Handbook on Aquafarming

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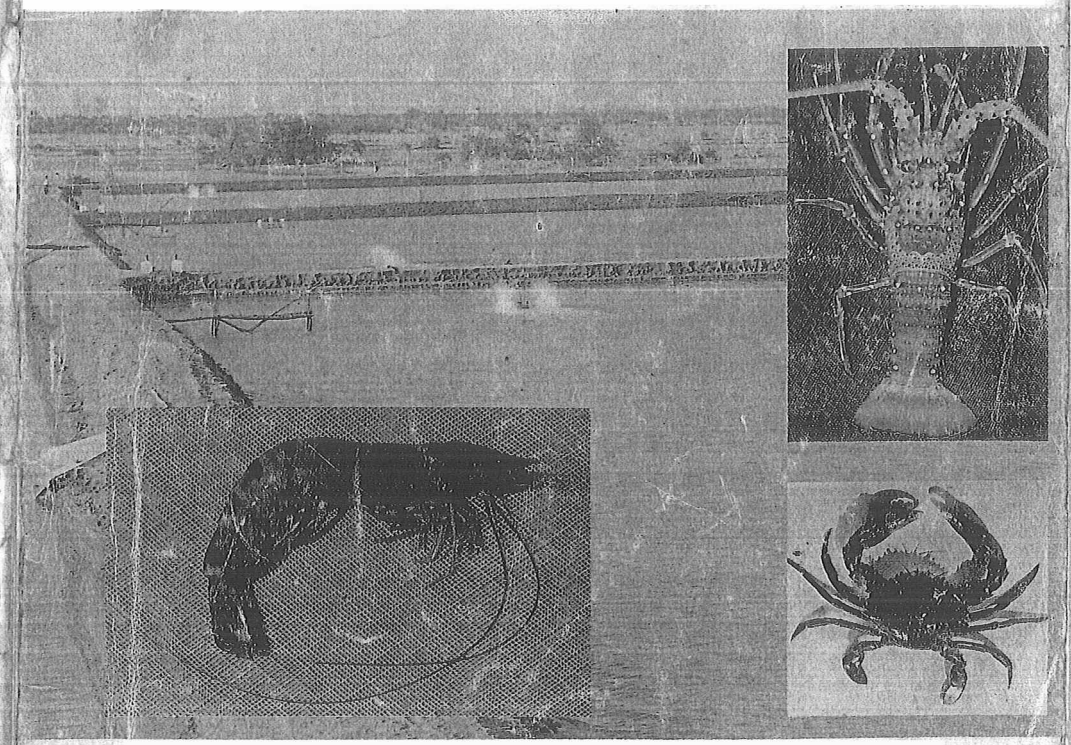
LOBSTERS
MUD CRABS



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Part II

LOBSTERS

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LOBSTERS

INTRODUCTION

Among marine crustaceans, lobsters are the most highly priced ones and of significant commercial interest in many countries. Due to their increasing demand as a favourite of epicurean gourmets, lobsters have captured excellent markets in developed countries. Lobster fishing, therefore, is practised on intensive scale throughout the world and a stage has come that most of the traditional lobster stocks are under heavy exploitation now. According to World Fishery Statistics, the annual lobster production of the world during 1981 - 1990 period ranged from 1.8 lakh tonnes in 1982 to 2.3 lakh tonnes in 1989, thereby showing an increase of only 28% over the years. The average annual production of about 2.1 lakh tonnes of lobsters, which included 1.9 lakh tonnes of spiny lobsters and allied species (92%) and 0.2 lakh tonnes of squat lobsters (8%), formed 6% of the world crustacean landings from the marine sector. The contribution of the former group from Indian Ocean region for the same period was about 60,000 tonnes on an average of which over 70% was recorded in the Western Indian Ocean mainly from the coasts of South Africa, Oman and Republic of Yemen. India landed an average of about 24,000 tonnes, of which nearly 90% came from the west coast.

