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INDIAN COUNCIL OF AGRICULTURAL RESEARCH

**PROSPECTS FOR DEVELOPING CULTURE OF  
EDIBLE OYSTER, CRASSOSTREA MADRASENSIS  
AND GREEN MUSSEL, Perna viridis  
ALONG KAKINADA COAST, ANDHRA PRADESH**

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### **Introduction**

Around Kakinada in Andhra Pradesh the edible oyster, *Crassostrea madrasensis* beds are found at Kakinada Fisheries Harbour, Chollangi and Uppada. This species spawns almost throughout the year with minor variations. The technology of oyster culture has been developed at the Tuticorin Research Centre of CMFRI. Since aquaculture is location specific, in order to test the viability of this technology under the conditions prevailing at Kakinada, experimental study on edible oyster culture was taken up at Kakinada. This enables us to suggest modifications that may be required in the culture technology to suit the local conditions.

Earlier attempts on location testing for oyster culture in this area were unsuccessful as spat collectors were often disturbed by fishermen, resulting in their loss. In the current experiments, ren culture method was attempted. This work was carried out by giving good publicity at the Kakinada Fisheries Harbour and in the process, considerable awareness was generated among the fishermen resulting in good protection to the rens.

### **Studies on Edible Oyster Culture**

#### **Experiment - I**

The rens were prepared at Tuticorin, using oyster shells as cultch material. The total length of each ren was about 70 cm with 5 to 6 oyster shells as cultch. About 6 to 7 hatchery raised oyster spat were attached on the cultch. Twelve such rens were transported to Kakinada on 26.2.1992 and suspended at Kakinada Fisheries Harbour from a horizontal rope, which was tied to the two concrete pillars of the harbour jetty. This site was advantageous as it offered protection to the rens.

The size (height) of oyster spat at the time of stocking at Kakinada ranged from 10 to 55 mm with a mean of 27mm. The growth of oysters was regularly monitored. The oysters were cleaned of

foulers like barnacles, serpulids etc., at monthly intervals. The oysters were harvested on 2.11.92 after a gap of 255 days. The actual culture period from the day rens were kept for settlement in the hatchery till harvest was about 280 days. At harvest the size of oysters ranged from 40 to 105 mm with a mean of 72 mm. The weight ranged from 35 g to 148 g with a mean of 68.6 g. The meat weight ranged from 2.4 g to 21 g with a mean of 6.5 g and an average meat yield of 9.6% (Table 1).

TABLE 1. Length-wise meat yield of *C. madrasensis* (culture period : February - November 1992)

Length group (mm)	Average weight (g)	Average meat weight (g)	% of meat
50-60	41.0	2.5	6.1
60-70	53.4	5.2	9.7
70-80	69.3	6.8	9.8
80-90	85.0	8.7	10.2
90-100	107.0	9.6	9.0

Two rens were physically damaged due to frequent hitting to the pillars of the jetty. The survival rate of oysters was 83%. Total weight of harvested oysters was 26.4 kg shell-on which works out to 2.64 kg/ren of 0.75 m length. Thus the production per metre ren was estimated at 3.5 kg.

#### **Experiment - II**

In this experiment, 18 rens were prepared each with 6 shells as cultch at Kakinada. The shells used were those of green mussel and window-pane oyster apart from edible oyster (Fig.1). The rens were suspended at the fisheries harbour in the middle of February'92 at the same location where the first experiment was conducted (Fig 2). The settlement of oyster spat was observed only at the end of March. Thereafter the growth of oyster spat was monitored every month. They were cleaned for fouling organisms like barnacles and serpulid



Fig. 1. Rens made of oyster shells.

worms at monthly intervals. Further settlement of oyster spat was observed continuously and they were removed to avoid overcrowding the ren (Fig 3). The oysters were harvested by the middle of September, 1993 i.e., 7 months after suspending

