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Short Communication

†Fattening of mud crab: an approach of aquasilviculture in Andaman Islands

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Abstract

During September - December 2004, mud crab fattening was attempted in tide-fed earthen ponds in Lakshmipur (North Andaman) and Bamboo Tickri (Middle Andaman) with mangroves such as *Rhizophora mucronata, R. apiculata* and *Avicennia marina,* covering 60 to 80% of the total pond area. Water crabs of *Scylla tranquebarica*, *S. olivacea* and *S. serrata*, each weighing 500 - 1500 g were stocked in the pond at a density of 0.5 kg/m^2 with suitable hideouts to reduce cannibalism. In 30 to 35 days, 85% survival was obtained with 8% weight increment. This paper outlines the measures that may be adopted for practicing aquaculture in mangroves.

Keywords: Mangroves, aquasilviculture, water crab, crab fattening

Introduction

Fattening and grow out practices of four species of mud crabs *Scylla serrata, S. tranquebarica, S. olivacea* and *S. paramamosain* (Keenan *et al*., 1998) are widely practiced in brackishwaters with mangroves (Kador, 1991). Among these, *S. serrata* and *S. tranquebarica,* are more preferred for fattening for their high commercial value (Cowan, 1984). Mud crab farming is widely practiced in many southeast Asian countries and Australia and it fetches high prices in local and international markets (Dorairaj and Roy, 1995; Baliao *et al*., 1999; Trino *et al*., 1999). The Andaman and Nicobar Islands, having vast resource of mangroves of about 966 km^2, comprise 20% of total mangroves of India (Forest Survey of India). Of this 37 km^2 is in Nicobar district and 929 km^2 is in Andaman region. Mangroves occurring in these islands are mostly fringing the creeks, backwaters and muddy shores and the width ranges from 0.5 to 1 km (Roy and Krishnan, 2005). An attempt on mud crab fattening was made in two ponds under mangrove cover in Middle Andaman and North Andaman.

Material and Methods

Mud crab fattening was undertaken during September-October at Bamboo Tikri (Middle Andaman) and November-December at Lakshmipur (North Andaman) in 2004 (Fig. 1). The ponds at Bamboo Tikri and Lakshmipur were located in intertidal areas with naturally available mud flat and extensive cover of mangrove species such as *Avicennia marina, Rhizophora apiculata, R. mucronata*, *Nypa fruticans* (mangrove palm) and *Acrosticum auriam* (mangrove fern). Both the ponds received freshwater influx during monsoon. The length and width of each pond was 15×20 m, covering an area of 300 m^2. The ponds were flooded with sea water during high tide up to a depth of 1.5 m and during low tide water flushed out and the depth reduced to 0.5 m. Mounds were left in the centre of ponds to maintain mangrove species undisturbed which occupied approximately 60% of

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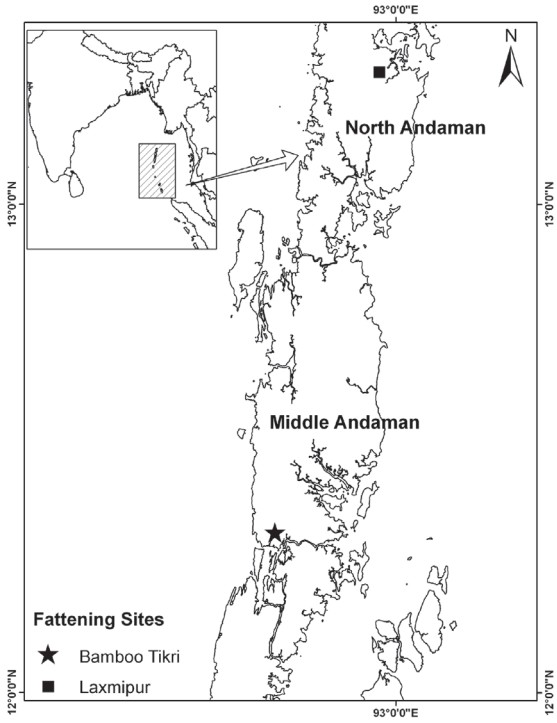

Fig. 1. Pond sites in Bamboo Tikri (Middle Andaman) and Lakshmipur (North Andaman)

the water spread area. The crabs made burrows inside the mounds and bunds for hideouts. In order to minimize mortality of crabs by cannibalism, clay pots and broken tyres were placed in the ponds as additional hideouts. The ponds were fenced outside by bamboo mat of 2 m height with 40 cm driven into the soil to prevent escape of crabs by digging holes. Polythene sheet of 30 cm width was meshed with bamboo mat inside the pond at the top to prevent escape of crabs by climbing. Net with 1 cm mesh size (knot to knot) was fixed at the inlet of the pond to minimize the entry of fishes which would feed on crab feed.

