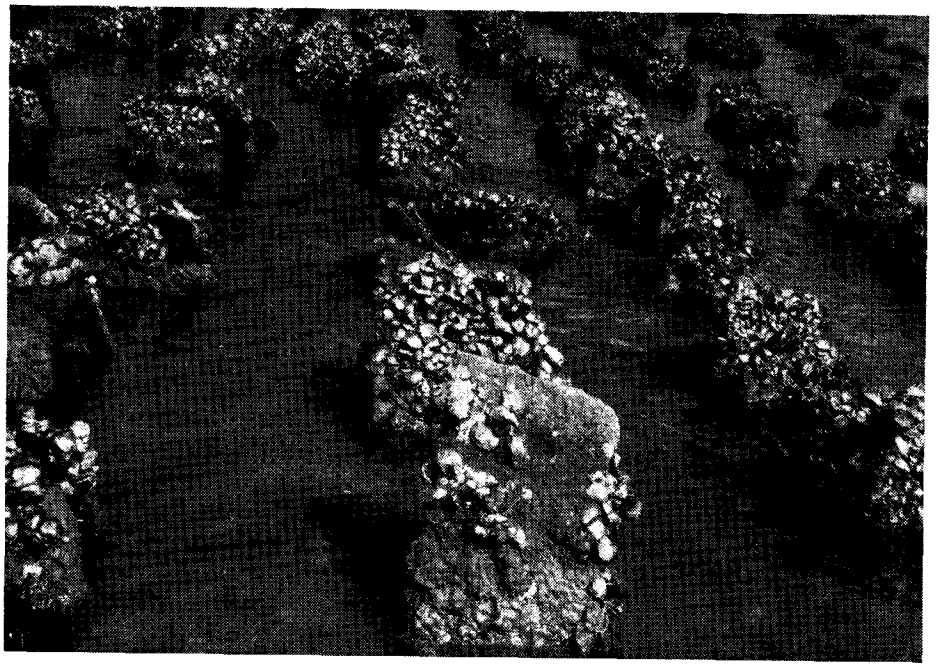

Oyster cultivation on sandstone slabs, Merimbula, New South Wales, Australia.

Oyster Farming

While oysters growing in their natural state are found in abundance around many islands of the South Pacific, the prospects for growing them commercially largely remain uninvestigated. This article describes the basic elements of oyster farming methods followed in the world's leading oyster-producing countries, which include Australia, Japan, the United States, France and Holland.

By J. M. THOMSON*

THE oyster industries of the world had their origin in simple reef-picking. For subsistence fishing for a small number of people this was sufficient, but as demand increased with growing populations, several shortcomings of the reef-picking system became evident. Firstly, oysters of all sizes are found in clumps, one on top of another. To get one oyster of reasonable size, several smaller oysters have to be chipped from the clump, and most of these are lost either because they are damaged in the chipping or there is no means of anchoring them again to the reef. Any increase in the area of production was impossible, as all suitable bottoms already had their oyster reefs. The only way to increase production to meet demand was to develop methods of cultivating oysters.

Oyster farming was started by a Roman in 195 B.C. While only a minor industry in Italy, today it has become very important in some other countries. Along the east coast of Australia, in Japan, the United States, France and Holland, oyster farming is big business.

Farming pays better than simple reef-picking because (i), the death rate can be reduced; (ii) the growth rate can be improved; (iii) oysters of a more or less uniform size can be kept together; (iv) pests can be more efficiently controlled; (v) more oysters can settle where clean silt- and slime-free surfaces are provided; (vi) bulk handling methods increase efficiency and so reduce the costs of operation; and (vii), use can be made of areas where oysters are not found naturally.

In its simplest form, oyster farming consists of taking oysters from areas where they settle naturally, but are overcrowded or die too quickly, to re-lay them on firm bottoms where they can be given more room to grow. Such bottoms may be inter-tidal or completely submerged. Submerged beds are usually harvested by dredging, though a method involving the use of long wooden tongs was formerly used to reach the oysters in parts of the eastern United States.

From such methods it is but a short step to artificial firming of soft bottoms in order to increase the area available for re-laying. To be firmed economically the bottom should be soft only to a depth of 2′. Beneath this there must be a layer of firm sand, rock, dead coral or dead shells; otherwise the firming material will sink below the 2′ level, requiring an uneconomical amount of filling.