Though limited fisheries have emerged in recent years for deep-sea lobsters in some parts of the world, assessment of their stocks does not throw hope for sustained fisheries in any appreciable level to meet the

growing demand of lobsters in the world markets. The only alternative left for stepping up lobster production in future is sea farming.

Lobster resources of India

The lobster resources of India include a few species of coastal and deep-sea forms which occupy different ecological conditions on the continental shelf and upper continental slope. Qualitatively these animals are of two major categories - the spiny lobsters or rock lobsters belonging to Family Palinuridae and the sand lobsters or Squat lobsters belonging to Family Scyllaridae. The coastal fishery is supported by the spiny lobsters *Panulirus homarus, P. polyphagus, P. ornatus, P. versicolor, P. penicillatus,* and *P. longipes* and the sand lobster *Thenus orientalis,* of which *P. homarus, P. polyphagus* and *T. orientalis* are the most dominant ones. Commercial fishing grounds for lobsters are rather discontinuous along Indian coast, the most productive areas being the northeast region and the coasts of Trivandrum, Kanyakumari and Tinneveli districts of Kerala and Tamil Nadu.

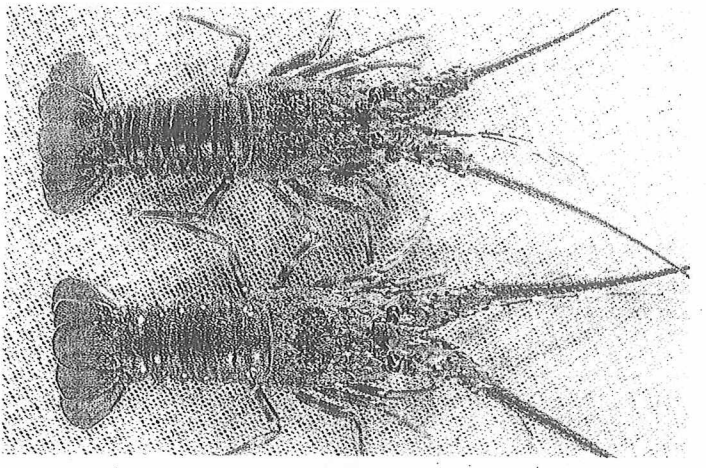
On the northwest coast, lobsters are caught mainly by bottom trawls which are operated in the muddy shrimp grounds. In most other regions, lobster fishing is restricted to the rocky inshore areas using artisanal gears such as bottom-set gill-nets, traps, trammel nets etc. The most important species constituting the catches are *P. polyphagus* and *T. orientalis* in Gujarat and Maharashtra, *P. homarus* in Kerala and *P. homarus, P. ornatus* and *T. orientalis* in Tamil Nadu coasts. The annual lobster landings during the past ten years (1982-91) ranged between 1300 and 4090t. About 70 to 80% of this catch was contributed by Gujarat and Maharashtra alone, and the rest mainly by Kerala and Tamil Nadu. The lobster fishery showed a declining trend after reaching its peak in 1985.

Two species of deep-sea spiny lobsters, namely, *puerulus sewelli* and *linuparus somniosus* are newly recognised resources at 200-400m depth. These are commercially exploited by large trawlers from the southwest coast, Gulf of Mannar and Andaman waters.

