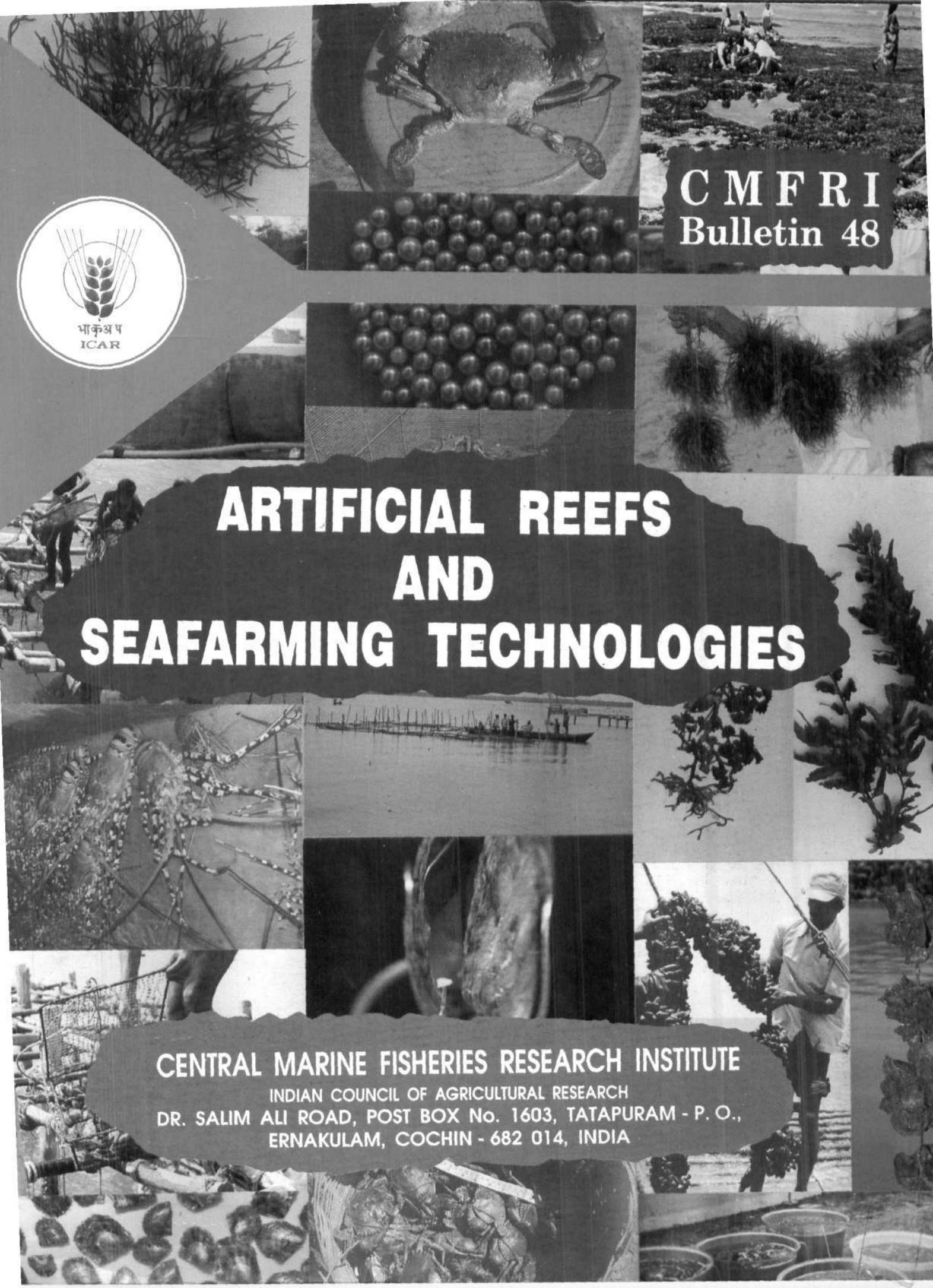

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CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
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C M F R I
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Dr. K. Rengarajan

Editor

January 1996

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LOBSTER FARMING IN INDIA

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Introduction

Spiny or rock lobsters are low volume and high value fisheries which support some of the most valuable marine resource worldwide. India, earns an approximate US $ 15 million each year through export of lobsters, mostly to Southeast Asian countries and Japan, although less than, 3,000 tonnes is landed annually. The potential for increasing the yield from the wild fisheries is limited, as the stock is subjected to extreme fishing pressure and is nearing their long term equilibrium yield. Hence, the most imaginative management strategy seems to be increasing the production through population enhancement and aquaculture. Recent success in rearing the phyllosoma larvae, has significantly improved the chances of captive breeding and seed production in spiny lobsters.

