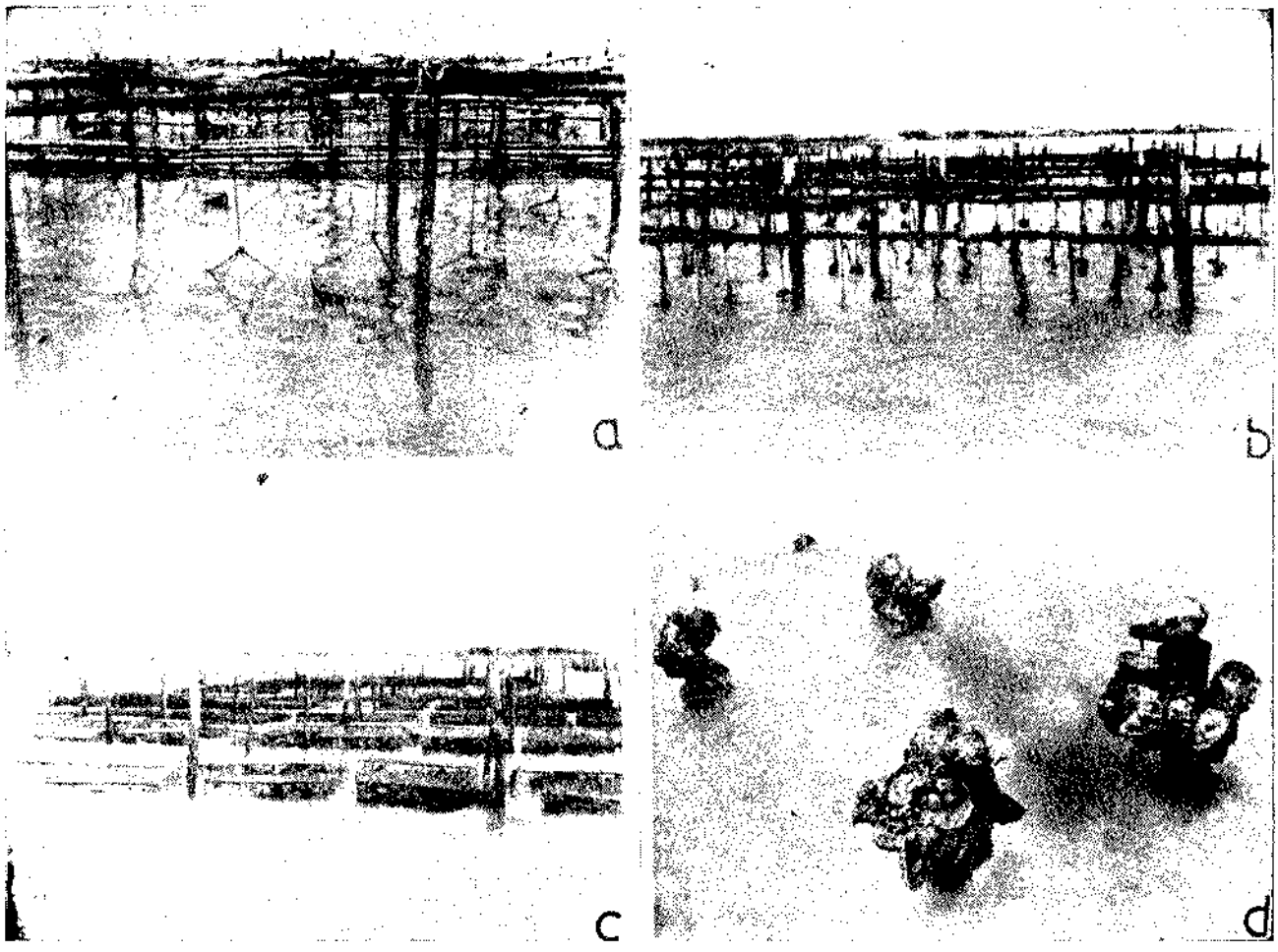

Plate I. (*a*) Box-type cages suspended from racks, (*b*) Strings hung from racks, (*c*) A view of oyster farm with racks on which trays containing oysters are kept, (*d*) Oysters grown on stakes.

of 2 metres. Long horizontal poles are tied across these poles at the top at a height of 1.8 m. From the horizontal poles, the cages (Pl. I a) or strings (Plate I b) are suspended.

