

MUD CRAB, *SCYLLA OLIVACEA* : FATTENING PRACTICES IN BANGLADESH

MD. YOUNUS MIA*

Department of Environmental Science & Resource Management, Mawlana Bhashani Science & Technology University, Santosh, Tangail-1902, Bangladesh

Abstract

The fattening and culture of mud crab, *Scylla olivacea* have been practiced in recent years in brackishwater ponds in Bangladesh. Small to medium sized and even large but gonadal immature crabs those have low market value are bought from farmers/fishermen/market and stocked in the fattening ponds. Fattening of crabs is profitable because of fast turnover, low operating cost, high survival rate and good market demand. Two types of earthen ponds are used to fatten the crabs. One type is connected to the river through inlets and outlets to exchange water during high and ebb tides. Another type is not connected to the river but water is pumped into and discharged from the pond. The importance of fattening has been recognized as a source of income and employment to alleviate the poverty of coastal people. Through this technology ponds and ditches in the coastal region can be utilized throughout the year. A net income of TK. 3,800 can be achieved from 120 m² pond using the crab fattening technology. There is potential to expand the crab fattening practices in the coastal areas of Bangladesh. Inadequate supply of stockable crab and feed are major constraints in this sector.

Key words: Mud crab, fattening, brackishwater ponds, Bangladesh

Introduction

There are 15 species of crab in Bangladesh, 4 freshwater and 11 marine (Saha and Ahmed, 1999). *Scylla olivacea*, popularly known as mud crab, is the most important species in Bangladesh for food and trade. Mud crab is an exclusively brackishwater species (Ferdouse, 1990). This species is distributed over a wide range of salinity from 2 ppt to full strength seawater (34 ppt), and therefore they are found from the coast to interior brackishwater. It is an euryhaline species but dies beyond 70 ppt, and it rarely tolerates turbid water (Khan and Alam, 1992).

In Bangladesh, mud crab occurs throughout the coastal districts of Bagerhat, Barisal, Bhola, Chittagong, Cox's Bazar, Khulna, Noakhali, Patuakhali and Satkhira (Ahmed, 1992). It also grows as an unwanted animal with tiger shrimp, *Penaeus monodon*, in the *gher* (traditional shrimp farm). Bangladesh earns considerable foreign currency through exporting mud crab to the international market. Bangladesh exported live crab for the first time in 1977. In Bangladesh, among the exportable fisheries commodity crab ranks immediately after shrimp from the point of economic importance. The country earns nearly US\$ 4.5 million annually by exporting crabs to the international market (Saha and Ahmed, 1999). Crab is highly sought after by people from different nations as a delicious food, with egg-bearing female crabs is in high demand due to their good taste (CCEC, 2002).

* Author for Correspondence: oshin1998@yahoo.com

With increased demand in the foreign market, and knowing it as a profitable business, the coastal people has started crab farming. The term culture and fattening are sometimes used interchangeably in crab farming but these are two distinct type of operations. Culture refers to the farming of under-sized crab for a considerable length of time, usually 3-6 months, to produce marketable adult crabs. During the culture operation, the crabs (both male and female) may moult a number of times. On the other hand, crab fattening pertains to culturing marketable sized mud crab; fattening female crabs with immature gonads for 2-4 weeks so that they put on additional weight through developing their gonads. Moulting does not take place during this period, and there is little or no growth involved. Survival is high and normally exceeds 90% (Liong, 1993; Saha and Ahmed, 1999; farmers opinion). Oviparous females have high market value for their red toe. Female crabs of over 180 g weight with mature gonad demand high price for export to foreign countries. Crabs below 180 g have no international market value and only have a limited local market. Farmers do not strive to produce crabs of internationally accepted weight and the introduction of crab fattening has been indiscriminate, possibly due to a lack of technical knowledge.

Culture and fattening practices vary widely in different parts of the coastal region. Both men and women are engaged in fattening practices using inundated ponds, ditches and other water bodies.

Materials and methods

This case study is an overview of fattening practices used in Bangladesh based on interview with farmers, visits to fattening ponds, as well as a review of research findings.