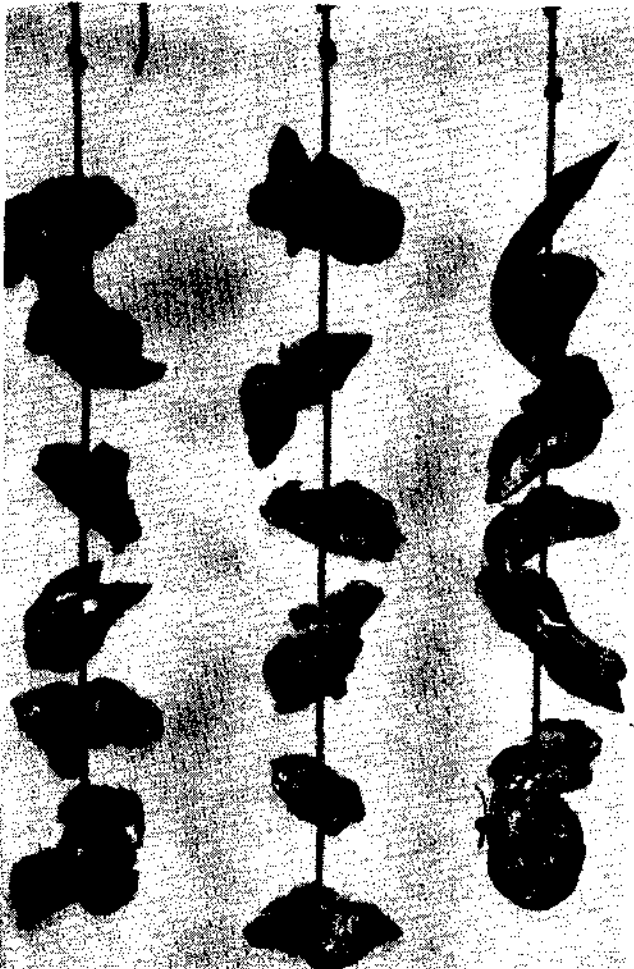


Fig. 2. Rens with oysters settled.



Fig. 3. A close-up view of an oyster shell ren with settled oysters. Note that it is cleaned of foulers and oyster spat.

the ren at the culture site (Fig 4). The effective culture period can be considered as six months, as spat settlement took more than a month.

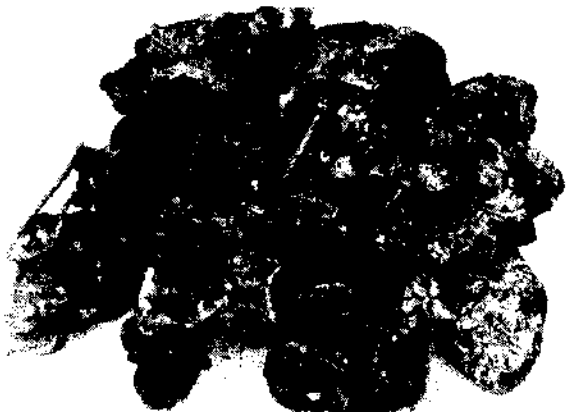


Fig. 4. Harvested ren with oysters and few green mussels.

The height of oysters at the time of harvest ranged from 28 to 105 mm with a mean of 66 mm. The weight ranged from 10 g to 112 g with a mean of 45.2 g. The mean meat weight was 4.1 g which works out to a meat yield of 9% (Table 2).

TABLE 2. Length-wise meat yield of *C. madrasensis* (Culture period : February - August 1993)

Length group (mm)	Average weight (g)	Average meat weight (g)	% of meat
30-40	10.1	1.3	12.4
40-50	13.6	1.5	11.3
50-60	25.4	2.5	9.7
60-70	43.1	4.2	9.7
70-80	62.7	5.7	9.2
80-90	78.5	6.3	8.0
90-100	99.8	7.6	7.6
100-110	101.0	9.0	8.9

On an average, six oysters were retained on each shell. The production was 1.63 kg/0.7 m ren which gives an estimated production of 2.32 kg/1 m ren/ 6 months.

