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CULTURE OF EDIBLE MOLLUSCS

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SPECIAL LECTURE

PROBLEMS RELATED TO SEED PROCUREMENT FOR CULTURE OF MARINE EDIBLE BIVALVE MOLLUSCS: CRASSOSTREA MADRASSENSIS AND MYTILUS (=PERNA) VIRIDIS

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Procurement of adequate quantities of seed is an essential primary step in undertaking culture practices of economic species of bivalve molluscs. This applies not only in respect of molluscan species but equally well to all other aquatic living resources as the crustaceans and finfishes.

Procurement of seed helps establishing fresh farms in suitable grounds having similar environmental conditions as the original habitat or planting them in the existing farms at favourable locations to substantially increase the yields. It helps promotion of export trade in selected varieties possessing qualities of consumer preferences. Seed occupy much less space and withstand the strains of transport better then the adult shellfish. Seed in some can be conditioned for exposure over tolerably long periods of time outside water to enable their being carried to long distances as from one country to another. Seed can be collected from natural habitats using appropriate methods or produced in hatcheries by employing advanced scientific techniques of induced breeding by suitable means and rearing of the resultant larvae to the stage of settlement as seed or spat feeding them on selected species of algal cultures. Although the methods for these purposes developed outside this country are broadly known, the requirements of the individual species vary a good deal and the techniques have therefore to be modified and perfected for the local species to respond favourably.

COLLECTION OF SEED FROM NATURAL SOURCES

Seed from well established natural shellfish beds is usually abundant but their satisfactory procurement depends upon many factors. The farmer should have precise knowledge of where, when and how best to collect the seed of the species in question.

Settlement of oyster spat on cultch: Much research has gone into problems related to oyster culture in France, England, United States of America, Canada, Australia, Japan, Philippines and other maritime countries where certain species are regularly cultured, viz., Ostrea edulis and Crassostrea angulata in Europe, C. virginica and /@ C. gigas in Japan and C. commercialis in Australia. C. madrasensis is being cultured in India in recent years on quite a small scale. Faced with the problem of denudation of once productive beds, France was the first country to have successfully established oyster culture on an industrial basis as early as the middle of nineteenth centry. It was recognised that collection of seed was an important aspect of culture. Wooden planks coated with pitch, other materials, untreated roofing tiles, and roofing tiles with a coating of lime and sand were tried and of these the last mentioned item proved to be efficient for after spat setting and a period initial growth, the spat could be flaked off and the tiles recoated with lime mixture to be used over again. Japan used mostly bamboo twigs fixed in tidal flats or scallopshells or even oyster shells strung on wire in garland fashion and fixed on stakes in suitable locations. In United States of America and Canada and also in Europe mostly dead oyster shells are made use of. In Australia spat are caught on stones spread over grounds in shallow waters. The choice of cultch depends to a large extent on the local availability of the material obtainable at reasonably low cost. Cultch should be clean for the larvae to settle and set as spat.

Cultch should be laid at appropriate time when the larvae are big enough to settle. If it is placed too early in water silt would settle and render it unsuitable for spat settlement, and if it is

/@ C. gigas in the United States of America and Canada,

placed late the absence of the larvae in the environment would defeat the very purpose for which the cultch is laid. The breeding period or periods should be correctly assessed. In temperate waters rise in water temperatures gives an indication of approaching breeding time. After spawning in the case of oviparous species or swarming in the larviparous ones, two to three weeks time would be required for completing the larval development to attain the partly creeping and partly swimming stage known as the pediveliger which now settles on the cultch laid or in the absence of it on any hard material at the substratum and explores the spot for a while creeping by its foot. If the spot is clean it moves to its under surface and attaches itself with the left valve to the surface of adhesion, fixation being secured by a rapidly hardening exudation from a gland at the foot base. Internal changes follow rapidly and the spat thus settled is a miniature oyster fixed to one spot.

The location where good setting takes place in the neighbourhood of oyster beds are in the direction towards which currents flow carrying the larvae and these have to be ascertained while laying the cultch. Favourable localities for spat setting are usually several in the vicinity of a single large bed. Cultch has therefore to be laid in several places simultaneously to obtain adequate quantities of spat.

Spawning or swarming of the adult oysters, rate of development duration of larval life, and setting intensities are determined by factors like fluctuations in water temperatures, marked though not small changes in salinity media, availability of food and changing phases of the moon. In the backwaters and estuaries seasonally cut off from the sea by sand bars, communication established with the sea after the monsoon rains promotes breeding and larval setting. Information centres for collection of relevant environmental data and reporting the same to aquaculturists as is being done in Japan would help a great deal to undertake timely field operations.

