The Fourth Indian Fisheries Forum, Proceedings

24-28 November, 1996

held at

School of Marine Sciences
Cochin University of Science and Technology
Kochi 682 014
Kerala, India

Asian Fisheries Society, Indian Branch

1999

The Fourth Indian Fisheries Forum Proceedings
24-28, November, 1996. Kochi p. 215-218.
Published in 1999.

Commercial Farming of Mud Crab in Coastal Ponds at Tuticorin

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Abstract

Mud crab farming is fast developing in shrimp ponds as diversified and alternative system of culture by the entrepreneurs. The resource potentials of seed and feed are highlighted. Fourteen ponds were converted for production of mud crab. Monoculture, polyculture and fattening methods are described. Production results of these trials vary from 1020-2440 kg/ha/crop, revealing the scope to improve high yield. Fattening of water crabs in a period of 7-8 weeks fetched an attractive revenue. Technology for production of gravid female which fetch a premium price in export trade was evolved. A high profit was realised in polyculture trials with milkfish as compatible species. Feed consists of low cost trash fish and gutted wastes of squid, rays and chick. The hydrological and environmental conditions were conducive and its requirements are discussed. The growth, survival and production results vary according to the size and number of seed stocked.

Introduction

Mud crab farming is gaining importance in the recent past with the aquaculture facilities developed in most of the coastal regions in South India. Farmers are in threshold of a major plan of diversification with the integrated culture of crab, groupers, milkfish, seacucumber, seaweed, oysters, clams and mussels in commercial shrimp farms and hatcheries. Present status and various techniques employed in this venture have been described by Marichamy 1980, 1986), Marichamy *et al.*, (1987),Srinivasagam and Kathirvel (1992), and Babu (1995). The Central Marine Fisheries Research Institute played a role in the demonstration programme entertained with a private entrepreneur at Tuticorin and the present papers deals with the results of commercial scale farming of mud crab carried out from converted shrimp farm.

Materials and Methods

The resourceful grounds, seasons and methods employed for the collection of wild seed were identified and reported by Marichamy *et al.*, (1987) and Marichamy (1993,1996). Punnakayal estuarine complex and surrounding lagoons and backwaters offer as perenial ground for the collection of mud crab seed in this zone. Shrimp ponds varying in the size 0.3-0.5 ha were redesigned for starting different types of crab culture such as monoculture with both sexes and monosex, polyculture with milkfish and fattening with water crabs. Adequate hide-out pots were provided at the bottom of the pond to serve as refugee cageand this method helped to increase the survival rate. Water exchange system and other farm management aspects were similar to the arrangements followed in earlier shrimp culture practices (Marichamy and John Motha,1986).

The occurrence of young ones of *Scylla oceanica* (Dana) in commercial catches were more common and the entire stock required for farming operations were gathered from the catches of indiscriminate fishing. Newly moulted water crabs of adult sizes were also gathered from commercial catches and preferred for fattening them in separate ponds at low stocking density. However, adequate number of low valued specimens were not available for stocking and this may become a limiting factor for expansion of crab fattening. Seed of milkfish were collected by using surft nets in the low saline reservoirs of salt pan area itself and stocked in polyculture pond. Trash fishes and gutted wastes of rays and sharks, peeling wastes of squid and clam meat were the items of feed materials procured in fresh conditions and supplied at 5-10% of body weight of biomass stocked in pond. Dusk of the day appeared to be ideal time for feeding the stock since birds do not compete with crabs.

The grow-out techniques adopted were similar to the system widely followed in Philippines, Thailand, Taiwan, Malaysia, Sri Lanka and Indonesia. Complete draining of water from rearing ponds was arranged in cool hours of the day once in a month with an aim to maintain good quality of water as well as to assess the survival of stock. The trend of growth was monitored by periodical sampling with cast-net operations. Care was taken to release more or less uniform size group of crab in grow-out ponds to prevent cannibalism and to increase survival rate. Artificial shelters were found occupied by moulted crabs invariably. A total perfect harvest is arranged by draining the water in early morning hours. Skilled workers were engaged in harvesting the crop, since specimens should be handled carefully without any loss of appendages. Newly moulted specimens or the soft shelled water crabs were identified by the colour and structure of the carapace as well as by pressing the left basal segments of second walking legs with thumb and segregated for further rearing in grow-out ponds. Normally, a moulted crab takes 8-12 days to get rigid, hard shell and become healthy. Harvesting was arranged around new moon days so that there would not be any loss of weight in specimens. About 10-15% of the stock was noticed in such stages and they were retained in the same pond to grow further. Three different culture techniques were followed.

