

PRAWN CULTURE IN SALT PANS IN EAST GODAVARI DISTRICT, ANDHRA PRADESH

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ABSTRACT

The paper presents the results of two prawn culture experiments conducted in the salt pans of Andhra Pradesh. The first experiment was conducted in the salt pans of Neellarevu during June-December 1974. Two adjacent pans of 0.61 ha (pond A) and 0.48 ha (pond B) were stocked with juveniles of *Penaeus monodon* and *P. indicus* of 65 mm mean lengths. In these ponds salinity varied from 21.97 ppt to 47.39 ppt and temperature from 29.2°C to 35.0°C. At harvest in December, the mean size of *P. monodon* was 165.4 mm and that of *P. indicus* was 140.7 mm. The production rate of prawns for the 6 months period was 164 kg/ha and 189 kg/ha respectively in the two ponds. The net profit was at the rate of Rs. 980/ha in pond A and Rs. 1113/ha in pond B.

In the second experiment conducted at Lakshmipathipuram, 9470 juveniles of *P. monodon*, mean length at 54.2 mm, were stocked in a salt pan reservoir of 0.26 ha provided with a box type sluice gate in December 1976. The pond water temperature varied from 25.5°C to 31.0°C and salinity from 21.27 ppt to 45.39 ppt. Rice bran at a rate of 13-16% of body weight of the prawn was given as supplementary feed. Growth rate was found to be low in higher salinity (38.72—45.39 ppt). At harvest, *P. monodon* had mean length of 123.4 mm with about 79.3% survival. After 168 days the yield was 259 kg/ha. A net profit of Rs. 1388 was gained per hectare in 6 months without hampering the salt production.

INTRODUCTION

SALT production in East Godavari District, is an industry of considerable magnitude. It is produced either by utilising the subsoil water or by using the brackishwater from the creeks. Before the brackishwater is let into the pans proper, it is held in the reservoirs for a few days to increase the salt concentration in the water. Salt is produced during summer from March to June and these areas are left idle during the remaining part of the year. There are several hundreds of hectares of salt pans around

Kakinada which utilise the brackishwater from the creeks for salt production. It is felt that utilisation of salt pan reservoirs for prawn culture would not only help increase prawn production, but also add to the income of the salt pan owners. Suseelan (1975) reported on prawn culture practices in salt pan reservoirs near Cape Comorin.

At Neellarevu, a small village, about 80 km from Kakinada, the fishermen cultured prawns in the salt pans and a study was conducted on the practice of prawn culture at this place. We have also conducted prawn culture experiments in the salt pan reservoirs at Lakshmipathipuram which is about 26 km from Kakinada and the results of these two studies are presented here,

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A. PRAWN CULTURE AT NEELLAREVU

There are 32 salt pans at Neellarevu which vary in extent from 0.5 to 3.0 ha. The bottom of each pond is an admixture of soft clay and sand. All the ponds are directly connected to a brackishwater creek which empties into the Bay of Bengal at Kothapalem, 9 km from Neellarevu. Gauthami branch of the Godavari River also empties at Kothapalem. The sea is to the east of Neellarevu and the village is encircled on the other three sides by vast tracts of backwater and mangrove swamps, which are rich in prawn and fish juveniles.

which supplies water to the ponds. During each visit a sample of at least 25 prawns from the ponds was measured for total length (Length between tip of rostrum and tip of telson) to the nearest mm. Since both the hydrographic and biological data between the ponds did not show appreciable differences, they were pooled and for convenience presented month-wise (Table 1).

Hydrographic conditions: The water temperature of the culture ponds varied from 29.2°C to 35.0°C, and was generally high during July-October (Table 1). The salinity in the

TABLE 1. *Hydrographic and biological data collected from Neellarevu prawn culture ponds in 1974*

