

**Marketing and Value Chain Analysis of Mud Crab  
(*Scylla sp.*) in the Coastal Communities of  
Bangladesh**

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## Executive Summary

Bangladesh is bestowed with a large coastal belt that supports the livelihoods of millions mainly through fishing and aquaculture related activities. While shrimp tops the list of the valuable aquatic products of Bangladesh but has caused grave environmental and socio-economic consequences in the wake of its expansion. Such consequences have not been internalised by the shrimp industry, instead they have been passed on to certain disadvantaged groups, which jeopardized the livelihoods of millions having no sustainable alternatives.

Recent studies have identified a number of potential alternative livelihood options for the disadvantaged groups, one of the options is mud crab *Scylla sp.* trading that has been gaining popularity among the coastal community of greater Khulna and Chittagong regions. However, as with other aquatic products the main problem of pro-poor entrepreneurship development in the country is that vertical integration between the primary producers and the consumers in the marketing system is yet to be developed. In absence of proper policy orientation, the activities of a number of intermediaries having no stakes in the production and processing of the products often make such integration really difficult.

In addition, coastal communities are more vulnerable to lose out in the marketing chain as they usually suffer more from lack of access to credit sources in comparison to the similar communities living in the vicinity of cities where pro-poor, NGO-operated micro credits are available. The present study was therefore carried out to review the socio-economic and livelihood situation of coastal communities involved in mud crab fishery with a view to widen our knowledge base on mud crab trading and the value chains involved so as to understand how the poor coastal communities, especially the women could benefit from possible technical and organizational interventions.

The study was conducted from April 2005 to March 2006 essentially throughout the coastal belt of Bangladesh. The coastal belt was divided into south west and south east parts so that the study could be carried out through a unique collaboration between two principal investigators from two universities in association with two regional partner NGOs.

The study focused on the socio economic conditions of fishers involved in the collection and trading of mud crab with particular attention to marketing channel and value chain analysis and a wide range of data was collected to that effect. Since most of the crab trading activities, both in terms of trade volume and the fishers involved, were concentrated in the greater Khulna region (South-western part of the study), the socio-economic study corresponds to that was obtained from this region. The most marginalized segment of the coastal population especially land less people, widow, orphan and children were found to be involved in mud crab collection for their livelihoods. They often live on government land with the anxiety of being evicted at any time. Their level of income fluctuates from time to time depending on the season of crab collection and in the lean season when they can afford very little food for their family. Meeting the basic necessities of life is difficult for most of them. The poverty ranking done through focus group discussion (FGD) shows that the crab collectors were the poorest in the chain having a modest

income to maintain their livelihood. These people did not have any access to other facilities of life such as health care and education. Their houses were made of mud, bamboo and paddy straws with only one room in most of the cases. Shared tube well was the source of drinking water while they were found to use pond water for cooking. They were found to use semi-structured toilets made of mud, leaves and bamboo but they were not hygienic. The average daily income of crab collectors was considerably lower than their counterparts in other economic activities. However, the number of crab collectors was found to increase over the last couple of years simply due to lack of viable alternatives. Because of existing social taboo over catching and eating crabs in Bangladesh, the crab collectors were found to suffer from social negligence and access to certain social institutions. Besides, the crab collectors were more vulnerable to lose out in the marketing chain by the intermediaries as they had no access to institutional credit sources.

Studies on the value chain analysis revealed that the market chain of the mud crab begins from the most disadvantaged section of coastal population who collect crab from the wild and sell to the local traders (locally called depot or *Aratdar*). *Aratdars* usually pay advance money to the collectors in the lean season in a condition that the later will sell their entire catch to the former at a certain price fixed earlier. Through such conditional trading local collectors never get the actual price of their catch. The study revealed that the local *Aratder* purchased crabs from the collectors or farmers in 2 - 4 grades, while the distributor bought the crabs from the local *Aratder* in 8 - 10 grades.

The price and demand of crab was higher in winter season, when the catch was minimal. Price of female crab was higher than that of the male. It was found that 90% of exportable crab came from natural sources with the rest being from the fattening centres. In the study area, there were 5 grades for the male crabs namely XXL, XL, L, M and SM, whereas 4 grades for female namely F1, F2, F3 and KS-1 both in descending order of live gross weight. It was observed that the highest average value for the XXL crab in Khulna district was Tk. 220/kg, while the highest value of Tk. 195/kg was found for F1 female crab in Bagerhat district at the collector level. The marketing channel involved a series of intermediaries involving the collector, fattener, depot owner, agent and exporter. The average highest range and the lowest range of value added in marketing network were found to be Tk. 10-15/kg for XXL male crab and Tk. 6-8/kg for SM grade crab.

The value addition pattern at the depot level remains almost similar among different study areas although a small variation was observed between the south east and south west part of the country. Interestingly, different crab pricing and marketing channels were observed in greater Khulna and Patuakhali regions-whole sellers in Khulna used to pay nominal price to those of Patuakhali hiding the fact that the crabs were being sent to Dhaka for export. On the other hand, considerable differences in pricing were observed within the collectors from different areas. Women collectors were found to be more vulnerable to exploitation by the *farias* (middlemen) than their male counterpart although they were the majority.

The low returns appeared to be relating to lack of live preservation technique as well as bargaining power in the marketing channel. In addition, the reasons for less value addition at small-scale producer level were presumed to be the lack of market access due to various institutional and non-institutional barriers e.g. high transportation cost/illegal toll/taxation, price exploitative market players between producers and consumers and so on. This is further because of a growing gap between the local traders and the exporters dwelling in the cities. Narrowing the gap not only requires institutional intervention for vertical integration between the crab collectors and the exporters but also improvements to the knowledge with regards to post harvest activities including all aspects of marketing and marketing channels.

### **Background of the Research**

Bangladesh has a 710 km long coast line along the Bay of Bengal from the mouth of the Naf river in the southeast to the mouth of the Raimongal river in the southwest (Azam, *et al.*, 1998) covering the regions of greater Chittagong, Noakhali, Barisal, Patuakhali and Khulna districts. Bestowed with huge natural resources, this coastal belt supports the livelihoods of millions mainly through fishing related activities as well as processing and marketing of a number of aquatic products. Undoubtedly shrimp lists the top among the coastal aquatic products, which generates jobs across this sector from fry collectors to growers and processors. Unfortunately, grave socio-economic consequences including conversion, expropriation and privatization of land; salinity intrusion; decline in food security; marginalization of coastal communities, unemployment, urban migration; and conflicts in land use resulted due to unplanned expansion of shrimp farming in Bangladesh. These environmental and social costs have not been internalised by the shrimp industries, instead they have been passed on to certain disadvantaged groups and future generations. Besides, the Government of Bangladesh has been implementing a stringent regulation on capture-based shrimp farming affecting the livelihood of millions of poor villagers, particularly the most vulnerable women and children having no sustainable alternatives (Mazid, 2002).

The involvement of poor women in coastal fishing is very much wider in the sense of their physical contribution and participation in various stages of production, processing and marketing of aquatic products. Being involved in fishing related activities over the years, most of the women have structurally changed their profession from a traditional one such as home gardening, duck/poultry rearing, working as maid servant etc. while lack of market access is further complicating any possible alternative. Alternative income generating activities are very limited. Recent studies have identified a number of potential alternative livelihood options that could have a considerable and positive impact on the livelihood of the poor as well as on enhancing foreign exchange earnings. One of these options is the expansion of mud crab (*Scylla serrata*) fishery.

The mud crab is widely distributed in the Indo-West-Pacific region from Hawaii, Southern Japan, Taiwan and the Philippines to Australia, Red Sea and East and South Africa (Motoh, 1979; Aiyun and Silliang, 1991; and Macintosh *et al.*, 2002). There are 15 species of crab available in our

country, among them 4 species inhabit fresh waters while the remaining 11 species inhabit marine waters (Ahmed, 1991). However, only the mud crab inhabiting marine or brackish waters is commercially important. Mud crabs occur abundantly in the whole coastal region of the Bangladesh particularly in the estuaries, tidal rivers of the Sunderbans mangrove swamps and vast coastal *ghers* or shrimp polders (Khan and Alam, 1991). The annual production of crab is estimated to be more than 10,000 tons (Zafar and Siddique, 2000). During winter (November to January), the largest number of crabs are harvested from the mangrove areas and the tidal rivers. During rainy season (June to August), shrimp *ghers* are the main sources of mud crab. The maximum number is catch occurs during spring tide and neap tide locally known as *goun* (Uddin, 2002). Apart from collecting from the wild, mud crab fattening in earthen ponds started during 1993 in coastal area of Bangladesh (Chakaria Sundarban, Rampal, Munshiganj and Paikgacha areas) with, however, little success.