Results and discussion

Site selection, Pond Characteristics and Pond Preparation

Mud crab grows best in brackishwater, such as tidal flats, estuarine areas, bay and lagoons. Pond sizes of 0.1-1.0 ha do occur, although most ponds are 120-400 m². Loamy or sandy loam soil is good for fattening. Before start of the fattening activities, ponds are dried and embankment repaired properly. Some pond complexes are near the brackishwater river with a connection between the ponds and the river. The water flow is controlled by a sluice gate with water changed during flow and ebb tides. Ponds not connected with the river are filled up and emptied by pumps.

A recommended dose of lime at the rate of 125 kg/ha is applied to the pond after drying to raise the soil pH up to 7.0-7.5. Though most of the farmers do not use lime unless water become dirty. Immediately after liming ponds are filled up with tidal water and seven (7) days later organic manure (cowdung) is applied at the rate of 750 kg / ha. After 3-4 days, inorganic fertilizers are applied at the rate of 25 kg urea and 15 kg TSP/ha. Water depth is maintained at around 0.5-1.0 m. Bamboo fences covered with nylon net are inserted 0.5 m deep into the soil around the pond to prevent the crabs from escaping. The fences last for around 2-3 years. The crabs are stocked into the pond 3 days after applying inorganic fertilizers.

Stocking

About 10,000 crabs with immature gonads are stocked per hectare (Saha and Ahmed, 1999), although up to 20,000 crabs per hectare are sometimes stocked by farmers present

survey. The weight of individual crab must be 180g or more but in some cases crabs of 170g may be stocked as weight will be gained during the fattening and maturation of gonads. Stocking is done during the early morning or late in the afternoon.

Behaviour

Crabs do not take much time to settle down on the bottom of a water body when released. They move freely in the water. They are observed clearly and are more active at night than during the day, even coming out of the water and resting near the edge of the pond.

Food and Feeding

Crabs prefer to feed at night. They are fed twice a day at 5-8% of body weight. In some cases feed is given once on alternate days at night. Generally, a diet containing 25% tilapia and 75% slaughterhouse waste, or 50% tilapia and 50% shrimp head, is fed. Locally available low-priced fish such as small carps and trash fish are also used as feed.

The feed is divided into three portions: one portion is applied from 05:00 to 06:00 h and remaining two portions from 18:00 to 19:00 h. After proper cleaning of the fish and slaughterhouse waste, they are cut into small pieces for crab feed. Adequate feeding is considered important because starving accelerates cannibalism.

- 100% trash fish as a control (T1)
- 50% trash fish and 50% shrimp head (T2)
- 50% trash fish and 50% slaughterhouse waste (T3)
- 100% slaughterhouse waste (T4)

Fattening of mud crab with 100% slaughterhouse waste (T4) led to the highest growth rate but the highest survival rate was recorded for diet T2.

Water Management

As a huge amount of raw animal materials is applied to the pond as crab feed, water is exchanged frequently to prevent fouling. At least 30-40% of pond water volume is exchanged. Discharged water always has a strong and offensive odour due to the use of raw feed, which is allowed to remain for a long time to give adequate time for the crabs to feed. Maintaining water quality is not easy but is important. Pond water quality for fattening has been determined on the basis of research.

Gonad Investigation

From 10 days after stocking, gonad maturation is assessed every 2-3 days. Sunlight does not pass inside the body of fattened crabs as matured gonads darken the body. On the other hand, sunlight passes into crabs with immature gonads, which are not yet fattened. Fattened crabs generally congregate at the inlet when water is let into the pond.

Harvest and Handling

When the crabs become fattened they are harvested. Tidal water is allowed to enter the pond so that the crabs move against the current and gather near the gate. Scoop nets and bait are used to harvest crabs. It is necessary to dry out the pond for total harvest. Crabs are also harvested individually by hand. Harvested crabs are bound with straw or string through a special process to avoid breaking their chelae and to enable easy handling.

Skilled workers may be needed to harvest and bind the crabs. Harvested crabs are washed in clean brackish water to remove mud. The exposure of crabs to sun and wind is avoided to minimize stress and mortality.

Transport

Crabs are transported from the field to Dhaka, the capital city, inside bamboo made baskets at 90-100 kg per basket. Before export, according to international criteria they are repacked at the rate of 16 kg per basket. The transport cost to Dhaka from different districts ranges from TK. 280-300 per basket, depending on distance.

