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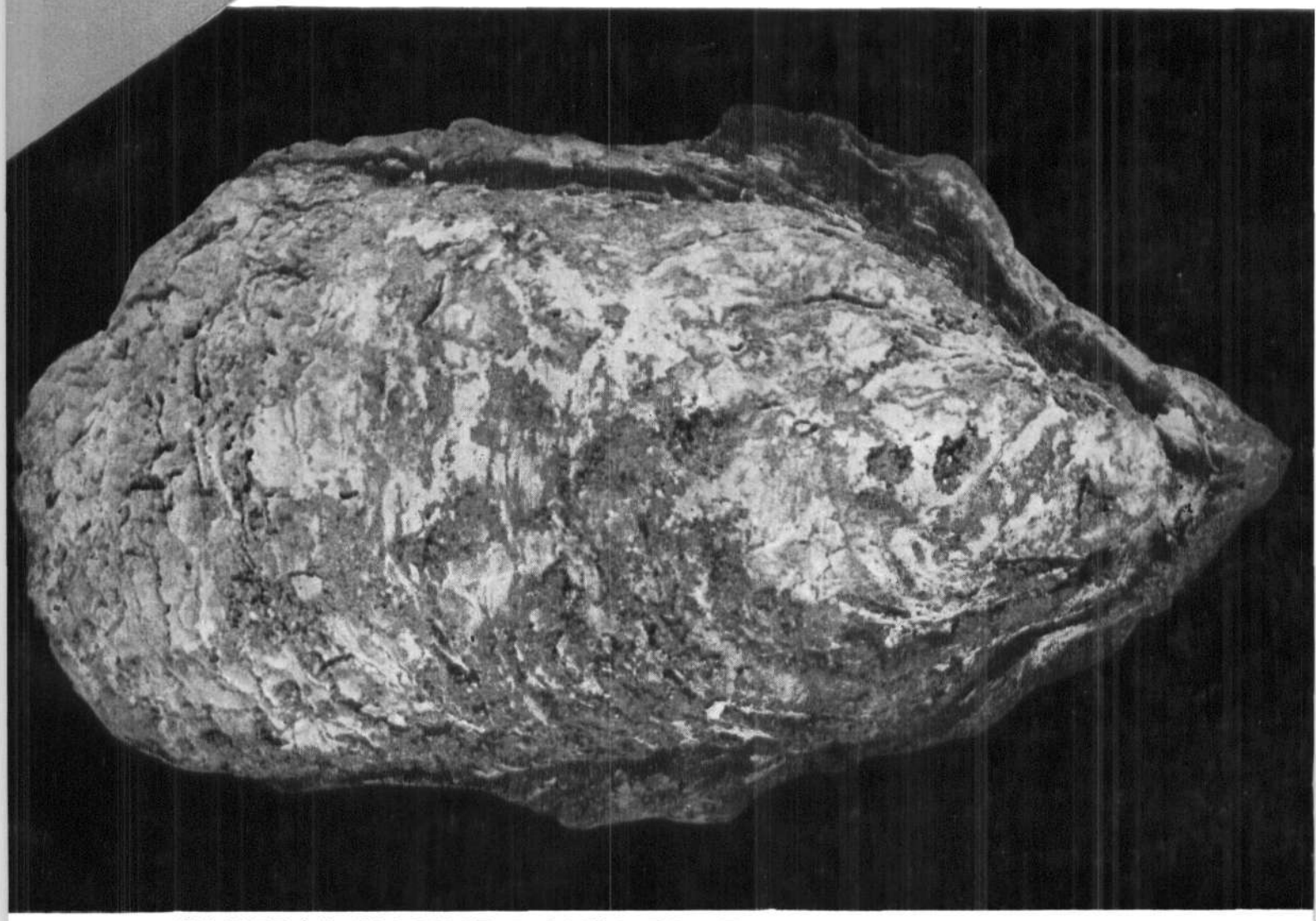
OYSTER CULTURE—STATUS AND PROSPECTS

