



# International Journal of Fisheries and Aquatic Studies

ISSN: 2347-5129

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.352

IJFAS 2016; 4(1): 453-457

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www.fisheriesjournal.com

Received: 15-12-2015

Accepted: 17-01-2016

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## Economic performance of live crab (*Scylla Serrata*) business in the southwest coastal region of Bangladesh

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### Abstract

Live crab business has proven as a promising fisheries/aquaculture practice in Bangladesh. The present study was aimed to examine the economics of collecting and fattening of live crab (*Scylla serrata*) at Paikgachha upazila under Khulna district of southwest region of Bangladesh. A total of 50 crab farmers were randomly selected from Paikgachha upazila of which 20 were crab collectors and 30 were crab fatteners. The study determined costs, returns and profitability of mud crab production in respect of crab collection and fattening. However, for the male crab, 5 grades namely extra-extra-large (XXL), extra-large (XL), large (L), Medium (M) and small (SM) were observed, whereas 3 grades were observed for female crab namely F1, F2 and F3 both in descending order of live gross weight. The average size of crab farm was about 1 acre. The demand of live crab was higher in winter season (November-March) when the production and catch were relatively higher. The results from profitability analysis revealed that total cost and gross return of crab collecting in one season (Sept-Feb) were about Taka 277,197 and Tk. 416,706 respectively whereas in one culture period (Nov-Feb) of fattening, per acre total cost and gross return were Tk. 729,619 and Tk. 864,314 respectively. Net returns of crab collecting and crab fattening were Tk. 139,510 per season and 134,95 per acre respectively and there corresponding benefit cost ratio were about 1.5 and 1.18 respectively. The average benefit-cost ratio (BCR) of crab collecting (1.5) and crab fattening (1.18) revealed that there is a great business potentiality in mud crab collection and fattening. Considering the total export earnings from mud crabs, this sector shows future potential and for achieving this, development and support should come from government and different non-government organizations to improve the sustainability of this sector in Bangladesh.

**Keywords:** Cost and return, live crab, profitability, Bangladesh.

### 1. Introduction

The mud crab (*Scylla serrata*), locally called as “Habba kakra”, “Silla kakra” or “Kankra” is one of the most important coastal aquatic species after the tiger shrimp in Bangladesh due to its high demand and price in the international market. There are thirteen marine and three fresh water species of crabs reported in the coastal waters of Bangladesh covering the districts of Khulna, Chittagong, Barishal, Satkhira, Bagerhat and Cox's Bazar<sup>[1]</sup>. Six important genera that are used as food crabs are *Scylla*, *Portunus*, *Charybdis*, *Matuta*, *Varuna* and *Sartorina*<sup>[2, 3]</sup>. In recent years, there has been increasing interest in crab farming due to growing markets and international demand. Capture and culture of live crab such as Chinese mitten crab (*Eriocheir sinensis*) and mud crab (*Scylla serrata*) have been expanding because of the high economic value of these species and their potential as an export commodity.

Live crab production is considered as a profitable and feasible business by most of the marketing operators. Due to religious myth on eating crabs, the mud crab (*Scylla serrate*) is not popular in Bangladesh even though they have commercial importance in the world market. It occupies the third position among the frozen foods exported from Bangladesh. Thus, crab an agricultural product, can be identified as a significant product in the economy of Bangladesh for its noteworthy contribution in soaring the foreign exchanges earnings. According to Export Promotion Bureau (EPB), Bangladesh started exporting crab in 1977 and the first consignment was worth \$2,000 only. Crab exports grew over the years to 2,973 tonnes in 2008-09 Fiscal Year, 4,416 tonnes in 2011-12 FY and 8,520 tonnes in 2013-14 FY. The country earned \$15.83 million from crab exports in 2012-13 FY. Crab exports fetched \$22.91 million in 2013-14 FY<sup>[4, 5]</sup>.

