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PROGRESS OF RESEARCH ON SEA RANCHING AT THE CMFRI

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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.

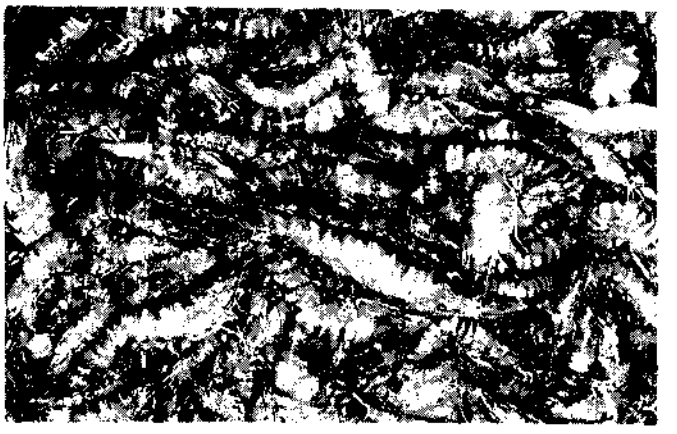

Fig. 1. Adult *Penaeus semisulcatus.*

Fig. 2. Juvenile *Penaeus semisulcatus.*

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, Anadara granosa* and *Paphia malabarica* (Fig. 3)

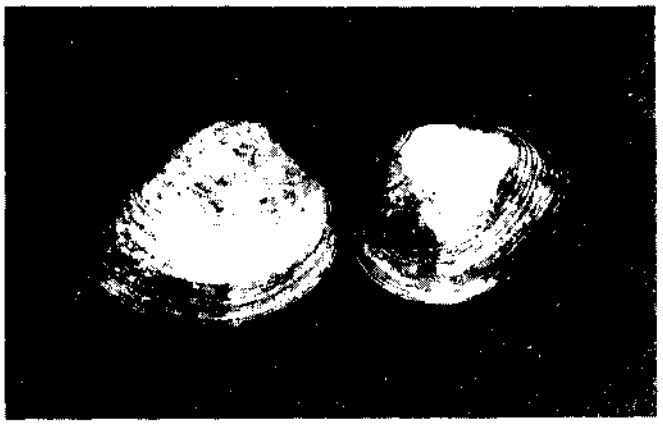

Fig. 3. Adult clams.

have been achieved by the Institute at the Tuticorin Reasearch 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 - producted seeds measuring 4.5 - 14.5 mm and about 5 1/2 months old were released into the lake, in an area of about 250 m^2 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.

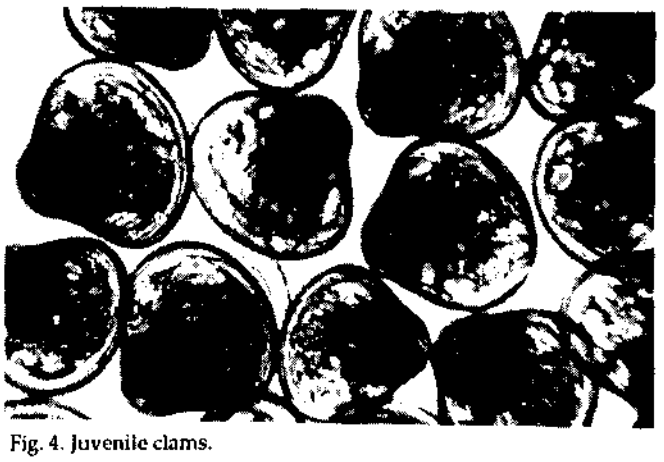

Fig. 4. Juvenile clams.

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 ranched. 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 nyloticus* 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 sucessfully 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).

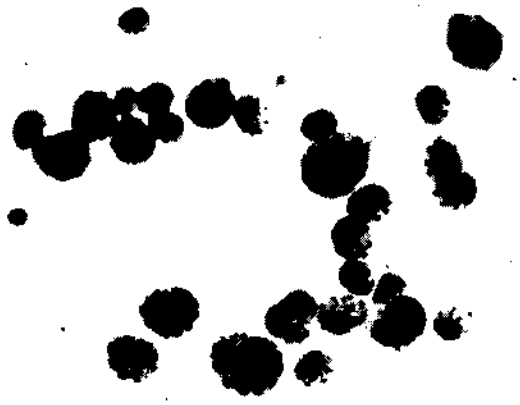

Fig. 8. Juvenile *Trochus* (Top shell).

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*, *Bohadschia argus*, *B. marmorate* (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 upto adult size (Figs. 9 - 18)

Fig. 9. Adult specimens of Sea cucumber (*Holothuria scabra*).

