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भारतीय कृषि अनुसंधान परिषद
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LOBSTER CULTURE ALONG THE BHAVANAGAR COAST

K. K. Philipose

Veraval Research Centre of CMFRI, Veraval - 362 265

Gujarat has made tremendous strides in the marine production during the past two decades. From a humble production of 82,159 tonnes in 1971 (7.1% of all India marine production), the production increased to 2.34 lakh tonnes in 1981 (17% of all India marine production) and further to 4.92 lakh tonnes in 1990 (20.1% of all India marine production, (Vivekanandan *et al.*, *in press*). This six times increase in the fishery was exclusively from the capture fishery sector. This tremendous growth in the marine fishery, coincided with a remarkable growth in the processing and export industry of the region. A substantial portion of the marine catch is contributed by the Saurashtra coast. The introduction of the commercial trawlers in 1967, mainly to capture shrimps for export market and subsequent large scale expansion of the trawlers were mainly responsible for the blue revolution along the Saurashtra coast (Philipose 1992).

Crustaceans mainly penaeid prawns and lobsters formed the bulk of the high value export items from the Saurashtra region. Lobster production had increased from 248.9 tonnes in 1982-'83 to 473 tonnes in 1991-'92, showing a 90% increase over the decade. The earnings from lobster export increased from Rs. 85.14 lakh in 1982-'83 to Rs. 18.6 crores in 1991-'92. (Table 1). This remarkable increase in the export earnings was because, (i) the total lobster catch increased considerably over the decade and (ii) the lobster price recorded a many fold increase in the local market because of the high export demand and a healthy competition among the exporters.

Spiny lobster *Panulirus polyphagus* (Herbst), locally called as 'Titan', supports the rock lobster fishery along the Bhavanagar coast. Lobsters are landed at all the major fishing centres from Ghoghala to Katpar in the district (Fig. 1). A

TABLE 1. Estimated lobster export from Gujarat, and income earned during the period 1982-'83 to 1991-'92

Year	Quantity in tonnes	Value in lakhs of rupees
1982-'83	101	85
1983-'84	73	48
1984-'85	373	295
1985-'86	644	563
1986-'87	412	557
1987-'88	401	630
1988-'89	209	299
1989-'90	395	698
1990-'91	353	1032
1991-'92	473	1860

major portion of the catch comes from the 'Bandhans' (fixed stake nets) and gill nets. 'Bandhans' are made of synthetic twines and has a mesh size of 1.5 cm to 2.5 cm and a length of 225 m to 450 m. The width (height) of the net is 1 m. 'Bandhans' are operated in the inter-tidal zones, where vast areas get exposed during the

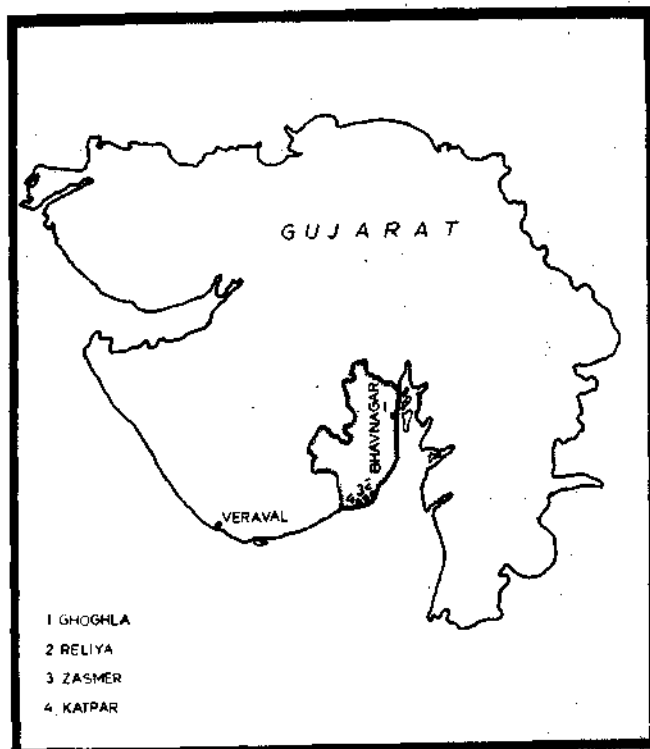


Fig. 1. Map of Gujarat showing Bhavanagar District. The numbered centres indicate the places of lobster culture.

low tide period. Lobster catches occurs throughout the year with the peak during September-October.