Table 1. Production results of mud crabs farming (Monoculture)

Stock particulars								Harvest particulars					
Period of stocking	Sex	Pond area ha	No. of crab stocked	Rate of stocking /ha	Size range mean mm	Weight range mean g	Day	Size range mean mm	Weight range mean g	Growth rate mm/g	Survival (%)	Production (Kg)	Rate of production Kg/ha/crop
17.7.95	Both	0.5	3500	7000	64-120	50-220	144	125-145	360-820	12.0/112.5	26.4	550.0	1100.0
3.8.95					80.6	105.0		138.0	645.0				
3.8.95	Both	0.4	4000	100000	65-122	50-240	148	125-140	345-780	10.7/92.2	20.2	408.0	1020.0
17.8.95					83.0	110.0		136.0	565.0				
31.8.95	Both	0.5	4000	8000	81-110	85-110	120	126-140	325-740	10.0/114.5	36.2	820.0	1640.0
23.9.95					95.0	130.0		134.6	528.6				
30.10.95	Male	0.4	2400	6000	76-120	75-235	142	128-142	440-710	10.2/110.8	33.8	520.0	1300.0
15.11.95					95.0	130.0		136.5	644.5				
30.10.95	Female	0.4	2400	6000	75-120	75-240	142	126-140	330-580	9.9/86.6	34.2	430.0	1075.0
15.11.95					92.0	125.0		135.0	525.0				

Results and Discussion

Large scale culture of mud crab becomes possible in coastal ponds with conducive environmental factors. The dissolved oxygen content fluctuated in the range 3.4-5.1 ml, salinity varied from 24.2-40.2 ppt and pH recorded in the range 7.85-8.10 with average water depth of 1 mt. About 20% volume of water was let out daily from and replenished.

The results of monoculture practices are given in Table 1. During July-September, 1995, mud crab juveniles of both male and female with an average size of 80-95 mm/105-130 g were stocked in ponds at different stocking density varying from 7000-10000/ha. Two more ponds were stocked with males and females separately in order to see the differences in growth and production trends. The mud crab released at 95mm/130g attained the size of 135mm/588g in 4 months period, recording a monthly growth rate varying from 10-13 mm and 55-114g. Weight input was in the ascending trend, whereas size-wise increase was found maximum when the stock crossed the stage of 100mm size. When both sexes were mixed in the grow-out ponds better production at 1640 kg/crop of 4 months was recorded when the rate of stocking was kept at 8000/ha. This may be attributed to the higher survival rate of 36% as well as to the larger size of seed stocked. A low production of 1020 kg/ha/crop of 148 days may be related to higher stocking of 10000/ha and lower survival rate noticed as 20%. Comparatively better production of 1300 kg/ha/crop of 142 days was recorded in a pond exclusively stocked with male crabs.Although the size and rate of stocking was kept uniform, the production was on low side (1075 kg only) and it may be due to lesser growth rate in female crabs.

Polyculture is a traditional practice in Taiwan and Philippines in tidal ponds with shrimp or milkfish as the main crop. In the present grow-out arrangements one pond in the size of 0.5 ha was designed for polyculture and the results shown in Table 2. Mud crab with the size at 92mm/115g and milk fish in the size of 90 mm/8 g were stocked during August 95 at the rate of 8000/ha and 4000/ha respectively. Ricebran mixed with soya and groundnut oil cake powder in small doughs were supplied to chanos on alternate days. Soil condition of such polyculture pond was found good without facing any problems due to accumulated sludges. The algal metress that grow at the bottom stands as the major diet for milkfish and thus it becomes a compatible species without any hinderance to the other stock. In polyculture trials, the rate of growth was comparatively less although the size and rate of stocking was kept uniform. The monthly average growth varied from 9.6-12 mm/36-111g. Growth increment for each stage was calculated and recorded a maximum rate of 14.5 mm when the stock reached 118 mm size. Crab seed released at 92 mm/115 g had grown to 136 m/626 g in 136 days. The milkfish seed stocked at the size of 90 mm/8 g. Progressed to 382 mm/440 g in the same period. The rate of growth was noticed in ascending trend and registered a maximum of 67 mm/month till it attained the size of 352 mm/325 g.

A maximum production of 2440 kg/ha/crop of 138 days was noticed when the stocking density was maintained at 8000/ha. The mud crab released at 92 mm/115 g progressed to 136 mm/626 g in 4 and half months. The survival was also good and recorded as 49%. This production was realised in addition to the yield of milkfish obtained at 1440 kg/ha in the same pond.