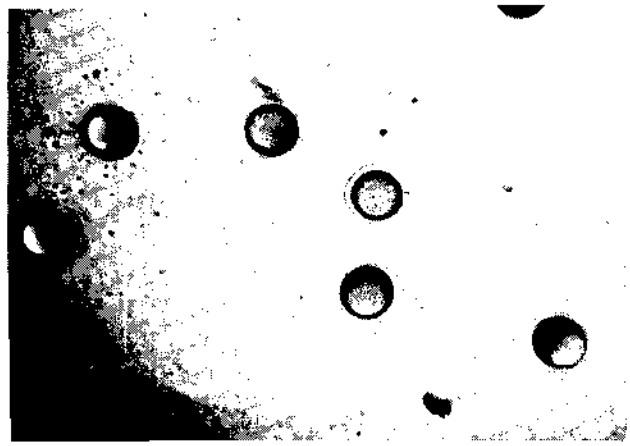

Fig. 10 . The eggs of Sea cucumber *(Holothuria scabra)*.

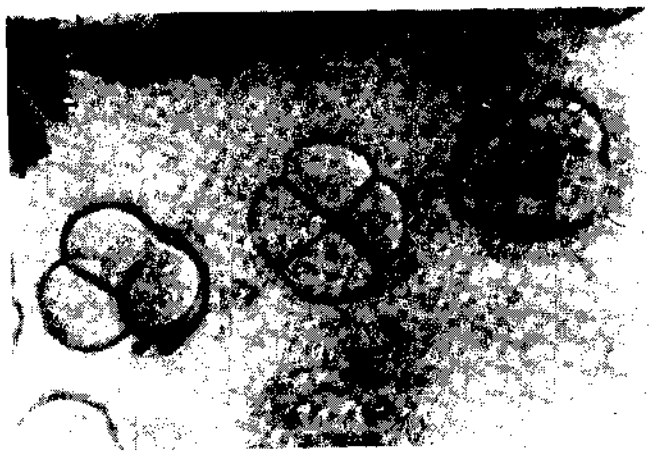

Fig. 11. The four celled stage of *H. scabra*.

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*.

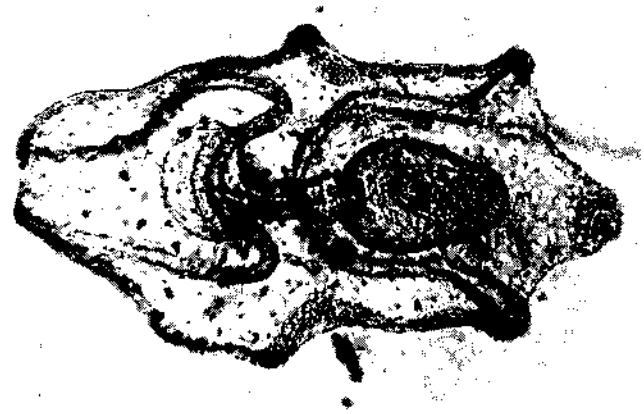

Fig. 15. The late auricularia larva of *H. scabra*.

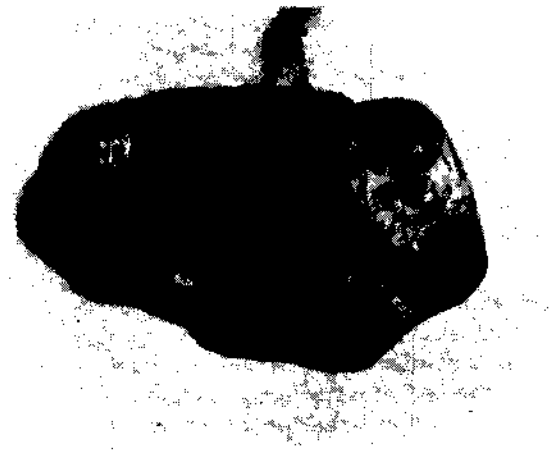

Fig. 16. The doliolaria larva of *H. scabra*.

Fig. 17. The pentactula larva of *H. scabra*.

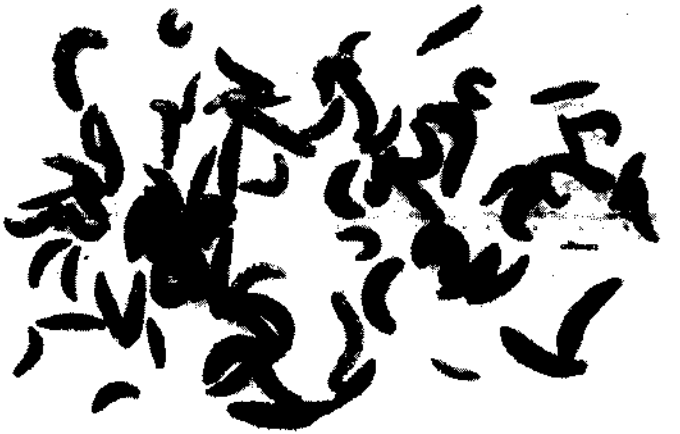

Fig. 18. Some juvenile specimens of *H. scabra*.

Future

Establishment of hatcheries at strategic locations and production of seed on a large scale for subsequent release into their natural habitats would go a long way in enhancing production of these animals from the coastal waters.