Considering the increasing demand of mud crab in the local and international markets, it has been gaining popularity among the coastal communities in greater Khulna and Chittagong regions (Azam *et al.*, 1998). Export of mud crab started in 1977-78 and became a stable business in 1982 and ranked third among frozen foods that were exported for earning foreign currency from Bangladesh (SEAFDEC, 1998; and Ali *et al.*, 2004). The export of live mud crabs from Bangladesh has increased many folds in the last decade (from US\$ 31,000 in 1989-90 to US\$ 57,92,000 in 1995-96 and sharply decreased from US\$ 55,35,000 in 1996-97 to US\$ 2,83,000 in 1999-2000 (BEPB, 2004).

The trading pattern of mud crab involves a series of intermediaries like the harvesters, supplier, exporter and the consumer. Final price of the product depends on the marketing network. The greater the number of the intermediaries, the higher the price of the crab (Ladra and Lin, 1991). The market chain of the mud crab begins in the poorer households in the village. The most marginalized segment of coastal population especially land less people, widow, orphan and children earn their livings for several months by collecting crabs from the wild and selling these to the local *aratdar* (who purchase crabs from the local collectors). In many cases, *aratdar* pays advance money to the collectors. In the lean season when people find no way to earn then they take loan from the local *aratdar* in a condition that they will sell their entire catch to that *aratdar*, at a pre-fixed price. Through such conditional trading local collectors never get the actual price of their catch.

In spite of its increasing demand and great export potential no marketing system has yet been established in Bangladesh for crab. This situation drew the attention of scientific communities and it was deemed necessary to find out the answers to some of the questions: who are actually involved in crab related activities and why, what is their socio-economic condition, what is the existing marketing channel, how and at what rate the values are being added in every stage of crab marketing, what are the problems in crab exporting and what should be done to improve the crab fishery.

## **Objectives of the Research**

### **The specific objectives**

- To review the socio-economic situations of coastal communities involved in mud crab fishery.
- To analyse the marketing channel of crab and value addition at each step of the existing marketing chain so as to understand how and what technological intervention can benefit the poor in the market chain;
- To identify the institutional and non-institutional barriers e.g. transportation, toll/taxation, illegal extortion to the movement of crab and to identify price exploitative market players in between crab collectors and exporters.

## **Materials and Methods**

### **Experimental procedure**

The study was conducted from April 2005 to March 2006 throughout the coastal belt of Bangladesh dividing it into south eastern part covering Cox's Bazar, Teknaf, Kutubdia, Moheshkhali, Banshkhali, Chittagong City, Noakhali, and Bhola, and the south western part covering Munshiganj, Shamnagar, Kaliganj, Debhata, Paikgacha, Batiaghata, Dacop, Koyra, Bagerhat, Rampal, Mongla, Dublar Char and kolatoli. Studies in the south-eastern part was conducted by Prof. Dr. Mohammad Zafar of the Institute of Marine Sciences, University of Chittagong in collaboration with a local NGO, COAST Trust while that of the south-western part was conducted by Prof. Md. Nazmul Ahsan of Fisheries and Marine Resource Technology Discipline, Khulna University in collaboration with another local NGO, Gono Unnayan Shangstha.

The data were collected through semi-structured or structured questionnaire following focus group (stakeholders) identification and focus group discussion (FGD). Secondary information (web articles, organizations' reports and official documents) were used to crosscheck, complement or illustrate the primary data collected through the questionnaire survey and group discussion.

Each of the two experts provided three man months' consultancy in their relevant fields i.e. socio economics and marketing aspects. The experts provided necessary inputs for questionnaire preparation, combination of sub sectoral reports, data analyses and data interpretation. The two regional partner NGOs assisted in routine field activities including selection of study areas after necessary reconnaissance survey, focus group identification and arranging for FGD.

### **Survey questionnaire**

Examples of key questions asked for collecting data from different stakeholders are:

#### *Questions for Crab Collectors -*

- How many members in your family?

- What is the source of your income?
- Do you only collect crab?
- What do you do in the lean period?
- Can you tell us how many people are involved in crabbing?
- Do you eat crab or sell it to the market?
- When do you collect crabs?
- How do you catch the crabs?
- Where do you sell the crabs?
- In what rate do you sell the crabs?
- Do you think that you are getting the actual price?
- Do you take loan (*Dadon* in dialect) from middlemen or *Aratders*?
- Do you think it is possible to get higher price if allowed to sell directly to the *Aratder*?
- Why do you take the loan?
- Do you have the idea about crab fattening?
- Will you start crab fattening if you have given the incentives?
- What is your daily income?
- What is the rate of mortality when you catch the crab?

*Questions for Aratders -*

- From whom do you buy the crabs-crab collector/middlemen?
- Do you buy crabs from the market?
- In what grade do you buy the crabs?
- Do you take loan from the wholesaler?
- How do you send the crabs to Dhaka?
- What is the transportation cost?
- What is the rate of mortality during transportation?
- How many depots in this area?
- Do you know about the crab farming?

*Questions for Wholesaler -*

- What grades do you offer to the *Aratder*?
- In what grades do you sell the crabs in international market?
- What is the rate of mortality during international transportation?
- What is the price of per kg crab?
- Do you get the actual price from the international buyers?
- What are the problems in crab export?
- What would you suggest for the development of crab marketing system in Bangladesh?

## Focus Group Discussion (FGD)

Focus group discussion was organized involving crab collectors and traders in the study site. The principal investigator exchanged views with the local people to get the concrete data about crab marketing.

## Results and Discussion

### Section 1: South-eastern part (greater Chittagong region)

#### Cox's Bazar Sadar and Teknaf

##### Crab fishery

A large number of coastal people mostly belonging to the Hindu community dominated by males (10-40 years of age) were found to involved in collecting crabs using nets, traps and handmade tools from the mangrove forests, rivers, tributaries and shrimp projects. They preferred "low tide period" as the suitable time for crab collection. Their socio-economic condition was found to be sub-standard and daily income was reported to be Tk. 80-100/day.

Crab culture in cages or ponds was not practiced in this region because they didn't know the technique rearing crabs in captive condition. However they showed willingness to commence crab culture particularly in bamboo cages. They sought help from the investigator to arrange crab culture programme for them.

##### Crab marketing and value chain

A total of 24 local depots (21 in Teknaf and 3 in Cox's Bazar Town) have been identified. In Teknaf, in addition to the permanent depots, availability of some temporary or seasonal depots were also been reported (Table 1).

**Table 1 Distribution of crab depots in study areas**

South-eastern component Greater Chittagong region			South-western component Greater Khulna region			
Area	Name of bazaar	Number of depot	District	Thana	Name of bazar	Number of depot
	Namar bazaar	2				
	Nykhong para	2	Khulna	Paikgacha	Paikgacha bazar	65
	Chowdhury para	3			Bacha	12
	Moulabhi para	2			kopilmoni bazar	17
	Kaneindar para	1		Dacope	Saheber abad	1
Teknaf	Unchiprung	2			Chalnabazar	8
	Lamba bill	3			Nolian	10
	Terchi breez	1			Poddargonj	3



South-eastern component Greater Chittagong region			South-western component Greater Khulna region			
	Ulubonia	2		Koyra	Koyra sadar	8
	Fulongkhali	2			Bedkasi	6
	Balokhali	1		Batiaghata	Hetalbunia	4
	Badarkhali	1			Kachakata	1
Cox's bazar	Khurushkhul	1	Sub-total 135			
	Ghonapara	1	Satkhira	Shamnagar	Shamnagar	2
	Badarkhali bazaar	3			Kolbari	26
Sub-Total (Teknaf + Cox'sbazar)		24			Horinagor	12
	Choarfaria	5			Vetkhali	8
Chakoria	Rampur	4			Noabeki	28
	Pekua	3		Kaligonj	Sadar	14
	Malumghat	4			Bodortala	10
	Khutakhali	1			Parulia	8
Sub-Total		20			Sokipur	3
	Ghorakghata	1		Debhata	Sadar	5
	Natun bazaar	6	Sub-Total 116			
	Hoanak	3	Bagerhat	Rampal	Sadar	7
Moheshkhali	Kalamarchara	6			Vaga	32
	Japua	1			Foyla bazar	10
	Barua bazaar	4		Bagerhat Sadar	Sadar bazar	15
	Nalbila	4			Gonai breez	14
Sub-Total		25			Digraj	12
	Kasherhat,Taltoli	3		Mongla	Sadar	4
Noakhali	Gosh field	2			Beela	6
	Hatia	6			Holudichunia	5
	Chaparashirhat	1	Sub-Total 105			
	Others	8				
Sub-Total		20				
Grand Total		89	Grand Total 356			

It was observed that the crab collectors sold the crab either to retailer or to assembler and wholesaler (*Aratdar*) through broker. Thus, the crabs entered into the international market by a number of exporters who aggregated the crabs from the wholesalers. Value addition and price grade of crab were found to vary in different study areas. Brokers bought the crabs in eight grades for male and four grades for berried female in most of the study (Table 2).