Water crabs procured from local fishermen were transported to the fattening ponds and acclimatized to the pond conditions before stocking. Crabs were weighed individually and 61 crabs (*S. olivacea*: 37, *S. tranquebarica*: 16 and *S. serrata*: 8) were stocked at Lakshmipur (mean weight: 972 g) and 62 crabs (*S. olivacea*: 41, *S. tranquebarica*: 15 and *S. serrata*: 6) at Bamboo Tikri (mean weight: 990 g). The approximate stocking density was 0.5 kg/m^2. Crabs were fed in the evening with trash fish and clam meat at about 8% of total body weight. About 20% of the feed was kept in check trays in the four corners and 80% was broadcast in the entire area of pond. On subsequent days, the feeding rate was calculated based on the unconsumed feed in the check tray. If feed on the tray was consumed completely, the quantity was increased by 5% of total feed on the next day. When residual feed was more than 5%, the feed offered was reduced by 5%. No changes were made in feed quantity if less than 5% of feed was unconsumed. Salinity (‰) was measured every day by a handheld refractometer (ATAGO) and temperature with a thermometer of 0.1° C accuracy. The pH was measured with a pH meter (Eutech Instruments) and dissolved oxygen (mg/L; Winkler's method) once in a week.

Harvesting of crabs commenced on 30th day after stocking. Fattened crabs were partially harvested and less hardened crabs were released back in to the pond for further hardening. Entire harvest was completed by 35th day by handpicking.

Results and Discussion

The range of water quality parameters recorded in Bamboo Tikri (Middle Andaman) and Lakshmipur (North Andaman) is given in Table 1. Temperature of pond water varied between 24.5 and 29º C, which was very close to the recommended range (25 - 30

Table 1. Pond water quality parameters in Bamboo Tikri (Middle Andaman) and Lakshmipur (North Andaman); ± indicates standard deviation

Parameters	Bamboo Tikri			Lakshmipur		
	Min.	Max.	Mean	Min.	Max.	Mean
Temperature (°C)	26.5	28.5	27.8 ± 0.47	24.5	29	26.0 ± 1.11
Salinity (ppt)	17	24	21.6 ± 1.71	9	23	17.1 ± 4.3
pH	7.29	7.89	7.58 ± 0.17	7.2	7.72	7.39 ± 0.12
Dissolved oxygen (mg/L)	5.42	5.72	5.54 ± 0.12	5.09	5.46	5.25 ± 0.14

º C) by Baliao *et al*. (1999). Salinity of pond water varied between 9 and 23 ‰ in Lakshmipur and from 17 to 24 ‰ in Bamboo Tikri, which are within the range suitable for mud crab (Cowan, 1984; Cholik and Hanafi, 1992; Mwaluma, 2002). The pH (7.20 - 7.72 and 7.24 - 7.89) and DO (5.09 - 5.46 mg/L and 5.42 - 5.72 mg/L) values recorded in Lakshmipur and Bamboo Tikri respectively were also within the range suitable for mud crab recommended by Cholik and Hanafi (1992) and Mwaluma (2002).

Survival rate of 85.2% (52 crabs) at Lakshmipur and 85.4% (53 crabs) at Bamboo Tikri were observed. The average body weight of crabs when harvested, was 1050 g and 1069 g at Lakshmipur and Bamboo Tikri, respectively, with approximate weight increment of 8%. Juveniles of *Mugil* sp. (mullet) and *Chanos chanos* (milkfish) were also harvested as bycatch. Though there was no significant weight increment, the replacement of water by muscle (protein) in the fattening process and hardening of exoskeleton substantially increased the economic value of water crab.

