A New Horizon in Sea Farming

Open Sea Floating Cage Farming of Lobsters

Successful Demonstration by CMFRI off Kanyakumari Coast

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Lobsters, a seafood item, are highly relished throughout the world. In India, lobsters are mostly available in rocky coastal habitats. Impacted by their delicious taste, the demand for lobsters is increasing at a fast rate in the national as well as international markets. The lobsters harvested from the coastal waters are packed and exported in live condition to the different destinations, mostly in the South-east Asian countries and to Japan. India is earning more than Rs. 72 crores per annum through export of lobsters. However, the under-sized lobsters harvested as part of the by-catch are not taken by the exporters. For this reason, they fetch either very little price or they are discarded.

In this background, the CMFRI has developed the technology of growing the undersized lobsters to a marketable size in sea cages. It has designed, developed and demonstrated the technology of 'Open sea floating cage farming' of lobsters. This technology is paving the way for increasing fish and shellfish production through cage farming in the coastal waters. Cages made of HDPE have been designed for the purpose, keeping in view the need for better floating and long duration endurance cages in the sea (Fig. 1).

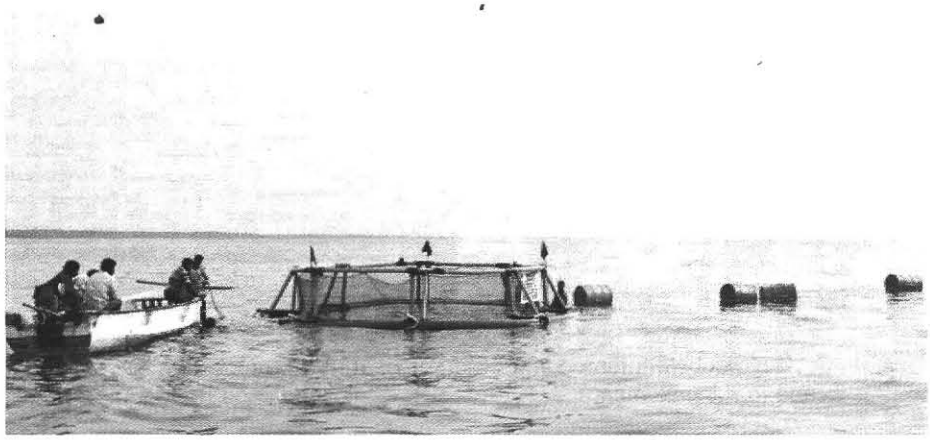

Fig. 1: HDPE sea cage moored and installed off Kanyakumari by the 'single point mooring' method.

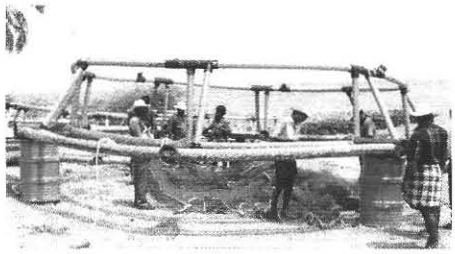

Fig. 2: Tying of inner net to the cage frame.

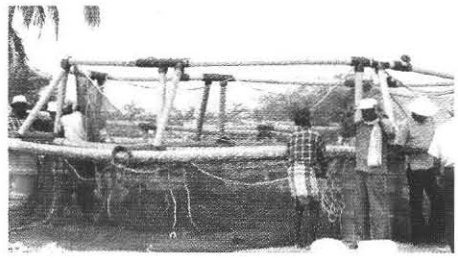

Fig. 3: Tying of innernet – nearing completion.

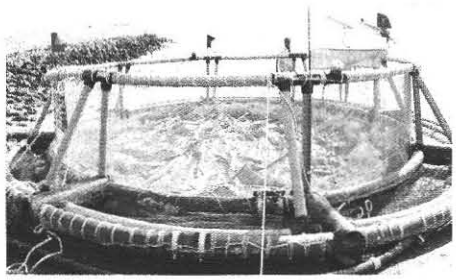

Fig. 4: Lining with 'silpolin' in the inner bottom net of the cage.

Fig. 5: Gabion box being filled with stones for transportation and placing later in sea bottom.

Preparation of HDPE Cages and Mooring

The circular HDPE cage frames were fabricated with an inner diameter of 6 mt (Patent filed: G. Syda Rao *et al.*, CMFRI - 2009). Appropriate inner and outer cage nets (40 mm mesh and 80 to 100mm mesh respectively) were tied securely to the cage frames. In the bottom portion, the cage nets were tied to a similar diameter sized HDPE ballast pipe placed inside with steel ropes. The process of net tying is depicted in Fig. 2 and 3.

The inner bottom of the inner net of the cage was lined with 'silpolin' sheet in order to provide the required bottom substrata for the lobsters stocked (Fig. 4).