	July	August	September	October	November	December	Remarks
Water temperature (°C)	32.5	32.5	35.0	33.0	30.1	29.2	
Salinity (ppt)	23.48	47.39	31.98	21.97	26.94	29.90	
Dissolved oxygen (ml/l)	5.22	5.26	6.08	6.13	4.99	4.93	
pH	7.6	8.3	7.9	8.2	9.0	7.6	
<i>Brackishwater creek</i>							
Salinity (ppt)	No data	12.55	12.79	6.76	11.10	11.59	
pH	-do-	8.00	7.65	7.4	7.65	7.3	
<i>Penaeus monodon</i>							
Total length range (mm)	53-105	80-125	80-141	135-148	No data	160-172	Stocking size 47-85 mm and mean size 65 mm
Mean length (mm)	79.6	97.4	109.4	139.0	do	165.4	
<i>P. indicus</i>							
Total length range (mm)	No data	64-120	75-128	103-139	114-155	129-155	Stocking size 45-85mm and mean size 66 mm
Mean length (mm)	-do-	94.9	98.9	122.4	131.9	140.7	

Data collection: Two adjacent ponds were selected for study. Pond A measured 0.61 ha and pond B, 0.48 ha. Fortnightly visits were made from July to December 1974 and data on water temperature, salinity (Mohr's method), dissolved oxygen (Winkler's method) and pH (Lovibond comparator disc used) were collected from the 2 ponds at 13.00 hrs uniformly. To understand the extent of flushing into the ponds salinity and pH data were also collected from the brackishwater creek

ponds fluctuated between 21.97 ppt to 47.39 ppt and was usually 2-3 times higher than in the brackishwater creek. As expected, the pH was invariably high in the ponds compared to the creek. Dissolved oxygen was generally high with a range of 4.93-6.08 ml/l.

Prawn culture practice: Salt is raised by fishermen during the February-May period either by pumping in the creek water with a motor or by manually lifting the underground

water. The off season for salt production *i.e.*, June-December was used for prawn culture. Early in June 1974 after the salt was lifted from the ponds, the brackishwater from the creek was let in by tidal flushing through a narrow (0.5 m) entrance channel. The water flow was regulated by raising/dismantling a muddy bund across the entrance channel where it opens into the ponds. During flushing, to prevent the escape of prawns from the ponds into the creek, cotton webbing of 1.5 cm stretched mesh size was fixed at the opening of the ponds. The ponds were elevated in such a way that in a fortnight tidal flushing is possible for 7-9 days. In the absence of the sluice gates the fishermen, however, allowed flushing for only 2-3 days in a fortnight. About 0.5 m deep water level was maintained in the ponds. Juveniles of *Penaeus monodon* and *P. indicus* were collected from the adjoining backwaters at a spot not exceeding 1 km from the ponds and transported as headloads in earthen pots. In each pond about 4,000 prawn juveniles mostly of *P. monodon*, were stocked from the middle of June to the end of August at irregular intervals. Some prawn seed and fry of *Chanos chanos* and *Mugil cephalus* also entered the ponds with the tide. In addition the fingerlings of the fish species when incidentally collected alongwith the prawn seed were also transferred to the ponds. No artificial feed was given. Mangrove twigs with leaves were planted in the ponds to offer shelter for the prawns and also to form feed as the leaves drop and decay. Also the twigs prevented poaching, since they have to be removed before any net could be operated to catch the prawns. Harvesting began by the middle of November and was completed by December end, for final harvest the ponds were completely drained.

RESULTS

The size range and mean length of prawns at stocking are given in Table 1. *Penaeus monodon* which were stocked at a length range of 47-85

mm (mean size 65 mm) grew to 160-172 mm (mean 165.4 mm) by December *i.e.*, in about 6 months they attained an increase of 100 mm (Table 1). *P. indicus* with a stocking size of 45-85 mm (mean 66 mm) reached a length range of 125-155 mm (mean 140.7 mm) in the same period. For this species the net increase in length is 75 mm which is less than that of *P. monodon*. Both *Chanos chanos* and *Mugil cephalus* measured 180-230 mm TL when harvested. The production figures for the two ponds studied are given in Table 2.

The production per hectare for the 6 month period varied from 164-189 kg of prawns and 85-94 kg of fish. The combined yield of prawn and fish varied from 249-283 kg/ha, and the money realised was Rs. 980 to 1113 per hectare (Table 2). It may be mentioned that the selling price of fish and prawns at Neellarevu is low due to inadequate transport facilities.

