

Inducing Maturity and Spawning of Tiger Prawn (*Penaeus monodon Fabricius*) in Captivity Through Eye Stalk Ablation at the Experimental Shrimp Hatchery at Okha (Gujarat)

K. L. Jotani, D. N. Chanda, P. R. Tank, R. P. Vavaiya

Fisheries Research Station, Gujarat Agricultural University, Okha-Port

ABSTRACT

The paper described the results of unilateral eye stalk ablation of pond reared brooder collected from Khafumba (35 km South East of Okha) and of wild brood stock collected from Navibandar (160 km South East). Hydrological parameters such as salinity, pH, water temperature and DO₂ were also recorded and reported. The present status of shrimp culture in Gujarat is also discussed.

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INTRODUCTION

The total waste land area for brackish water in Gujarat is around 3,76,000 hectares. However saltpan area of Surendranagar (16,190 hac.), Kutch (50,000 hac.), Kheda (20,735 hac.), polluted belt of coastal Bharuch (20,000 hac.) are not found suitable/feasible for culture purpose (MPEDA-1987-97). Subtracting these areas from the total waste land the available area is 2,68,075 hectares.

South Gujarat has 35,000 ha. of potential area out of which 92,035 ha. are in Valsad, Surat and Bharuch districts.

Saurashtra has 5000 ha. of potential area out of which 1,05,000 ha. are in

Ahmedabad, Bhavnagar, Amreli, Junagadh and Rajkot districts.

Kutch contributes 10,000 ha. potential area out of 18,400 ha. Thus the total potential area comes to 50,000 hac. from all three zones.

Department of Fisheries has allotted 2,601 ha. of kharland to 251 beneficiaries on lease. Actual area under shrimp culture in Gujarat at present (1994-95) is 744 ha. Additional 4,256 ha. area is proposed to be brought under culture within 2001 A.D. to achieve a target of 5,000 hac. to produce 10,100 M.T. of shrimp from the present production of 830 M.T.

It is estimated that out of 4,256 ha. about 3,801 ha. can be utilised under extensive farming and 455 ha. for semi-intensive farming. It is envisaged that the present average stocking density of 85,250 shrimp seed/ha. is to be increased to 1,24,000 seeds/ha.

Present catch level of shrimps through capture fishery is at stand still or has shown depletion up to some extent. Therefore shrimp production through aquaculture is the only substitute at present.

Looking to the area to be brought under culture (5,000 ha.) up to 2001 A.D. approximately 550 million seeds will be required.

Up to 1995 two hatcheries were established one each at Tata Chemical Ltd., Mithapur and Fisheries Research Station (the then GFASRI), Guj. Agril. Uni., Okha. The later is an experimental one established in order to create seed bank in near future and to supply good quality seeds to the aquaculturists in Gujarat.

Experiments to obtain maturity and spawning in captivity of *P. merguensis* and *P. monodon* through eye stalk ablation were initiated by the scientists of GFASRI before 1992, but without success. Seeds of *P. merguensis* were produced in the hatchery through gravid female supplied from wild stock by departmental vessels. After merger of GFASRI into Gujarat Agricultural University, the scientists concentrated more on shrimp hatchery for seed production looking to the ever increasing demand from aquaculturists in Gujarat, as almost all the seeds require for culture/rearing were imported from other states. A breakthrough in inducing maturity and spawning of *P. indicus* through unilateral eye stalk ablation in captivity was obtained in the year 1994-95 (Jetani *et al.*). A total of 3.74

lakhs post larvae of *P. indicus* were produced during that year.

MATERIALS AND METHODS

Brood stock of pond reared prawns were collected from Khatumba (35 km south east of Okha). The pond was input of salt pan with heavy flow of gulf water created by 10 heavy duty water pumps. At the mouth of flow cast of 1 cm mesh size was operated several times. With other non penaeid, metapenaeus species and fish like scatophagus, *P. monodon* were fished and transported by road to experimental hatchery in 1000 lit plastic drum with 70 lit. of sea water. During the transportation, water was oxygenated occasionally to maintain DO₂ with medical oxygen cylinder. Wild stock brooders collected from Navibandar (160 km south east) were purchased from fishermen. These brood stock was also transported by road to hatchery by same manner but density of brooders per plastic drum of 100 lit. was reduced and continuous oxygen was given to reduce the stress on prawn. Transported prawns were slowly acclimatised in hatchery water. Quarantine treatment such as 50 ppm formaldehyde were given for 15 minutes in sintex drum.

Weight, measurement and sex differentiation of collected brooders were done simultaneously. Each batch of brooder were stocked separately in round plastic pools having 6'D x 2'H for at least 4 days. Pond brooders were treated with erythromycin @ 20 ppm during this period, and behaviour of prawns was observed. Prawn brooders were fed with live nereis and goat liver @ 12% of total biomass daily. Sea water used was allowed to settle for 24 hrs in 5000 lit. closed-black sintex tank. Settled sea water was chlorinated @ 10 ppm by bleaching powder for 24 hrs and dechlorinated with sodium thiosulphate, followed by aeration for 24 hrs

TABLE 1

Maturity and spawning experiments in *P. monodon*.