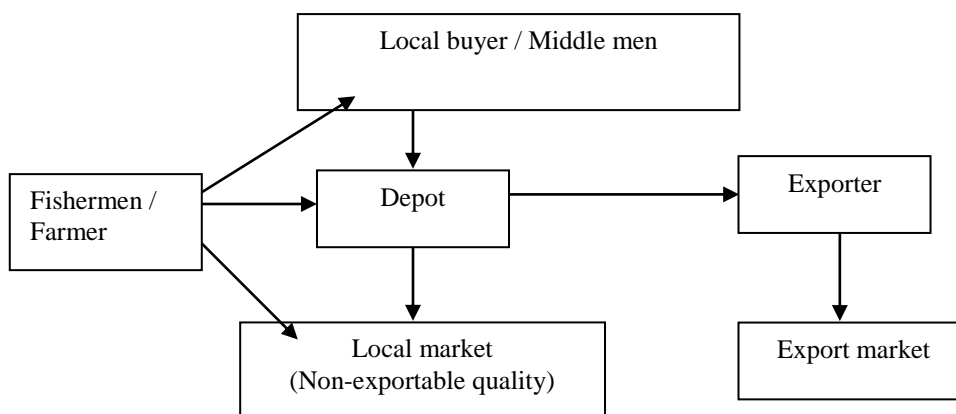


Fig. Crab marketing flow chart.

Fattening cycle

Crab fattening usually runs throughout the year, depending on availability of expected sizes of female crabs. In one year, 9-10 cycles of fattening can be done in a pond. Crab fattening can be done profitably by repeated stocking and harvesting. In Bagerhat, Bhola, Cox's Bazar, Khulna, Noakhali and Satkhira regions, crabs are available for stocking and water salinity level is also suitable in these regions.

Future Trends

Since crab fattening is profitable, it has been rapidly expanding and creating awareness among coastal people. An inadequate supply of stockable crabs has been a major constraint in expansion of fattening. To further develop fattening, an adequate supply of stockable- sized mud crabs should be ensured. Inadequate supply of feed is occasionally another major problem.

Large scale exploitation of mud crabs from the wild environment and destruction of mangroves threatened the breeding and nursery grounds of the crabs that ultimately caused reduced supply of crabs from the natural environment. Hatchery produced seeds have been identified as a possible alternate solution of the problem. Guidelines on maturation and techniques for efficient seed production must be developed for an appropriate hatchery technology to make mud crab fattening a profitable venture.

Although mud crab fattening takes place in earthen ponds in Bangladesh, cage culture has been introduced in the Philippines and Malaysia (Daisy, 1992; Liong, 1992). The advantage of using bamboo-made cages is that selective harvesting can be done. If the

crabs do not attain the desired weight, they could be easily returned to their compartment and fattened further.

Table 1. Weight gain, survival rate and production of mud crab obtained through different feeding treatments (Ahmed *et al.*, 1998).

Parameters	Treatments			
	T1	T2	T3	T4
Initial weight (g)	193.21	197.61	195.15	196.28
Final weight (g)	205.42	209.47	213.77	217.48
Survival rate (%)	89.00	91.00	88.00	68.00
Production (kg/ha)	1096.94	1143.71	1128.71	887.32

Table 2. Physico-chemical parameters of the crab fattening ponds (Saha and Ahmed, 1999).

Depth (meter)	Temperature (°C)	Salinity (ppt)	Oxygen (ppm)	pH
1.0 – 1.5	22 - 23	5 - 25	4 - 8	8 – 8.5

Table 3. Cost-benefit analysis of crab fattening of one hectre pond ((Saha and Ahmed, 1999).

A. Fixed cost				
Materials	Price (Tk)	Amount	Duration	Total cost (Tk)
1. Bamboo fence (height 1.5 metre)	70/-	400 metre	3 Years	28,000/-
2. Gate (wood made)	9,000/-	2 (nos)	3 Years	18,000/-
3. Guard shed	1,000/-	2 (nos)	2 Years	2,000/-
Total cost	-	-	-	48,000/-
B. Variable cost				
Materials	Price (Tk)	Amount	Total cost (Tk)	
Pond lease	650/-/hac/month	-	650/-	
Immature female crabs (indiv. weight 180 g)	100/-/kg	1800 kg	1,80,000/-	
Lime	4.50/kg	125 kg	562/-	
Urea	5/-/kg	25 kg	125/-	
TSP	14/-	15 kg	210/-	
Feed @ 5-7%				
a) Tilapia/trash fish	22/-/kg	589 kg	12,958/-	
b) Slaughtered house waste	10/-/kg	1769 kg	17,690/-	
Labour (20 days)	50/-/day	4	4,000/-	
Miscellaneous	-	-	5,000/-	
Total cost	-	-	2,21,195/-	