Making A Shell Bed

The area of the proposed bed should be marked out with stakes—the exact dimensions do not matter. This area can then be covered by filling material such as rocks or shells. Most popular in Australia, where this method is sometimes practised, are boughs and twigs from nearby trees, the tea-tree *Melaleuca erocifolia* and the swamp oak *Casuarina glauca* being most favoured.

Outside the boundary of the bed, channels are dug in the mud till the firm layer is found. This material is shovelled on to the timber so that the bed becomes raised about 1′ above the surrounding bottom. The surface is raked level and the bed is left to settle. After some weeks a final layer of old, clean shells—preferably sun-bleached—can be added, and the bed is then ready for oysters.

The bed will need raking over periodically to free the silt which tends to settle out. If this is done during a good run of tide over the bed the silt will be carried away; otherwise buckets of water or spray from a hose will wash it away.

The surrounding ditches from which the solid top layer was dug should be kept open, and any sinking of the bed should be corrected by adding more solid material.

In the more advanced oyster-farming countries, techniques have gone far beyond the shell-bed phase of farming. Instead of removing the natural reef-oysters, movable artificial surfaces are set out so that the catching capacity of an area is increased many-fold. The mobility of the catching material (termed 'cultch' by oystermen) enables the young oysters to be removed from densely-caught areas to places where trial or observation has shown that oyster growth is good. Provision of artificial cultch also increases the area of the catching sites, for it has been found that oysters can be caught far from natural beds, their previous absence simply being due to the lack of a firm substrata suitable for settlement.

Growing areas have been increased, not only by firming bottoms for shell beds but also by providing other means of raising oysters above bottoms which naturally are so soft that the oysters would sink into the mud and be smothered. This can be done either by supporting the oysters in some way upon racks built to stand above the mud, or by suspending them from rafts.

Cultch Materials

Although naturally-caught oysters can

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Tray cultivation, George's River, New South Wales. Separate supports are used instead of the more usual racks on which trays are placed side by side. Note the brush fence in the background to break the wash of the waves.

be transferred later to oyster farms, the oyster farmer is well advised to catch his own spat wherever possible. The method adopted depends upon the subsequent type of cultivation and upon the local abundance and price of materials.

To be successful, a cultch material needs to have a surface which is finely roughened, free from slime such as bacterial films or filamentous seaweeds, and it should not produce secretions such as gums or resins which might be repugnant to the oysters. The cultch must also retain the oysters either to harvestable size or to a size where they can be transferred successfully to other methods of cultivation. The cultch itself must be resistant to wave action or attack from boring organisms such as shipworm.

When the oysters are to be harvested they must be separable from the cultch without breaking the oysters. If rock is used as a cultch material, only soft rocks such as sandstone should be selected. Oysters can be separated from hard rocks such as granite only with difficulty, and most of them will be smashed in the attempt.

Any material that satisfies the above requirements, and is plentiful and cheap, can be used as a cultch material. The following are commonly used in the main oyster farming countries: Shells—mostly old oyster shells but also scallop and other shells (U.S.A. and Japan); terracotta tiles coated with lime (France, Holland); timber such as bamboo (Japan); black and orange mangroves, black wattle and white cypress, sawn and tarred timber slats, fibro-cement slats, sandstone (Australia).

Shell Cultivation

Shells can be broadcast on to firm bottom to catch spat (the young oyster at the stage of settlement). This is often done on submerged dredge beds so as to replace the cultch removed by harvesting the oysters.

Better catches are made by more controlled methods. In parts of the United States and Canada, old oyster and scallop shells are put into wire baskets about 2′ 6″ long and 18″ in diameter. These are stacked upright, usually in the intertidal zone.

In Japan and parts of the Philippines, oyster and scallop shells are strung on 13-gauge galvanized wire. The strings of shells are set out to catch, hanging vertically into the water either from racks or rafts. The length of the string varies according to the local situation. If the oysters are to be transported any great distance before setting out to grow, the Japanese oyster farmers have found it necessary to place the strings horizontally between tide-marks for hardening off before the shells are taken ashore for packing.