Batch No.	Month Date	No. of eggs		Nauplii	Zoea	Mysis	PL-1	PL-20	Remarks
		Fertilised	Unfertilised						
1	14-Aug-95	3,000	58,000	—	—	—	—	—	—
2	23-Sep-95	4,000	9,000	—	—	—	—	—	—
3	18-Oct-95	80,000	—	—	—	—	—	—	—
4	21-Oct-95	4,00,000	—	—	—	—	—	—	—
5	22-Nov-95	15,000	1,35,000	—	—	—	—	—	—
6	28-Dec-95	100	800	—	—	—	—	—	—
7	08-Jan-96	300	2,000	—	—	—	—	—	—
8	24-Jan-96	25,000	50,000	—	—	—	—	—	—
9	31-Jan-96	3,000	—	—	—	—	—	—	—
10	03-Feb-96	200	2,500	—	—	—	—	—	—
11	02-Mar-96	30,000	—	27,000	20,000	6,500	3,850	260	Released PL-16
12	16-Mar-96	2,00,000	—	1,10,000	27,000	7,500	4,000	800	to RCC pond
13	25-Mar-96	31,000	—	8,000	5,800	—	—	—	Sudden mortality

then filtered through 37 micron pore diameter nylobolt silk cloth. Brood stock pool water was exchanged daily eliminating excess food, faecal matter and moult if any. Healthy and viable brooders were selected for maturation and female eye stalks were observed, which has (unilaterally) ablated with electro-quatory machine within minimum time period. Brooders were treated with 20 ppm oxytetracycline for 30 minutes before and after eye stalk ablation and were released in maturation tank in the ratio of 1 : 1 male and female.

The brooders were exposed to cool fluorescent lamps providing 400-500 lux light

intensity in 12:12 light/dark regime. To reduce the light intensity fluorescent lamp were covered with blue polyethylene film and remaining period under complete darkness by covering the tank with black polyethylene sheet. Sea water treated by method described earlier was exchanged (about 90%) twice a day and mechanical sound disturbance was minimised. Hydrological parameters were observed as per Table 2. Maturation period varied between 8-10 days. Matured and impregnated females were scooped out and released in 3'D x 2'H plastic liner containing sea water of 30 ppt salinity and treated with 10 ppm EDTA for spawning at night. Adequate

TABLE 2

Hydrological parameters.

Sr. No.	Month	Salinity ppt	pH	Water Temp. °C	DO ₁ ppm	Remarks
1.	Jul-95	31-34	7.5-8.1	27.0-30.0	> 4 ppm	
2.	Aug-95	30-35	7.5-8.0	28.3-31.0	> 4 ppm	
3.	Sep-95	35	7.5-8.5	28.5-29.5	> 4 ppm	
4.	Oct-95	35	7.5-8.5	27.7-29.9	> 4 ppm	
5.	Nov-95	35-36	7.5-7.8	23.0-27.8	> 4 ppm	
6.	Dec-95	37-38	7.5-7.9	21.5-24.8	> 4 ppm	
7.	Jan-96	37-38	7.5-7.8	20.2-25.8	> 4 ppm	
8.	Feb-96	37-38	7.5-8.1	21.0-26.0	> 4 ppm	
9.	Mar-96	37-38	7.8-8.1	23.5-26.7	> 4 ppm	

aeration was provided and tank was covered with polyethylene. After spawning in the early morning, eggs were collected by siphoning and treated with 4 ppm OTC. Number of eggs laid were observed under research microscope and numbers unfertilised and fertilised were calculated by random sampling.

Hatching was observed after 14-15 hrs in successful experiment No. 11, 12 & 13. In remaining experiments fertilised eggs showed development up to nauplii in situ N-6 to Z-3 stages were fed with cultured *Chaetoceros affinis* @ 5000 cells/ml. After Z-3 to PL-6 stage *Artemia salina* nauplii @ 5-10 nos/ml and were introduced along with chaetoceros @ 18,000 to 22,000 cells/ml.

RESULTS AND DISCUSSION

Maturity in ablated females was observed after 10 days of eye stalk ablation. In some female this period was prolonged to

2 weeks. Maturation period was almost same in pond reared brooders and natural brooders. No significant difference was observed as all other factor remained same. Fecundity, fertilisation rate and hatching in case of pond reared brooders were comparatively lower than those brooders which were collected from natural resources.

Sadahara, 1995 had studied pond reared *P. monodon* on maturation and reproduction. He observed 'lower fecundity, in females matured in captivity compared to wild gravid spawners'. The present experiments results agree with Sadahara's views. Females having weight more than 78 gms and male weighing 65 gms and above were found most suitable for obtaining fertilised and viable eggs. Overall length and carapace length of prawn brooders are important factors for impregnation, however being 1st experiment this was overlooked. S. Canese *et al.* 1993 in their 1st experience of

controlled reproduction in captivity in Italy obtained the same result in female weighing more than 6 gms and mean body weight of male 45 gms of pond reared brooders.

In this successful experiment of 7 months it was observed that fertilised eggs of pond reared *P. monodon* developed up to

nauplii in situ. This was observed after 12 hrs. (approximately) after spawning. The ciliate problem can be rectified introducing cartridge filter in hatchery. However eggs of natural prawn brooders could be successfully developed up to post larvae in the same media may be due to better resistance power of egg case.

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