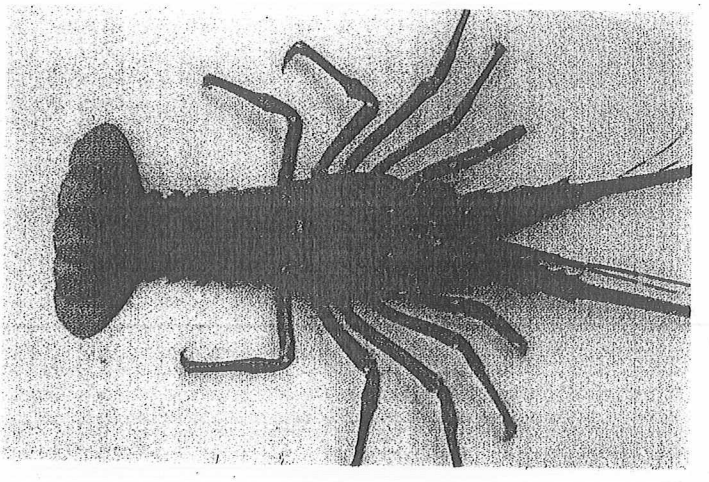
Culture of spiny lobsters

Tropical spiny lobsters have several essential characteristics which make them suitable for aquaculture. They are adaptable to captive conditions, less cannibalistic and relatively faster growing than their counterparts in the subtropical and temperate regions.

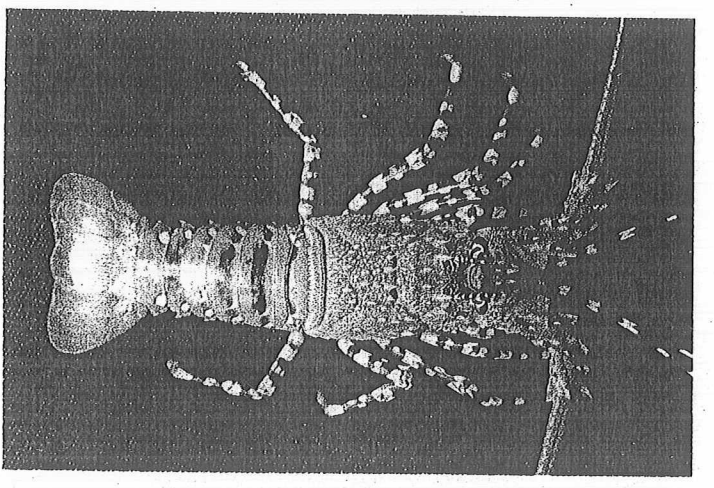
Panulirus polyphagus



Panulirus homarus



Panulirus ornatus



Raising under-sized or juvenile lobsters of wild origin in suitable enclosures to marketable size through appropriate feeding schedule and water quality management is all that is done in spiny lobster culture at present. It is successfully practiced in many tropical countries like Japan, Taiwan etc. In Japan, extensive culture of *P. japonicus* is being undertaken along the southern coast. The Government of New Zealand recently permitted private farmers to start spiny lobster culture. In Taiwan a well organised industry is developed for the culture of *P. homarus*. Here, under-size lobsters obtained by the capture fisheries, which are too small for human consumption, are used as seed for farming. These seed with an initial size of about 10cm and weighing 25g at stocking are grown in lobster ponds to the average market size of 330g in about 16 months. Mortality from stocking to harvesting is about 20%. The largest size lobster farm, which contains a minimum of five to six grow-out ponds, has about 1.3ha of water and has the capacity to produce about 150,000 market size lobsters a year.

Prospects of lobster culture in India

In India, spiny lobster culture hitherto considered commercially and economically not viable has suddenly become promising with the dramatic increase in the price of small and medium sized lobsters, which are exported as live, whole cooked or in frozen condition. Until nineties, exporters preferred only larger lobsters weighing 250g and above the growing lobsters to such sizes was not economically feasible. The change of preference to smaller size lobsters for export has indeed given an impetus for lobster culture in the country.

Cultivable species - their identity, distribution and biology

Among the shallow water lobsters occurring along Indian coast, *P. polyphagus*, *P. homarus* and *P. ornatus* can be considered for commercial culture in their respective regions of abundance (Fig. 1). These species can be easily distinguished based on the following morphological features and colour markings which are discernible from early juvenile stage onwards.

Panulirus polyphagus (Fig. 2) - Attains a maximum body length of about 37cm. Carapace rounded and moderately covered with spines and tubercles. Antennular plate with a single pair of anterior spines. Abdomen without grooves. Body colour dull greenish. Each abdominal segment with a distinct transverse band of white colour along the posterior margin. Legs with indistinct blotches and short stripes.

