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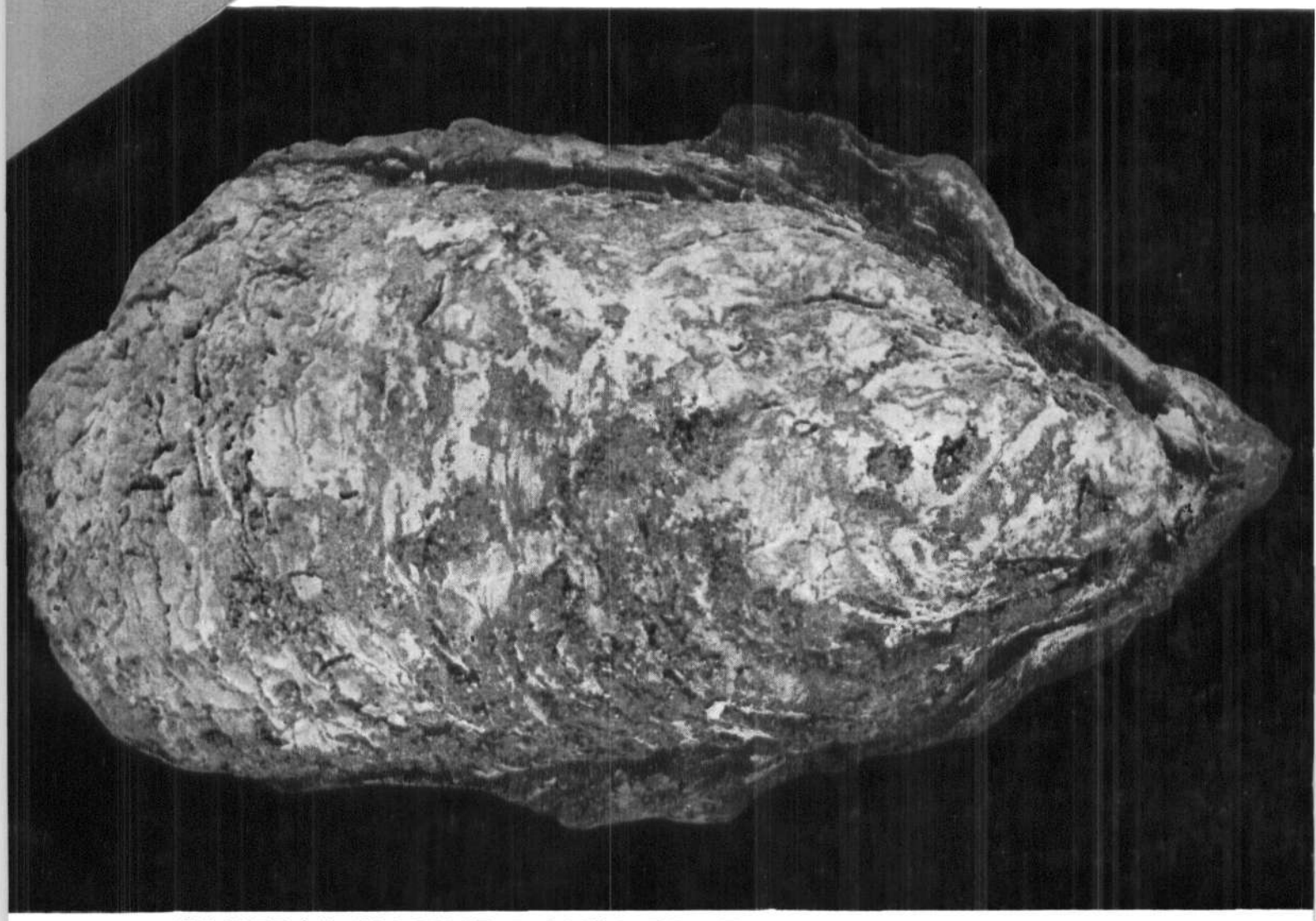

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OVERVIEW OF OYSTER CULTURE : PRESENT STATUS AND PROSPECTS

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The world oyster production is about one million tonnes per annum and the leading oyster poducing countries are U.S.A., Japan, Republic of Korea and France. There is world wide interest in increased supplies of oysters as the shellfish is a delicacy and command a high price. As in the case of other bivalve molluscs culture practices have to be adopted for augmenting production of oysters from natural beds for effecting regular supplies without depleting the natural resources. In view of this, oysters are cultured in several western countries and some countries in the Far East. As much as 12% of world production from aquaculture is accounted for by oyster culture.

OYSTER CULTURE IN THE WORLD

It is interesting to find that as early as First century B.C. the Romans were aware of the habits of oysters and employed simple methods for setting of oyster seed on piles fixed in coastal waters and reared them to a size when they were collected and consumed.