The economic feasibility of fattening of mud crab is projected in Table 2. The expenditure on total operation cost including cost of water crab and feed was 40.7% of total income. Capital investment for the pond was Rs. 5,000 for one year with proper care and maintenance. One crop could be completed within 30-35 days and six crops could be achieved in one year. Assuming that the land is owned by the farmer, only depreciation on the construction material (fixed cost for 6 crops) was calculated as 16.6%, which amounted to Rs. 833. Total deduction on the total income was Rs. 6,433 which includes operational and depreciation cost of pond per crop. After all the deductions, the net income was Rs. 8,147/ crop / pond of 0.03 hectare. Profit would highly depend on feed cost. Suseelan (1996) suggested that fattening is highly remunerative considering the short period. Suseelan *et al*. (1995) estimated an annual net profit of Rs. 1,11,550 for six crops of fattening in a 0.1 ha farm in Kerala backwaters. The present study indicates that low stocking density could yield a similar net profit of Rs. 8,147 per crop in a 0.03 ha pond which amounts to Rs. 48,882 per year through six crops.

Since Andaman and Nicobar Islands has a high rainfall of more than 3180 mm/year (Meteorological Department, A&N Islands http://*www.andaman.org.in*/) the selection of suitable site for crab fattening is important. Stocking density is another important factor which influences the survival and production. Triño *et al*. (1999) found that a higher survival rate (98%) can be obtained with low stocking density. The major constraint restricting expansion of mud crab culture is the limited supply of crab seed for stocking in enclosures. Hence suitable hatchery technologies need to be developed to meet the demand for seed.

Table 2. Economics of mud crab fattening (30-35 days) in one pond (area: 300 m^2)

Expenditure/Income	Amount (Rupees)
Capital investment:Pond preparation including excavation,bund building, bamboo fencing, etc.	5,000
Operational expenditure**:**	
Water crab @ Rs.70/kg (total: 60 kg)	4,200
Feed purchase @ Rs. 20/kg (total: 70 kg trash fish and clam meat)	1,400
Total operational expenditure	5,600
Gross income**:**(Total: 54 kg @ 85% survival and sold @ Rs. 270/kg)	14,580
Deductions:	
Operational cost	5,600
16.6% of capital investment (depreciation amount)	833
Total deductions from gross income	6433
Net profit:	
(Gross income - total deductions)	8,147

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References

Baliao, D. D., M. A. De Los Santos and N. M. Franco. 1999. Pen culture of mud crab in mangroves. *Aquaculture extension manual*, 29: 10 pp.

Cholik, F. and A. Hanafi. 1992. A review of the status of mud crab (*Scylla* sp.) fishery and culture in Indonesia. *In*: C. A. Angell (Ed.) *The Mud Crab*: *Report of the Seminar on Mud Crab Culture and Trade*. Bay of Bengal Programme. Madras, India, p. 13 - 28.

Cowan, L. 1984. Crab farming in Japan, Taiwan and the Philippines. Queensland Department of Primary Industries, Brisbane, Old. *Australia Information Series* Q184009, p. 43 - 61.

Dorairaj, K. and S. D. Roy. 1995. Mudcrab culture in the Andamans. *Seminar on Fisheries- A Multibillion Dollar Industry*, Madras, India, p. 17 - 19.

Kador, A. 1991. Mud crab - A potential aquaculture resource of Bangladesh. *In:* C. A. Angel (Ed.) *The Mud Crab: Report of the Seminar on Mud Crab Culture and Trade*. Surat Thani, Thailand, p. 95 - 102.

Keenan, C. P., P. J. F. Davie and D. L. Mann. 1998. A revision of the genus *Scylla* de Haan, 1833 (Crustacea: Decapoda: Brachyura: Portunidae). *Raffles B. Zool.*, 46: 217 - 245.

Mwaluma, J. 2002. Pen Culture of the Mud Crab *Scylla serrata* in Mtwapa Mangrove System, Kenya, Western Indian Ocean. *J. Mar. Sci.*, 1: 127 - 133.

Roy, S. D. and P. Krishnan. 2005. Mangrove stands of Andaman *vis-a-vis* tsunami. *Curr. Sci.,* 89: 1800 - 1804.

Suseelan, C. 1996. Crab culture and crab fattening. *Bulletin Central Marine Fisheries Research Institute*, Kochi, India, 48: 99 - 102.

Suseelan, C., R. Marichamy, M. K. Anil and R. Sathiadhas. 1995. Mud crab culture. Technology Transfer Series - 3. Central Marine Fisheries Research Institute, Cochin, 8 pp.

Trino, A. T., O. M. Millamena and C. Keenan. 1999. Commercial evaluation of monosex pond culture of the mud crab *Scylla* species at three stocking densities in the Philippines. *Aquaculture,* 174: 109 - 118.

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