Edited by : K. NAGAPPAN NAYAR AND S. MAHADEVAN



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

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TECHNIQUES OF COLLECTION OF OYSTER SPAT FOR FARMING

P. MUTHIAH [1]

Methods of spat collection commonly practised:

Dependable and consistent supply of seed is an essential prerequisite for viable aquaculture industry. Oyster seed commonly called *spat* is procured from natural resources by placing suitable cultch materials in the water column at the most appropriate time and place. Cultches used vary from twigs of various trees to modern synthetic materials. In 1670, Goroemon Kobayashi of Hiroshima first used bamboo poles with twigs and nets for successful collection of oyster seed. Bamboo branches and branches of trees such as oak, pine and chestnut were also used. Shells of scallop and oysters are commonly being used in the form of ' rens ', hung horizontally or vertically from the racks. Recently *Netlon* a hexagonal plastic netting with a mesh size of 5 cm. of size 5-10 × 15 cm. is also being used for spat collection (Fujiya 1970, Bardach *et al.* 1972). In New Zealand Curtain (1974) found that asbestos cement strips or sticks serve most effectively in spat collection. In Carribean bitumen painted wooden planks and branches of red mangrove are used for collecting seed oysters. Plastic mesh collectors similar to *Netlon* are used in Canada and U.S.A. (California, Virginia). Ropes intertwined with twigs are employed in Italy. Rens of shells, metal net baskets or triangular wooden frames with empty shells inside serve as spat collectors in North America (Imai, 1971). Thomson (1954) states that sticks of black and orange mangrove, wattle, white cypress and swamp oak and brush woods in addition to Fibro cement slates or tarred sawn timber slates are used as spat collectors in Australia. Quayle and Smith (1976) state that in British Columbia though rens of oyster shells are commonly used, strips of wood veneer of spruce or fir that are coated with cement are also popular. In France the main spat collector is ribbed PVC tubes 1.2 m long and 2.3 cm in diameter. Six tubes are tethered together as a bundle and placed on a 'table'. Rens (Chapelet) of oyster, mussel and scallop shells are also used. In flat oyster culture stacks of 10-12 lime coated tiles each arranged as a bouquet using a zinc wire are placed on a pole erected in the bay area for spat collection.

In India, Hornell (1916) experimented with lime coated tiles to procure oyster spat in Pulicat Lake. The choice of cultch material depends on culture methods adopted, material availability and economic and practical utility. In oyster culture experiments carried out at Tuticorin, a number of cultch materials were tried. This paper outlines the results of experiments on spat collection carried out at Tuticorin during 1978-80.

Experiments on spat collection:

Because of easy availability cultch materials i.e., oyster shells, coconut shells, asbestos sheets, mussel shells and tiles were tried during 1980 spawning season.

Oyster shell rens:

Holes were drilled at the centre of 2,000 oyster shells. 20 such shells were strung on a G.I. wire (No. 10) of length 1½ metres. Each unit is called a ' ren '. Since the depth of water in the bay area was 0.5 to 1.5 m, 100 rens were laid horizontally on a rack (Pl. I a). The number of oyster spat collected on oyster shells ranged from 0 to 27 and average spat/shell was 7.

Coconut shells:

1,200 empty coconut shells dipped in tar and dried were punctured at the centre. A unit of seven such shells were strung on a nylon rope (3 mm) of length

[1] *Present address*: CMFRI, Research Centre, Tuticorin-628 001.

1½ metres with interspace of 10 cm. Thus 180 rens having a surface area 75 m² were placed horizontally on a rack (Pl. I b). Maximum number of spat settled on a coconut shell was 5. Average settlement was 1/shell.

Asbestos sheet :

Lime coated asbestos sheets (100 nos.) each of size 120 × 80 cm were placed in grooves of pamlyra reapers which were tied to poles driven in the bottom (Pl. I c). Minimum and Maximum settlement were 2 and 10 respectively. Average settlement per sheet was 4.

Mussel shells :

Several strings of mussel shells were placed horizontally on a rack. The spat settlement was moderate. The average spat settlement was 5/shell.

