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MAJOR BREAKTHROUGH IN SPINY LOBSTER CULTURE

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Spiny lobsters form an important component of the crustacean resources of our marine fisheries. It is second in importance to prawns in terms of commercial value and has an export market. The Central Marine Fisheries Research Institute has been carrying out researches on spiny lobster resources along our coast, their fishery, production and biology based on the natural stocks. Due to its high export value, there has been heavy pressure on these coastal stocks. (Table)

Six species of spiny lobsers of commercial importance occur in Indian waters and these are:

Panulirus homarus (Linnaeus)
Panulirus polyphagus (Herbst)
Panulirus penicillatus (Oliver)
Panulirus ornatus (Fabricius)
Panulirus versicolor (Latreille)
Panulirus longipes (Milne-Edwards)

While the Institute is working on the rational exploitation of the lobster stocks, it has also started programmes for developing proper techniques for their culture. The major constraints encountered in lobster culture are:

1. Our inadequate knowledge of their reproductive physiology
2. Protracted complex life cycle with larval phase extending to several months and problems of maintaining the larvae.
3. Nutritional (feed) requirements of larvae and adults.
4. Slow growth of lobsters from puerulus stage to maturation and harvestable sizes.
5. Behaviour of lobsters.

In fact, even in areas such as water quality requirements, diseases, and management techniques for lobster culture, our knowledge is still meagre. In view of these inadequacies, the Institute has given priority for the following:

- Collection and maintenance of brood stock
- Controlled breeding
- Larval rearing
- Culture of baby lobsters (puerulus) to commercial size.

The programme also involves a multi-disciplinary approach including researches on nutrition, pathology, physiology, endocrinology and genetics.

One of the first tasks undertaken was the collection and the rearing of puerulii and metamorphosed baby lobsters of *P.homarus* to maturation and harvestable sizes. It was possible to collect from the inshore waters as well as from special puerulii collectors operated from rafts used for open sea mussel culture puerulii and young lobsters and rear them to marketable size of 200 gm weight under experimental conditions in a period of 18 months. The growth rates in such culture operations with clam and mussel meat as feed were almost identical with that studied for growth obtaining in the natural population of *P.homarus*. On an average, growth increment worked out to about 12 gm during each intermoult period, the moulting frequency being around once every 30 to 55 days. Further increment of weight is also characterised by such a slow trend of growth.

In connection with the work on growth and reproductive physiology and endocrinology of *P.homarus*, recourse to the wellknown and widely adopted technique of eye stalk ablation was resorted to. Such techniques are employed in studies on crustacean growth and reproduction in many parts of the world. The hormonal system in crustaceans involved in growth and reproduction is antagonistic and reproduction alternates with growth. There are the moulting hormone and the moult inhibiting hormone. Unlike in the case of vertebrates, particularly mammals, the endocrinology of crustaceans has been very little understood. The lobster culture programme in the Institute includes investigation on crustacean endocrinology in order to understand the hormonal regulation of growth and reproduction and to be able to manipulate these hormonal function, once they are clearly understood, to achieve higher growth rate and temporal control of reproduction.

In *P.homarus*,as in other crustaceans, the endocrine complex present in the eye stalk controls the secretion of hormone and hence the need to study this complex in detail. One of the wellknown methods in endocrinology is to block the system and to observe the results. As an experimental procedure, the eye stalk is electrically cauterised or ablated to block the hormonal system and study the effects on growth and reproduction.

Fig. 1. A group of normal spiny lobsters, *Panulirus homarus*.

Fig. 2. A group of eye ablated lobsters

Fig. 3. Close up view of a normal lobster to show the compound eyes

Fig. 4. An ablated lobster with antennule-like growth at the place of the ablated eyes (close up view)

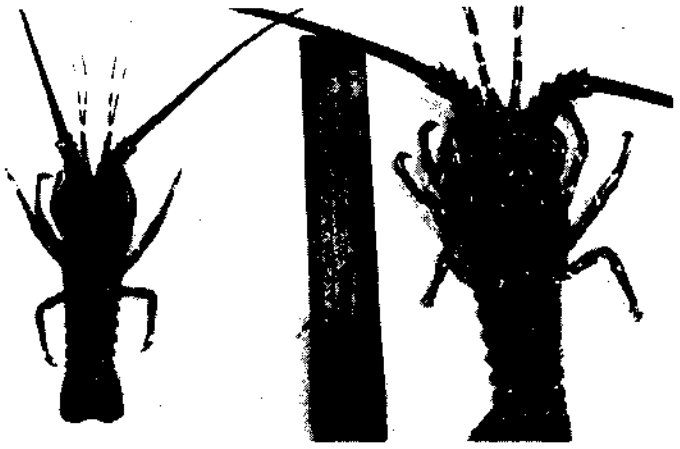

Fig. 5. Control lobster after 90 days normal growth - 49.7 gm to 71.3 gm.