**Table 2 Grade and price of crab at different markets in the Chittagong area**

	Grade	Weight (g)	Price in Taka/kg in different markets					
			Teknaf	Chakaria	Noakhali	Entire Chittagong area		
						Collectors to aratdars	Aratdars to distributors	Distributors to exporters
Male	XXL	500 +	-	200	-	-	200	350-500
	XL	400 +	-	150	70	120	150	300-450
	L/LM	300 +	-	90	40	-	-	250-350
	M/MM	250 +	60-80	60	20	-	90	200-250
	SM	200 +	15-20	30	12	15-20	30	100-150
	SSM	100 +	-	10	-	-	-	-
Female	FF1	200+	120-150	170	70	150	250	400-550
	F1	180+	-	150	40	50	230	350-500
	F2	150+	25-40	50	20	-	110	250-400
	F3	120+	-	20	12	-	50	200-300
	KS1	180+	-	50	-	-	20	-
	KS2	150+	-	10	-	-	10	-
	KS3	120+	-	10	-	-	-	-

### Loan (*Dadon*) system

Crab collectors in most of the cases did not get actual price of their products due to intervention of brokers and loan burden. The crab collectors were bound to sell the crabs at a low price to the specified brokers or wholesalers who provided them loan in their lean period. Likewise, wholesalers were to sell their products to certain distributors who gave them loan in their business (Fig. 1).

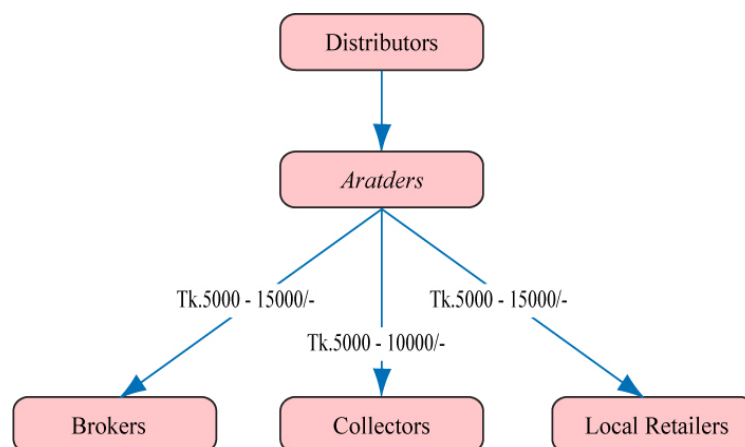


Fig. 1. Loan (*Dadon*) providing system in Teknaf region.

## Chakaria and Kutubdia

### Crab fishery

Crabs were being collected from the shrimp projects using traps or from the nature using line by persons belonging to all religions (Muslims, Buddhists and Hindus), and their age was over 15, dominated by male. According to the local people, crab might be found all the year round, but the peak season was believed to be June-August, while winter was the off-peak period, when the price of crab increased. Local people started pond and cage culture of crab in some parts of Chakaria (Badarkhali and Satdalia), whereas it is yet to be initiated in the Kutubdia Island. A total of 20 crab depots were listed from Chakaria, but there was no depot available in the Kutubdia Island (Table 1).

### Crab marketing and value chain

The crab collectors were found to sell their products either directly to *Aratders* or via middlemen to wholesalers. As there was no depot in Kutubdia, the crab collectors sold their products at Pekua and at the local market for domestic consumption. At Badarkhali and Choarfari, the crab collectors sold crab in 4 grades at the rate of 15-120 Tk./kg depending on size (Table 1.2). It was found that the wholesalers had to sell crabs at a lower price if they had taken loan from the distributors.

## Moheshkhali

### Crab fishery

The crab fisher community was dominated by Hindu and a few were Muslims. Their age ranged from 10-40 years, and most of them were male. They collected crabs from mangrove areas, estuaries and shrimp culture ponds using cage and hand made iron tool during low tide. Their socio-economic condition was sub-standard and they were exploited by the middlemen in crab trading. A total of 25 (11 seasonal and 14 permanent) crab depots had been identified (Table 1).

The crab collectors of Moheshkhali came to know about the cage culture of crab from Chakaria but they had no facilities or technological help to start crab fattening in cages.

### **Crab marketing and value chain in Moheshkhali**

A large portion of crab was sold to wholesalers or brokers and were exported to international market by Dhaka-based distributors or exporters. The crabs were transported by truck, and the transportation cost was estimated to be 8-10 Tk/kg. The crab collectors sold their crabs at the rate of 15-100 Tk/kg depending on size (Table 1).

### **Loan (*Dadon*) System**

The wholesalers were found to provide loan (for purchasing equipments and livelihood maintenance) to the collectors who are compelled to sell their products to that wholesaler at relatively low price. The re-payment of loan was done by selling the crabs to the pre-defined groups. The same trend was found to exist between wholesaler and distributor.

### **Banshkhali and Chittagong City**

Some depots were found at Banshkhali: Chanua, Ramdashat, and Jaldi. In Chittagong city areas, crab depots were located at Bakshirhat, Firingibazar, Patenga, Chawkbazar. Crab collectors from Fauzderhat and Sitakundu sold the crab in Chittagong city. A minor proportion of crab was found to be consumed locally, whereas a large portion was sent to Dhaka market. The consumer of mud crab was dominated by the Hindu community. The price of crab was found to be higher during the Hindu festival. Besides, some city hotels bought crabs for foreigners, mostly from Taiwan, Hongkong, China, Thailand and the Philippines.

### **Noakhali**

#### **Crab fishery**

The crab fisher community comprised of 80% Hindu and 20% Muslim. Among the crab collectors, 90% were male and 10% female; and their age ranged from 10-45 years. They collected crabs from estuaries, mangrove forest areas, ponds and canals using hooks, cages, iron made tools and nets. Low tide was the best time for crab collection. They usually collected crab from early morning to early evening from July to November. Crab culture was not practiced in this region. A total of 20 crab depots were found in Noakhali region (Table 1).

### **Crab marketing and value chain in Noakhali**

The crab collectors sold their products either to brokers or wholesalers. The Dhaka-based distributors or exporters collected crabs from wholesalers. The price of crab in the wholesale market ranged from 12-70 Tk./kg depending on size and sex (Table 1).

## **Bhola**

### **Crab Fishery**

The crab collector groups comprised of children, youth, and women, dominated by male, mostly from Hindu community. They didn't know what type of crab they are catching, but they were able to identify the male and female ones. They used net, bait, line, behundi net, push net for crab catching.

### **Marketing**

There was no separate depot for crab, rather fish depots were used simultaneously for crab trading. Local *Aratders* were found to buy small and large crabs at an average rate from fishermen or collectors. Considering the mortality rate of crab during catching, they took additional 10 crabs at the time of buying 100 crabs from the collectors. If additional crabs were not available, the *Aratders* offered reduced price (10% less) to the collectors. Local *Aratders* sent their products through sea trucks/passenger steamers to Dhaka at their own expense. Transportation cost varied from 400-500 Tk. per basket containing 500-700 crabs.

### **Loan (*Dadon*)**

Crab collectors or fishermen took loan (ranged from Tk.100 to more than 1000) from local *Aratders* depended upon the relationship between *Aratder* and crab collector. No specific time was set for re-payment of loan as long as the crab supply continued.