The domestic market of mud crabs has not yet developed because of high price and religious prohibition among the Muslims. All the harvested crabs were sent to the foreign countries through airfreight. According to EPB, China is the single largest crab exporter from

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Bangladesh. Crab is also being exported to around 17 other countries, including Malaysia, Indonesia, Taiwan, Japan, Singapore, Korea, the US, Myanmar and some European countries. Mud crab production appears to have a bright future both in creating employment opportunity and foreign exchange earnings. The physical, chemical and biological parameters are also suitable for crab culture in the southwest region of Bangladesh. In southwest coastal belt of Bangladesh, millions of poor fishers, traders and transporters are directly or indirectly dependent on live crab catching and collection, especially from the swamps of the Sundarban reserve forest. Most of the crab studies in Bangladesh were dealing with biological and physical aspects of crab production<sup>[6-10]</sup>, but little is known of the economic analysis on farm level mud crab farming in Bangladesh. Therefore, the present study was aimed to determine the economics of crab collection and fattening with respect to costs, returns and profitability analyses. In the southwest region of Bangladesh.

## 2. Materials and Methods

The main purpose of the study was to collect and analyze field level data both in physical and monetary terms on the

production of crab. Greater Khulna is one of the concentrated areas of mud crab business in Bangladesh. Therefore, to examine the current farming practices of crab collection and fattening in terms of their costs and returns, Paikgachha upazila of Khulna district in the southwest region of Bangladesh was purposively selected for the present study. Data was collected during the months of January to March 2013. Both primary and secondary data were used in the study where primary data was collected through field survey. For this, a draft interview schedule was prepared to collect the expected information from crab collectors and fatteners. Then the schedules were pre-tested to verify the relevance of the questions and the nature of response from crab farmers. After pre-testing, the final survey schedule was developed with necessary corrections and modifications. Secondary data was collected from publications of Bangladesh Bureau of Statistics, Department of Fisheries and some official documents. In total 50 samples were considered for the present study. The sample respondents included crab collectors and crab fatteners, and the distribution of them are shown in Table 1. Focus group discussion was also organized involving crab collectors, fatteners and traders in the study site.

**Table 1:** Study design and distribution of sample respondents

Study areas (Villages in Paikgachha)	Crab collectors selected (persons)	Study areas (Villages in Paikgachha)	Crab fatteners selected (persons)
Korolia	10	Shibbari	10
Bhatikhali	5	Korolia	10
Alamtat	5	Fulpur	10

Source: Field survey, 2013.

### Analytical Techniques

In this study, some economic techniques were used for the analysis of data. The data were arranged in tabular form and were analysed as per objectives of the study. Average and percentage were used to show the results in a comprehensive manner. The economic techniques that were employed in analysing the data are described below.

### Profitability analysis

To determine the profitability of crab farming, costs items were divided into two components: fixed costs (which includes land use cost, tools and equipment cost and interest on operating capital etc.) and variable costs (food costs, tax, labour cost, transportation cost etc.). Net return or profit was derived by deducting all costs (variable and fixed costs) from gross return. In determining the net return or profit of the crab farmers, profitability analysis was used. For this purpose, the following equation was employed to determine the profitability of the crab farmers.

Net return/profit of farmers:

$$\Pi = P_m \cdot Q_m - (TVC + TFC)$$

Where,

$\Pi$  = Profit of crab collector/fattener

$P_m$  = Per unit price (Tk./kg) of crab

$Q_m$  = Total quantity of crab (Kg)

TVC = Total variable costs of crab collector/fattener

TFC = Total fixed costs of crab collector/fattener

Undiscounted benefit-cost ratio (BCR) was computed by the following equation.

$$BCR = \text{Gross return} / \text{Total cost}$$

## 3. Results and Discussion

The mud crab fishery is absolutely based on wild catch mainly from the swamps of the Sundarbans and vast areas of the

traditional shrimp *ghers* along the coastal region of Bangladesh. The actual culture technique of mud crab has not yet been developed in Bangladesh. In the present study, it was observed that 55 percent of the crab collectors collected crabs from the Sundarbans mangrove forest, whereas 35 percent and 10 percent collected crabs from *ghers* and rivers/canals, respectively. Seventy five (75) percent of crab collectors used *cuchia* as bait. Collectors were found to collect crabs for 12-15 days in 1 trip. It was also observed that the season during September to February is profitable for crab collectors. Around 10-12 trips were occurred by the crab collectors in one season (Sep-Feb).