The term "farming" and "fattening" are two distinct operations. Farming is essentially a grow-out operation in which the juveniles are grown for several months to marketable size. Fattening, on the otherhand, refers to short duration culture of undersized size lobsters to a specific acceptable size and hence command better price. In the export market, whole cooked lobsters weighing 175-400 g fetches the highest price, whereas live lobsters should be above 400 g to get the best price. Demand for a certain size group and the price may vary from time to time in the overseas market. Among the whole cooked variety, *Panulirus polyphagus* with its deep red colouration after cooking and the prominent white abdominal band is the most preferred, whereas live lobsters of *P. ornatus* is in maximum demand in the Chinese market. So, the farming or fattening operation should be carried out depending on the overseas demand for the lobsters.

Culturable species and their distribution

Though the lobsters are widely distributed along the Indian Coast, the major fisheries are located on the northwest (Maharashtra and Gujarat), the southwest (Kerala and Tamil Nadu) and on the southeast (Tamil Nadu) coasts. Among the six shallow water species, only three, *Panulirus polyphagus*, *P. homarus* and *P. ornatus* are exploited in commercial quantities. *P. ornatus* grows fast and attains a maximum size of 3.5 kg and is most suitable for fattening, whereas *P. polyphagus* and *P. homarus* attains sexual maturity early (around 175 g), grows to a maximum of 1.5 kg and are good for whole cooking.

Seed supply

Seed in lobster farming refers to the juveniles used for culture. The lobster farming industry requires, large number of juveniles for the culture operations. Though complete larval development of five temperate species have been studied (Kittaka, 1994), commercial seed production is yet to be perfected. Until then, lobster farmers have to depend upon naturally available juveniles (500-300 g depending upon the species) which form a substantial portion of the commercial fishery. In Gujarat, exclusive fishing of juveniles of *P. polyphagus* is carried out in intertidal areas and sold to lobster farmers. The seeds thus procured are transported carefully and used for stocking in the grow out system. However, the impact of such large scale fishing of juveniles on the recruitment process and on the fishery is not known now.

For the lobster fattening industry, the term seed refers to the lobsters which are just below the commercial size, whether it be for whole cooking or for live transport. In the case of *P. homarus* and *P. polyphagus*, which are suitable for whole cooking, the seed size for fattening would be below the commercial size of 175 g, but above 150 g and for *P. ornatus*, it would be below 400 g, but above 300 g.

