Natural populations of marine animals may decline in their productivity over a period of time due to continuous and heavy exploitation of the resources or due to natural causes or a combination of both. Such a situation would warrant control of fishing activities to safeguard their productivity. Alternatively, the productivity of such marine animals can be maintained and increased to some extent through the process of sea ranching.

Sea ranching involves controlled breeding of marine animals, large scale production of their seed and release into the coastal waters, lagoons and brackishwater areas depending on the type of animals under question.

**Prawns**

The prawn fisheries of India are supported mainly by the capture of prawns from the sea. This resource has been continuously exploited over the past several decades and production appears to have reached a point of stagnation, the catches from the inshore waters not improving any further in spite of additional fishing efforts. Therefore, to increase the productivity of prawns from the inshore waters, work has been initiated by the CMFRI to identify suitable species of prawns which can survive, grow and breed in high saline waters. Penaeid prawns like *Penaeus semisulcatus*, *P. japonicus* *P. latisulcatus* and *P. canaliculatus* have been identified for this purpose. All these species could be bred under controlled conditions and a few generations of some of these species have already been raised without going back to the sea which is the normal phenomenon to take place in the case of marine prawns. In order to take up this programme on a large scale, to begin with, the green tiger prawn, *P. semisulcatus* (Fig. 1) has been selected for sea ranching at the Regional Centre of CMFRI at Mandapam Camp. During the last two years, the species has already been bred under controlled conditions and a generation of prawns has been raised recently from the hatchery bred stock. These prawns were induced to spawn without having to go back to sea, for the first time. This opens up vast scope for development and management of brood stock for hatchery production of seed. A total of more than 4,70,550 of hatchery produced post larvae in the size range of 10 - 15 mm TL were released into the Pillaimedam salt water lagoon (at Mandapam) during 1988 - '89, to supplement the natural recruitment. From the commercial fishery in the adjacent sea it was observed that the majority of the stock released has migrated from the lagoon into the sea (Fig. 2). This work is at present only on an experimental scale but needs to be strengthened and scaled up for mass production of seed and release into the sea. This species has the advantage in that, it does not migrate long distances and is habituated to live in the sea - grass and seaweed beds of the region.
Clams

A number of clams are of high food value in the country and clam meat has high potential for export. The shell is used in lime and cement industries. Heavy exploitation of clams is found in many coastal areas. Being sedentary, they can be removed from the natural beds easily with minimum effort. Therefore, the populations are subjected to indiscriminate exploitation leading to decline in the catches. Induced breeding and hatchery production of the clams Meretrix meretrix, M. casta, A. granosa and Paphia malabarica (Fig. 3) have been achieved by the Institute at the Tuticorin Research Centre. Among these species, the seeds of P. malabarica have been ranched in Ashtamudi Lake, in Kerala State. A total of more than 63,000 hatchery-produced seeds measuring 4.5 - 14.5 mm and about 5 / 2 months old were released into the lake, in an area of about 250 m² during 1989. Since this species has great export value (about Rs. 1 crore per year on about 500 tonnes of frozen meat), there is urgent need to enhance production from this resource by hatchery production of the seed and sea-ranching.

Fig. 3. Adult clams.

Fig. 4. Juvenile clams.

Pearl oysters

The pearl banks of the Gulf of Mannar are world famous. Up to 1961 there has been a regular annual fishery for the pearl oyster for recovery of naturally produced pearls which was under the control of the Government. But, for several years now, no pearl fishery has been held since the natural populations have declined due to various reasons. In view of the situation, the Institute had already undertaken a programme of sea ranching of pearl oyster (Pinctada fucata) (Fig. 5) through artificial breeding and seed production of the pearl oyster in the laboratory at the Tuticorin Research Centre of CMFRI. Several lakhs of spat (Fig. 6) have already been sea-ranching. The Institute successfully bred the blacklip pearl oyster (P. margaritifera) also with a view to produce pearls as well as increase its populations through sea ranching.

Fig. 5. Adult pearl oyster.

Fig. 6. Pearl oyster spat.

Top shell

The top shell, Trochus niloticus is a valuable gastropod, which is sought after for its ornamental
shell which may fetch about Rs. 50 - 60 per piece. The species has limited distribution in the Andaman and Nicobar Islands. The populations are reported to be declining. In view of this, the CMFRI initiated work to breed an allied species viz. *Trochus radiatus* (Fig. 7 & 8) with a view ultimately to breed *T. nyloticus*. The Institute successfully bred *T. radiatus* and has plans to initiate the work on *T. nyloticus* in the Andaman and Nicobar Islands with the ultimate objective of sea ranching this species to increase its natural population.

