MARINE DEPARTMENT
NEW ZEALAND

DREDGE OYSTER FARMING

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TECHNIQUES FOR FARMING THE DREDGE OYSTER

Introduction

These brief notes have been prepared to give some indication of the procedures that could be adopted for farming dredge oysters and are based on experience in farming other oysters of a similar type in other parts of the world. Unfortunately, there are relatively few data on growth rates and age of the New Zealand oyster; so it is not possible to indicate the ideal age or size at which these oysters should be harvested. However, it is assumed that they are rather more slow growing than some of the other species and to be economic would need to be harvested after three or at the most four years' growth.

The Dredge Oyster

Like all other oysters of the genus *Ostrea*, the Strait or dredge oyster is larviparous, that is, the eggs are fertilised and retained within the mantle cavity of the female, where they develop into free swimming larvae. In most other oysters of this genus the larvae are liberated at a relatively early stage of development and swim or drift in the plankton for up to ten days before settlement as spat. However, in the dredge oyster, the larvae are not released until they are at a late stage of development and usually settle and attach five minutes to one hour after release from the parent. This means that even in areas of fairly strong currents, settlement is likely to be restricted to the vicinity of the adults, particularly as the larvae are probably released at, or about, slack water.

In Foveaux Strait the dredge oyster occupies an environment which is characterised by its uniformity. Temperature fluctuations between summer and winter are relatively small, about 5°C, and the salinity also varies very little. The bottom is apparently a firm coral or shell sand overlain by shells, and the depth of water varies between 10 and 40 metres. However, this same species is found attached to rocks, at or below low water of spring tides, on the shores of Stewart Island. It also occurs in small numbers in suitable localities on many other parts of the New Zealand coast, so that it would appear to be tolerant of a fair range of temperature and sea conditions.

Growth and Survival of the Oyster

Little is known of the growth rate, but, as already mentioned, it would appear to take three years for the Strait oysters to reach market size. In higher temperatures, and with better feeding conditions, the growth may be more rapid. This appears to be the case, for example, in Tasman Bay, where the oysters are generally bigger and fatter than they are from

the Strait. Unlike the rock oysters, which probably require to feed for only 18 hours or less out of the 24, the flat oysters, if given the right conditions, will feed and function throughout the 24-hour period. Thus any form of inter-tidal cultivation tends to restrict growth. Furthermore, these oysters are liable to be less tolerant of adverse weather conditions and could suffer very heavy mortalities if exposed to freezing conditions in winter. Like other oysters, they may be subject to predation by certain snails or starfish or to shell damage by burrowing worms and sponges, any of which could cause additional mortalities.

Basic Requirements for Oyster Grounds

To ensure good growth and good survival, oysters should be cultivated in areas where they can remain permanently submerged and at the same time in areas where they can be protected as much as possible from wave action and from predators and disease. They need to be cultivated on a firm bottom. Compacted shell gravel, coral sand, muddy sand, or mud overlain with shell is likely to be suitable. Sand, as such, should be avoided. It is very liable to shift and bury the oysters, which thus causes heavy losses. An additional requirement, therefore, is sheltered water free of too much wave action, which could disturb the beds. Areas liable to sudden heavy discharges of fresh water should also be avoided. Reductions in salinity can adversely affect growth and in some cases cause mortality, whilst the mud washed off the land could smother the oysters. Small discharges of fresh water, on the other hand, are unlikely to be important and could in fact result in better growth of the oysters by carrying nutrients from the land which would stimulate growth of the phytoplankton organisms, on which the oysters feed.

Areas subject to pollution by industrial waste should be avoided, but oysters will withstand pollution by moderate quantities of domestic waste. Though the oysters will become polluted, the contaminating bacteria can be removed by a simple and inexpensive process which involves keeping the oysters in clean water for approximately 48 hours It should be noted that the bacterium *Escherella coli,* which is used as an indicator of faecal contamination, is present in the gut of all animals, including humans. Therefore, drainage from grazing land is liable to carry the same bacteria into suspension and result in the pollution of the oysters.

The depth of water is not of great importance. Provided the oysters can be kept permanently submerged, there is no reason why they should not be cultivated in water as shallow as 1 or 2 metres or in depths down to 40 metres such as are found in Foveaux Strait. The important factor to take into consideration is the disturbance of the bottom which is likely to occur from wave action. In general, the depth to which waves will affect the bottom is approximately equal to the distance between their crests. Therefore, in sheltered areas where there are short, steep seas the effect is unlikely to extend more than a few feet down into the water, whereas in areas exposed to long swells there is liable to be a considerable disturbance of the bottom at a fair depth. This disturbance could result in moving the oysters away from the beds in which they have been laid, or in burying them in the bottom. Sheltered shallow

waters have the additional advantage of reducing the time spent working, because there is less time expended in raising and lowering the dredges. The dredges themselves are more efficient in shallow water, and under sheltered conditions it is obviously easier for the boats to work for longer periods.