Since many years, it was observed that large number of juveniles of *p. polyphagus* were getting caught in the 'bandhans', gill nets and in the trawl catches. Since the acceptable weight of young lobster for export is 50 g and above, young lobsters are usually sold for prices as low as Rs.15 to 20 per kg. Hence, the fishermen and exporters felt in general that if the under sized young ones can be reared for a few months in some controlled conditions and fattened to attain 100 g or more, the returns would be enormous.

In a hypothetical situation one kilogramme under sized lobster, weighing 40 g each, fetches only Rs. 20. But if they can be reared to 100 g each, the yield would be 2.5 kg of exportable grade lobster fetching an average price of Rs. 250 per kg. Thus it is clear that a mere investment of Rs. 20 can bring back a return of about Rs. 600 within a short span of time. This thinking seems to have encouraged a number of fishermen along the Bhavanagar coast to venture into the culture of juvenile lobster. This unique culture system, locally known as 'pit culture' offers immense potential for propagation to the other lobster fishing areas. A general account of this type of spiny lobster culture has been given by Suseelan *et al.* (1993) in the handbook on 'Shrimps, Lobsters and Mud crabs' published by the MPEDA at the 'INDAQUA' fair at Madras in 1993. A detailed account of this culture practice and its merits are described here.

Site selection and pit preparation

Areas adjoining the coral reefs, in the intertidal zones are selected for digging the pits. Usually pits are dug in where the substrate is hardened due to the fusion of dead corals and sand particles. This substrata prevents water seepage from the pits and are ideal for inter tidal culture activities.

Pits are dug parallel to the coast line. After digging and levelling, coral boulders are arranged inside the pits to provide natural shelter to the lobster. Sea water enters the pit during high tide and hence water exchange takes place without any manual effort.

Pits are reported to be varying in size from place to place. Pits ranging from 1.75 x 1 m size to 21 x 7 x 1 m size are in operation at present. However, for the better management,

10 x 7 x 1 m sized pits are reported to be more accepted among the culturists. In some cases pits are also partitioned using nylon nets, so as to stock separate size groups, avoiding competition for food and shelter.

Pits are invariably covered with nylon monofilament nets (Fig. 2). Nets are fixed on wooden frames using reepers and nails. The wooden frame is firmly fixed all along the sides of the pit, using concrete blocks. The net cover is usually kept in a tent like position using wooden pieces fixed at regular intervals inside the pit. The net cover prevents the lobsters from escaping when tide water floods the pit.

Seed collection and transportation

Young lobsters caught in the 'bandhans' are collected and transported by road or over sea using wet gunny bags and plywood boxes to the culture site since lobsters can be kept alive outside sea water for considerable time. If provided with wet seaweeds, seawater soaked saw dust or wet sand, transportation of juveniles do

not pose any problem.

Stocking density

Stocking rates varies from farmer to farmer and in most cases excessive stocking and as a result stunted growth has been reported from many places. However, through trial and error method some of the farmers now stocks 10 to 15 young ones per square metre. At Zasmir in a pond of 21 x 7 x 1m size, a stocking density of 3000 numbers was reported with good growth rate. Sarvaiya (1991) recommended 1000 numbers in a pond of 10 x 7m size and reported of getting a much better growth rate. However, after analysing the growth rate in different systems a stocking density of 10-15 lobster per square metre seems to be the ideal proposition.