### **Problems in crab marketing in Chittagong region**

- Crab collectors couldn't get the actual price as they took loan from the *Aratders*.
- Mortality of crab occurred during transportation from local markets to Dhaka market.
- Mortality also occurred at different stages of transportation for international market.
- If the exporters transported 500 kg of crabs, they got money of 350 kg as the buyers arbitrarily decided to set the mortality rate at 30%.
- Opportunity to export processed crab was very little.
- International buyers used to set the price of crabs at their will.

## **Section 2: South-western part (greater Khulna region)**

### **Social Status of mud crab collectors**

#### **Age structure**

In Khulna district, most of the crab collectors (35%) were in the age group of 33-41 years, whereas 14%, 25%, 18% and 8% of the collectors belonged to age groups 15-23, 24-32, 42-50 and above 50 years, respectively. In Satkhira district, most of the crab collectors (39%) were in the age group of 33-41 years, whereas 11%, 19%, 23% and 8% were in the age groups of 15-23, 24-32, 42-50 and above 50, respectively (Fig. 2).

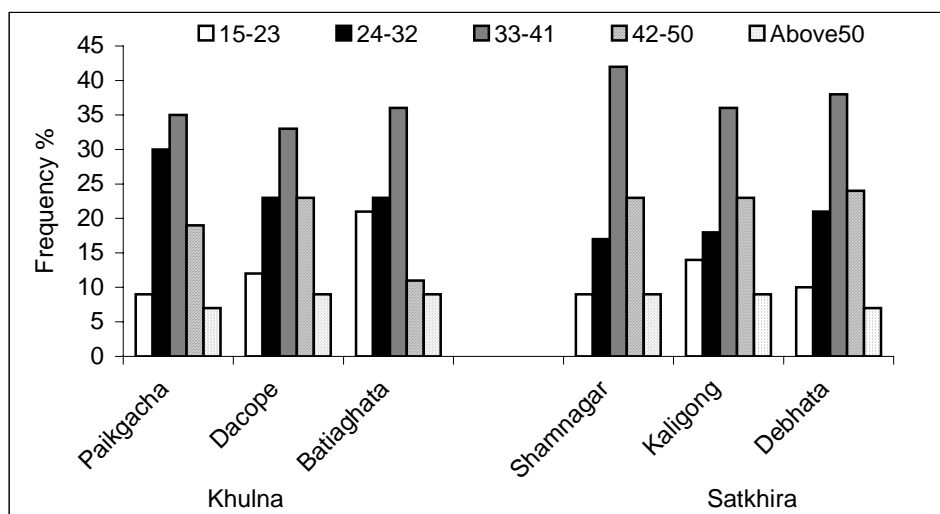


Fig. 2. Age structure of the crab collectors in Khulna region.

### Sex ratio

In Khulna district, 81% of the crab collectors were male and the rest (19%) were female. Similar sex ratio was observed in Satkhira district where 82% of the crab collectors were male and the rest (18%) were female (Fig. 3). In the study area, 81% of the total crab collectors were male and the rest (19%) were female. The main sources of crabs were the Sunderbans and the rivers far from the locality. Therefore, the crab collectors had to stay there 7 to 15 days that was usually impossible for the female crab collectors. Females were mainly involved in collecting crabs from *ghers* and bank of the rivers. Another reason for less involvement of female in crab collecting activities was social restriction.

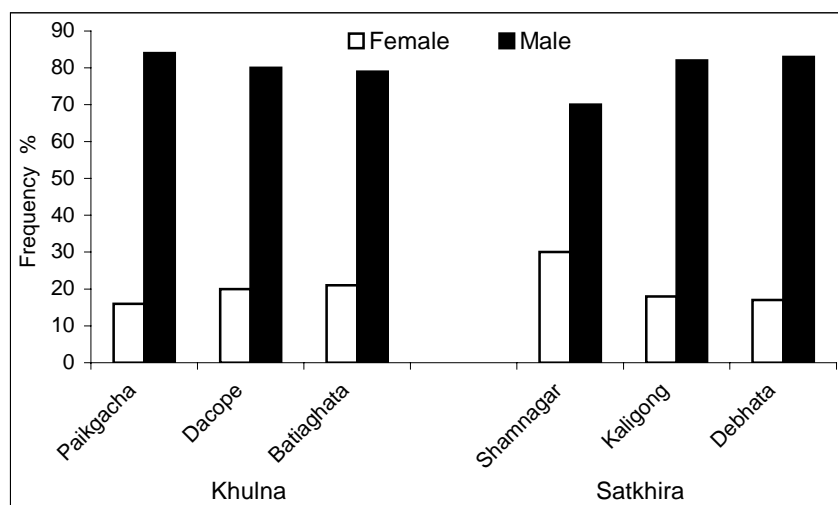


Fig. 3. Sex ratio of the crab collectors of Khulna region.

## Religious status

About 89% of the collectors were Hindus and only 11% were Muslims (Fig. 4). This agrees with the findings of Ahmed, 1992 who reported that the majority of the fishermen in different parts of the country are Hindus. Religious restriction on eating crab might also discourage the Muslims to be involved in catching crabs.

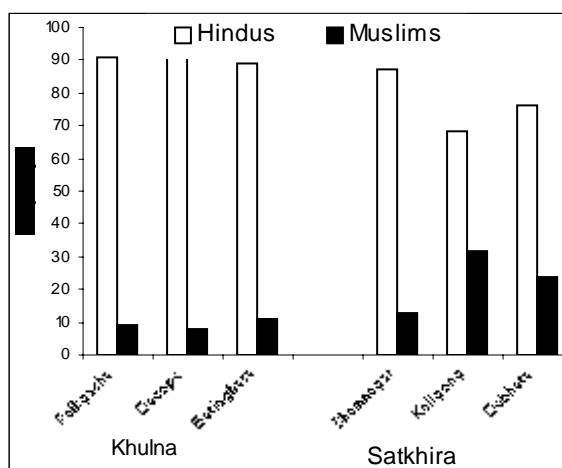


Fig. 4. Religious status of the crab collectors in the Khulna region.

## Educational status

Generally, the crab collectors comprised of the most marginal segment of the coastal population and as such had little or no education, about 58% were found to be educated at the level of class one to two, about 10% at the level of class five to nine, whereas the rest were completely illiterate (Fig. 5). The Government and the leading NGOs should take this matter into account so that a proper strategy can be made. Unfortunately, the non-formal education facilities provided by different NGOs in other parts of the country were not found in these communities.

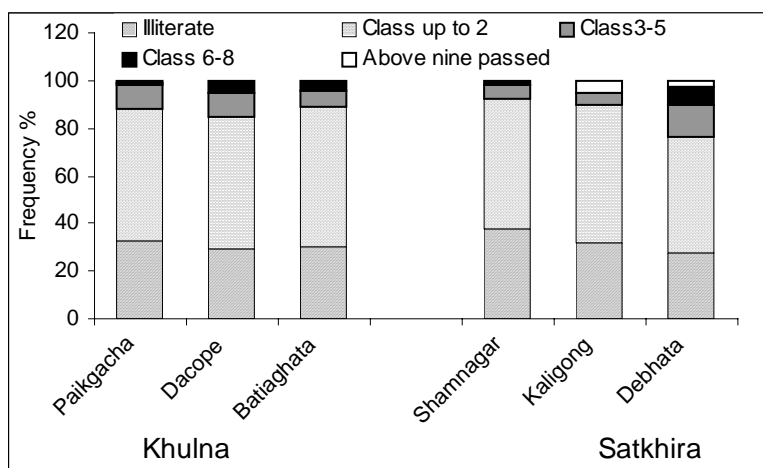


Fig. 5. Educational status of the crab collectors in Khulna region.

### Family size

In Khulna district, it was observed that 52% of the collectors had above 6-7 members in their family, whereas 29%, 12% and 7% of them had 4-5, above 7 and 2-3 members in their family, respectively. On the other hand, in Satkhira 41% of the collectors had above 6-7 members in their family, whereas 27%, 13% and 21% of them had 4-5, above 7 and 2-3 members in their family, respectively (Fig. 6).