Fig. 6. Eye ablated lobster after 90 days growth - 49.7 gm to 184.3 gm.

Spiny lobster landings (with annual production estimates from three maritime states) and exports from India during 1978-1981

Year	Landings (in tonnes)				Export	
	All India	Maharashtra	Gujarat	Tamil Nadu	Quantity (in tonnes)	Value (1000 Rs.)
1978	1,307	607	339	249	691	45,668
1979	1,135	499	211	340	752	53,456
1980	679	225	204	90	501	27,889
1981	1,481	388	786	238	636	47,003

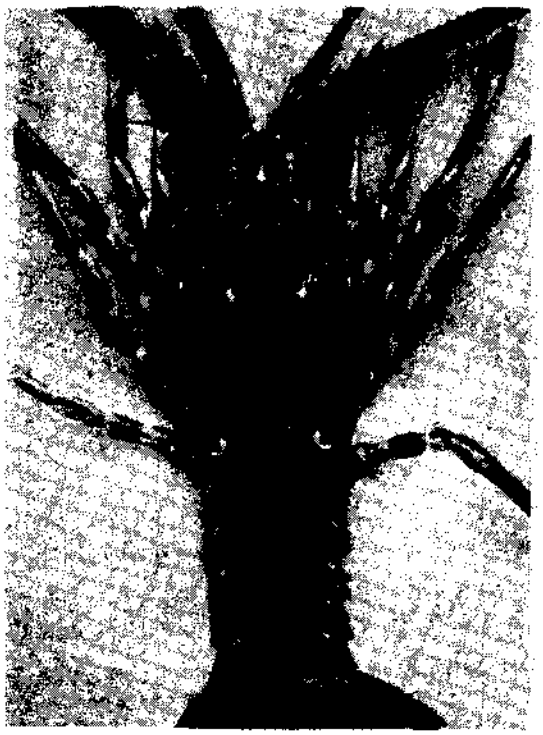

Fig. 7. An ablated lobster with antennule-like growth at the place of the ablated eye (Full view)

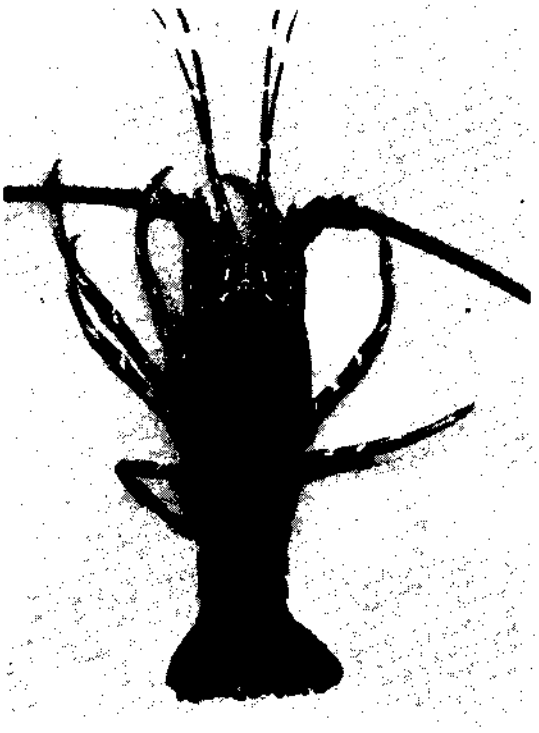

Fig. 8. An ablated lobster without the antennule-like growth.

The higher rate of growth observed in such eye stalk ablated lobsters is of great significance in regard to our understanding the hormonal action on moulting and growth. Since faster growth is a phenomena related to increase in production, it is of importance in culture production.

The results have been spectacular and fully justify consideration as a major breakthrough in making spiny lobster culture a viable proposition. My colleagues Shri E.V.Radhakrishnan and Shri M. Vijayakumaran who have been working under my guidance have in a series of experiments conducted on individual as well as groups of lobsters employing the eye ablation technique demonstrated that:

1. In a group of 10 early juvenile lobsters each weighing about 84.5 gm, when ablated and reared in experimental techniques for 165 days attained a mean weight of 432 gm as compared to the growth increment of only 57 gm for the control group.
2. In another trial involving 14 lobsters the average growth increment was 110.6 gm in 108 days, the corresponding growth for the control lobsters being 37.5 gm.
3. With repetitive trials with different number

Lobsters Are Human Too

IMAGINE a blinded animal growing big and strong and ... antennae in place of their blinded eyes. ... that is what is done to lobsters. S... menon is possible a... Scientist...