B. PRAWN CULTURE EXPERIMENTS AT LAKSHMIPATHIPURAM

Farm site: A reservoir 0.26 ha in area (Plate I A) was selected at Lakshmipathipuram for conducting prawn culture experiments.

The farm site (Lat. N 16°06' long. E 82° 17') is situated right on the south bank of the Bhairavapalem creek (Tippa kalava) which runs for a distance of about 8 km through mangrove forests and opens into the Kakinada Bay. The farm is elevated in such a way that even at the highest tide the water from the creek does not enter the pond.

For salt production the water from the brackishwater creek is pumped by a diesel pump set into a relatively deeper pond (depth 1 m) for passing through a series of 4 ponds (depth 0.4-0.6 m) which together act as the reservoir and finally let into the actual salt pans. It is this reservoir that was utilised for conducting prawn culture. The pond bottom is muddy.

TABLE 2. *Details of production of prawns by culture at Neellarevu and the money realised by their sale*

		Pond A (0.61 ha)	Projected per hectare	Pond B (0.48 ha)	Projected per hectare
Yield for 6 months in kg :					
<i>Penaeus monodon</i>	..	30	49	26	54
<i>P. indicus</i>	..	70	15	65	135
<i>Chanos chanos</i>	..	42	69	25	52
<i>Mugil cephalus</i>	..	10	16	20	42
Total	..	152	249	136	283
Money realised (Calculated at per kg)					
<i>P. monodon</i>	Rs. 8	} Rs. 598	Rs. 980	Rs. 535	Rs. 1113
<i>P. indicus</i>	Rs. 4				
<i>C. chanos &</i>					
<i>M. cephalus</i>	Rs. 1.50				

TABLE 3. *Data on P. monodon culture at Lakshmiipathipuram : Temperature and salinity of the pond and the food given*

	Numbers measured	Length range (mm)	Mean Length (mm)	Mean weight (g)	Weight (g) of rice bran given per day per prawn	Food as % of body weight	Tempe- rature (°C)	Salinity (ppt)
8-12-76	.. 115	32-96	54.2	1.04	—	—	—	—
14-12-76	.. —	—	—	—	0.145	13.87	27.5	21.27
20-12-76	.. —	—	—	—	—	—	27.5	25.05
5- 1-77	.. 65	46-104	75.7	3.32	0.533	16.07	28.5	35.53
17- 1-77	.. 80	66-125	85.8	4.63	0.640	13.83	26.0	—
27- 1-77	.. 57	60-130	89.3	4.79	0.652	13.42	—	—
17- 2-77	.. 121	86-154	105.1	8.19	1.097	13.40	30.6	36.41
3- 3-77	.. 137	76-154	106.6	8.39	1.203	14.34	25.5	—
18- 3-77	.. 130	85-145	113.5	9.56	1.229	12.86	25.5	38.72
7- 4-77	.. 80	102-152	115.8	10.00	1.434	14.34	31.0	—
22- 4-77	.. 171	100-152	118.8	10.78	1.554	14.42	29.0	40.03
6- 5-77	.. 51	115-170	123.3	10.82	1.600	14.79	30.0	—
18- 5-77	.. 224	110-170	123.4	10.87	—	—	29.0	45.39