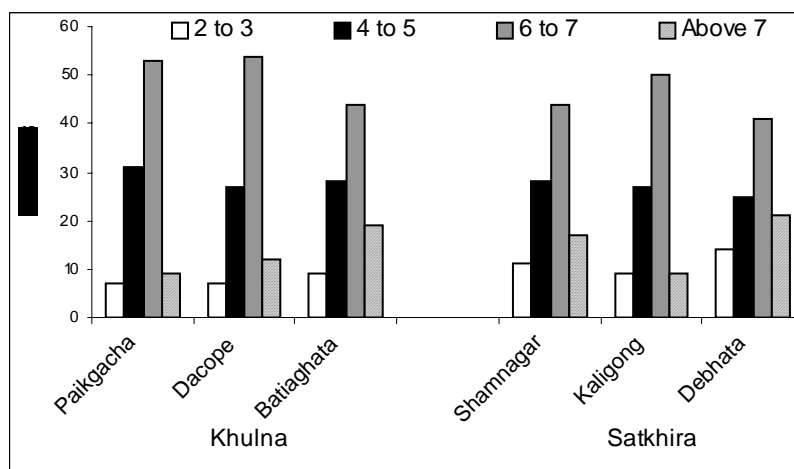


Fig. 6. Family size of the crab collectors in Khulna region.

### Drinking water facilities

Sixty-four percent of the crab collectors used filtered pond water, 5% used ponds water directly and 8% used rainwater for drinking purpose whereas none of them had their own tube-well. However, 23% collectors used tube-well provided by the local government or those belonging to schools or neighbours (Fig. 7).

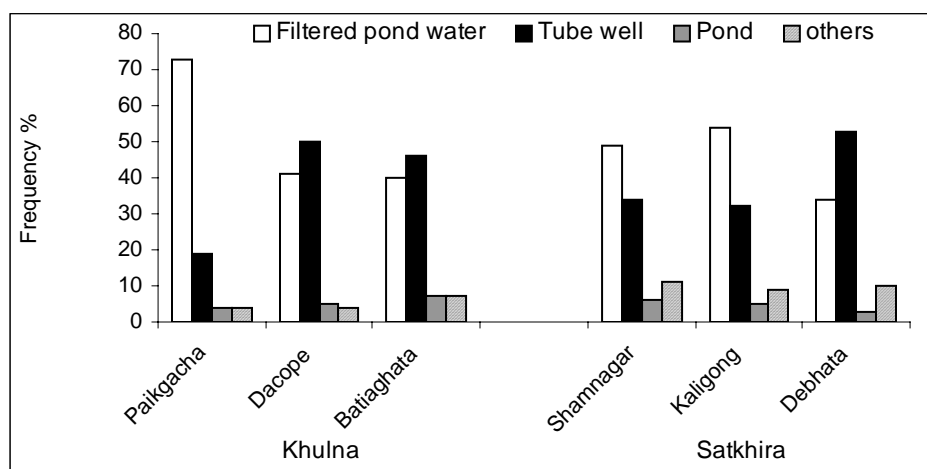


Fig. 7. Drinking water facilities of the crab collector in Khulna region.



### Sanitation facilities

Two types of toilet such as 1) *Katcha* toilet-made of bamboo with leaf shelter and inadequate drainage system and 2) Sanitary toilet- made of bamboo walled, ring slave with good drainage system were found to be used by the crab collectors.

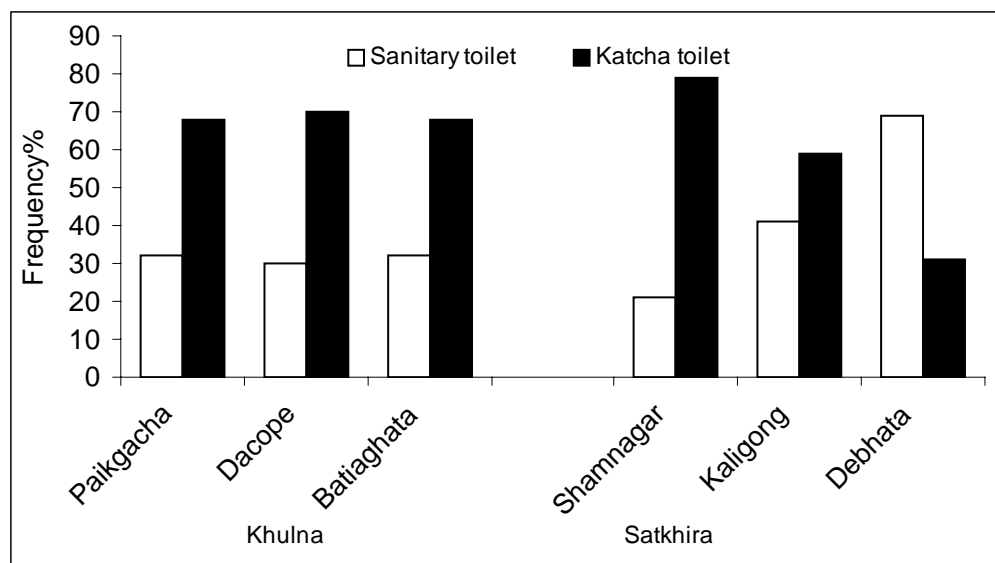


Fig. 8. Sanitation facilities of the crab collectors in Khulna region.

it was observed that only 32% of the crab collectors could afford sanitary toilet provided by local government office (Fig. 8).

### Use of electricity

Only 18% of the crab collectors in Khulna and Satkhira districts had electricity facility.

### Housing condition

The crab collectors were found to live in four types of houses viz. i) Wooden wall with tin shed (2%), ii) Mud wall with tin/asbestos shed (6%), iii) Mud wall with *golpata* shed (31%) and iv) Mud wall with straw shed (61%).

### Health care facilities

Most of the crab collectors (90%) were found to be dependent on village doctors (unqualified practitioners, homeopathy, *kabiraj*, etc.) for their treatment, while only 10% got health services from qualified doctors from local government health centre (Fig. 9).

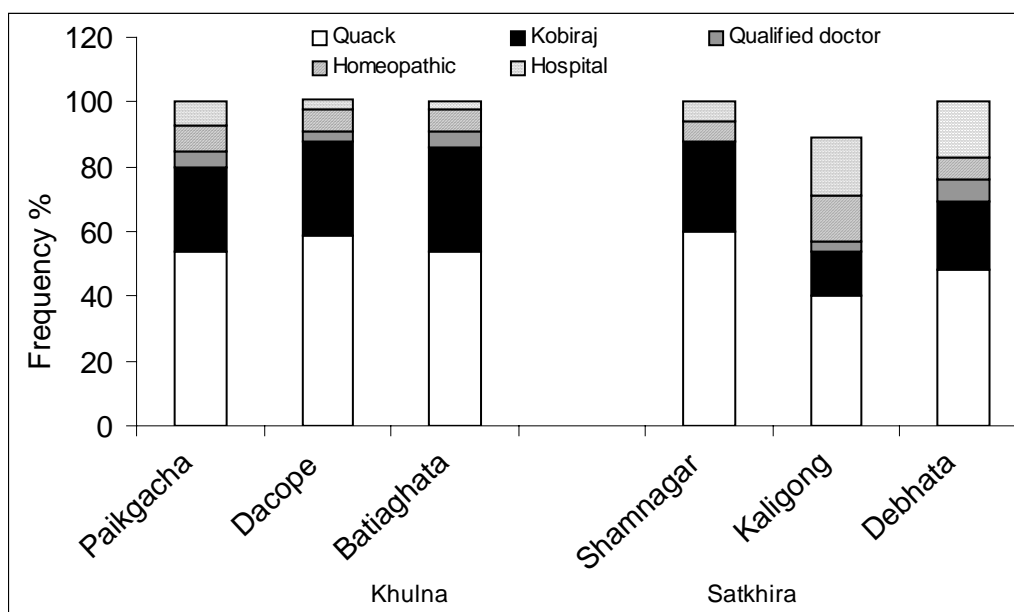


Fig. 9. Health care facilities for the crab collectors in Khulna region.

## Economic Status of Mud Crab Collectors

### Ownership of land

Twenty three percent of the crab collectors had no own land, while 39%, 27%, 8% and 3% of them had 0-5, 6-10, 11-15 and above 15 decimal lands, respectively. The landless collectors lived in *khas* land.

### Occupation

Primary occupation of the crab collectors was to earn their livelihoods. The fattener collected crabs from depot that had no export value. The secondary occupations of the crab collectors in Khulna district were labour (67%), fishing (15%), craft and gear making (5%), wood collection from the Sundarbans (4)% and van pulling (9%) while those in Satkhira district were labour (64%) fishing (19%), craft and gear making (3%), wood collection from the Sundarbans (4%) and van pulling (10%).