C. Interest of the bank @ 14%	-	-	18,843/65
Total cost (A+B+C)	-	-	2,88,038/65

Income:

Avg. wt of crab (g)	No. of crabs	Survival rate(%)	Total wt (kg)	Price (Tk/kg)	Total price (Tk)
190	9,000	90	1,710	180/-	3,07,800/-

Net Income:

1 st batch (1), income 3,07,800/-, cost 2,88,038/65	19,761/35
2 nd batch (2), income 3,07,800/-, cost 2,21,195/-	86,605/-
3 rd batch (3), income 3,07,800/-, cost 2,21,195/-	86,605/-
4 th batch (4), income 3,07,800/-, cost 2,21,195/-	86,605/-
Net profit (1+2+3+4)	2,79,576/35

Table 4. Cost-benefit analysis of crab fattening activities for one cycle (30 days) of 3.0 decimal (120 Sq.m) of pond area is shown below (Directly interviewed with farmer).

A Fixed cost				
Materials	Price (Tk.)	Amount	Duration	Total cost (Tk.)
1. Bamboo fence	26/-	50 metre	3 years	1,300/-
2. Net	10/-	50 metre	1 year	500/-
3. Guard shed, gate etc.	-	-	2 years	1,000/-
Total cost				2,800/-

B. Variable cost			
Materials	Price (Tk.)	Amount	Total cost (Tk.)
1. Pond (own)/dyke preparation	-	-	1,000/-
2. Crab	100/-	50 kg	5,000/-
3. Feed	20/-	35 kg	700/-
4. Labour for harvesting	50/-	2 no.	100/-
5. Binding tape & miscellaneous	-	-	100/-
Total cost			6,900/-
Total cost (A+B)			9,700/-

C. Income					
Avg. wt of crab (g)	No. of crabs	Survival rate (%)	Total wt (kg)	Price (Tk/kg)	Total price (Tk.)
200	225	90	45	300/-	13,500/-

Net income

Income (C) – Total cost (A+B) = 13,500/- - 9,700/- = 3,800/-

References

- Ahmed MK, 1992. Mud crab – a potential aqua-resource of Bangladesh. In: Angell CA, ed. The Mud Crab. Report of the Seminar on the Mud Crab Culture and trade, Surat Thani, Thailand, 5-8 November 1991 –BOBP/REP/51. Madras, India: Bay of Bengal Programme, pp 95-102.
- Ahmed SU, Saha MR and Mazid MA, 1998. Culture of mud crab. Fisheries Newsletter. Bangladesh: Bangladesh Fisheries Research Institute, 6(1-2): 1-7.
- CCEC, 2002. Sundarban conservation through fattening by Batiaghata harvesters participation. Crab Newsletter. Khulna, Bangladesh: Centre for coastal Environmental Conservation.
- Daisy FL, 1992. Mud crab- mud crab fattening practices in the Philippines. In: Angell CA, ed. The Mud Crab. Report of the Seminar on the Mud Crab Culture and Trade, Surat Thani, Thailand, 5-8 November 1991 – BOBP/REP/51. Madras, India: Bay of Bengal Programme, pp151-153.
- Ferdouse F, 1990. Live mud crab – a Malaysian favourite. INFOFISH International, 6/90 (May-June): 55-57.
- Khan MG and Alam MF, 1992. Mud crab- the mud crab (*Scylla serrata*) fishery and its bio-economics in Bangladesh. In: Angell CA, ed. The Mud crab. Report of the Seminar on the Mud Crab Culture and Trade, Surat Thani, Thailand, 5-8 November 1991 –BOBP/REP/51. Madras, India: Bay of Bengal Programme, pp 29-40.
- Liong PC, 1992. Mud crab culture and fattening in Malaysia. In: Angell CA, ed. Report of the seminar on the mud crab culture and trade held at Surat Thani, Thailand, November 5-8, 1991. Madras (India): BOBP/REP/51, pp185-190.
- Liong PC, 1993. The culture and fattening of mud crabs. INFOFISH International, 3/93 (May-June): 46-49.
- Saha MR and Ahmed SU, 1999. Fattening technique of mud crab. Khulna: Bangladesh Fisheries Research Institute [In Bangla].