Velon screen and polythene liner sheet :

Other spat collectors used in experiments are velon screens, polythene liner sheets and PVC tubes. Velon screen or polythene liner sheets of size 4.25 × 16.5 cm encircled on a metal frame (Pl. I d) were tied to the rack. Spat settlement was 87 and 215 respectively on the velon screen and polythene liner sheet. Removal of spat from these collectors was easier than scraping of spat from tiles.

PVC tubes :

Nine PVC tubes of 3 cm dia. and length 1 metre fixed on to wooden rings at either end. About 20 such rolls of these PVC tubes were laid on a rack. Average settlement of spat was 30/single tube.

Tiles :

Lime coated tiles 24 × 15 cm in size were kept in nylon knitted cages each of 100 × 90 × 15 cm size, in such a way that the concave side of the tile faced downwards. Fifty tiles in 2 tiers of 25 each were placed in each cage (Pl. II a). A total of twenty cages were arranged on a rack (Pl. II b). Settlement on the tiles was encouraging. In some tiles as many as 120 spat settled down. The average settlement of spat/tile was 33.5 (Pl. II d).

Spat Collection :

Based on the encouraging results obtained, large-scale collection of oyster seed was attempted using lime coated tiles as collectors. Thangavelu and Sundaram (1983) have given details of the lime coating process. Lime coated tiles numbering 18,000 to 50,000 were laid during the peak spawning seasons i.e., April-May and August-September from 1978 onwards upto 1984 and the details are given in Table 1.

TABLE 1. *Details of Spat Collection*

Items	Year	1978	1978	1979			1979	1980			1980
	Season	April-May	August-Sept.	April-May			August-Sept.	April-May			August-Sept.
	Place	Creek	Creek	Creek	Natural bed	Tuticorin Bay	Tuticorin Bay	Creek	Natural bed	Tuticorin Bay	
Total No. of racks		30	30	10	20	18	20	2	2	30	Not tried
Total Number of lime coated tiles provided		27,000	30,000	10,000	20,000	18,000	20,000	2,000	2,000	30,000	
Number of spat settled/m² of surface area ..		153	Nil	76.9	92.3	316	43.8	100	107.7	184.1	
Total spat collected ..		3,00,000	Nil	50,000	1,20,000	3,90,000	57,000	13,000	14,000	3,59,000	

In 1978 April-May season 30,000 lime coated tiles were provided in the creek and 30,000 spat were collected. Number of spat per m² of surface area of cultch was 153. During August-September season in the same area, there was no settlement because of the closure of creek mouth.

In 1979, April-May season spat collection was carried out in three different places viz., creek, natural bed and bay area (Pl. II c). The spat collection in the bay area was very good. The number of spat/m² of the surface area of cultch was high (316/m²) in the bay

when compared with creek (76.9/m²) and natural bed (92.3/m²), thus indicating, the shallow intertidal open sea area is better suited for attempting large-scale spat procurement and its great potentialities. In August, 1979, however, in the same area 57,000 spat could be collected.

Experimental collections made in 1980 April-May season also followed an identical pattern of 1979 results. Therefore from 1981, spat collection was intensified in April-May season. The average spat settled per tile during 1981, 1982, 1983 and 1984 were 12, 15.6, 29 and 15 respectively.

Oyster shell rens were also employed in the April-May spawning seasons from 1980 onwards. The average spat/shell ranged from 5.8 to 6.5.

Setting behaviour :

In order to place the cultch at the appropriate time and position, precise information is essential on the setting behaviour of oyster larvae. Very often strong currents interfere with the larval settlement. Heavy collection of 386/m² in the bay area may be due to its shelterd nature. Korringa (1952) points out the concentration of setting in the periods of slack water.

Hornell (1916) recorded better spat settlement on the lower or concave surface than the convex surface of the tile. A maximum of 80 and minimum of 9 spat were found attached to the concave side. The ratio of spat settled on concave and convex surfaces was 5: 1 (Silas *et al.*, 1982). Average settlements on the concave and convex sides were 21.1 and 2.6 respectively. As indicated by Knight Jones (1951) for Essex oyster beds, there appears to be a preference to the darker lower surface than the convex surface which is laid with silt. Other factors that are known to influence the setting behaviour of oyster are the intensity of light, depth, angle of surface, cleanliness and roughness of the surface (Quayle, 1980).