### Daily expenditure in crab collection

#### Crab collection from ghers, rivers etc.

Crab collection expenditure was found to depend mainly on the amount of baits. Baits were available in the local markets. Baits may be fresh or formulated and dried. The collectors needed Taka 20-60 for purchasing the baits.

### **Expenditure for harvesting crabs from the Sundarbans**

About 59% of the crab collectors collected crabs from the Sundarbans in groups each usually consisting of three members. It was found that Tk. 1001-1100 was spent by 38% groups followed by Tk. 801-900, 901-1,000, and 1,101-1,200 by 19%, 23% and 20% groups, respectively for a 12 days' crab collection voyage to the Sundarbans. Boat, bait and license fees were required for the purpose. The collectors who did not own any boat were found to hire boat from other fishermen. Often pirates and dishonest forest officials forced them to pay extra money.

### **Daily income from crab collection**

In Khulna district most of the crab collectors (49%) earned Tk. 31-60/day by selling their collected crabs, whereas 25%, 24%, 9% and 3% of them earned Tk. 61-90, 91-120, 121-150 and more than 150/day, respectively. On the other hand, in Satkhira district, about 39% earned Tk. 31-60/day by selling their collected crabs, whereas 33%, 16%, 9% and 3% of them earned Tk. 61-90, 91-120, 121-150 and more than 150/day, respectively.

### **Credit facilities and *Dadon* system**

Like other coastal communities the crab collectors usually had no access to any institutional credit. Sixty six percent of the crab collectors Khulna and 60% in Satkhira were found to go to the money lenders for *dadon* with a high interest rate. Usually the depot owners act as the money lenders and compel the collectors to sell their harvest at a fixed price much lower than the market price. The poor crab collectors had nothing to do with such conditional trading as they are unable to invest for boat rent, bait costs, license fees and food cost during long days fishing in the Sundarbans.

### **Crab harvesting and marketing**

Mangrove areas, tidal rivers and *ghers* were the wild sources for mud crab harvesting. Collectors were found to capture crabs by using rope line, hook line and set bag net. Boom, thopa, scoop net, bait stick, iron hooks, etc. were also used to harvest crab from the *ghers*. Most of the mud-crab depots were located near the river for easy landing of harvested crabs. The depots were also connected with the link roads for easy transport to highways connecting the capital city.

### **Source of crab**

It was observed that most (63%) of the crab collectors in Khulna district collected crabs from the Sundarbans area, whereas 26% and 11% collected crabs from *ghers* and rivers, respectively. Similar results were obtained from the Satkhira district.

### **Harvesting methods: Types of bait, gears and crafts**

Different types of baits were used for crab harvesting purpose, which included live frog, eel and tilapia. In Khulna district, most of the crab collectors (65%) used eel as bait, whereas 18%, 6%

and 11% fishers used tilapia, frog and others as the baits, respectively while in Satkhira district, 68% of the crab collectors used eel as bait, whereas 28%, 4% and 8% used tilapia, frog, respectively. Most of the crab collectors (245) used bait stick for crab collection whereas 173, 109, 291, 75, 11 and 88 numbers of respondents used scoop net, don, rope line, boom, hook and other gears, respectively. Azam, *et al.* (1998) also found that the common gears for crab collection were bamboo trap or “boom/ chai/ tonga”; rope line or “don”(rope with stick, angling with hook); long metal hook and nets. Dinghi boats were exclusively used by the collectors during harvesting crab from the mangrove forest, Sundarbans.

### Period of involvement in crab collection

Most of the crab collectors were involved in the trade for more than 10 years (Fig. 10).

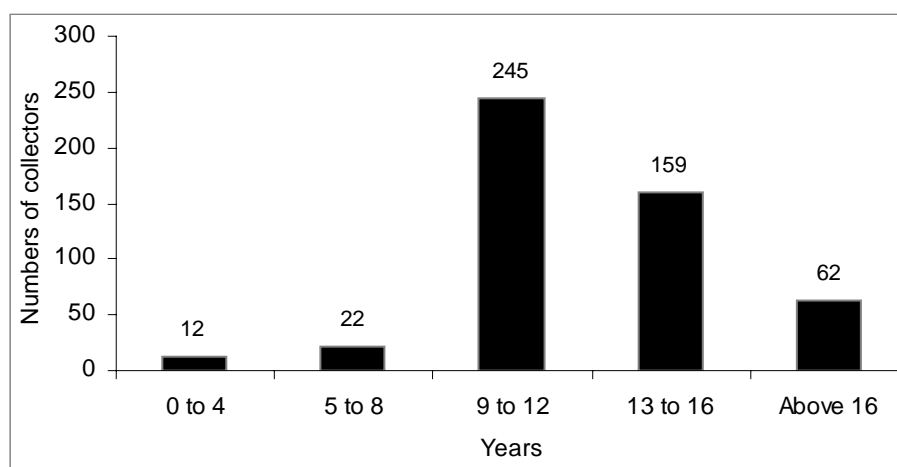


Fig. 10. Years of involvement in crab collection in the Khulna region.

It was observed that 56% of the crab collectors spent 6-8 hours in a day for crab collection whereas 5%, 3% 36% of them spent 3-5, 0-2 and above 8 hours in a day, respectively. In the Sundarbans areas the collectors spent more than 8 hours per day to harvest crabs.

### Seasonal variation in catch

In case of *ghers* and rivers an individual collector could daily gather on an average 1 kg of crab in summer, 8 kg in rainy season and 3 kg in winter. On the other hand, in case of the Sundarbans, one group comprising three collectors usually harvests 30 kg in summer, 160 kg in rainy season and 80 kg in winter in a single trip of 12 days.

### Transportation

Mainly bamboo made baskets were used as transporting materials. Besides, jute bags, plastic buckets and small nets were also used by some individual crab collectors.

## Selling system

In Khulna district, 71% of the crab collectors sold their catches to the depots, 12% to the *Farias* (middleman) and 17% to the local markets whereas in Satkhira, 60% of the crab collectors sold their catches to the depots, 14% to the *Farias* and 26% to the local markets (Fig. 11). Those who collect crabs from the *ghers* and rivers usually sell those to the *Farias* at the harvesting site.

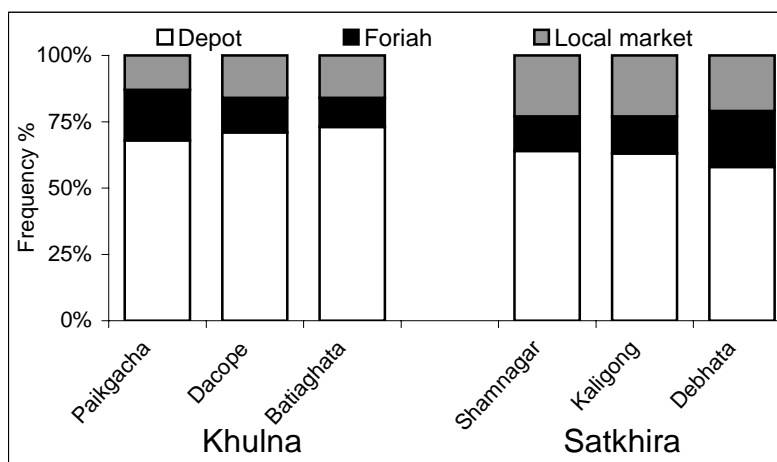


Fig. 11. Selling system of the collected crabs in Khulna region.

## Selling price of crabs

The selling price of crabs was found to depend on sex, size, sexual maturity, hardness of the carapace and locality (Table 2).