In Canada and parts of the United States, many oysters are caught on good quality egg-crate fillers which are dipped in a mixture of equal volumes of cement, slaked lime and moderately fine sand, then bundled, usually four at a time, in a heavy-gauge wire netting. These may be set out inter-tidally on mud-flats, but the catch is usually better when the crate fillers are suspended from a raft. These collectors later can be broken up either by hand or by a hand-made threshing machine, and the separated oysters can either be broadcast on firm bottoms or used in tray cultivation.

Stick Cultivation

Sticks can be set out in bundles on racks built of 2″ x 1″ hardwood held at catching level by 2″ x 2″ uprights stuck in the mud bottom. The distance between the runners of the rack varies according to the length of the sticks, but usually is from 2′ to 3′. Sticks can also be pushed into the bottom, either vertically or at an angle, but the catch is uneven along the length of the stick in such circumstances.

Natural timber can simply be bundled in lots of ten to twenty sticks, bound together by heavy gauge wire. But sawn timber slats (which need to be dipped in tar) are best nailed in a framework where 1″ battens are nailed 6″ apart on two cross battens, and then piled in a battery so that the battens of one frame fit between those of the frame beneath. After tarring they should be weathered

Scraping one-year-old spat from lime-coated tiles, Arcachon, France.

A low fence with projecting horizontal top to prevent access by crabs.

in the sun for two weeks before setting out; otherwise the tar seems to be toxic to oyster larvae. Fibro-cement slats can also be set out in batteries, the slats being separated by a slat set at right angles to the main system.

Oysters caught on sticks are usually cultivated this way to selling size, the sticks being nailed out singly and the battery of slats set out, a single frame on a rack, about twelve-sixteen months after setting out to catch. Up to this stage it is advisable to keep the cultch in bundles to prevent fish feeding on the young shellfish. If sticks do not last the required time or are accidentally broken, or if oysters fall off, the oysters can be put on to trays or set out on shell beds.

Rock Cultivation

Blocks of sandstone or loose shale about 2′ x 1′ x 4″ can be set out to catch, either by piling two or three stones on end at an angle of about 70° to the bottom, or by raising the stone above the bottom on a platform of hardwood timber or on racks similar to, but narrower than, those used for sticks. Or they may be held above the bottom on tripods of small stakes thrust in the ground.

They are set out in rows so that a man can walk easily between them, and between every ten rows a wider channel should be left to permit a boat to pass. The spat catch mostly on the underside of the slabs.

If a heavy catch is made in spring or early summer the stones are turned over the following year. But if the main catch is in late summer the young oysters will not be tough enough to withstand marauding fish the following spring, and the stones cannot be turned for a further year.

Tray Cultivation

The tray method is used in conjunction with one or more of the methods used to catch the spat. Generally oysters are held in the trays only nine to twelve months before marketing so they are fairly advanced in growth before being trayed.

Trays may be of any size. Those used in Australia are usually about 9′ long and 3′ wide; 3″ x 1″ timber is used. The 3′ end-pieces are nailed on the 9′ side-pieces so that the shorter pieces overlap the longer. The mesh of wire netting depends on the size of oyster to be set out; usually ¾″ mesh is used, but it can range from ½″ to 1¼″. It should be of the heaviest gauge obtainable. The wire is stapled to the outer frame of the tray and then the two 3′ spreaders are forced in between the long side-pieces, thus both tightening the wire and dividing the tray into three compartments, each approximately 3′ square.

The trays are tarred to protect the timber from shipworm and the wire from corrosion. It is claimed that cold tar seals the wire better where it twists, but hot tar penetrates the timber better. The tarring is best done by dipping in a tank made for the purpose.