#### Effect of curing on settlement

In the course of the second experiment, some shells of window-pane oysters were kept immersed in seawater for about two weeks before they were suspended for oyster spat collection. It has been observed that the settlement of spat on these shells was quick and firm when compared to untreated shells. This may be due to the formation of "Primary film" on the shells which will facilitate easy settlement of larvae (Perkins, E.J. 1974. *The Biology of Estuaries and Coastal Water*. Academic Press, 678 pp).

#### Environmental conditions

The salinity temperature and oxygen values of the sea water at culture site were monitored throughout the culture period. The salinity ranged from 12.45 ppt to 34 ppt, the temperature from 23 to 27.5 °C and the oxygen from 3.0 to 5.2 ml/l. There were no wide fluctuations in these parameters.

#### Remarks

In the first experiment where the hatchery-raised oyster spat were transported from Tuticorin, they attained a mean height of 72 mm in about 9 months. In Tuticorin area the edible oysters attained a size of 80-90 mm in one year (Nagappan Nayar, K. 1987. *Bull. CMFRI*, No. 38 : 59 - 63). The meat

content in both places was about 10%. In the second experiment, the effective culture period was reduced to six months and the oysters attained a mean height of 66 mm with 9% meat yield. The oyster can be marketed at this size. As there are vast shallow water bodies in this area, apart from the Kakinada Bay, the present study indicates the suitability of developing this area for edible oyster culture and a seasonal crop of 6-9 months duration can be raised. It may be prudent to use the window-pane oyster shells as cultch material in the preparation of rens as they are locally available in sufficient quantities compared to oyster shells. Moreover window-pane oyster shells offer more surface area for the spat to settle and grow. Utilization of the cured shells may reduce the effective suspension period of the rens apart from yielding good results.

#### Studies on green mussel

A good *Perna viridis* (green mussel) bed was found in the Kakinada Fisheries Harbour. While culturing *C. madrasensis* in the Kakinada Fisheries Harbour area, green mussel spats settled on the ropes of oyster rens. The mussel spat were observed on the rens in July 1992 at an average length of 16 mm i.e., about one month old. They had grown to a length range of 33 to 81 mm and a mean length of 49.4 mm by the middle of November. The mean weight was 13.3 g. As the oysters were harvested, the mussels were removed from the rens and kept in 3 elongated nylon bags of 1 m length and 15 cm width (Fig 5). The bags were vertically suspended in the same area. The mussels again got attached to each other through the byssus threads and formed bunches within the bags (Fig 6). By the end of March 1993, these mussels had grown to a length range of 60-115 mm with a mean length of 80.1 mm. The weight ranged from 19 to 138 g with a mean value of 67.7 g. The average meat yield was 21.6% of the total weight (Table 3). It was seen that the meat yield was better at 80 mm length, indicating that this length group was the desired size for higher yield at harvest.

In the second experiment, oyster rens were suspended in February 1993. The green mussel spat started setting in April and reached a mean length of 65 mm by the end of August i.e., in about 4 months. The mean weight was 33 g, meat weight 9.2 g and the percentage of meat yield was about 28%.

#### Remarks

The growth rates of green mussel observed in



Fig. 5. Meshed nylon bags with green mussels, before suspending at the culture site.