Table 2 Manpower distribution in mud crab depots in greater Khulna region

District	Thana	Area	Manpower			Total
			Male	Female	Children	
Khulna	Paikgacha	Paikgacha bazar	215	2		217
		Bacha	35	1		36
		Kopilmoni bazar	61			61
		Saheber abad	2			2
	Dacope	Chalnabazar	27			27
		Nolian	35	1	2	38
		Poddargonj	10	1		11
		Koyra sadar	24		1	25
	Koyra	Bedkasi	18	3		21
		Hetalbunia	10			10
	Batiaghata	Kachakata	3			3
Sub-total			440	8	3	451

District	Thana	Area	Manpower			
			Male	Female	Children	Total
Satkhira	Shamnagar	Shamnagar	6			6
		Kolbari	87	1	1	89
		Horinagor	42			42
		Vetkhali	16		1	17
		Noabeki	92	3		95
		Sadar	38			38
		Bodortala	31			31
	Kaligonj	Parulia	19	1		20
		Sokipur	10			10
	Debhata	Sadar	14			14
Sub-total			355	5	2	362
Bagerhat	Rampal	Sadar	22			22
		Vaga	85	2		87
		Foyla bazaar	27		1	28
		Sadar bazaar	35	1		36
	Bagerhat	Gonai breez	39		2	41
		Sadar	36	3		39
		Sadar	15			15
	Mongla	Beela	17			17
		Holudichunia	11	1		12
Sub-total			285	7	3	297
Grand total			1092	20	8	1110

### Crab depots

A total of 365 depots (135 in Khulna, 116 in Satkhira and 105 in Bagerhat district) were identified (Table 1). The size of depots was found to vary from 40 to 320 sq. ft. (average 165.11 in Khulna, 172.5 in Bagerhat and 161.17 in Satkhira district) for *Katcha* (made of bamboo, bamboo-fence, and by Nypa-leaves with earthen floor), 48 to 900 ft<sup>2</sup> (average 189.77 in Khulna, 181.33 in Bagerhat and 169.65 and 187.32 in Satkhira district) for *Semi-pacca* (made of bamboo, wood and tin roof with concrete floor) and 40 to 625 ft<sup>2</sup> (average 213.35 in Khulna, 209.23 in Bagerhat and 187.32 in Satkhira district) for *Pacca* (made of bricks, RCC and concrete). There were 1110 people engaged in the 356 depots (Table 2)

### Sources of crab

Depots were found to receive crabs from three sources viz. from wild collectors or catchers, middlemen locally called *foria* and farmers or fatteners. Among them, the collectors were the

main (62%) supplier, while 14% and 24% of the crabs were supplied by the farmers and *forias*, respectively.

### Selling price

The price of mud crab was found to vary with season as well as on international market demand. The highest value was found during festival time in the importing countries like New Year 's Eve, Christmas eve and so on.

### Rejection

Generally dead and undersized crabs were rejected by the depot owners. In Khulna, on the average 3% of the crabs were rejected from each depot, whereas 5% and less than 5 % crabs were rejected by the depots in Satkhira and Bagerhat districts, respectively (Fig. 12).

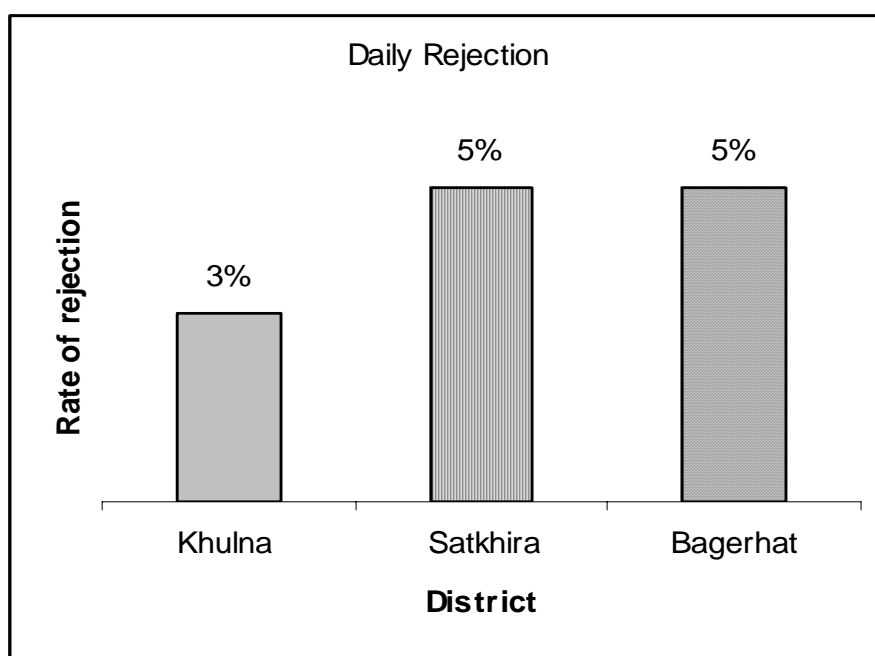


Fig. 12. Daily rejection rate in different districts in Khulna region.

### Marketing channel

A series of intermediaries were found in the present marketing channel of mud crab in greater Khulna region. A similar marketing channel was found in all the Upazilas in Khulna region (Fig. 13).

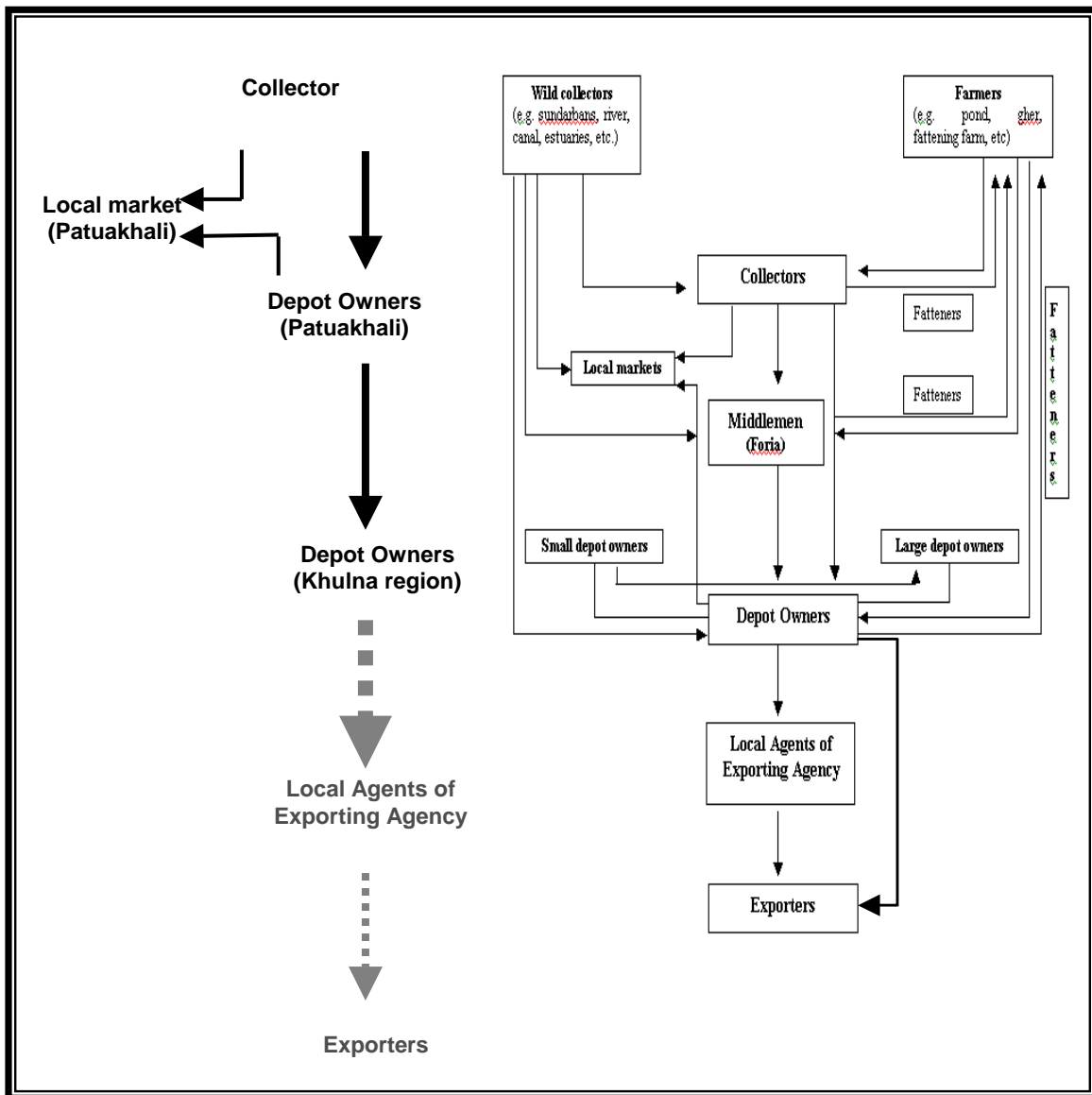


Fig. 13. Crab marketing channel.