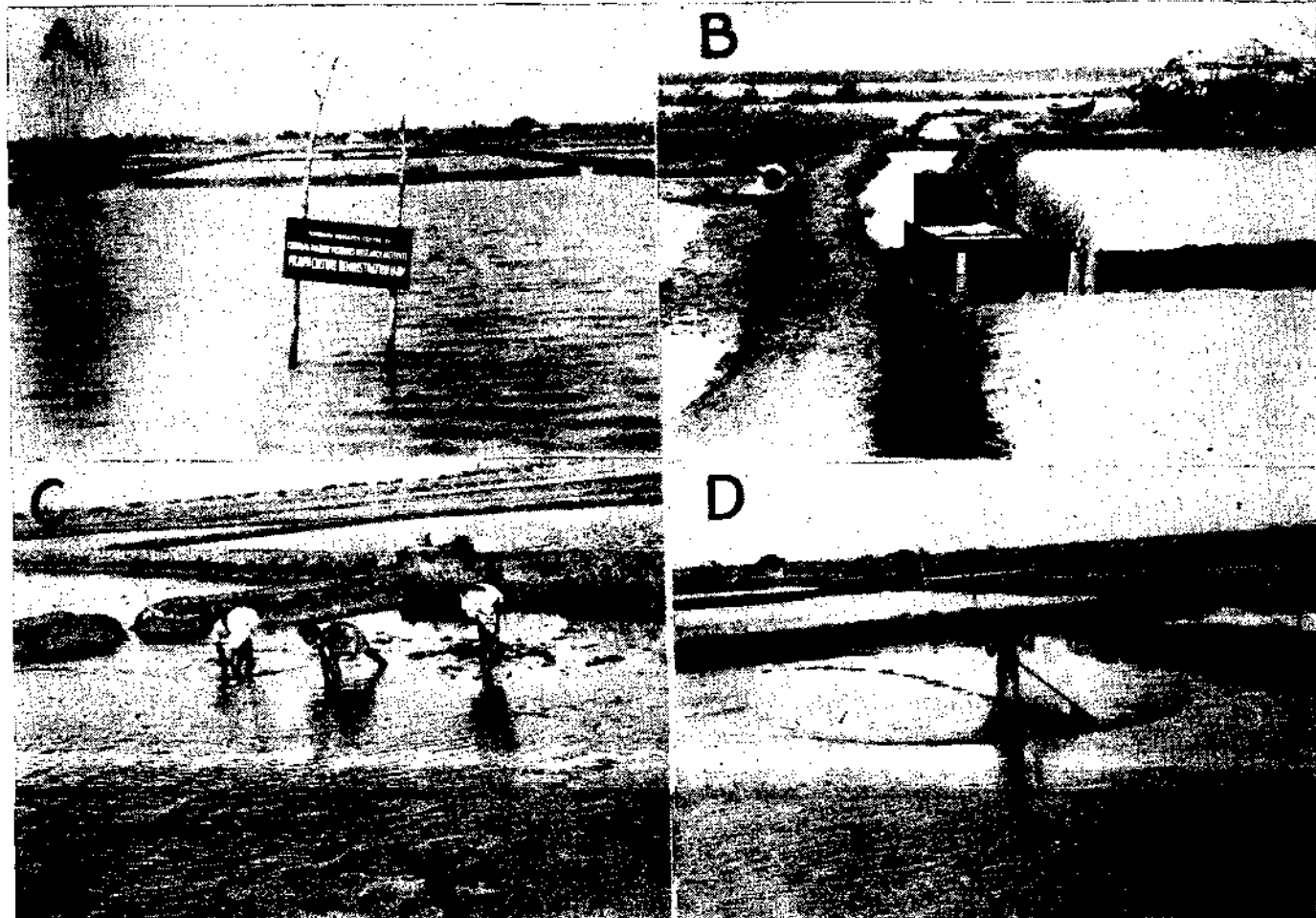


PLATE I. A. Salt pan reservoirs used for prawn culture at Lakshmi pathipuram, B. Sluice gate (Brackishwater creek and the hut of salt pan owner can also be seen), C. Hand picking of *P. monodon* and D. Harvesting by push net.

Duration of the experiment : The experiment was initiated in the reservoir in December 1976 when there was no salt production and continued upto May 1977 (total duration 168 days). Salt production was started in part of the salt pans in April 1977 and continued upto first week of June. Thus, prawn culture and salt production ran simultaneously during the latter part of the experiment.

Particulars of prawn culture : Before stocking the reservoir the water from it was bailed out and cleared. A box type sluice gate measuring 125 × 70 × 85 cm. was fixed. The sluice gate contained two shutters ; one of plank and the other of nylon mesh. Periodically (at intervals of 4 days to 1 week) water was pumped into the ponds from the brackishwater creek through the sluice. Prawn seed was obtained from the fishermen who operate dragnets in the brackishwater creek and land their catches at B. V. Palem, at a distance of 4 km from the pond. The seed was transported to the farm site by a plank-built boat filled with brackish-water.

A total of 9470 juveniles of *P. monodon* of the length range 34-95 mm were stocked from 8-12-76 to 10-12-76 of which 1660 died immediately after stocking, leaving 7810 juveniles surviving. This gave an effective stocking rate of 30,040/ha.