On the other hand, juvenile crabs were collected from Sundarbans and adjacent rivers for hardening and fattening and the rejected crabs were transferred for trading into the crab depots. Simple small ponds are used in coastal areas for crab fattening in Bangladesh. These ponds are fenced by bamboo sticks locally known as "Pata" to prevent escaping of crab. Fattening usually requires 2-4 weeks to complete. Within this time, premature crabs are well fed to develop their body fully. In the study area, most of the ponds were divided into 4-6 compartments by using bamboo fences of 1 to 2 meters in height. The pond depth varied from 0.25 - 1.50 meter and water ranged between 0.50 - 0.75 meter. Most of the ponds were rectangular having a common inlet and outlet made of PVC pipes. The peak season for fattening was winter (November-February). The stocking density varied from 2000 pieces of crab/acre and fed at 10 percent of body weight once in a day during evening hours. The farmers used trash fishes, snail meat, offal of chicken and cattle meat as feed of crabs. The period of fattening and hardening varied from 10 to 25 days depending on the stage of gonad and/or hepatopancreas development, shell development and price of fattened crabs in the depots.

**Costs involved in crab collection**

In this study, costs were estimated by using cost accounting method. Variable costs for crab collection included food for labour, baits cost, Synthetic rope (tape) used for binding crab

legs, transportation cost, tax, labour cost and loss of mortality. On the other hand, fixed costs included tools and equipment use cost, interest on operating capital, etc. Detail costs of crab collection are presented in Table 2.

**Table 2:** Costs of collecting and marketing of crab (cost/trip (12-15day)/collector)

Particular	Unit	No./ Quantity	Price/unit (Tk.)	Cost (Tk.)	Total cost per season (Sept-Feb) in Tk.
<b>A. Variable cost</b>				22000	264,000
a. Labour used	person	2	300	9000	
a. Food provided (2 persons)			120	3600	
b. Baits (Cuchia)	kg	20	30	600	
c. Synthetic rope (tape) used for binding crab legs	kg	10	140	1400	
d. Tax				3000	
e. Transportation cost				3000	
f. Mortality loss	Kg	5	160	800	
g. Miscellaneous				600	
<b>B. Fixed cost</b>				1099.73	131,96.76
a. Depreciation cost of boat				1050	
b. Interest on operating capital				49.73	
Total cost (A+B)				23,099.73	277,196.76

**Costs involved in crab fattening and hardening**

Variable costs for crab fattening and hardening included crablet/soft shell crab, pond preparation/raising dyke, zeolite, feed cost, human labour, mortality loss, lime, transport, alum

etc. and fixed costs included cost for land use, depreciation cost, interest on operating capital etc. Table 3 shows the costs of crab fattening and hardening.

**Table 3:** Costs of crab fattening and hardening per acre per culture period

Particular	Unit	Quantity	Price/unit (Tk.)	Cost (Tk.)
<b>A. Variable cost</b>				
Crablet/soft-shell crab	kg	2000	247.69	495,380
Pond preparation/Raising dyke		6	2500	15,000
Human labour	person	6	300	1,800
Lime(1time/2 month)	kg	2	13	26
Alum	kg	1	32	32
Zeolite	kg	1	15	15
Feed cost (10 percent of body weight in a week)	kg	3,200	30	96,000
Mortality loss	kg	300	247.69	74,307
Transport				1,000
Miscellaneous cost				1,500
Total Variable Cost(TVC)				685,060
<b>B. Fixed cost</b>				
Land use cost				25,000
Depreciation cost				5000.00
Interest on operating capital				12,559.43
Miscellaneous				2000.00
Total fixed costs (TFC)				44,559.43
Total cost (A+B)				729,619.43

**Profitability of crab farming**

The returns were classified into gross return, gross margin (return on the basis of cash cost) and net return (return on the basis of full cost). To determine the returns from crab collection a comparative economic analysis was made for one season (September-February) where 12-15 trips were made. A brief account shows below how the individual cost and return was computed in the present study.

Gross return, the money value of total output, consisted of the values of live crabs. It may be noted here that on an average,

price of live crab received by the collectors were found to be Tk. 800, 700, 600, 500, 120, 500, 200 and 150 per kilogram of crab in Paikgachha for grade XXL, XL, L, M, SM, F1, F2 and F3 respectively. Table 4 shows that crab collectors earn by selling crabs from three different ways. On an average a crab collector earns Tk. 29,282.96, Tk. 4742.57 and TK. 700 per trip from crab exporter, fatterner and local consumer respectively. The estimated total gross return of a crab collector was found to be Tk. 34,725.53 per trip.