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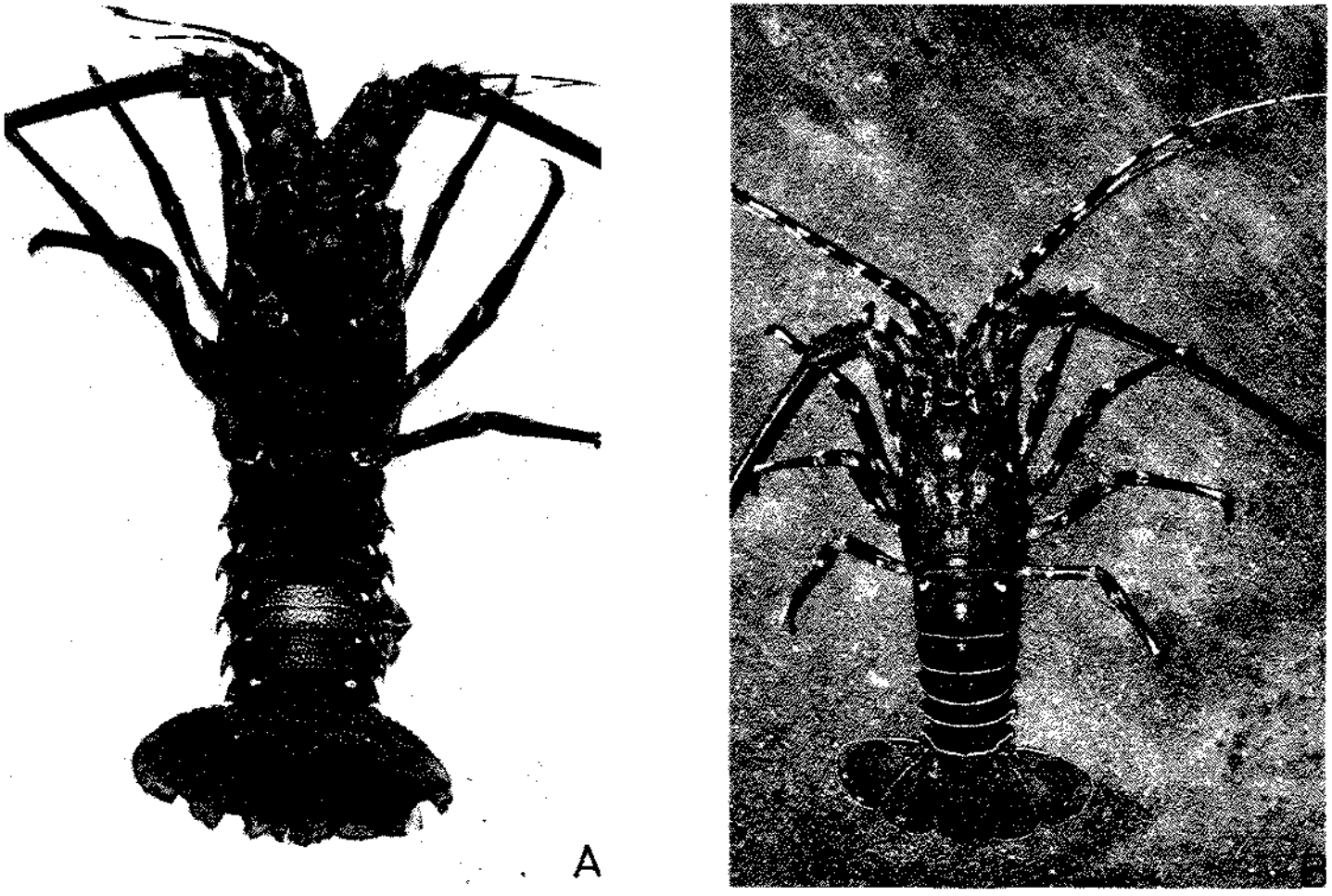

Plate I A. *Panulirus homarus* (Scalloped spiny lobster) suitable for farming and fattening along the southwest and southeast coast of India and B. *Panulirus polyphagus* (Mud spiny lobster) suitable for farming along the northwest coast of India.

Farming system

Commercial farming of spiny lobsters in India is carried out in Gujarat, where juveniles of *P. polyphagus* are farmed in intertidal pits, until they attain the size of 125-150 g. Experiments carried out in the Central Marine Fisheries Research Institute showed that indoor grow out system is most suited for lobster farming as it is most convenient for management. Farming in grow out ponds have been reported from Taiwan. Experimental culture of lobsters in floating cages was also reported from India, but the commercial feasibility of such operations is not known.

The indoor grow out system consisting of a series of circular or square or rectangular cement tanks, has several advantages, as the different units will be easily accessible for feeding, cleaning and maintenance. The farming or fattening system can be either a flow through model or a semi-closed recirculation system incorporating biological filters. Water reuse system has several advantages as the water quality can be strictly controlled and sudden stress on the farmed animals could be avoided. If flow through systems are used, continuous monitoring of water quality has to be carried out.

Water quality management

Spiny lobsters are susceptible to sudden changes in water quality. The optimal environmental requirements for lobster farming are: temperature (26-33°C), salinity (25-35 ppt depending upon the species), pH (6.8-8.5) and dissolved oxygen (> 3.5 ppm). In recirculation system, ammonia (< 0.1 ppm) and nitrate (< 0.1 ppm) levels have to be closely followed. Sudden fluctuations in water quality normally occur during rainy season and care should be taken to maintain the critical parameters such as salinity and pH to acceptable levels. In flow through systems, continuous circulation of fresh seawater has to be maintained, especially during night when the lobsters feed and undergo moulting. The dissolved oxygen and ammonia may reach critical levels during early morning due to decomposition of unfed feed and excreta in the system.

