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UNPRECEDENTED GROWTH INDUCED IN SPINY LOBSTERS

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Introduction

With the ever increasing demand, the lobster fishing grounds all over the world are being heavily exploited and this is also true in Indian lobster fishery. Attempts for growing lobsters in captivity in order to augment the production have met with only partial success. Apart from other problems their slow growth rate is one of the main constraints. Investigations have been carried out at the Field Laboratory of the Central Marine Fisheries Research Institute at Kovalam, Madras since 1976 to rear the spiny lobster *Panulirus homarus*, which contributes to a major portion of the lobster fishery in southern parts of India. Early juveniles of this species have been consistently reared in the laboratory to marketable sizes in a period of sixteen to eighteen months. However, it was felt that it may not be economically feasible to carryout large scale culture of lobsters unless the rearing period is brought down considerably. The only way to accomplish this is by accelerating the growth rate of lobsters and this has been the major concern of the CMFRI Laboratory at Kovalam, resulting in several experimental studies.

It has been well established that the X-organ sinus gland complex in the eyestalk of crustaceans plays a major role in the control of moulting and growth in them. Experiments in ablation of eyestalks and thereby removal of the gland complex was not found to be useful in the acceleration of moulting in *P. cygnus* in Australia and *P. argus* in America, leading to the conclusion that Moult Inhibiting Factor (MIH factor) may not be present in the eyestalk of palinurid lobsters. However, encouraging results have been obtained for the first time in accelerating moulting frequency and weight gain in the spiny lobster *P. homarus* consequent to the present experiments in removal of eyestalks.

Early juveniles, maturing and mature *P. homarus* ranging from 20 to 250 g in body weight were used in this study. The technique used was bilateral removal of eyestalks by ligation. Lobsters were reared in groups and equal number of males and females were used in all the treatments. Salinity of the seawater used varied between 32 and 35% and the water temperature ranged from 22 to 33.8° C. In the experiments the lobsters were fed *ad libitum* on the clam *Meretrix casta* twice daily. In one of the experiments mussel meat and chopped fishes were given once daily initially and clam meat twice daily later.

Moulting frequency

The results prove that eyestalk removal accelerated frequency of moulting in *P. homarus*, indicating the presence of an MIH factor in the eyestalk. Whereas the control lobsters moulted 4 times in 140 days reaching 70 g, the ablated lobsters moulted 7 times to reach the marketable size of 200 g in the same period. Intermoult period increased with the size in both ablated and control lobsters, but the increase in ablated ones was considerably lower than that of the control.

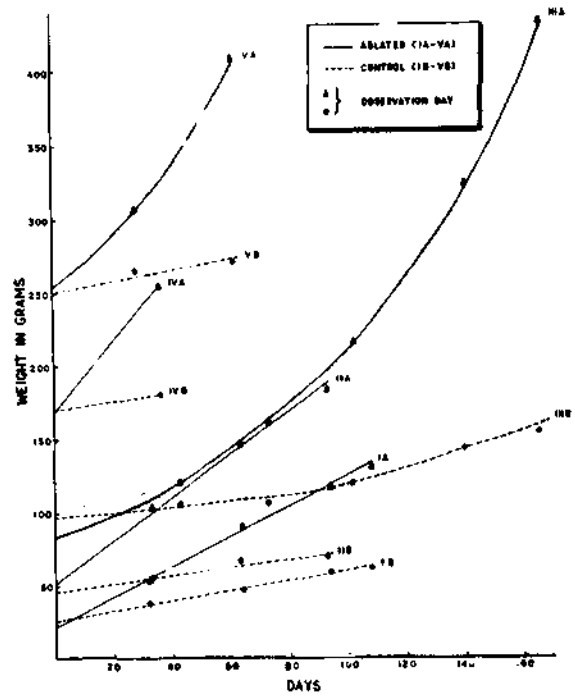

Fig. 1. Increase in weight in eye ablated and control spiny lobsters *P.homarus* in different experiments.

