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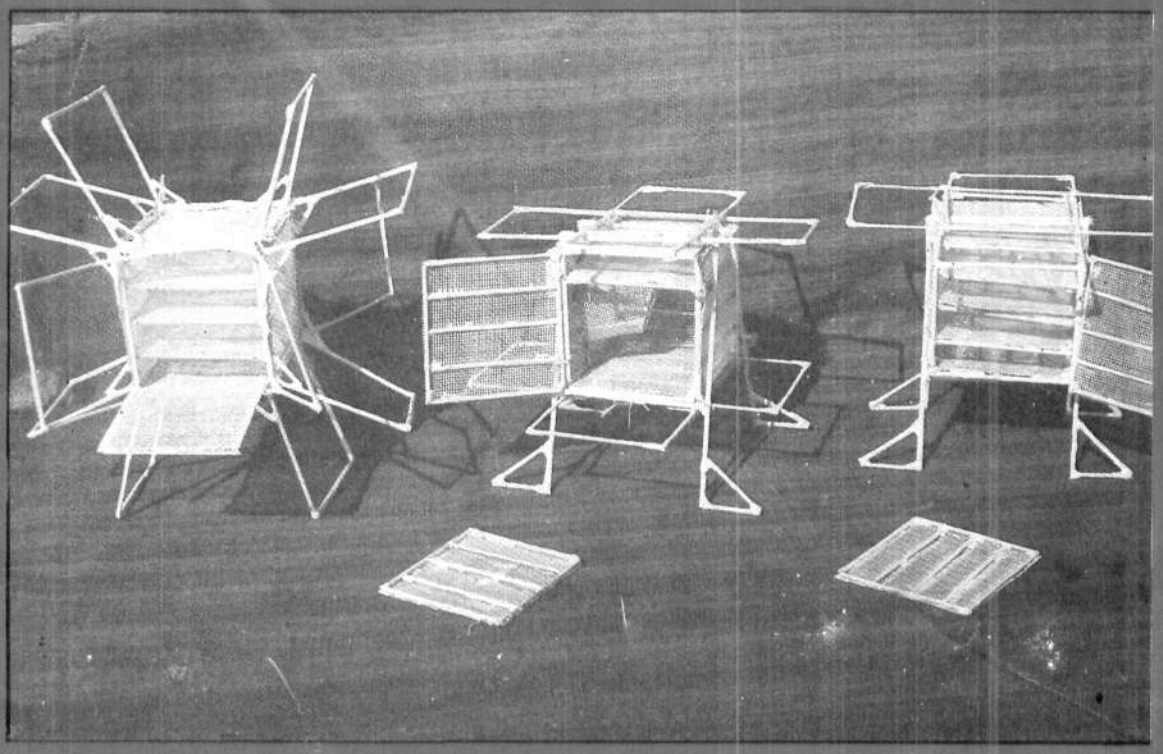

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866 SHALLOW SEA BOTTOM FARMING : MULTICROP SYSTEM DEVELOPED AT VIZHINJAM *

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Introduction

Eventhough mariculture technology for various organisms like mussels, pearl oysters, lobsters and crabs has been developed during the last three decades by the CMFRI and several other institutions in India, there has been considerable practical difficulties for commercialising these programmes in Indian waters due to the rough weather conditions during the two monsoon periods as well as due to the non-availability of adequate protected bays along the Indian coasts. Mariculture technologies have been develoed by other countries, using floating structures like rafts and longline system. The rough weather condition is one of the major constraints to maintain such structures in our open sea. Considering these aspects the CMFRI has initiated a project in May 1995 at Vizhinjam for the development low cost technology for the farming of pearls and mussels. Accordingly the farming procedures were oriented to utilise shallow sea bottom, and new designs of cages which can suit to the bottom conditions were evolved so that the wave action at the surface level will not have much impact on the animals farmed in such cages.