Rice bran consisting about 10% husk was given daily as supplementary feed at a rate ranging from 12.86 to 16.07 percent of individual body weight of the prawn. A total of 1173 kg of rice bran was given in 155 days.

Regular observations were made to collect data on length composition of the stocked prawns. Also, data were collected on salinity and temperature of pond water. Samples for measurements were obtained by cast netting and the prawns were released back into the pond after measuring (Table 3).

The mean length and weight at stocking were 54.2 mm and 1.04 g respectively. The pond was harvested after 168 days. At harvest, the mean length and weight were 123.4 mm and 10.87 g respectively. This gave a total average growth of 69.2 mm and 9.83 g (Table 3). The growth rate until 18-3-1977 (100 days) was comparatively high giving a total average length increment of 59.3 mm (about 0.60 mm/day) and an average weight increment of 8.52 g (0.085 g/day). The growth rate during the remaining 68 days was very slow giving an increment of 9.9 mm (0.14 mm/day) and 1.31 g (0.013 g/day).

The temperature of the pond waters varied from 25.5°C to 31.0°C. Though the temperature was relatively high during April-May, temperature variations did not reveal any trend.

The salinity ranged from 21.27 ppt on 14-12-76 to 45.39 ppt on 18-5-77. In spite of periodic flushing the salinity showed an increasing trend. Although the factors influencing the growth rate are not understood, higher salinities during the later 68 days coincided with the slow growth of the prawns.

Harvest : Harvesting (Pl. I C, D) was started on 18-5-77 and continued upto 27-5-77 (Table 4). A total of 67.3 kg (Number estimated 6192) was harvested, giving a survival rate of 79.3% in 160 days. *P. monodon* yield by the culture experiment for 168 days worked out to 259 kg/ha.

TABLE 4. *Harvesting particulars of P. monodon at Lakshmpathipuram*

Date of harvest	Weight harvested (kg)	Estimated Nos.	Amount realised (Rs.)
18.5.1977	6.8	626	123.00
24.5.1977	27.5	2530	527.50
25.5.1977	26.5	2438	424.50
27.5.1977	6.5	589	97.50
Total	67.3	6192	1172.50

Economics :

The details of the economics are given below.

Expenditure :

	Rs.	P.
Cost of 9470 Nos. of prawn seed ..	473	50
Seed transportation charges ..	36	00
Cost of rice bran ..	235	00
	<hr/>	<hr/>
	744	50
Interest on Rs, 744.50 @ 18% for 6 months ..	67	00
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	811	50

Total income through sale of 67.3 kg of *P. monodon* Rs. 1172.50. Net profit Rs. 361.00. Percentage profit on investment 44.50.

A total of 17.1 kg of *M. monoceros* were also harvested and the money realised was Rs. 84.75.

The cost of land and its development for prawn culture are not considered here since the land is already developed for salt production and the same is used for prawn culture without any further development. Expenditure towards watch and ward duty was not incurred because the salt pan owner's house is located in the field itself (Pl. I B).

REMARKS

Comparison of the results obtained in *P. monodon* culture at the two places show that at Neellarevu the low stocking density resulted in faster growth and lower production while at Lakshmipathipuram high stocking density is correlated with lower growth rate and higher production.

The major advantages of prawn culture in salt pan reservations are :

(a) the ponds are already available which means very little capital investment for development of pond for prawn culture and

(b) the prawn culture does not in any way affect salt production because the off season for salt production can be utilised for prawn culture.

The other advantages observed are the availability of prawn juveniles in close proximity and availability of rice bran, calm meat etc., as supplementary food.

Although the production of prawns by culture from salt pans is not as high as that observed in 'trapping cum holding' practice in Kerala (George *et al.*, 1975; Nair, 1975) and in the experimental brackishwater farm at Kakadwip (Jhingaran and Gopalakrishnan, 1973), the results are encouraging since prawn culture in salt pan reservoirs provides only additional and subsidiary source of income. The present study shows that culture of prawns (*P. monodon* and *P. indicus*) in salt pan reservoirs is technically feasible and commercially viable.

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