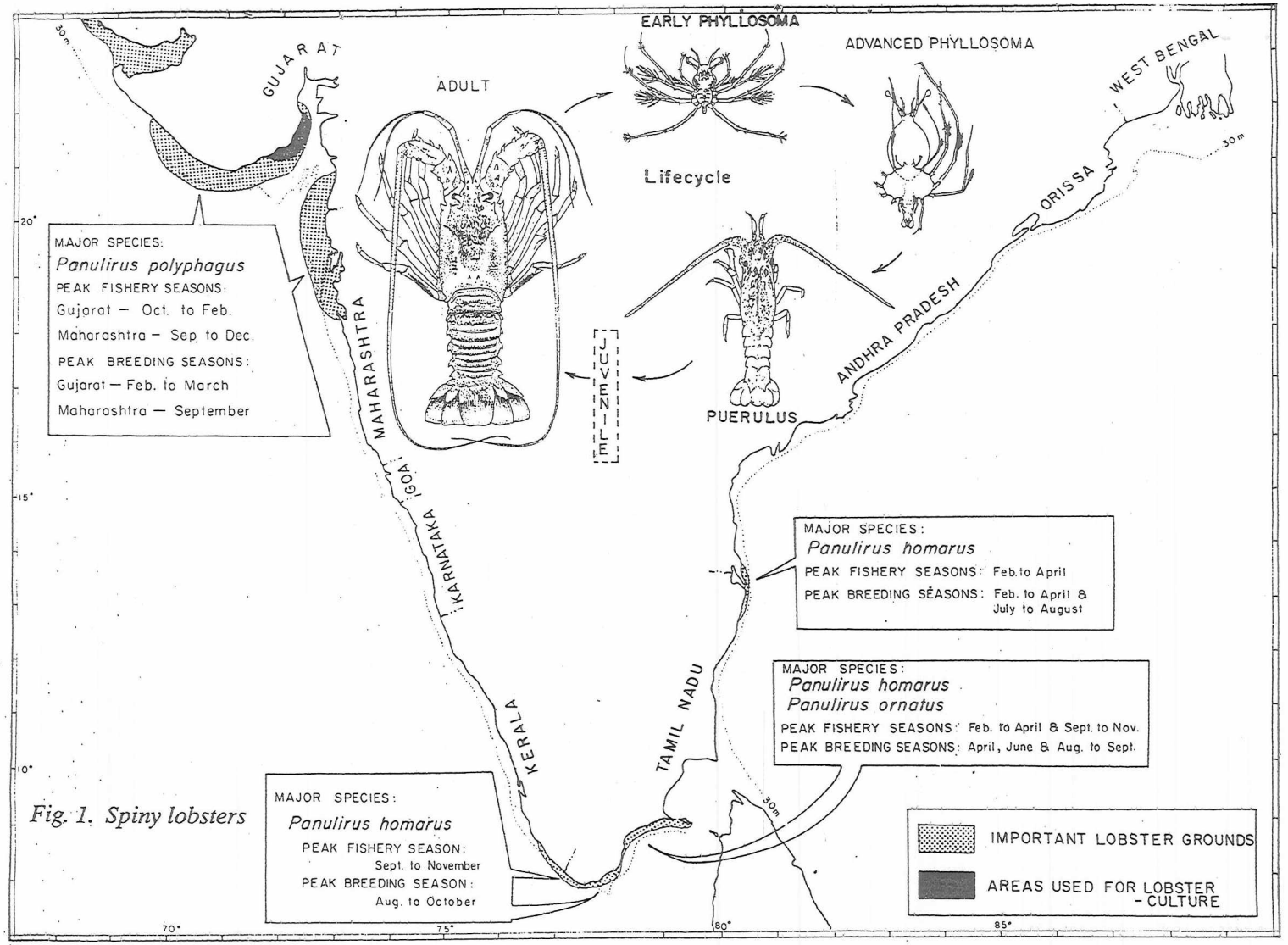


Fig. 1. Spiny lobsters

Panulirus homarus (Fig. 3) - Medium size lobster growing to about 30cm in body length. Carapace rounded with numerous spines. Antennular plate bearing two equal pairs of spines and many scattered smaller spines in between. Abdominal segments grooved transversely, grooves some times interrupted medially. Colour of body dark greenish to blackish. Lateral border of each abdominal segment with a white circular spot.