Weight gain

The weight gain in ablated and control lobsters from experiments I to V is shown in Figure 1. Growth of lobsters is a manifestation of moul-

Table 1. *Growth of ablated and control lobsters Panulirus homarus*

Expt. No.		Description	No. of lobsters	INITIAL		FINAL		Total No. of days	Increase in weight/day (g) (Average)	% increase/day
				CL (mm)	Wt. (g)	CL (mm)	Wt. (g)			
I	A	ABLATED	14	27.0	20.4	53.1	131.0	108	1.02	5.0
	B	CONTROL	14	28.7	24.8	39.7	62.3		0.35	1.4
II	A	ABLATED	6 × 3 (18 Nos)	36.5	49.7	59.7	184.3	93	1.45	2.9
	B	CONTROL	6 × 2 (12 Nos)	35.8	46.8	41.9	71.3		0.26	0.55
III	A	ABLATED	10	44.7	84.5	77.4	432.0	165	2.1	2.48
	B	CONTROL	10	47.3	98.6	56.2	155.7		0.35	0.35
IV	A	ABLATED	4	56.2	169.0	65.3	255.0	36	2.38	1.46
	B	CONTROL	4	58.2	169.2	59.2	181.0		0.33	0.19
V	A	ABLATED	6	66.1	256.5	77.8	408.0	61	2.5	0.97
	B	CONTROL	6	66.0	250.3	67.4	272.5		0.36	0.14
VI	A	ABLATED	5	41.2	69.4	53.0	141.0	63	1.14	1.64
	B	CONTROL	5	39.9	66.0	44.2	83.4		0.28	0.42

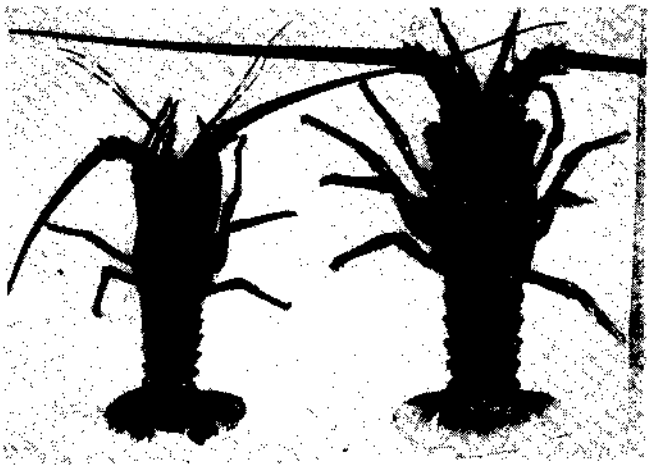

Fig. 2. Growth difference in eye ablated (right) and control (left) spiny lobsters.

ting and size and weight increase at moult. Eyestalk ablation in *P. homarus* accelerated both these factors and enhanced growth rate obtained is the cumulative effect of these two. Three to sevenfold increase in weight was obtained in ablated lobsters compared to the control (Fig. 2). Weight increase per day is proportional to the size of the lobsters. Ablated juveniles recorded an average increase of 1.02 g/day while the increase was only 0.35 g/day in the control. Weight increase per day gradually increased with size and the maximum of 2.5 g/day was obtained in maturing and mature lobsters (Table 1). Eventhough relative increase in growth, expressed in terms of percentage weight gain per day, was more in early juveniles, absolute increase in bodyweight was higher in bigger lobsters. Maximum weight gain of 4.6 g/day was obtained in an ablated mature lobster weighing 256 g.

Food conversion

Accelerated growth is achieved by increased food consumption and assimilation and by better conversion efficiency. The experiments show that in *P.homarus*, at *ad libitum* level of feeding, food consumption of ablated lobsters was twice that of the control animals, recording two to three fold increase in food conversion efficiency. Even when equal quantities of food wire given to both the groups in Expt.VI the ablated ones recorded four fold increase in weight compared to control. This would indicate that increased food intake in ablated individuals only may be supplementing the individuals only may be supplementing the accelerated growth rate caused mainly by hormonal imbalance.

Tail weight

The proportion of tail weight to body weight of ablated and control lobsters weighing 200 g and above shows that there is no significant difference in this relationship between the experimental and control animals. The percentage dry matter in the flesh also showed similar trend indicating that ablation do not alter this relationship.

General remarks

Apparantly there is a Moult Inhibiting Hormone Factor in the eyestalk of spiny lobsters, which on removal accelerate the growth significantly. Further experiments are in progress to

map out the gland so that manipulation of the hormone produced by the gland may accelerate the growth rate without impairing the vision of the lobsters. This basic discovery opens up further avenues for advanced research in lobster endocrinology.

From the present results it is clear that it would be possible to grow marketable size lobsters from juvenile stage in 5 to 6 months and to double the size in another 3 or 4 months. Such phenomenal growth would throw open great possibilities of developing genetically fast growing strains of lobsters and more than all make *P. homarus* a very suitable candidate species for culture.

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