Spatfall prediction :

For successful spat collection, timing for laying of cultch materials is one of the crucial factors. Therefore, it is very essential to determine accurately the time of spatfall. If spat collectors are placed well in advance of spatfall they may be coated with a thick film of silt and fouled becoming unsuitable for the larvae to settle down. Studying the gonadial condition of oyster and concentration of the oyster larvae in plankton will help to determine the time for placing the spat collectors. Matthiessen (1974) stated that the suspension of strings was postponed until the density of larvae reached 25 larvae/litre. During the peak spawning season i.e. April-May and also in August-September when 70% of female oysters observed were in fully ripe condition, spat collectors, oyster shell rens or lime coated tiles would be kept ready for laying. With the appearance of the oyster larvae in the plankton samples collected from the area, actual laying of spat collectors would start. The peak occurrence of oyster larvae was noticed to be in the first fortnight of April when average salinity was 33.8‰. and the temperature ranged from 30 to 31.5°C. Rao (1951) also found identical conditions in the oyster beds at Madras.

Foulers on the cultches :

Mackenzie (1970) states that the intensity of fouling can be reduced by delaying planting of spat collectors until larvae were ready to settle. Loosanoff (1961) was of the opinion that fouling intensity was less in the polystream (polychlorinated benzene) treated cultches and the number of spat settled was three times more than that on the untreated ones. The spat settled on tiles were kept in the cages for two months before scraping of spat was done for further rearing. During the period the common foulers noticed were barnacles, serpulids, *Anomia*, *Polycarpa* sp., *Styela* sp. and compound ascidians. These were periodically cleaned.

Hardening :

Seed oysters to be transported have to be conditioned. Hardening is a process by which these seed are periodically exposed during low tides. Experiments conducted on hardened and non-hardened seed, showed that the hardened seed could be kept in semiarid condition upto 120 hrs. with 76% survival. The survival rate of non-hardened seed for the same period is 22%, thus indicating the ability of the hardened seed to withstand semiarid or arid conditions better.

Remarks

Condition of cultches and the method of exposure are the prime factors for spat collection. The cultch materials must be finely roughened, free from slime and without any secretion such as gums and resins. Most of all the spat collectors must retain the oysters until they are scraped for further rearing or until they attain marketable size. They should withstand the wave action and the attack of boring organisms.

Spreading cultch materials on the bottom, or placing them on racks or suspending from raft are the three methods of exposure of spat collectors in the water column. Raft suspension method is efficient but the cost of flotation is high. Efficiency of rack system for