Panulirus ornatus (Fig.4) - The largest species under the genus, this lobster grows to about 50cm in body length. Carapace rounded and covered with numerous spines and tubercles. Antennular plate bearing two pairs of spines, the anterior pair being much larger than the posterior. Abdominal segments smooth, without transverse grooves. Body colour greyish brown. Each abdominal segment with a broad dark transverse band and two large white spots on either side. Legs with black and light yellow stripes.

P. polyphagus is generally associated with muddy sea bottom and found in maximum abundance along Maharashtra and Gujarat coasts. *P. homarus* and *P. ornatus* co-exist more commonly in the rocky coastal areas of southwest (Trivandrum-Cape Comorin), Gulf of Mannar and Madras. The former species forms 70-90% of the lobster population in the southern districts of both the coasts, while the latter is dominant (60-70%) at Mandapam.

Spiny lobsters are heterosexual and strictly marine throughout their life. After attaining maturity at the age of 2 to $2^1/_2$ years they reproduce in the inshore waters. Though breeding is a continuous process, peak breeding occurs in different periods of the year and at different regions of the coast for each species. In general, peak breeding is noticed during February-April and June-September in our coasts (Fig.1). The life cycle involves a rather prolonged metamorphic phase extending for several months. Fertilized egg, after completing embryonic development in the 'berry' of mother lobster, hatches out as a flat transparent larva called 'phyllosoma'. This pelagic larvae passes through a series of successive phyllosoma stages by moulting during the next 10-12 months and transforms into the characteristic post-larvae called 'puerulus'. The puerulus, though resembles a miniature lobster in body form, continues to be transparent and settles down for benthic life. The puerulus soon develops into a juvenile or baby lobster.

The lobsters are nocturnal and omnivorous. They feed on a wide variety of bottom dwelling organisms and decaying animal matter. The

most favoured food appears to be bivalve molluscs, polychaets and fish. Growth is relatively faster in the early stages and the animal attains 20 to 25cm in the first 2 years. After this the growth rate is very low being 2 to 3cm only per year. Spiny lobsters are believed to have a life span of 7-8 years in Indian waters.

Present status of lobster culture

An organised culture fishery for lobsters has not yet developed in India although feasibility of spiny culture has been demonstrated as early as late seventies by the Central Marine Fisheries Research Institute. Commercial farming of spiny lobsters is practised at present in a limited scale on the Gujarat coast. Private fish farmers of the Bhavnagar District (Fig.1) make use of the coral reefs or rocky areas for this purpose. Juveniles of *P. polyphagus* collected from the rocky and muddy areas during ebb tide are grown in 'pits' dug out in the inter-tidal zone at a stocking rate of 20 lobsters / sq.m. The 'pit' is usually of the size 30x15x1.25m and covered with monofilament net fixed at the margin with concrete. The tide flushes the pit with fresh sea water twice daily. Crushed trash fish, small crabs, marine worms, clams etc. are used as food for the lobsters. The juvenile lobsters with an initial weight of 30-35 g grow to 100-125g in 10-13 weeks.

The seed used for this culture is purchased from local fishermen who collect them from the inter-tidal areas using stake nets ('Bandhan' etc.) at the rate of about Rs.20/kg. After harvesting, the lobsters are sold for Rs.200-250 / kg in Bombay market.

Of late, interest in lobster farming is also evinced in other regions of Indian coast. Some private farmers have started pilot scale farming of *P. homarus* and *P. ornatus* on the southwest and southeast coast.