Design and fabrication of high density stocking cages

The designs of the cages with various modifications were made by the senior author. Cages of 64 x 64 cm were fabricated with four shelves to accommodate 1,000 oysters in each shelf as a unit for high density farming. The design was made in such a way that individual unit of 64 x 64 cm was made using 10 mm M.S. rods with three supporting rods at a distance of 16 cm. The frames were covered allaround with nylon netting of required mesh size so that it was possible to stock oysters of different sizes at different stages of farming. A total of nine frames were assembled into a box type cage with four inner shelves. The oysters or other bivalves stocked in the cage were then installed at a site having favourable ecological conditions.

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The cage (Fig. 1, 2, & front cover photo) has the advantage of using for farming as well as fishing simultaneously by replacing the middle

Fig. 1. The pedestal cages operated at Vizhinjam with the stocked animals in high density.

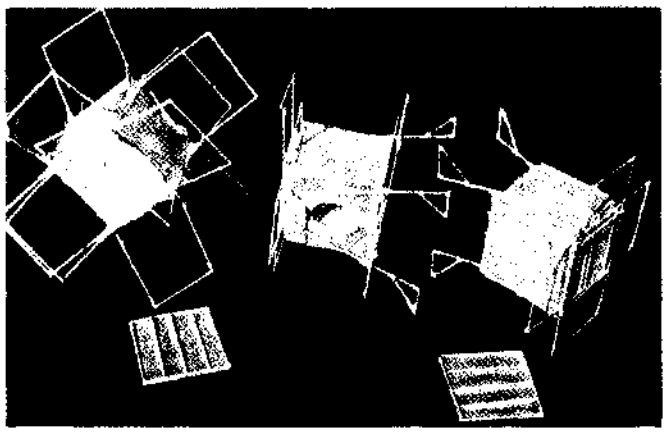

Fig. 2. The cages when remaining in the tilted condition (see the cages do not touch the bottom on any tilted position).

shelf with a lateral frame having a trap mouth to make "two-in-one" cage. (Fig. 3) Using those two-

Fig. 3. The two-in-one cage with trapmouth for fishing-cum-farming of oyster using the top and bottom shelves.

in-one cages it was possible to catch ornamental fishes, edible fishes, lobsters, mud crabs, and other marine organisms simultaneously while mussel or pearl oysters were stocked at the top and bottom shelves. These investigations are being carried out at Vizhinjam Bay near Trivandrum (Fig. 4 & 5).

To avoid the body of the cages touching the sea bottom and to prevent its organic decay by contact with bottom silt/sediments, proper pede-

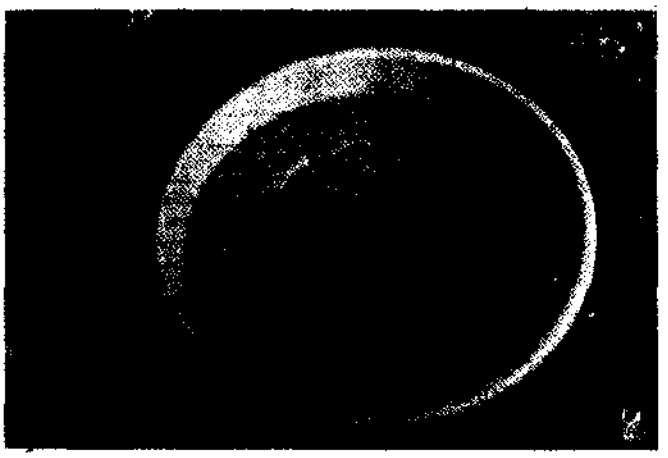

Fig. 4. Lion fish *Pterois* sp. caught in Two-in-one cage.

Fig. 5. Fishes caught in Two-in-one cage.

stals of 120 cm height with a resting space of 70 cm^2 were also fabricated using 2.5 cm M.S. rods in such a way that using two such pedestal frames the cages could be kept above the sea bottom without touching the ground (Fig.1).