General Principles of Cultivation

After a suitable area has been selected and a lease arranged, the bed or beds will need to be marked out. This can be done most conveniently by placing posts or other suitable shore marks in positions to give clear bearings. Notices, buoys, etc., may also have to be displayed according to the terms of the tenancy. The next step is to prepare the bed and to remove rubbish and possible predators or pests.

Conventional dredging will cut away the weed, and the material brought up on deck can be sorted, predators removed, and the shell cultch, if any, returned to the ground. Little is known of predation by New Zealand starfish, but there are some species which will almost certainly feed on oysters. Crabs may also destroy spat, and certain of the predatory snails will bore into the shells. None of these groups of animals can contribute to the fishery and so should be destroyed when brought up in the dredges. In areas where the bottom tends to be soft, i.e., of sandy mud, shell cultch in the form of cockle, mussel, or oyster shell should be laid to provide a firm substrate. Clean bleached shell from natural banks is obviously more suitable than old shell dredged up together with its attached encrusting fauna. Once the shell has been distributed, final harrowing should be conducted to level the bed. This can be done quite simply by towing the dredge with the bag open; the blade bites into the substrate, the shells are rolled over the belly and fall out at the back, whilst the silt, if any, goes into suspension and is swept away by the tide.

With the ground prepared, the next stage is to seed it with oysters. Numbers to be relaid will vary with availability of stocks, but the aim should be to lay not less than 50,000, and preferably nearer 500,000, per acre. Occasional harrowing by the method mentioned above may have the advantage of clearing weed, turning over the oysters and so smothering encrusting growth on the shells, and in some cases lifting out those oysters which have become partly buried in the bottom. Once one ground has been prepared and seeded, then harrowing and cleaning of at least two other similar areas should be begun.

When dredging for market, all the catch should be culled, the market oysters removed, and the remainder graded by size into approximately one and two year olds. These oysters will then be laid separately on the previously cleaned beds to be harvested two or one year later. The beds of oysters will need to be dredged over or harrowed occasionally to prevent accumulations of silt. In the event of the dredge catches showing evidence of undue mortality or the presence of substantial numbers of predators then additional dredging would be necessary to remove them.

The actual breeding season of the oysters will vary slightly with

location and most probably with water temperature. They breed in the summer and preparations should be made so that at the beginning of the spatting season fresh, clean, bleached shells can be scattered through the grounds as spat collectors.

Equipment and Installations

On fairly soft bottoms the heavy dredges used on the Foveaux Strait oyster grounds would be unnecessary and in fact could damage the growing edges of the young oysters. In shallow water, 2 to 3 metres deep, light hand dredges towed from a flat bottomed skiff could be sufficient. Alternatively in slightly deeper water, winch operated diving dredges, which are more efficient than the conventional dredges, could be used to advantage. Depending upon the locality and proximity to shore installations, it could also be of considerable advantage to work the dredges continuously, to load up the boat, and to bring all the material ashore for sorting and grading under cover. This permits the use of mechanical screening devices and conveyor belt handling. Reject shell and small oysters would be relaid the following day before dredging commenced and the waste material, starfish, weed, crabs, etc., would be disposed of ashore. This procedure further reduces the cost of skilled labour afloat and permits the use of unskilled or semi-skilled labour ashore.

If it is necessary to cleanse the oysters, then allowance must be made for the setting up of a cleansing plant. Cleansing takes 48 hours and this means that the tanks, which have a carrying capacity of 50 oysters per square foot of floor area, would need to be sufficiently large to take the equivalent of two days' throughput. However, they have the further advantage that they provide live storage facilities, if these are required in order to spread the work load.

In attempts to establish oyster culture in a new area there will inevitably be a number of uncertainties. For example, until oysters have been relaid and attempts made to cultivate them, there will be no positive indication of how well they will grow or how well they will fatten or whether they will spat successfully. Though a potential area large enough to enable future expansion may be leased, it is recommended that one bed of approximately an acre in the centre of the area be prepared and seeded first. If the results show promise, then further cultivation can be undertaken along the lines already described.

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