TABLE 3. Length-wise meat yield of *Perna viridis* (culture period : July '92 - March '93)

Length group (mm)	Average weight (g)	Average meat weight (g)	% of meat
20-30	2.5	0.35	14.0
30-40	7.3	1.05	14.6
40-50	9.2	1.85	20.1
50-60	19.0	4.18	22.0
60-70	34.9	7.54	21.6
70-80	63.2	12.77	20.2
80-90	77.5	17.82	23.0
90-100	96.1	20.73	21.6
100-110	107.0	22.30	20.8
110-120	138.2	27.33	19.8

the present experiments were good and comparable to 64 mm in 8 months at Ennore, 66 mm in 5 months at Vakalapudi near Kakinada and 66 mm in 6 months on the natural beds at Kakinada

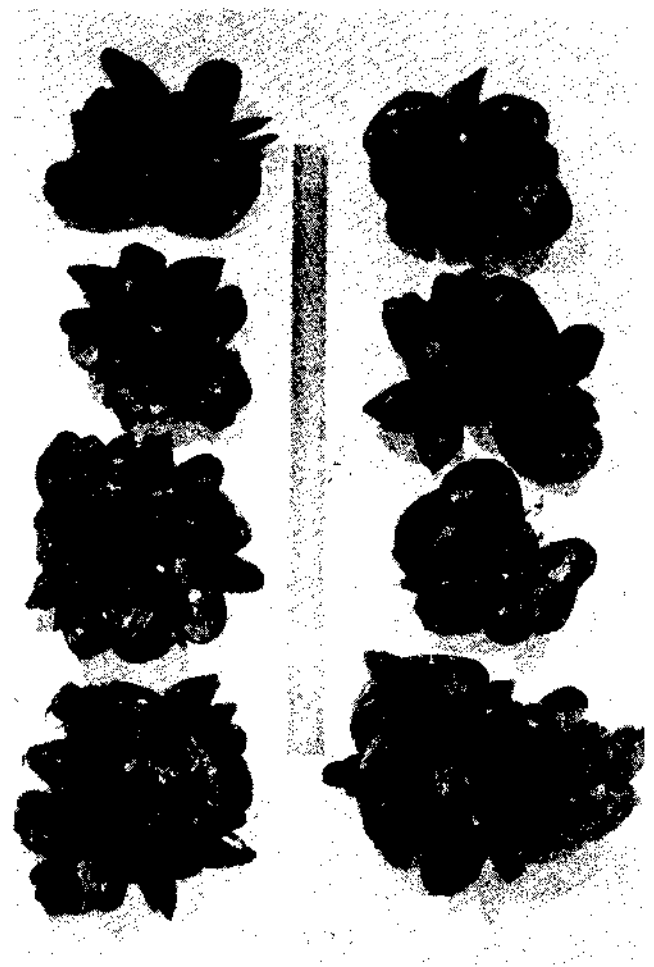


Fig. 6. Clusters of green mussels removed from nylon bags at the time of harvesting.

TABLE 4. Length-wise meat yield of *Perna viridis* (culture period : March-August 1993)

Length group (mm)	Average weight (g)	Average meat weight (g)	% of meat
30-40	6.5	1.75	26.9
40-50	10.3	3.17	30.7
50-60	15.3	4.50	28.7
60-70	27.6	8.10	29.3
70-80	41.7	11.20	26.9
80-90	47.0	13.50	28.7
90-100	70.5	17.00	24.1

(Narasimham K.A. 1980. *Bull. CMFRI*, No.29 : 10-17). At Calicut the harvestable size of 80 mm was reached in five months after seeding at 20-30 mm, by raft culture method (Kuriakose P.S. 1980. *Bull. CMFRI*, No.29 : 33-38). The production per nylon mesh bag of 1 m x 15 cm was about 4 kg and mortality was negligible.

This study indicates the possibility of culturing the green mussel in nylon net bags of about one metre length in shallow water bodies like the Kakinada Bay. In order to avoid clustering, to begin with, the mussel spats can be held in small mesh narrow bags, so that they attach together and take a longitudinal cylindrical shape. The external nylon bag may be periodically replaced by a wider mesh bag to accommodate the growing mussels. This method helps to prevent the dropping of the

mussels. The nylon bags are reusable and this method of culture can be practised in shallow waters (2m depth) with the length of the mussel bag restricted to about 1m.

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