Food and feeding

Since the areas adjoining coral reefs are rich in productivity and abound with a variety of organisms like worms, bivalves, small crabs, echinoderms and a host of other organisms, tide

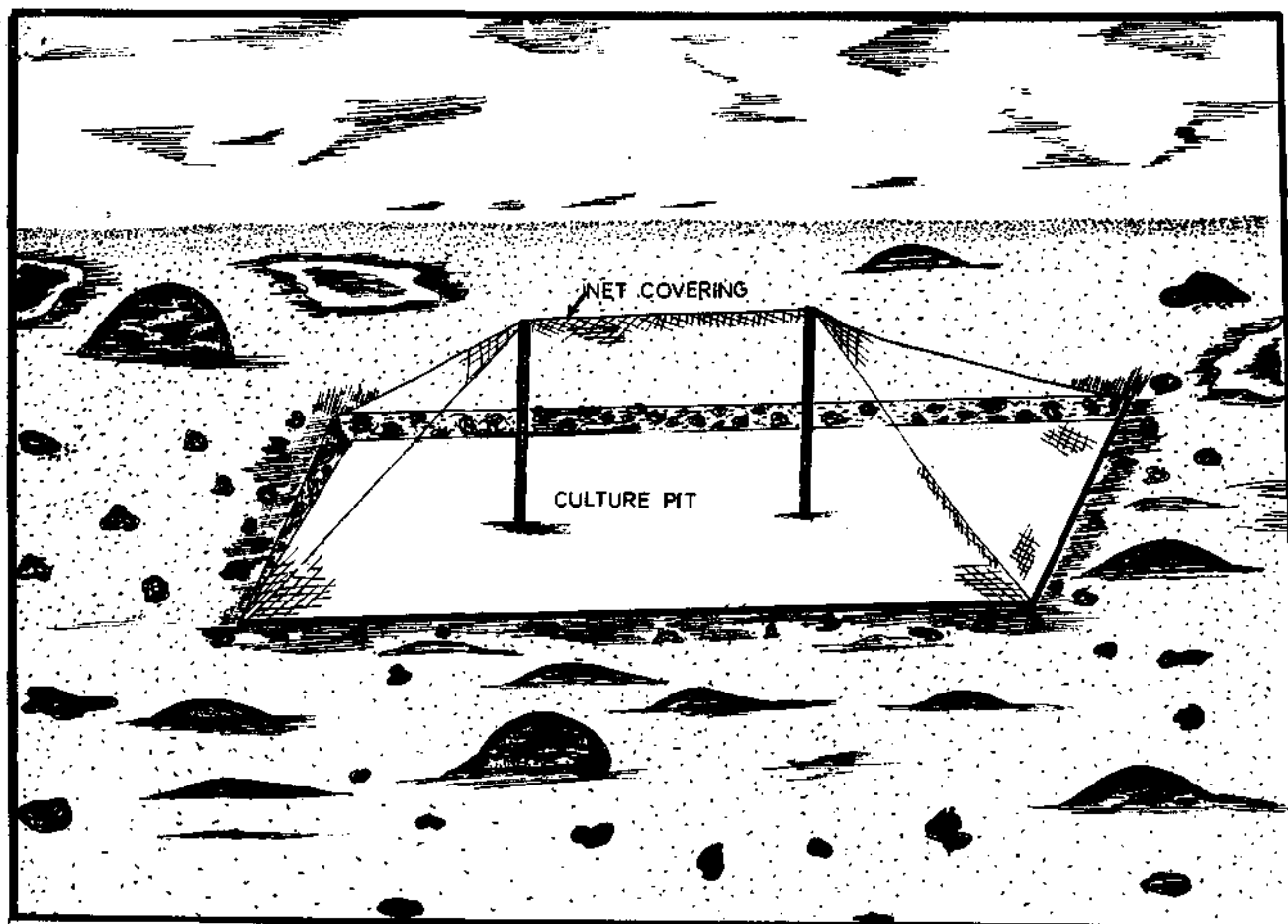


Fig. 2. Diagrammatic representation of a lobster culture pond in the intertidal zone.