The growth pattern observed in male and female crabs exhibited distinct difference. The male crab seed released at 88 mm/120g in November 95 progressed to the size of 136 mm/644 g in March 96 and registered a maximum growth of 14 mm with the size group of 110-120 mm whereas females of the same size had grown to 135 mm/525 g only, although the period and rate of stocking were the same. The monthly rate of growth in males was found higher at every stage. In the fattening system of adult post moulted water crabsthe growth by size was very low but noticed higher input of weight.

Moulted specimens in the size ranging from 128-142 mm/405-720 g were gathered from commercial centres at

Table 2. Production results of mud crab farming (Polyculture)

Stock particulars								Harvest particulars					
Period of stocking	Sex	Pond area ha	No. of crab stocked	Rate of stocking /ha	Size range mean mm	Weight range mean g	Day	Size range mean mm	Weight range mean g	Growth rate mm/g	Survival (%)	Production (Kg)	Rate of production Kg/ha/crop
S. oceanica	17.8.95	0.5	4000	8000	70-125	70-300	138	130-142	440-810	9.6/111	48.8	1220	2440.0
	30.8.95				92.0	115.0		136.2	626.0				
C. chanos	20.8.95	0.5	2000	4000	81-96	60-120	138	360-415	350-580	62.4/94	84.5	720	1440.0
	25.8.95				90.0	8.0		382.0	440.0				

Total production in polyculture - 3880.0Kg

cheaper rates and stocked in a separate pond at the rate of 3000-4000/ha and reared for about 4-8 weeks under fattening. It was cared to maintain a steady hydrological conditions in these ponds, because abrupt changes in salinity may result in further moult and loss of weight. Environmental management is an important aspect in fattening system and the proven technology developed in Thailand is adopted here. Marichamy (1995) highlighted the salient features of this techniques. Monosex stocking is considered as highly advantageous. Production of gravid females under this method is a profitable venture.

When matured size crabs of both male and female stocked together in rearing ponds of high salinity conditions it leads to gonadal maturation, mating and finally spawning. With the result, a number berried/ovigerous females were noticed in monoculture system. In brackishwater media such a situation will not arise. In order to have value added product of females in subsequent stocking operations it was cared to segregate the collections sex-wisely and stocked in separate ponds, so that females were prevented from mating and spawning. This strategy was aimed to produce more gravid females which fetch premium price in international market. Marichamy et al (1986) and Marichamy (1996) highted this technology with the experiments made with Scylla serrata (Forskel).

Alice (1979) found that at 26 ppt lesser moults occurred with increment in weight and more moults of 30ppt resulted in lesser weight input. In the present environment the salinity was recorded at lower ranges during November-January. The monthly average weight input was comparatively higher (75-115g) in these months. The production results are highly related to the methods of culture, the growth and survival of stock. Heasman (1980) opined that mud crabs exposed continuously to optimum temperatures grow slower and do not reach the same maximum size as those exposed to seasonal variations. In tropical waters as seen evidently now, they grow faster due to variations in temperatures during seasons. Srinivasagam and Kathirvel (1992) reported the average monthly growth as 14mm/29g and production rate in monoculture as 494-600 kg/ha and 690 kg/ha in polyculture. Better growth rate of 12mm/112.5 g/month was noticed in the present works. Production varied from 1075 to 1640 kg/ha/crop of 4 months in monoculture and in polyculture still encouraging results were noticed. A highest record production of 2440 kg of crabs and 1440 kg of milkfish/ha were obtained in polyculture system. Baliao *et al.*, (1981) and Lijauco *et al* (1980) have experimentally evaluated stocking densities of between 500-20000 crab per ha. and indicated that the lower the density the lower the mortality and faster the growth. This is in confirmity with the present findings.

High stocking of 10000/ha resulted in low survival at 20% and production at 1020 kg/ha/crop. High productions were observed when stocking was kept low at 8000/ha.

As observed in a number of earlier operations (Marichamy *et al.*, 1987) males exhibited higher growth rate and production. Stocking of chanos as compatible species promotes the polyculture system in maintaining the pond bottom free from sludges. Mud crab fattening and polyculture are more remunerative and the technology developed envisages the scopes for a still higher production potentials.

Acknowledgemnets

The authors are grateful to M/s. Motha Brothers, First Aqua Farm, Veppalodai for the supports and co-operations extended in this programme of culture. The guidence and keen intrest evinced by Dr.M.Devaraj, Director, Central Marine Fisheries Research Institute, Kochi is greatefully acknowledged.

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