CMFRI
bulletin 42
Part Two

DECEMBER 1988

NATIONAL SEMINAR ON SHELLFISH RESOURCES AND FARMING

TUTICORIN

19-21 January, 1987

Sessions II-VI

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

50. RECENT TRENDS IN OYSTER CULTURE IN INDIA

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ABSTRACT

Rack and tray method of culture of the oyster *Crassostrea madrasensis* has been developed initially at Tuticorin and oysters have been cultured successfully Recently Innovations have been made in the methods of collection of oyster spat and techniques of rearing them. The development of hatchery techniques for large-scale production of oyster seed has led to reorientation of culture techniques. Oyster seed are produced in the hatchery by employing different types of spat collectors depending on the kind of culture practice in which they will be used. Prospects for ren, stake and bottom sowing methods of culture have been studied.

INTRODUCTION

Although Hornell (1910) attempted experimental oyster culture and indicated the possibilities for oyster farming as early as at the beginning of the present century, there was revival of interest in the subject only recently when the Central Marine Fisheries Research Institute took up a research project on developing techniques for collection of oyster spat and rearing them in suitable grow out systems As a result of the studies carried out in this project, methods for large scale collection of spat of the oyster *Crassostrea madrasensis* have been evolved and the spat thus obtained were cultured to marketable size by a rack and tray method (Mahadevan et al. 1980, Nayar and Mahadevan 1983). Subsequently experimental research in oyster culture has been done in different institutions at different places on the east and west coasts of India. Rao et al (1983) collected spat of *C. madrasensis* on different types of spat collectors and cultured them in Vaigai esturay. The work done by Dhulked and Ramamurthy (1983) and Joseph and Joseph (1983) has indicated the possibilities for culture of *C. madrasensis* in Mulki estuary, Karnataka. Purushan et al. (1983) studied the setting and growth of oyster in Cochin backwater. Reuben et al (1983) carried out culture experiments on the same species in Bheemunipatnam backwater. Parulekar et al (1983) have reported the feasibility of culture of *C. gryphoides*.

It has been felt that it is necessary to make some modifications in culture techniques for reducing the investment required for oyster farming. New types of spat collectors and methods of rearing oysters have been developed. Hatchery techniques for production of seed of *C. madrasensis* in laboratory have also been developed. The Central Marine Fisheries Research Institute has established at Tuticorin, a oyster hatchery where oyster seed are produced using different types of spat collectors depending on the kind of culture system that will be used. Ren, stake and on bottom methods of culture of *C. madrasensis* have been tried and they have given encouraging results.

SPAT COLLECTION TECHNIQUES

Previously various kinds of spat collectors such as lime coated tiles, asbestos sheets, mussel shells and oyster shells were used for spat collection (Mahadevan et al., 1980, Thangavelu and Sundaram 1983). Spat settlement was found to be higher on the lime coated tiles than other spat collectors. Laying of spat collectors in all the months of the year indicated that there are two peak periods of spawning on Tuticorin coast, one in April-May and another, a secondary spawning period in August-September during which there was only limited spawning. Large scale spat collection was attempted by employing 30,000 to 50,000 lime coated tiles during a season and good number of oyster spat were collected. Spat collectors were laid in different areas viz., Karapad creek, near natural bed and intertidal part of Tuticorin Bay and it was found that spat settlement in the bay was 316/m² on lime coated tiles. In the near natural bed area and in the creek, the

settlement was comparatively less 92/m² and 76/m² respectively. This indicated the potentiality for large scale collection of oyster spat in the shallow inshore area of the Tuticorin Bay. Since use of lime coated tiles involved much labour for giving lime-coating to the tiles and scraping of seed oysters from them, oyster shells on rens, PVC pipes and velon screen encircled on a metal frame were tried as spat collectors. The rens of oyster shell and PVC pipes were found to be effective for collection of spat.