**Table 4:** Gross return of crab collector (return/trip (12-15day)/collector)

Items	Amount (Kg)	Price (Tk./Kg)	Gross return (per trip) in Tk.	Gross return per season (Sept-Feb) in Tk.
Crab exported	60	488.05	29,282.96	416,706.36
Sell to the fatterner	15	316.17	4742.57	
Sell to local market	10	70	700	
Total gross return			34,725.53	

The estimated average gross margin per trip was found to be Tk. 12,726 for a crab collector in Paikgachha upazila. The estimated average net return was found to be Tk. 11,626 for a crab collector. The benefit-cost ratio (BCR) of crab farming

was found to be 1.5 implying that Tk. 1.5 would be earned by investing every Tk. 1.00 for crab production. Therefore, it can be said that crab collection is profitable for crab collector (Table 5).

**Table 5:** Gross margin and net return from crab collection

Sl. No.	Item	Per trip (12-15 days) in Tk.	Per season (Sept-Feb) in Tk.
A	Gross return	34,726	416,706
B	Variable costs	22,000	264,000
C	Gross margin (A-B)	12,726	152,706
D	Total fixed costs	1100	131,967
E	Total cost (B+D)	23,100	277,197
F	Net return (A-E)	11,626	139,510
G	BCR (undiscounted) (A/E)	1.5	1.5

In case of fattening and hardening, soft cell crab known as 'Khosa' crab were collected by the farmers at 50 Tk./kg and the average selling price was calculated at Tk. 508.42. The estimated average gross return was found to be Tk. 864,314 for producing total 1700 kg crabs per acre per culture season. The average gross margin of crab farming was found to be Tk. 179,254. The estimated average net return was found to be Tk. 13,495 which indicates that crab production is a profitable business for the crab farmers. The findings were supported by the previous studies<sup>[11, 12, 13]</sup>. The benefit-cost ratio of crab farming was found to be 1.18 implying that Tk. 1.18 would be earned by investing every Tk. 1.00 for crab production (Table 6). Therefore, it can be concluded that the crab production is profitable for farmers.

**Table 6:** Gross margin and net return for crab farming

Sl. No.	Items	Crab farming amount (Tk./acre)
A	Gross return	864,314
B	Variable costs	685,060
C	Gross margin (A-B)	179,254
D	Total fixed costs	44,559
E	Total cost (B+D)	729,619
F	Net return (A-E)	13,495
G	BCR (undiscounted) (A/E)	1.18

#### 4. Conclusion and recommendation

The present study demonstrated that both the crab collection and farming were profitable business. However, there are some concerns prevail in this sector. The harvesting of mud crab completely depends on the natural sources in Bangladesh. Over exploiting is the main concern for the sustainability of this sector. Besides this, there are no standard culture techniques for mud crab. Although the mud crab business had developed since mid 80's, the livelihood of the crab fishermen remained unchanged. The crab collectors and the fatteners suggested that the government should pay some attention to this sector to prevent over exploitation of the species and to prevent environmental degradation affecting their habitat. There is a growing interest among farmers for crab fattening. The main factor behind this interest is the increasing demand for crab in the international market. After the outbreak of shrimp and prawn diseases, many farmers diverted from shrimp farming to crab fattening. According to their responses, they can get higher profit within a shorter time and with lower investment required compared to shrimp. The Fisheries Research Institute in Paikgachha upazila is playing a significant role by providing different training programmes for the farmers and establishing model farms for disseminating

modern aquaculture techniques. Various non-government organizations in the southwest of Bangladesh (e.g. Caritas, Shushilan) are also encouraging the crab fatteners and working with the fishers on sustainable farming practices and for adopting new technology through different development programs.

In conclusion, a considerable scope apparently exists in the study area for the expansion of mud crab business in the country. The study reveals that the mud crab business is highly profitable. One way to bring more profit is by reducing operating costs as much as possible. This can be achieved through scientific, biological and technological mechanisms, such as reducing mortality loss, transportation cost, labour cost and other operational costs. The government and NGOs should come forward to launch a proactive campaign that would create a local market for mud crab. An export market cannot sustain on its own for longer term unless supported by a strong local market. Mass awareness campaign is necessary to educate people that the custom of eating crab has no religious or scientific basis.

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