Problems and constraints

One of the major problems facing spiny lobster culture throughout the word is shortage of seed. At present the culturists entirely depend on the natural seed resource which is too inadequate to satisfy the fast developing lobster culture industry. Though it has been possible to successfully complete the larval development of some of the species in laboratory condition by countries like Japan, a break-through has not been achieved so far for the production of pueruli in captivity. It is also not known when hatchery produced lobster seed will be available to the culturists. Until a viable technology for seed production is developed, the lobster farmers have to depend upon the wild stock.

Lobster culture with puerulir as seed is considered to be risk-prone and less profitable. Studies conducted at the Field Laboratory of CMFRI, Kovalam, Madras have shown that puerulir require 300-600 days (43-86 weeks) to grow to a size of 150g, although the postlarvae of *P.ornatus* and *P. argus* are reported to attain about 300-450g in 300-550 days. Apart from the difficulty in collection of large numbers of puerulir from the nature, the low survival in early stages, inadequate information on their food requirements and relatively longer period to grow them to commercial size are other problems in farming them. So, the only realistic approach for the time being will be to collect the early juveniles from the wild and grow to marketable size.

Future prospects

Almost all lobster fishing countries have enforced legal minimum size for lobsters in order to conserve this valuable natural resource and such management regulations are strictly followed by the fishermen. In India, however, such legal restrictions do not exist although it is high time they did so in the context of increasing fishing mortality taking place for juvenile lobsters throughout the country. Fishery monitoring studies of CMFRI have shown that 30-40% of the lobster catch at present consists of juveniles and over 75% of them are below 50g size. In most areas of Indian coast, these undersized lobsters are not released back into the sea and are either sold at cheaper rates for local consumption or simply discarded. Needless to say that this is a colossal waste of the valuable marine living resource which has been fetching to the country foreign exchange to the tune of about Rs.35 crores every year. The example set by the fish farmers of Bhavnagar district in Gujarat, is an eye-opener to the coastal fishermen of other areas of the country in making better use of millions of baby lobsters which are mercilessly destroyed in capture fishery.

The growth rate of spiny lobsters in tropical waters is highly encouraging when compared to that in temperate regions as revealed by experimental culture at laboratory and field levels in many parts of the world. At the field Laboratory of CMFRI, Madras, juveniles of *P.homarus* were grown from 45g to 270g in 43 weeks and they attained 150g in 33 weeks. With better water management and holding conditions, spiny lobsters can be grown to marketable size of 150g in a reasonable period of 16-18 weeks. The growing period can be further shortened by inducing accelerated growth by bilateral eyestalk ablation. It has been shown that 45g *P. homarus* could be grown to 150g in 10 weeks by this method. The

estimated growth of ablated *P.ornatus* is 2173g/year, *P.homarus* 749g/year and *P.polyphagus* 779g/year if the initial weight is taken as 80g.

Among the three species of spiny lobsters mentioned as suitable for farming in India, *P.ornatus* is the most promising one as this is the fastest growing lobster available in Indian coast. Juveniles of this species have been reported to occur in abundance at Tuticorin. *P.homarus* juveniles are caught in large numbers in most areas of its fishery on the southwest and southeast coast. At Madras, the catches of trammel nets operated in the artisanal sector include a high proportion of under-sized lobsters of the species, especially during February - May. Similarly for *P.polyphagus*, the rocky and muddy intertidal zone of Gujarat and Maharashtra is good nursery ground where puerulir and juvenile stages occur in peak abundance during June-October.

In the absence of a hatchery technology for large-scale production of seed, lobster culture can be popularised with the naturally available baby lobsters. From the available information of growth potential there also appears tremendous scope for increasing the output if the farming is done on scientific lines. The scientific approach can be in different ways. The lobsters can be grown on nutritionally balanced diet in field conditions or in indoor cement tanks having continuous seawater flow. Indoor farming many be capital intensive but higher stocking can be practised with good water management. Lobster culture can also be carried out in cages and trays fixed serially in lagoons and shallow water bays.