For the mooring, initially, the gabion boxes of 3x1.5x1.0 m were filled with stones and loaded in trawlers (Fig. 5). These stone - filled gabion boxes were placed at the sea bottom off Leepuram - Kanyakumari at N 08.06.419^0 and E 077. 33.918^0 at about 8.5 meters depth. ☞

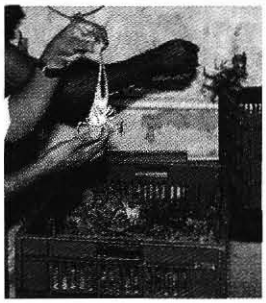

Fig. 6: Segregation of undersized lobsters .

Fig. 7: Segregated undersized lobsters kept ready for transporting and stocking in cage.

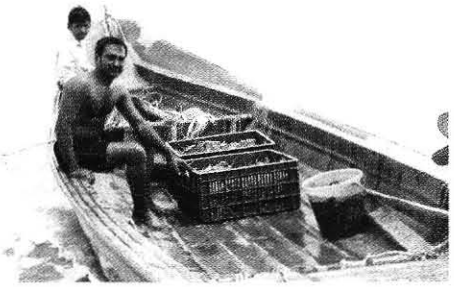

Fig. 8: Baby lobsters kept in boxes in 'vallam' for stocking.

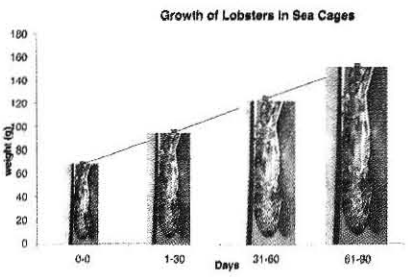

Fig. 9: Growth of lobsters reared in a cage in Kanyakumari.

Fig. 10: View of lobsters inside the floating cage (SCUBA).

Fig. 11: Boat decorated for the harvest function in Kanyakumari.

Fig. 12: Harvesting of lobsters from cage in progress.

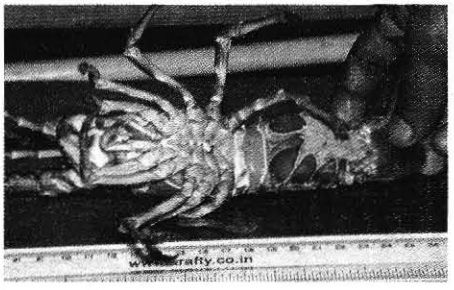

Fig. 13: Lobster with full egg mass collected from the cage.

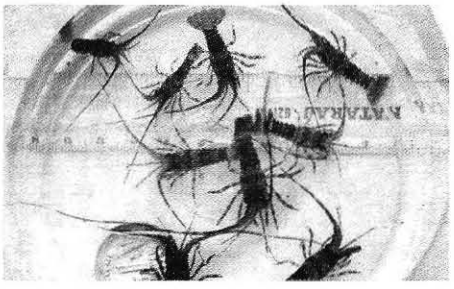

Fig. 14: A collection of very small baby lobsters that congregated near the floating cage.

After placing the stones in the gabion box, the cage in floating condition was moved to the site and fixed at the bottom to the gabion box with alloy mooring rope with four floats (sealed oil barrels coated with FRP) and a shock absorber. The proper placement of gabion box at the sea bottom and fitting of the alloy rope were ensured by checking through SCUBA diving. The top portion of the cage was covered with a bird net (80 to 100mm mesh) and fitted with blinking signals.

Lobster as Candidate Species and Stocking of Lobsters in Cage .

Considering the rich lobster grounds off Kanyakumari, Muttom, Kadiapattinam and Enayam along the Kanyakumari coast, the availability of lobster young ones in the by catches almost throughout the year, experiences gained in respect of encouraging growth rate of lobsters reared in cages earlier along Kerala coast, as well as the unit value of its meat, lobster was chosen as the candidate species. The smaller and under-sized lobsters of size group of less than 100g used for cage farming were obtained as 'by – catch' in fish nets and as well as in specific nets such as '*chingi valai*' and traps. They were carefully segregated from the larger ones (Fig.6and 7). Morphometric measurements indicated that the average length of each was 110 mm and the average weight of each was 68.5 g. The weight of baby lobsters each, at the time of stocking ranged from 45 to 90 grams. Thus, the smaller and under sized groups of lobster young ones, when grown in cages, are expected to ensure their survival as well as growth in their natural habitat without affecting the natural resource.

The lobsters were kept in plastic boxes and these boxes were loaded in 'vallam' and transported to the cage and stocked (Fig. 8) in them. A total of 2,400 lobsters were stocked in the 6 m diameter cage having a depth of 4.5 meters. Hiding / shelter gadgets were provided inside the cage for lobsters.