Japan has a long history of oyster culture carried out as an occupation since the seventeenth century to meet the large demand in that country (Cahn, 1950). Until the early part of this century simple culture methods were in vogue. Oyster spat were made to set on stones or sticks and they were reared on the spat collectors themselves or scattered at the bottom of shallow coastal areas. In 1923, Japanese scientists evolved the technique of hanging method of culture. This method gave consistently good production and was progressively adopted by commercial oyster farmers in several Prefectures including Kanagawa, Hiroshima, Miyagi, Iwate, Shizuoka, Wakayama, Shimane, Kumamoto and Mie (Imai, 1977).

Japan produces about 200,000 tonnes of oysters annually and the bulk of the oyster production is obtained in raft culture carried out in coastal waters in the depths of 3-9 m (Ikenoue, 1983). Rack culture is practised in shallower depths of 2-4 m. In long line culture, paired horizontal ropes are floated at the surface of the sea with the help of floats and anchored firmly at the ends. This method is successfully used in the open sea up to a depth of 30 m on the northern Pacific coast of Japan. The production from long line method ranks next to that from raft culture. From the rafts, racks or long lines ropes with spat collectors are hung. The culture techniques are being improved from time to time by using more durable materials like synthetic or steel ropes instead of straw ropes, and styrofoam floats in the place of wooden barrels used in earlier decades. The traditional bottom culture is rarely practised in Japan. Apart from oyster production for the local market, Japan produces and exports large quantities of seed of the Pacific oyster, ***Crassostrea gigas*** to U.S.A. and France for culture purposes.

U.S.A. ranks first in oyster production and the annual yield is about 300,000 tonnes of which 40% is from culture and the rest from harvesting from natural beds on the east and west coasts. Owing to the high cost of labour and materials involved in other types of culture, bottom sowing method only is used for culture of oysters in U.S.A.

Oyster production of the Republic of Korea was very low in 1950s but as a result of large scale raft culture, the production increased to 72,731 tonnes in

1972 and 187,033 tonnes in 1980. Korea exports canned oysters to U.S.A. and other countries.

In France, after several years of intensive studies, the technique of collection of oyster spat on lime-coated curved earthernware tiles was developed in the early period of this century. This type of spat collector is still in use in France and other countries like U.K. The annual oyster production of France amounts to 112,000 tonnes. Oyster culture is carried out by table method or bottom culture. The European oyster, *Ostrea edulis* is farmed by both bottom culture and table method while *Crassostrea gigas* is cultured only by the table method, rearing oyster seed in synthetic net bags called *pockets* laid over 'tables' erected in coastal waters. *C. gigas* is reared in plastic trays kept off bottom on steel framework int he Federal Republic of Germany (Meixner, 1979).

In Canada, different culture methods *viz.*, raft, stick as well as bottom culture are used for *C. gigas*. Apart from shell rens, sticks and veneer rings have been found useful for collection of oyster spat in British Columbia. Stick and tray culture methods are employed in Australia for culturing the Australian oyster, *C. commercialis* (Glude, 1979).

Oyster Culture in India

Small scale bottom culture of oysters by transplanting the spat from the natural beds to shallow areas of convenience has been in vogue in some places along the west cost like Jaytapur and Utsali but the production is insignificant. Hornell (1916) conducted experiments on spatfall of *Ostrea* (=*Crassostrea*) *madrasensis* on lime-coated tiles in Pulicat Lake. He also indicated the possibilities for the culture of oyster along the east coast using methods similar to those developed in Arcachon, Southern France (Hornell, 1910). Subsequently, some attempts for the collection of spat of *C. madrasensis* were made in the Madras Fisheries Department.

After experimenting with different methods of oyster culture, the rack-and-tray method for rearing of *Crassostrea madrasensis* was developed by the Central Marine Fisheries Research Institute at Tuticorin. The technique can be used in shallow coastal waters with water depth of about 2 m. Oyster spat are collected by laying lime-coated tiles or oyster shells in the vicinity of breeding oysters and they are reared in steel framed and synthetic twine meshed trays which are kept on a rack constructed with wooden poles (Mahadevan *et al.* 1980, Nayar and Mahadevan 1983). The oysters grow fast and attain an average size of 80-90 mm weighing 100-120 g with meat forming 8-10% at the end of one year. From culture operations in a 3-year period in 0.25 ha area, the estimated production of oyster would be 125 tonnes with a meat yield of 10 tonnes. At the end of each year approximately 42 tonnes of oyster could be harvested. Apart from meat, the oyster shells fetch a substantial return as by-product since they are used in the manufacture of Calcium carbide and cement. Spatfall and good growth of *C. madrasensis* has been observed in the estuarine environment at Athankarai (Rao *et al.*, 1983). There is influx of freshwater in the estuary in the northeast monsoon which causes mortality of oysters and therefore they have to be harvested before October. Experimental culture of *C. madrasensis* has been carried out in Mulki estuary and Cochin backwaters. Rapid growth of oysters has been recorded in Mulki estuary which is encouraging. The biological aspects such as age and growth, spawning, sex change, early development, spatfall, factors influencing them, pests and predators have been studied in *Crassostrea madrasensis* and *C. gryphoides*. Biological information on oysters in other areas is required for determining the scope for culture.