**Sea cucumber**

Valuable resources of sea cucumbers are available in certain localities of the mainland, Andaman -

![Fig. 7. Adult Trochus (Top shell).](image1)

![Fig. 8. Juvenile Trochus (Top shell).](image2)

Nicobar Islands and the Lakshadweep. Although 13 species are of commercial value, in India at present only 2 species, viz., *Holothuria scabra* and *H. spinifera* are fished in the Gulf of Mannar and Palk Bay for processing and export of product called Beche-de-mer. Export earnings crossed Rs. 1 crore in 1989. But, there is good scope for using the other larger species such as *H. atra* in the mainland, *H. nobilis*, *Bohadschua argus*, *B. marmorata* (40 cm) and *Stichopus chloronotus* in the Lakshadweep and species of *Actinopyaga echinites* (35 cm and 500 gm - 1 kg) in the Andamans where they are abundant.

The sea cucumber, *Holothuria scabra* (F. 9) is the dominant species exploited by fishermen through skin diving in the Palk Bay and Gulf of Mannar. Over years of exploitation of this species, the stocks of the sea cucumber started declining. Being a benthic animal with only little movement, it is vulnerable for easy capture. Despite advice by the Institute, strict regulations could not be enforced for restricting the capture of young ones below 8 cm in size for which there is a ban by Govt. of India. Capture of such immature animals leaves no chance for them to breed and hence populations tend to decline. In view of this situation, the institute undertook experiments to breed the animals in captivity to produce seed and sea ranch the same at the Tuticorin Research Centre. A breakthrough has been achieved one year ago in the induced breeding of the animal and the seed could be reared up to adult size (Figs. 9 - 18)

![Fig. 9. Adult specimens of Sea cucumber (Holothuria scabra).](image3)

![Fig. 10. The eggs of Sea cucumber (Holothuria scabra).](image4)
Fig. 11. The fourcelled stage of *H. scabra*.

Fig. 12. The blastula of *H. scabra*.

Fig. 13. The dipleurula stage larva of *H. scabra*.

Fig. 14. The early auricularia larva of *H. scabra*.

Fig. 15. The late auricularia larva of *H. scabra*.

Fig. 16. The doliolaria larva of *H. scabra*.
THE OCCURRENCE OF LIVE BAIT FISH IN SOUTH ANDAMAN WATERS AND ITS SIGNIFICANCE

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Introduction

It is well known that the key factor required for the initiation of a pole and line tuna fishery is the availability and abundance of suitable live bait fishes. While surveying the infestation of the crown of thorn starfish *Acanthaster planci* in the National Marine Park, Wandoor and adjacent areas of South Andamans during April - May, 1989 some preliminary observations on the availability of live bait fish in the area were recorded. Eventhough it is not possible to arrive at conclusions based on the data collected, it is felt that the present observation can be used as a background information for a detailed investigation on the availability and abundance of live bait resources of the Andaman and Nicobar Islands.

The survey

The shallow nearshore areas of the labyrinth group of islands of National Marine Park, Wandoor viz. Twin, Jolly Buoys, Malay, Red Skin, Alexandra and Tarmugli islands; the North Bay and Scissosiris Bay at Port Blair were surveyed during April - May, 1989 for this study (Fig. 1). Initially the areas were explored for the location of sprat schools (Fig. 2). Later, random samples from various sites were collected by a drag net of 20 x 2m size (Fig. 3). The quantity of sprats and other fishes in the hauls from the different sites was recorded. The duration of each haul was ten minutes. The quantities noted were taken only as indications of availability and no statistical estimates were made.

Occurrence of live baits

The sprat, *Spratelloides delicatulus* (Front cover photo) which is recognised as one of the ideal live bait fishes for tuna by pole and line was available at the various collection sites (Fig. 1). The catch per haul of *S. delicatulus* and other fishes caught from the different sites are given in Table 1.

It could be seen that *S. delicatulus* was the most common and abundant species caught in all the collection sites. The percentage of *S. delicatulus* in the total catch ranged from 63% in Malay Island to 100%