Feeding and Monitoring of Growth of Lobsters in Sea Cage

The lobsters stocked in the cage were fed with live mussels and chopped low value fish flesh. The periodical monitoring of the growth of lobsters in the cage indicated the growth rate as 1.0 g per day (Fig. 9). The underwater observations by SCUBA revealed that the lobsters were healthy and fouling in nets of the cage was negligible as may be seen from Fig. 10.

Harvesting of Lobsters

Observations indicated that by the end of the third month of rearing, most of the lobsters stocked in the sea cage had attained marketable size. Hence a partial harvesting was conducted on 7-2-2010. Harvesting was done by lifting the outer ballast along with the outer and inner nets. The lobsters that congregated in the inner net were collected by scoop nets. From the cage, a total of 175 kg of lobsters were harvested after 94 days of rearing (Fig. 11 and 12). The weight of each of the lobsters ranged from 110 to 245 g and the length varied from 160 to 210mm. The harvested lobsters were handed over to the team members of sea farmers, who were included as part of the demonstration project. The harvested lobsters fetched an average price of Rs. 1200/- per kg. The harvest was carried out in the presence of Dr. Madan Mohan, Assistant Director General (Marine Fisheries), ICAR, New Delhi, Mrs. Ajitha Mano Thangaraj, District Panchayat Chairperson, Kanyakumari, Mr. A. Chidamabara Nathan, District Superintendent of Police, Kanyakumari, several NGO and SHG representatives, CMFRI scientists, staff and entrepreneurs.

Table 1: Economic features of lobster mariculture in open sea floating cages

Stocking details

Total number of lobsters stocked in the cage	2,400
Average Body Weight (ABW) at the time of stocking	68.5 g
Average Body Length (ABL) at the time of stocking	110 mm
Seed source	Natural collection

Harvest Details (Partial Harvest):Period of culture: 94 days

Total harvested weight of lobsters	175 kg
Maximum weight noted	235 g
Minimum weight noted	110 g
Maximum length noted	210 mm
Minimum length noted	160 mm

Economic indicators

Particulars	Amount in Rs.
Investment for 6 meters diameter cage	4,00,000/-
Total cost of production(includes seed, feed, feeding charges and net cleaning)	1,20,275/-
Gross revenue obtained (by sale of lobsters)	2,10,000/-
Net income	89,725/-
Cost of production (per kilogram weight of lobster)	687/-
Price realised per kilo of lobster	1,200/-

Economic Aspects

A gross revenue of Rs. 2,10,000/- was realised, the net income being Rs.89,725/-. These results have demonstrated that lobsters are one of the important candidate species for the 'Capture - based farming' in marine floating cage along Kanyakumari coast. The economic aspects of lobster floating cage farming are given in Table 1.

Conservation aspects: In the cage, female lobsters with full egg mass were noted after two to three months of rearing from the size of 135 grams onwards (Fig.13). Thus the cage farming of lobsters in this coast assumes high significance due to its "Conservation Mariculture" potential. Very small lobster young ones were also seen attached to the cages (Fig. 14). Thus, apart from profitable production of the highly relished lobsters with export potential, their conservation is possible by allowing them to mature and to release the reproductive products in their natural ground itself for the lobster fishery to flourish forever. Hence, in this coast, it is proposed to maintain the broodstock of lobsters as a 'community level activity', in separate cages in the cage farming site for breeding in their natural habitat as an important step towards conservation.

The same cage was stocked again with the lobster young ones immediately for the next crop.

Other Observations/Inferences

1. The results of growth and production of lobsters in cages proved that they are one of the best candidate species for farming (capture based mariculture) in marine floating cages.
2. It is also possible to farm and harvest four crops of lobsters per cage per year.
3. The fish (including ornamental fish) and lobster population around the cage had increased, enhancing the marine biodiversity in the region.
4. The cage and mooring system have withstood the impacts of severe rough sea conditions characteristic of the Kanyakumari coast signifying the technological achievements of the CMFRI in the novel open sea cage mooring and open sea cage farming.
5. The cage-reared female lobsters matured at a smaller size indicating a higher 'index of reproductive potential' (IRP) compared to the lobsters collected from the natural habitats.
6. Considering the setbacks to the land – based farming of lobsters due to lack of suitable technologies and production methods, the open sea cage farming of lobsters could be regarded as the only best profitable alternative for lobster mariculture.

Acknowledgements

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11ft Giant-Herring in Sweden

A report from Stockholm published in The Hindu of 13 May 2010 says that a 'giant herring measuring 3.5 meters has been discovered off Sweden's western coast – the first one of the kind found in the Scandinavian country in more than 130 years, it is stated. *Regalecus glesne* known as the King of Herrings or Giant Oarfish, was found dead in the small fishing village of Bovallstrand on Sweden's west coast, about 90 km from the Norwegian border, the rarely seen regalecus, the world's longest bony fish, can reach up to 12 meters, it is stated. The last time this herring was seen in Sweden was in 1879, according to House of the Sea museum in Lysekil, where the fish was taken in Sweden.