Oyster shell rens

Twenty to twentyfive shells are centrally punctured and strung on a No. 10 Galvenized iron wire of length of 1.5 m. These rens are laid horizontally on a rack. When the seed oysters attain a size of 15-20 mm, separate rens are prepared by stringing 5-6 oyster shells with spat, on a 3 mm thick synthetic rope with PVC spacers allowing an interspace of 10-15 cm between successive shells. The rens thus prepared are suspended from a rack till the oysters grow to harvestable size of 80-90 mm (length).

PVC pipes

PVC pipes of 2.5 cm diameter and 1 m length are used as spat collectors. Nine such pipes are made into a bundle fixing the ends of the pipes in a wooden circular board with grooves. Twenty such bundles are placed on a rack. On an average 30 spat are collected per single pipe. The ribbed PVC pipes are being widely used as spat collectors in France along the Britanny coast. The advantages of using this as spat collectors are easy handling of the material and quick removal of spat from the pipes which is possible by slightly twisting the tube.

HATCHERY PRODUCTION OF SEED

It has been realised that for establishing oyster culture as an industry in the country, development of hatchery techniques for production of oyster seed in laboratory is quite essential. It may not be possible to collect sufficient quantity of seed for stocking in farms as intensive spawning period is limited to short duration. Further spatfall in nature is often erratic as it is influenced by hydrological factors which are variable in different years. Natural spat collection is also labour intensive. A molluscan hatchery has been established at Tuticorin with necessary infrastructure facilities like filtered seawater, microalgal culture, aeration system and larval and spat rearing tanks (Nayar and Easterson 1983, Nayar et al. 1984). It has been possible to induce *C. madrasensis* to spawn in the laboratory by conditioning them for maturation and artificial spawning. The larvae obtained from the spawnings have been successfully reared in favourable condition and the oyster seed are being produced on a large scale in the hatchery. The hatchery techniques have been streamlined and it is now possible to produce oyster seed on a mass scale at any period of the year (Nayar et al 1984).

Oyster seed have been collected in the oyster hatchery on different types of spat collectors taking into consideration the kind of culture method which will be employed. Spat settled on oyster shells are being used in the stake or ren method of culture. Cultchless spat which are made to set on shell-grit or polythene liner sheet are used in bottom method of culture or rack and tray system.

CULTURE TECHNIQUES

Stake method

Oyster spat set on oyster shells have been nailed to a stake of 1.5 m length with two shells on the side and one at the tope of the stake. These stakes are erected in the shallow intertidal region. Usually oyster seed of size 1-2 mm produced in the hatchery have been used in stake culture. For initial rearing of 2 to 3 months in order to avoid predation by crabs, shells with oyster spat could be covered with a velon screen. With relatively low maintenance expenditure, the oysterlings can be grown to marketable size of 80-90 mm in one year when they could be harvested. The production rate by this method varies from 10 to 15 t/ha. The stake culture method is commercially employed in British Columbia (Quayle 1969) and Taiwan (Chen 1976).

Bottom culture

The cultchless spat and some of the spat which set on oyster shells have been broadcast on the hard bottom in the Karapad creek and Korampallam canal and they have exhibited good growth. Wherever shallow coastal areas with a firm bottom are available, culture could be undertaken by this method on a large scale. The oysters grew to a mean size of 75 mm at the end of twelve months in bottom culture. This method of culture is widely employed in U.S.A and U.K.

Ren culture

In this method oyster shells with oyster spat are strung on a 3 mm thick synthetic rope, the ren. On each ren five to six oyster shells have been strung with interspaces of 15 cm. About 25-30 rens are suspended from a rack which is constructed by erecting six vertical casuarina poles of 3 m length at a distance of 2 m between them At a height of 2 m, two long casuarina poles 6 m in length are tied from which shell rens are suspended. The oysterlings are cultured on the rens for one year when they grow to an average size of 85 cm.