water brings in sufficient quantity of these organisms which forms the natural food items of *P. polyphagus*. Supplementary feeding was done by using the trash fish from the 'bandhan' catches. Trash fishes are crushed before feeding lobsters in the rearing pit. At present no specific feeding rate is practiced by any of the fishermen and in most of the cases excess feeding has been reported. But, since the water inside the pits is regularly exchanged through tidal flow, deterioration of the water quality has not been reported. No specific feeding time was followed by any of the farmers.

Growth rate

In majority of the cases reported, it was found that lobsters weighing below 50 g was used for stocking in the ponds. The rearing time was 80 to 90 days in most cases, and it was reported that the lobsters were fattened to 100 to 125 g within this period. Although much higher growth rates were reported from some other areas its authenticity could not be verified. However, in almost all the cases average monthly weight increment was found to be 25 to 30 g per month.

Harvesting and marketing

The cultured lobsters are harvested after draining the pits during low tide period or after pumping out the water. Lobsters hiding in the crevices are hand picked and marketed alive. Cultured lobsters weighing in excess of 100g individually, fetches prices ranging from Rs. 200 to Rs. 250 per kg. Almost all the lobsters are procured by the processing plants at Veraval for exporting to the overseas markets.

Discussion

Sarvaiya (1987, 1991) reported extensive lobster culture activities from the Bhavanagar District. He had also reported a case study from Katpar where a growth rate of 100-125 g weight increment in 80-90 days was observed in a pit. The pond size in this case was reported to be 7m x 4.6m x 1m. It is assumed that since the pond size was smaller the management and feeding would have been much easier and resulted in a better growth rate. However, even in larger ponds, an average growth rate of 25-30 g per month was found quite possible.

The economics of this unique culture system is not fully available at present. Because of the large scale 'bandhan' operation, the availability of the young ones are in plenty and

the prices are also very low. Since the feed used is mainly trash fish of low value, the input and maintenance cost of the system is very low.

The yield from a pond of 70 sq.m size, in which 1000 young lobsters were stocked, was reported to be about 100 kg per crop and about 300 kg in an year from three crops. The cost of juveniles worked out to be Rs. 2,100/- at the rate of Rs. 20/- per kg. The income from the sale of 300 kg of lobster at the rate of Rs. 250/- per kg worked out to be Rs. 75,000. Even after deducting all the input costs like seed, trash fish, nylon netting, labour charges etc., it may be still possible to make a net income of about Rs. 50,000/- from a 70 sq. m pond. This high income earning is possible because of the price barrier existing between the under sized lobster and the large sized lobster. Hence, through this type of culture practice, where fattening of the juveniles is mainly done, a precious resource otherwise wasted is well utilized and valuable foreign exchange is earned.

The most significant reasons for the high growth rate reported in this type of culture is due to (i) regular exchange of water in the ponds, through tidal inflow, (ii) availability of cheap trash fish, in large quantities in the area as feed and (iii) high productivity naturally available in the coral reef areas.

Lobster catches from the traditional fishing grounds in the southwest coast has been showing a declining trend for many years now (Philipose, 1991). Occurrence of juvenile lobsters in the gill nets, trawl nets, stake nets and disco vajas are quite common in almost all the areas where lobster fishery exists. In most areas especially along the southwest coast, juveniles are still sold for very low prices or are discarded. Hence, in this areas it will be a very viable and economical proposition to have a series of ponds dug in the beach with water exchanging either through tidal inflow or by mechanical pumping, to culture the young lobsters to marketable sizes. Once perfected this will help to conserve the resource, to utilize it in a better way, to augment the income of the fishermen and also to generate useful employment to the fisherwomen in the rural fishing villages.

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