Maintenance

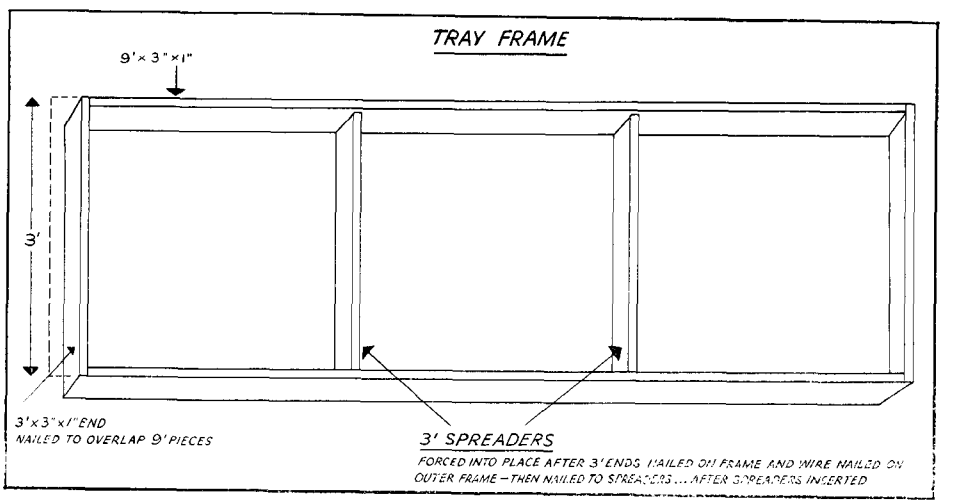
In most places it takes three or four years to produce an oyster large enough to be worth eating, though there are small areas where two years is sufficient. Where oyster farming is most profitable it is a full-time business. In reef-picking, the oysterman takes what nature leaves after three or four years.

In farming, careful maintenance will multiply the number of surviving oysters many times over. Pests such as starfish and boring whelks have to be guarded against and removed from the beds. In some places it has been necessary to build wire fences to keep out rays and other fish. In Arcachon, in France, little fences about a foot high are built to keep out crabs which move across the bottom. Regular inspection is necessary to keep racks and trays in good condition. Breakwaters may have to be built to stop wave action washing oysters from trays or breaking sticks.

When oysters are marketed they should be culled beforehand and small ones returned to trays or shell beds for further growth.

Observation of local natural oysters will indicate the best levels for catching and growing. If hot sun tends to stunt growth, the oysters should be put well down in the inter-tidal zone. Only local knowledge can tell when cultch material should be put out to catch the spat. This

(Continued on page 70)



Details for constructing a tray frame are shown in this sketch.

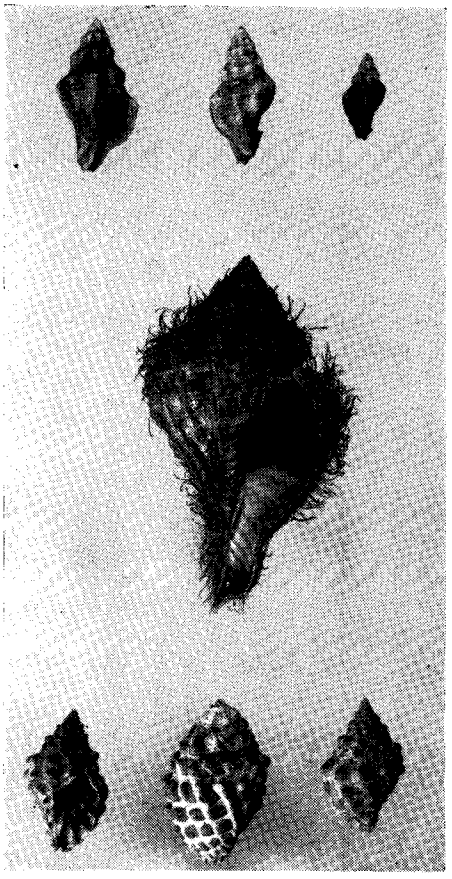
Visual Aids

PEANUT POSTER. The Literature Bureau has produced on behalf of the Health Education Council of Papua and New Guinea, a four-colour poster to encourage the use of peanuts in the local diet. Measuring 17″ x 13″, and attractively printed in red, brown and black on a pale green background, the poster depicts a Melanesian nursing mother cooking peanuts, and carries the caption "Eat Peanuts".