DISCUSSION

Keen interest is being evinced by some entrepreneurs in India in taking up oyster culture. Oyster resources are distributed at several places along the Indian coasts (Alagarswami and Narasimham 1973, Mahadevan 1987). This indicates that it may be possible to culture the shellfish if appropriate techniques are used. *Crassostrea madrasensis* is a rapidly growing oyster species attaining 80-90 mm length in one year and is thus highly suitable for farming. The technical know-how developed by the Central Marine Fisheries Research Institute in oyster farming techniques and possibilities for large scale production of oyster seed by hatchery techniques will be of immense help to enterpreneurs who wish to carry out oyster culture.

Oysters have to be cultured in unpolluted waters and depuration of oysters has to be carried out as they may accumulate pathogenic microorganisms in the course of filter feeding. The Central Marine Fisheries Research Institute has developed a simple method of depuration of oysters in which the oysters are first cleaned, hosed with a jet of seawater and they are kept in trays in running seawater in a tank for twenty four hours. In recent years seawater used in depuration is treated with chloride, ozone or ultraviolet light. Regular qualitative and quantitative bacteriological monitoring of oysters as well as oyster growing waters is essential for determining the safety of shellfish for human consumption.

The oysters may accumulate shellfish toxins as a result of feeding on toxin bearing dinoflagellates. A well known shellfish poisoning is paralytic shellfish poison (PSP) caused by the dinoflagellate *Gonyaulax* sp (Ray 1984). Monitoring shellfish toxicity and blooms of toxic dinoflagellates in oyster growing waters is necessary to ensure the safety of shellfish. The Central Marine Fisheries Research Institute is regularly monitoring the plankton in Tuticorin Bay where oyster culture is carried out for the occurrence of toxic dinoflagellates in plankton.

Except in a few coastal cities and towns the food value of oysters is not known in our country. For creating marketing possibilities three consignments of oyster meat each of one ton obtained by shucking oysters cultured by the Central Marine Fishheries Research Institute at Tuticorin were supplied to Integrated Fisheries Project, Cochin and the latter processed and canned the meat and marketed it in several cities in the country. The response to the trial marketing has been very good which indicates that there are marketing possibilities for the sea food if steady supplies could be ensured (Samuel et al 1982). Sale of oyster shells as raw material to Calcium carbide industry and for preparation of shell grit for use in poultry will yield additional income. Extension programmes such as publication and distribution of pamphlets and articles and screening of documentary films highlighting aspects on oyster culture and value of oysters as food have to be organized to promote oyster utilization and farming. In exhibitions held at A. I. R. Science Festivals, Tourist Fair and Farmers Fortnight Celebrations, exhibits relating

to various aspects of oyster resources and culture have been arranged and explained,

The Central Marine Fisheries Research Institute has recognized the importance of transfer of technology of mariculture of oysters and has organized oyster farming as part of Lab to Land programme of I. C. A. R. In this programme fifteen fishermen were given orientation training in oyster farming as well as infrastructure facilities. The fishermen carried out oyster culture successfully and produced 12 tons of oysters. This programme generated 323 man-days without affecting the regular avocation of the fishermen as they attended to oyster culture during their spare time.

Training programmes in oyster culture are being conducted by the Central Marine Fisheries Research Institute from time to time for the technical personnel from fisheries departments of maritime States, Fisheries corporations and Fisheries Colleges and other institutions to impart training in the technology of oyster culture and allied aspects.

An Ad-hoc Research Scheme is proposed to be taken up in Central Marine Fisheries Research Institute to survey the Indian coasts for identification of potential sites for oyster farming and experimental introduction of oyster culture in selective representative ecosystems for assessing their suitability and estimating the production potential. At present research is carried out in CMFRI to make innovations in culture techniques which will result in reduction of inputs. Breeding experiments are being conducted in hatchery to evolve oyster strains with desired qualities like more rapid growth and high meat content.

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