Thinning and growing oysters

Oysters which have grown to 50 mm size and above are segregated from the box type cages and transferred to rectangular trays of size 90 × 60 × 15 cm each tray holding 150-200 oysters. Twenty such trays are kept on a rack (Pl. I c). The oysters are reared from settlement, for a period of one year when they attain marketable size of 80-90 mm, weighing 80-100 gm with meat forming 8-10%. During rearing, periodical cleaning of oysters, cages and trays and maintenance of racks have to be carried out for healthy growth of oysters.

With successful mass production of oyster seed in the CMFRI oyster hatchery at Tuticorin, the spat which had set on shells in the hatchery are being utilised for stake method of culture (Pl. I d).

Harvesting and marketing

The meat of oysters in sexually ripe stage are creamy in colour, tasty and in best condition with maximum weight and the oysters have to be harvested when they are in that stage. Soon after spawning, the oyster meat will be thin and not very tasty. The condition factor of the oysters ranges from 40 to 180. The higher condition factor is found before the spawning season i.e. April-May and August-September. When the meat is plumpy and creamy about 100-120 oysters yield one kg of meat. Harvesting of oysters is done manually. Harvested oysters are cleaned with a jet of water and purified by keeping them in filtered, unpolluted sea water for 12-15 hrs. The oyster meat is shucked after placing the depurated oysters in hot water for 2 minutes. After washing thoroughly, the shucked meat is sold locally. On three occasions, large quantities of cultured oysters were harvested and the shucked meat was sold to Integrated Fisheries Project, Cochin. The meat was quick frozen, transported in insulated van and are either smoked and canned or canned in brine. It was sent to several far off places for consumption (Samuel *et al.*, 1982).

Remarks

Oyster culture at Tuticorin (Nayar and Mahadevan, 1983) and some of the experimental culture carried out in Athankarai estuary (Rao, *et al.*, 1983) Bheemunipatnam backwaters, Andhra Pradesh (Ruben *et al.*, 1983), Mulki estuary (Mohan Joseph and Shantha Joseph, 1983), Goa (Parulekar *et al.*, 1983) and Cochin backwaters (Purushan *et al.*, 1983) indicate good prospects for oyster farming along the Indian coasts.

The rack culture technique developed at Tuticorin could be profitably employed to conduct oyster farming in the stretches of shallow coastal waters at several places along the Indian coasts. Bottom sowing method of culture should also be attempted in shallow areas with hard bottom in view of the advantage of low investment needed.

Adverse conditions of hydrographic or biological factors such as predation, parasitism and disease may cause considerable damage to the tended stock. Though at present pollution is not posing a big problem, in the near future, because of increasing industrialization along the coastal areas, it may cause environmental problems. Proper treatment of domestic, oil and thermal pollutants will reduce the injurious effects on the environmental conditions.

Predatory gastropods cause mortality of oysters when they are reared in box-type cages (Thangavelu and Muthiah, 1983). Rao *et al.* (1983) have mentioned the predation of cultured oysters by the crabs *Scylla serrata* and *Pagurus* spp. in Athankarai estuary. *Balanus amphitrite* is a serious one among the pests in tropics and competes with oysters for space and food. The wood borers *Teredo furcifera, Lyrodus pedicellatus, L. affinis* and *Martesia striata* cause damage to the poles with which oyster culture racks are constructed (Nair and Dharmaraj, 1979). Studies on the remedial measures for these problems have to be carried out to facilitiate better production from oyster farming.

The meat of oysters cultured at Tuticorin is free from pathogenic bacteria. Heavy metal contaminants have been found to be well below the admissible limits. But the recent incidence of paralytic shellfish poisoning in Vayalur village, Tamil Nadu (Silas *et al.*, 1982) and in Kumble estuary near Mangalore (Karunasagar, 1984) indicate the need for monitoring studies on the sanitary quality of shellfish growing waters, shellfish toxicity and occurrence of toxic dinoflagellate blooms in the areas where bivalves are cultured. Depuration of oysters before marketing them, should be made mandatory.

Canning and marketing of oysters cultured at Tuticorin has shown that there is good demand for canned oysters. More extension work is needed for disseminating information on the food value of oysters, techniques of oyster culture and the various uses of

oyster shells i.e. in calcium carbide and cement industries and poultry farming apart from its use in the production of lime which could lead to adoption of oyster culture practices commercially.

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