However, there are possibilities of the cages tilting towards the sides due to irregular sea bottom or with wave action. However, adequate provi-

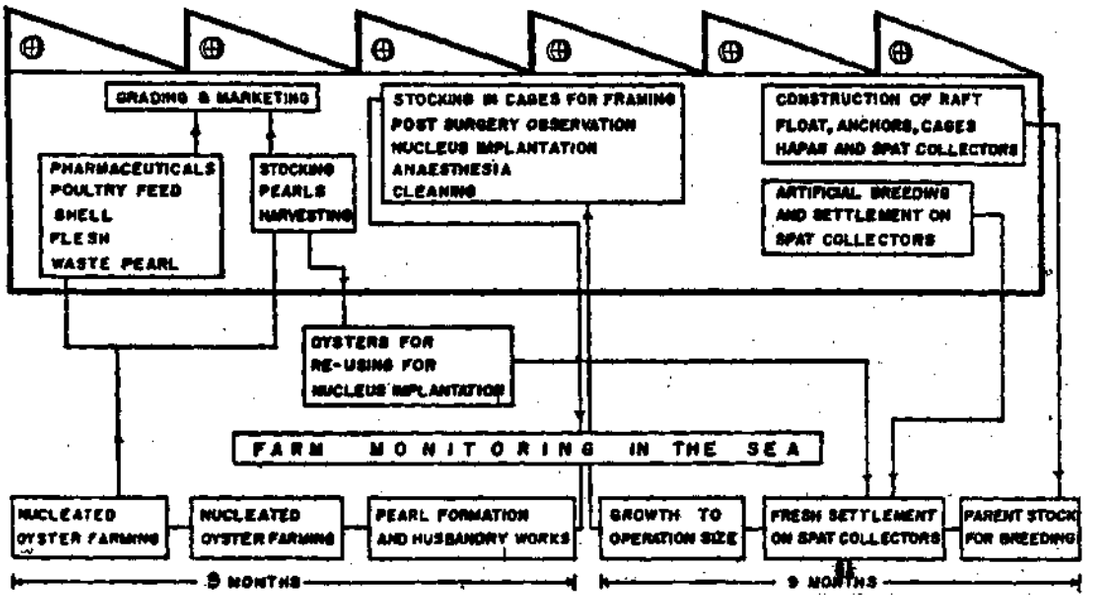

Fig. 6. Project on pearl culture (work-flow chart)

sions were given by providing extra frames at the top and bottom of the cages as shown in Fig. 2.

A prototype design without pedestals but with radial supporting frames was made in such away that if the cage was tilted in any angle, it did not touch the sea bottom. This design is currently undergoing trials at Vizhinjam. The designs described here are being patented.

These cages have been found to be highly useful for fattening lobsters, crabs and fishes and also for broodstock development, in addition to the regular farming-cum-fishing by providing additional lids for feeding. It has also been observed that by attaching nylon frills on the sides of the cages, these cages could act as spat collectors for pearl oysters and mussels and also act as fish attracting devices by providing adequate extra biomass as feed for the fishes.

The cages can be operated in shallow sea bottom from catamarans, canoes or boats by individual fisherman or by groups of fishermen using marker nylon ropes of adequate size and floats which can also be used for attaching nylon frills for attracting spats and thus to raise natural stock of pearl oyster seeds for large scale farming.

Suitable areas for farming and appropriate designs

The cages can be operated in shallow sea bottom with sandy or gravelly base as well as in lagoons of Lakshadweep and Andaman Islands, shallow areas of the Gulf of Mannar and Palk Bay region. The cages can be selected according to the depth, nature of sea bottom, currents and drifts of the area where farming is proposed to be taken up. Depending on the availability of seed, the size of the farm can be decided and accordingly the investment can be regulated.

Candidate species and farming procedure

The design of the cage is versatile and almost all marine candidate organisms suitable for farming can be grown depending on the habitat of the species. The cages could be used for fattening the juveniles of finfishes and shellfishes to marketable size by changing the mesh size of the cages and the feeding pattern of the cultivated species. It is also possible to grow most of the sedentary marine animals as well as free living ones using these cages.