Crassostrea madrasensis occurring on the southern and central regions of the east and the west coasts is an oviparous species. There are no larviparous edible oyster species of commercial importance in the Indian waters. The spat are collected on lime and sand coated tiles and reared in trays in the well laid out experimental oyster farm of the Central Marine Fisheries Research Institute at Tuticorin where the adult marketable size is attained in about a year. The Japanese oyster Crassostrea gigas is introduced into the United States, Canada, Central and South America as well as some of the European countries because of its faster rate of growth than the indigenous species in those countries. Conditioning the spat of the Madras oyster for transporting and marketing them in other oyster growing countries may be tried because it grows even faster than C. gigas.

Seed of the sea mussel: The mussels cultured in Europe are the Atlantic species Mytilus edulis and the Mediterranean species M. galloprovincialis. On the Pacific coast of North America occurs M. californianus and off Japan M. crassitesta, the exploitation of both of which is low due to consumer preference for other bivalve species available in abundance. Among other mussel species are the green mussel, Mytilus viridis (Syn. Perna viridis) and the brown mussel, P. indica both of which are regularly utilized as food in India by the coastal populations who have developed a liking for them and the mussels are being cultured on scientific lines to a limited extent in demonstration farms of the Central Marine Fisheries Research Institute's Research Centre at some places both on the east and the west coast of the country (Madras, Calicut and Vizhinjam). M. viridis extends its distribution beyond the Indian territory to Singapore where attempts are made to culture the species.

In France where mussel culture is an ancient practice seed collection is resorted to by the "bouchot" system of culture with twigs interwoven in V-shaped fashion in the muddy tidal flats parallel to coast line. The seed setting on them grow not only very fast, but

they are also free from the attacks of predators and pests which normally take a large toll when they are lying on the substratum. Along the Northern coast of France stout 4 m. long oak poles are used as stakes. Ropes upon which mussel seed are allowed to set are spirally twisted round the poles. As mussels grow, thinning is done. To prevent the mussels falling off they are put in narrow long net bags which are in turn tied to the poles. This helps the younger mussels time enough to secure fresh attachment by their byssus threads.

The mussel culture industry of Spain has made rapid strides since the Post-Second World War years when they adapted the raft culture method in the very productive waters of the Galician Bays and her present annual production has come to rank the highest among the mussel producing countries of the world. The rafts are wooden platforms mounted on sturdy floats (fibreglass mold). They bear wooden poles fixed to frame work and they jet out to support ropes which hang down into waters. The smaller rafts (20 m x 20 m) support suspension of 500 ropes each and the larger ones upto 1000 ropes. Seed settle on them and grow on these ropes. When setting is poor seed from elsewhere are supplemented.

In Philippines seed are carefully hand-picked from the natural environment by cutting out the byssus but not by pulling them out of their attachment. They are put in bamboo trays along with some cultch and the trays are fixed to bamboo poles above the level of the bottom of the bay in shallow waters in such a way that they are always immersed in water even at low tides.

In our waters mussels seem to breed round the year but with a peak season of intensive reproduction followed by profuse seed setting. Based on observations so far made it is now known that this period of abundant seed setting differs in different regions along the coasts. The seeds are at present collected from natural grounds by hand-picking after the period of intense spat settlement.

RAISING THE SEED BY EMPLOYING HATCHERY TECHNIQUES

In the United States of America, Canada, Britain and Japan large scale production of seed under fully controlled conditions especially of the edible oysters and to some extent other species of shellfish is being practised, employing hatchery techniques. Inducement of C. madrasensis and M. viridis to spawn, effecting fertilisation of the spawned out eggs, rearing of the larvae through various stages on a supply of food organisms and creating conditions for the grown up larvae to set as spat have been tried in our laboratories with a certain amount of success, but the techniques have to be standardised for production in the hatcheries on commercial scale. Spawning can be induced by physical, chemical, mechanical, electrical and biological stimulations but they are not universal in their application as the responses vary with the different species. A large number of algal cultures are generally used for feeding the growing larvae, of but all are not equally suitable for different /@ need preliminary investigations. With the adequate laboratory and field facilities that are being built up at the CMFRI it is possible to initiate and carry out successfully hatchery techniques for augmenting oyster and mussel production.

/@ shellfish species. These and many other problems

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