A new dimension has been given to oyster culture by the successful production of seed of the oyster *Crassostrea madrasensis* on mass scale by hatchery techniques developed at the Tuticorin Research Centre of CMFR Institute (Nayar *et al.*, 1984). The achievement has opened up avenues for supplying oyster seed at any time of the year for stocking in oyster farms.

There appears to be a gap in the proper assessment of the oyster resource potential of maritime States other than Tamil Nadu and Karnataka. It is necessary to take up the task by undertaking time bound programme of resources survey in the States and Union Territories.

Another line of future investigation pertains to the identification of suitable areas and sites for undertaking extensive culture of edible oysters. Some data base for site selection is available only for Tamil Nadu. The advances made in oyster culture technology have evoked widespread interest amongst several entrepreneurs and agencies in States like Kerala, Goa and Maharashtra. Unfortunately, precise information on the suitability of sites in these states is lacking. This lacuna in our knowledge should be filled.

It is not uncommon to come across instances of large scale oyster mortalities both epizootic and enzootic in culture as has been the experience in coun-

tries like U.S.A., France and the Netherlands. But to a certain extent such problems have been overcome by diagnosing the aetiological agents and taking up preventive measures and treatment. In some countries like U.S.A., disease resistant strains have been developed by spotting oyster disease affected areas and locating the surviving oysters in the midst of large scale destruction. These oysters are bred in captivity and the progeny are broadcast over natural beds so that the stock will be disease free due to acquired immunity. Cross breeding between an oyster strain known to be disease resistant with another of established susceptibility to disease would help to evolve one which is totally disease resistant. Large scale mortality of oysters on account of diseases of viral and other microbial origin are not common in India. Identification of superior strains of oysterwith reference to faster growth, disease resistance, higher yield of meat involving genetic selection and cross breeding would be a future line of work in this country.

The technology of oyster farming followed in advanced countries is capital intensive. Our efforts, on the other hand, have been directed towards development of low cost technology. The oyster meat at present commands a lucrative price at international level. Experimental culture undertaken at Tuticorin showed that the present rack and tray culture system can be further modified and made cheaper by reducing the cost on labour and material inputs if string (ren) culture is taken up. This would perhaps also serve as a feasible alternate method for areas along our coasts which do not have shallow tidal flats. Development of culture technology suitable for the geographical and topographical characteristics of each maritime zone will ensure greater success.

The labour intensive spat collection and transportation method by using lime coated tiles has been found to be costlier than collecting the spat on shell cultch. Large scale spat collection by using shells would not only reduce the expenditure but enable long line culture in deeper areas.

The future development of increased oyster culture activities also depends on finding potential new markets. Initial test marketing indicated good demand within the country. The export market for oysters is already known but the quality of the product in competition with other exporting countries would be a deciding factor.

Paralytic shellfish poisoning(PSP) represents a serious health hazard which needs attention of oyster culturists since the oysters are filter feeders ingesting toxic dinoflagellates like *Gonyaulax* (Ray, 1984). Further, it is well known that oysters tend to accumulate heavy metals like mercury and zinc beyond the acceptable level of safety. It would, therefore, be necessary to strictly enforce pollution control measures in the areas of oyster culture.

Research and Development

Future research priorities include investigations on nutrition, growth, improvement of stocks by selective breeding, utilization of other species of oysters that are suitable forcultivation and development of techniques for monitoring and control of marine toxins.

For further development of oyster culture on a commercial scale, coastal tracts have to be made available to prospective farmers on lease. For this purpose, the Government have to enact suitable legislation. However, the allotment of coastal areas for oyster farming should not at the same time come into conflict with traditional fishing activities.

Several essential inputs are needed for oyster farming. Financial institutions like banks and agricultural and cooperative credit organizations have to extend financial assistance to those interested in the new avocation.

It is hoped that with the technical knowhow now available, entrepreneurs will come forward and take up oyster farming so that the resources available along our coasts are fruitfully utilized to augment marine fish production. The Institute will extend technical expertise to such ventures. The feedback data obtained from commercial ventures would help the scientists to improve and streamline the culture practices wherever necessary.

Extension activities have a special role in popularising oyster farming as well as making the oyster a relished sea food amongst the public. Training of intending farmers and entrepreneurs in oyster culture, popularization of oyster as food, educating the industry on post-harvest and processing technology and promoting internal and external markets would go a long way in establishing commercial oyster farming in the country.

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