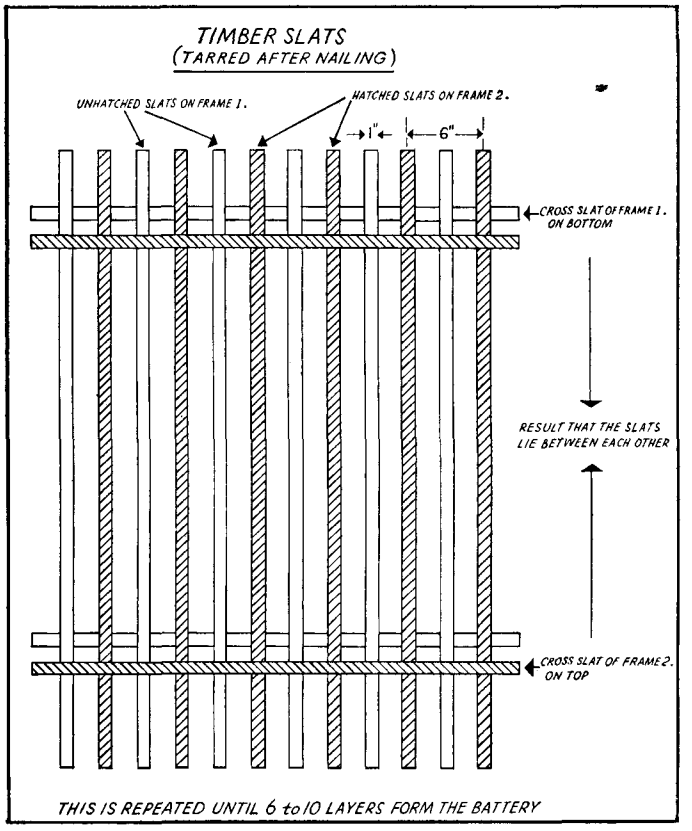
An inspection copy of this poster with details of production costs is available from the Literature Bureau, Box 5254 G.P.O., Sydney, N.S.W. The Bureau will also welcome enquiries from territorial administrations requiring advice or assistance in the preparation of materials to suit their own needs.

Miscellaneous

BINDING FOR PAPER BACK BOOKS. The rapid deterioration of paper-bound books is usually a problem in most island areas. For Penguin, Pelican, Pan, and other paper-bound books of similar size it is now possible to buy simple binding outfits which can be used without any previous experience of binding. These outfits, known as "Bind-Your-Own Book Covers," are produced by Bind-Your-Own Ltd., 22 Charing Cross Road, London, WC2, for stg. 7/6 a set. Sufficient material is supplied in each set to cover six books; the outfits including cloth cover-boards, spine cloths, end papers, glue, and paper for gold lettering. For one book, the whole operation of removing the original paper covers and placing on the new boards and end papers can be performed in about ten minutes.



Oyster pests. Top — tingle whelk; centre— hairy whelk; bottom— mulberry whelk. All are common borers of tropical and sub-tropical oyster reefs.



This sketch shows how a battery of frames is made up from tarred timber slats.

Oyster Farming

(Continued from page 52)

should not be put out too soon before the time the oysters spawn, because the cultch becomes fouled with seaweed and sand, and will not catch. And always there should be a reserve stock of oysters which can breed and carry on the species. Too heavy a harvest can deplete a fishery, as has been seen too often.

Oyster farming provides a means of producing an increased number of oysters of the best possible quality. Conditions vary from place to place, and only experience can teach what methods are best for each situation, but the methods I have so briefly outlined here have been found practicable and profitable in the great oyster industries of the world.

SUGGESTED READING

Handbook for Oyster Farmers. C.S.I.R.O., Australia, Division of Fisheries. Circular No. 3, 1954.

Oyster Farming in the Maritimes. Fisheries Research Board, Canada, Bulletin No. 131.

Oyster Cultivation in Britain. Ministry of Agriculture, Fisheries, and Food, 1956.

Oysters. C. M. Yonge, The New Naturalist Series, Collins, London.

SPC Conference On Rural Health

Special emphasis will be placed on maternal and child health at a conference on rural health that, at the invitation of the Government of French Polynesia, the South Pacific Commission will convene at Papeete, Tahiti, from April 18-27. At least twelve territories in the Commission area will be represented.

The agenda will cover discussions on rural health services, maternal and child health programmes (including technical problems related to weaning foods), immunizations, anaemia, obstetric services, and school health.

Two eminent authorities have been engaged as consultants for the Conference. They are Dr. N. R. E. Fendall, M.D. (Lond.), B.Sc., D.P.H., Director of Medical Services, Kenya, who is an expert in the field of rural health services, and Dr. Wiktoria Winnicka, Director of the Maternal and Child Health Division, World Health Organization.