Programme for marginal farmers and large scale pearl farming

The shallow sea bottom farming and the farming system using different types of cages presented here are relevant to multicrop systems as well as single species crops such as peral farming and/or mussel farming. The general methodology for any crop is the same for both marginal farmers as well as large farmers or for national programmes. Different managerial systems

would be required for large scale adoption of pearl farming, as given in the work flow chart.

a. Seed development and supply of oyster stock for implantation

Since pearl oyster is the raw material for pearl culture, adequate availability of oyster stock is to be ascertained by the organising agency before starting a major programme by adopting marginal or large scale farmers. It could be done through hatchery supply or through the supply of natural population in the natural farm. Proper training programmes for this purpose should be organised on a large scale.

b. Implantation of oysters and distribution to farmers

The trained persons can establish distribution centres for the supply of implanted oysters to the farmers. It can be a major source of income for the fishermen even without much sophisticated training. If each fisherman can start his own implantation centre depending on their personal experience, there will be wide variations in the output and the quality of pearls.

c. Husbandary work, harvest and marketing

By using the high density stocking cages as well as the two-in-one cages the fishermen farmers can collect nucleated oysters and farm them in the sea. Fouling organisms get attached on the surface of the oysters as well as on the cages and hence cleaning is essential or remove them in the case of high density stocking cages atleast once in a month. The cages are lifted, cleaned and put back into the sea. The cleaning work can be done by the members of the family of fishermen at no additional cost.

In the case of two-in-one cages since the farmer lifts the cages daily or atleast on alternate days for the collection of ornamental fishes, edible fishes, lobsters, crab etc. he can watch the intensity of fouling and attend to the cleaning work accordingly.

In the tropical conditions harvest of pearl is possible within 6 to 9 months after the implantation. So the farmer will have to maintain implanted oysters only for such a short period and the pearls can be extracted, washed in soap water and marketed directly or through an agency after sorting them into different grades. Already experiments have proved that the yield of high quality 'A' grade marketable pearls is 20 to 50 % and it is found that the economics of a unit system using high density stocking cages is very encouraging.

d. Unit system of high density stocking cages

A cage of 65 x 64 x 64 cm can hold 4,000 nucleated oysters. The details on the recurring expenses using a single cage is given in Table 1.

TABLE 1. *Recurring expenses for shallow sea bottom farming of pearls*

Particulars	Amount (Rs)
Cage with pedestal	1,060
Nylon net (2 kg)	505
Labour charges for netting	100
Nylon thread (0.5 kg)	60
Marker rope (15 m)	200
Float (1 no.)	250
Nylon frill (2 kg)	250
Cost of nucleated oysters (4,000 Nos)	16,000
Labour charges for cleaning (9 months)	1,575
Total	20,000

Total expense for fabricating the cage and launching it in the sea is Rs. 2,425/- and the cleaning charges for a single cage for nine spells is about Rs.1,575/- and including the total cost of nucleated oysters at the rate of Rs. 4/- per oyster, (Rs. 16,000/-) the total investment is Rs. 20,000/-. At the yielding rate of 25 % pearls the sale proceeds of 1,000 pearls at the rate of Rs. 50/- is Rs. 50,000/- and the net profit anticipated by the fishermen is Rs. 30,000/- as shown in the operational details in Table 2.

TABLE 2.Operational details for *low cost shallow sea bottom farming of pearls*

Particulars	Amount (Rs.)
Cost of pedestal cage, nucleated oysters * and farming expenses (Stocking density : 4,000 numbers, Duration of farming : 6-9 months Pearls production @ 25 % : 1,000 numbers),	20,000
Sale proceeds of 1,000 pearls	50,000
Net profit	30,000

(* cost of 4,000 nucleated pearl oysters = Rs 16,000 included).

Remarks

A General picture on the scope of adopting shallow water bottom farming of pearls by marginal fishermen farmers as well as by large farmers through a statewise or a national programme is dealt with in this account. We need take up this programme also for a multicrop system of farming-cum-fishing and farming-cum fattening of lobsters, crabs and fishes. The programme implementing agency has to make arrangements for seed development and supply of oysters, distribution of implanted oysters to the farmers and financial and technical support to the farmers for farming as well as marketing of pearls. The new designs of cages developed at Vizhinjam for shallow water farming could cut down the imputs on farming expenses to the minimum and it is hoped that the findings at Vizhinjam willl enable sea bottom farming on a large scale in the seas around India and elsewhere.

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