Farm management

For lobster farming and fattening, stocking may not be possible in a single operation. Stocking will be continuous process as sufficient quantity of seeds may not be available on a single day. Differet sizes have to be separated and after conditioning, can be stocked in separate tanks. The optimum stocking density in indooor grow out system would be 10-15 lobsters/m^2 for farming and 5 numbers/m^2 for fattening. Since spiny lobsters are nocturnal and gregarious in habit, communal shelters have to be provided for faster growth.

Molluscan meat is the most preferred diet of lobsters. However, this could be supplemented with trash-fish and squid head. Since fresh meat is likely to bring in tremendous bacterial load into the system and is difficult to procure for daily feeding, moist compound diets using these fresh ingredients and other raw materials such as rice bran and soyabean could be prepared and stored for daily feeding. Moist feeds with good elasticity and water stability were found to be acceptable for lobsters and this will be especially good for feeding lobsters maintained in recirculation systems.

Growth of tropical lobsters are relatively faster under optimal environmental conditions. Juveniles of *P. homarus* weighing 80-100 g could be grown to 175 g in four months. *P. ornatus* has been estimated to take 7-8 months to attain 400 g in captivity from an initial size of 100 g. Fattening will be much faster. *P. ornatus* weighing 300 g is expected to attain the target size of 400 g in less than 3 months.

Though disease is generally not a serious problem in lobster farming, sudden fluctuation in environmental conditions has been found to bring in a condition called Moult Death Syndrome (MDS). The affected lobsters die either soon after the moulting or within a few days. Nutritional deficiency also is likely to affect the normal moulting and growth of lobsters. Protozoan infestation is also not uncommon and it can be controlled by treatment with 30 ppm formalin for a consecutive three days. Bacterial infection normally occurs through injuries and this can be effectively controlled by oxytetracycline or furazolidone treatment. Good sanitation in the farming system and maintenance of proper water management are essential prerequisites for successful lobster farming.

Stock enhancement through artificial shelters

Population enhancement by attracting spiny lobsters to artificial habitat is a natural form of farming. Cuba and Mexico increased their lobster production severalfold by providing artificial shelters or 'Casitas' in shallow coastal waters. Artificial shelters provide food and shelter and protection from predators to the juvenile and adult lobsters. Studies show that food and shelter are the two important limiting factors which make lobsters susceptible to predatory attacks. Commercial size lobsters can be harvested periodically from these shelters leaving the undersized lobsters back into the sea. The use of appropriately scaled 'Casitas' may be an economical and effective approach for increasing lobster production in our country.

Harvesting and marketing

Harvesting of lobsters from indoor grow-out system is a matter of draining the water and picking up the commercial size for marketing. In fattening cages and pens, harvesting can be done by lifting the cage or the net in the pens and scooping out the lobsters.

The harvested lobsters can be marketed either in whole cooked form or in live condition depending upon the size and species. For whole cooking, live lobsters are dipped in chilled water for few minutes until they die and then immersed in boiling water containing acetic and citric acid for few minutes. After cooking, the material is again kept in chilled water and then cleaned, packed and blast frozen. For live lobster transport, live lobsters are immobilised in chilled water for few minutes and then packed in thermocol boxes with packing material and a coolant. The lobster cartons are then air lifted to the respective destinations.

Future prospects

The technology for lobster farming and fattening has already been developed. High demand for live and whole cooked lobsters in the international market and the high price offered, makes lobster farming an attractive industry. But nonavailability of a perfected hatchery technology and limited availability of juveniles and subadults from the wild are the two major constraints facing lobster farming. Small scale farming or fattening can be carried out utilising the undersized lobsters caught along with the commercial size lobsters. Harvesting of juvenile lobsters for farming should be avoided as we have inadequate information on the impact of fishing of juveniles on the natural recruitment processes and on the fishery. The annual landing of lobsters in the country is already on the decline (Radhakrishnan, 1995), as some of the species have already been overexploited in the absence of strict implementation of a legal minimum size and other management measures. Until a hatchery technology is perfected for commercial seed production, conservation measures have to be implemented to ensure sustenance of fishery as well as farming practices.

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