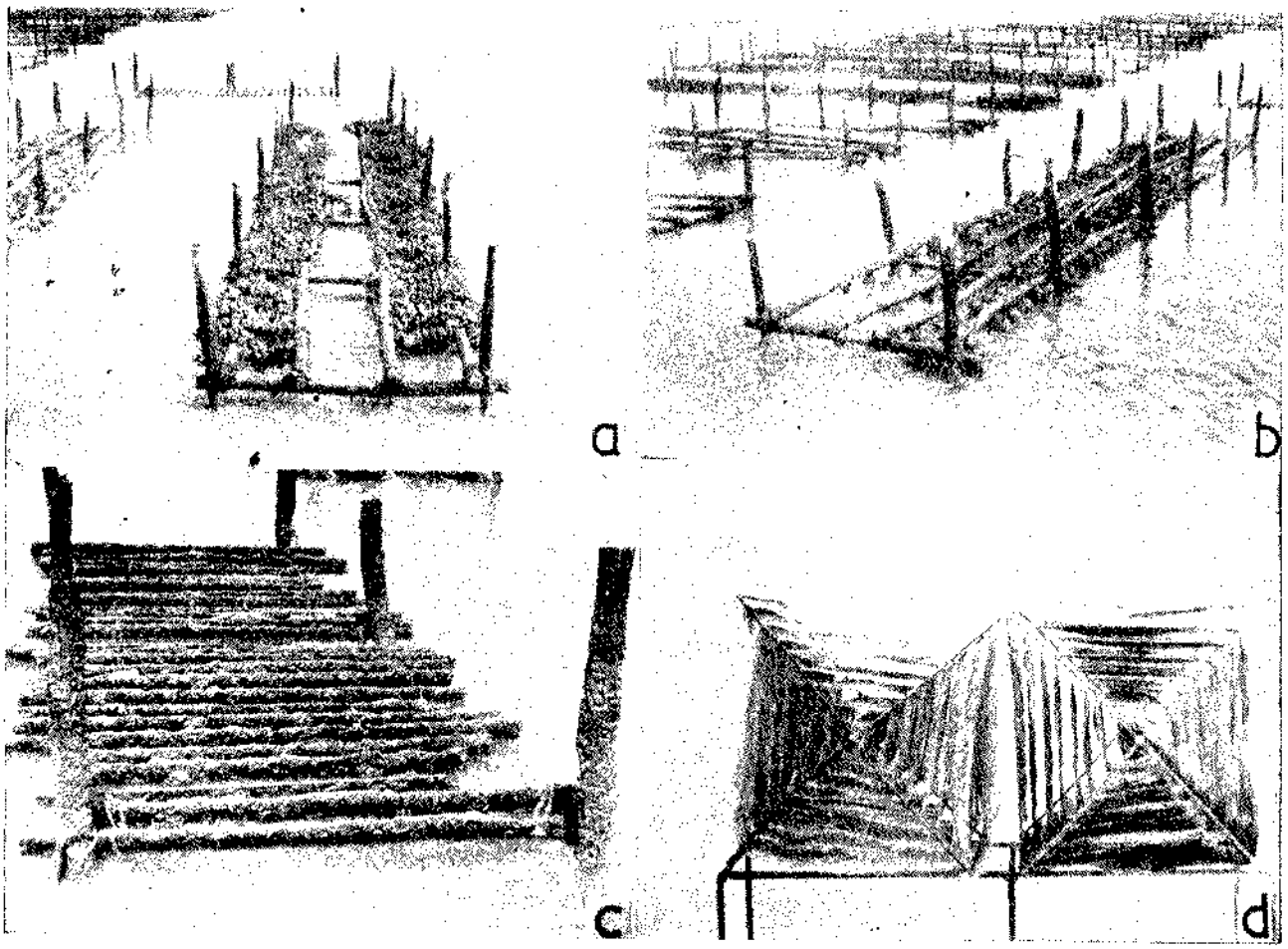

PLATE 1. (*a*) Oyster shell rens on a rack for spat collection. (*b*) Coconut shell rens on a rack. (*c*) Asbestos sheet. (*d*) Velon screen and polythene liner sheet encircled on a metal frame used for oyster spat collection.

spat collection is better because of lesser attack by predators and accomplishment of recovery of cultch materials.

Of the various materials of spat collectors, lime coated tile is being used in Holland and France for commercial spat collection. The advantage with this spat collector is that the tiles used in one season can be recycled for subsequent season. In the areas where sufficient depth is there to rear the oysters by suspension method, rens of oyster shells can be suitable material for spat collection. Recent uses of PVC pipes and synthetic materials for spat collection will help in easy removal of spat instead of labour involving scraping process.

Although a few lakhs of spat were collected during the experiments at Tuticorin, it is possible to procure more by employing larger number of suitable spat collectors. But natural setting may vary with location and time, and is largely governed by year to year variations in the environmental characteristics. Hence dependence on nature alone for seed requirements has its limitations. Hatchery production of seed appears to be the assured means of continual, dependable supply for culture operations. Considering the high cost that may be involved in the hatchery production of seed in advanced countries, it appears that in tropical countries like ours the running cost of the hatchcery operations may not be prohibitive. Glude (1979) reported that demand for edible oysters may increase to more than 2 million tons by the year 2000 A.D. By resorting to hatchery production of seed oysters, it is possible to set up 'seed banks' as tried in the Pacific Northwest coast (Glude, 1979) for effecting regular supply to oyster farmers.

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