Letters to the Editor

Do l... pain

Sir, — (THE HI... Prasad's ... blinding ... that lobs... reminde... that Jew... dissecte... The Ku... black ... being h... A ... phrase ... ford to ... necess... sufferi... would ... pursuit... ing lob... and f... they ...

NOVEM...

TODAY

SCIENCE

LOBSTERS

A Giant Leap

IN A STARTLING discovery, marine scientists recently found that the Indian species of lobster, *Panulirus Homarus*, grow fastest when they have been blinded. The technique was developed at the Kovalam (Mad... ratory ...

... tank for 165 days. These lobsters grew to a mean weight of 432 grams. In the ... ablated group of lobsters ... and weight ...

... their no... The ... was first ... search co... cessful in ...

Do lobsters feel pain when blin...

MADRAS, Oct. 25.

Do lobsters which are blinded by ... tists feel pain? Is it not cruel to cl... eyestalks of these crustaceans?

Many have expressed ... and some have vehemen... of depriving them ... organ so that the...

Dr. Guha ... the Centr... stitute ... is ...

...tting off the legs was evolved ...jection.

...y the concept of "pain" ...tally different from that ...bjections should not ... the organisms ...portant sensory ...r crustaceans ...ory mechani... "pain." ...d by ... ...het thy ...spon... ...ow ...

...tion of accelerated moulting ...tion) and precocious growth ... eyestalks were re...

"How do you know"

Sir, — In defence of blinding lobsters, (THE HINDU, October 26), Dr. Guha Prasad has obeserved that "the question of pain or suffering is a projection of our own mind" and "the concept of pain in lower animals is totally different from that in human beings".

I am reminded of the following conversation in an old movie called "I want to live" between Miss Barbara Graham, the condemned prisoner in the gas chamber and her executioner:

Executioner:

"Miss Graham, when I pull the lever the cyanide pellets will sink into the acid and the fumes will engulf the chamber. Take a deep breath, it will be painless"

Graham: "How do you know?"

S. Rajagopalan

of lobsters varying from 4 to 18, the growth increase in the eye stalk ablated lobsters recorded was between 1.45 and 2.5 gm/day, which in the controls was hardly 0.35 gm/day, all lobsters being fed *ad libitum* with clam meat.

4. In one experiment, a lobster with an initial weight of 254 gm attained 402 gm after a single moult in 31 days - a weight increase of 148 gm after a moult! These figures appear incredible as compared to hardly 12 gm increment in weight recorded in the inter-moult period of about one month in the controls as well as observed in the natural population.

These findings are remarkable since eye ablation technique in the American and Australian spiny lobsters *P.argus* and *P.cyngus* respectively did not yield results. This also definitely shows that culture of lobster from puerulus or early juveniles to a marketable size of 180 to 200 gm is possible in about 5 to 6 months and an almost doubling of weight is possible in another 2 to 3 months - in other words a 400 gm lobster in about 9 months!

From the time that the results of these experiments on spiny lobster growth adopting the eye ablation technique was announced, there has been a spate of letters in some of our national dailies questioning the ethics of such experiments with animals as this is considered as being against the tradition of our country (ref: p.4). In scientific research, experimentation with animals is inevitable. Such researches on other crustaceans have been in vogue for ages all over the world. Here the mandate has been to find out whether mariculture of spiny lobsters is a feasible proposition or not. Complacency due to the negative results obtained by scientists in the USA and Australia would have put the clock back several years. The success with eye ablation technique has now given us a clue as well as a lead to enhance our indepth studies on the endocrinological function of growth and maturation to map the endocrine organ, identify the hormones and understand their functions. The next step could be the acceleration or inhibition of growth/maturation as may be desired in the different phases of culture, through hormonal treatment and not consider eye ablation as the ultimate technology for obtaining higher production.

These researches no doubt open up the great possibilities of developing genetically faster growing strains for producing "Giant" lobsters and more than all make *P.homarus* a very good candidate species for culture. I would also take this opportunity to announce that my colleagues Shri E.V.RadhaKrishnan and Shri M.Vijayakumaran have also met with success in experiments carried out on 2 other species, *P.ornatus* and *P.polyphagus*. The lobster culture programme in the Institute is being accelerated to answer many of the problems that have come up in the course of the work undertaken during the last 2 years.