### Value chain analysis

The trading of mud crab consisted of a series of intermediaries between the catchers, depot owners, agents and exporters. In addition to the intermediaries, the exporters play a significant role in uplifting of price and creating artificial crisis by paying advance money to the depot owners so that the later can provide *dadon* to the resource poor crab collectors. It was seen that 52% of



the depot owner took *dadon* from the local agents of the exporter. The final price of the product was found to depend on the total marketing network. The greater the number of the intermediaries, the higher the price of the crab. The intermediaries took Tk. 50-60/kg for XXL grade crab without adding substantial value in it. It was also not possible to estimate the extra margin they add by intentionally under grading the crabs received from the collectors. The value chain analysis revealed that the value addition at the fattener/farmer step was the greatest among all other intermediaries (Table 3) suggesting that further technological advancement in fattening of undersized or soft shell crabs could bring a momentum in crab business.

**Table 3 Investment-return analysis of fattener/farmer in Khulna region**

Marketing channel	Value chain											
Stakeholders	Product	Buying price (Tk./Kg.)				Investment (Tk./Kg)			Average expense (Tk./Kg.)	Selling price (Tk./Kg.)		
		Lowest	Highest	Average	Item / Description	Own	Lease	Both		Grade	Lowest	Highest
Female	KS1	25	35	28	1. Land rent (lease value)	0.00	2.92	1.93	15.75	F1	193	198
	KS2	20	30	26	2. Permanent labor cost	8.00	8.00	8.00	15.75	F2	107	111
	KS3	18	22	19	3. Transport cost (Van/rickshaw/boat)	2.06	2.06	2.06	15.75	F3	66	71
Fattener	XXLPD	30	40	36	4. Bag price				15.75	XXL	197	211
	XLDP	25	35	28	5. Feed cost	2.06	2.06	2.06	15.75	XL	122	146
	LPD	20	25	24	6. Other operational cost (fencing, pond maintenance, harvest etc)	2.01	2.01	2.01	15.75	L	98	121
	MPD	18	22	22					15.75	M	88	97
	SMPD	12	15	13					15.75			
<b>Total=</b>						<b>14.13</b>	<b>17.05</b>	<b>16.06</b>				
<b>Average=</b>						<b>15.75</b>						

\*\* Highest Margin= Highest selling price-(Total average expense+ Highest buying price)

\*\* Lowest Margin = Lowest selling price-(Total average expense+ Lowest buying price)

### Major problems in marketing of mud crab in Khulna region

Mud crab marketing system was found to face a number of problems including poor communication network between collecting areas and the depots, lack of buyer and market information, absence of government registration process, insufficient marketing facilities, absence of local market, social and religious custom, debt return problem, bank credit problem, involvement of unproductive middlemen, muscle power by local leaders, demand driven market pricing, grading fraudulence by the depots/exporters, inadequate space and frequency of air flights to the importing countries, high mortality rate due to mishandling and poor transport system etc.

### General Discussion

The present study focused on mud crab trading as an emerging exportable commodity of Bangladesh and assessed the applicability of value chain analysis of this commodity. Ideally, the value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to the final consumers and final disposal after use (Kaplinsky and Morris, 1999). Value chain analysis can deepen inquiry into the disjuncture between high levels of economic integration into national and global product

markets and the extent to which countries and people actually gain from such integration. Analyzing value chains can bridge the gap between the focus of mainstream economics on aggregate measures of poverty such as income and the stress of livelihoods perspectives on micro-level complexity (Kanji and Barrientos 2002).

In the context of fisheries, increased trade poses a significant risk to valuable ecosystems, but on the other has great potential as a source of desperately needed income for local fishing communities. This is particularly true for the coastal communities involved in collecting crabs, the main target group of this study. Trade can enhance employment and income generation, both directly, and through multiplier effects, in developing countries but of equal importance is the need to consider distributional impacts of trade to ensure that it is poor producers who actually reap the economic benefits of trade rather than mere increase in macroeconomic indicators (Macfadyen *et al.*, 2003). On the other hand, there are those who hold the view that, particularly in a country like Bangladesh and other developing countries in Southeast Asia, current export regimes are resulting in reduced availability of fisheries products, undermining local food security (Van Mulekom *et al.*, 2003). Taking this into consideration, the mud crab as a fishery product stands apart from other exportable fishery products in Bangladesh as the former has very little local market niche. With a predominant Muslim population having religious and cultural restrictions eating crabs, absence of a robust and sustainable export market for crabs would be an wastage for this renewable natural resource. Therefore, a pro poor strategy must be taken in building links between sustainable livelihoods at the community level and external (and even domestic) trade that are beneficial to coastal communities.

The most marginalized segment of coastal population especially land less people, widow, orphan and children earn their livelihoods for several months by collecting crabs from the wild and selling these to the marketing channel comprising a number of intermediaries. These people have been marginalised by the consequences of horizontal expansion of shrimp farming activities in the coastal areas in recent past. The environmental and social costs of shrimp farming have not been internalised by the shrimp industry, instead they have been passed on to certain disadvantaged groups of coastal population who are now the main driving force behind the mud crab business. Unfortunately, apprehending the prospect of earning hard cash from trading a number of intermediaries have already been active to reap the benefit out of the poor collectors. The study revealed that the market structure of is completely demand driven and the prices are settled down by the exporters dwelling in the capital and their commissioned agent. Even the depot owners who gather crabs from the collectors are vulnerable to price exploitation. This situation further complicates the livelihood issue of the resource poor crab collectors who came to this profession out of desperation.

A comprehensive approach is therefore essential to build consensus among different stakeholders in mud crab trading on the necessity for vertical integration. This would address the problem of the fragmentation of the poor collectors, a large majority of whom still operates alone and are not affiliated with any organization. This weakens not only their socioeconomic position but also affects their performance as a market player. This position makes them vulnerable in

bargaining with other market actors such as depot owners, commission agents and exporter who have better capital endowments. This situation is further aggravated by the lack of transparency in the price formation process and asymmetric information flows, lack of capital for investments in improved technology (fattening/stocking in earthen ponds in case of market saturation) and lack of post harvest handling knowledge that is vital to crab as a live product.

Thus, it appears crucial for crab collectors to develop resilient community institutions that can withstand the rigors in winning the fight for actual market share. This will involve engagement with both local and national governments, and collaboration with like-minded stakeholders such as nongovernmental organizations (NGOs), as well as academic and research institutions. Besides, a strategic concern that deserves serious attention is the current “under pricing” of fisheries products in foreign markets. The final consumer prices do not reflect the true cost of producing fishery products as long as externalities are not made to “show up” in the value chain. The poor crab collectors on the other end of the value chain, which is the locus of under pricing, do not earn enough from their production to give them incentive to utilize and manage these resources sustainably. Governance and distributional outcomes are often skewed to the advantage of traders, processors and other intermediaries resulting in the marginalization of small producers. As a result, various socio economic externalities are borne by the collectors themselves who are least able to cope with market fluctuations.

Through this research effort, it had been possible to find out that many countries imported crabs from Bangladesh, which indicated that it had large international market. Several recent studies examined crab markets worldwide and suggested that the market was very large and increasing (Brien and Miles, 1994; GLOBEFISH, 1995 and AUSTRALIA, 1996). However, as the value chain analysis revealed, the price gap between the collector and the exporter is far from the added value at intermediate steps. This is quite unlike other export oriented fisheries products including the much talked shrimp where majority of the values are added at the exporter (processors) level. In contrast the capital investment for value addition in mud crab trading at levels upstream the collectors mainly consists of transportation and bamboo made baskets. The low returns experienced by the poor crab collectors are due to the lack of bargaining power in the marketing channel. The demand-driven marketing system often leads to price exploitation. The coastal communities further suffer from lack of access to credits that result in conditional trading where the *Aratdars* pay *dadon* to the collectors so that the later must sell their entire catch to the former at a price fixed earlier.

The study further showed that a substantial part of wild crabs has no market value simply because of soft shell or inadequate female gonad. In addition, handling and transportation of live crabs is also responsible for huge post-harvest loss usually incurred by the collectors themselves. Mud crab, individually trussed, are packed in bunches in baskets. Most depot owners buy all the crabs delivered to them, rejecting only weak, dead and undersized crab. A deduction from the agreed buying price is made for undersized crab as well as perceived mortality during transportation to the capital. Thus, a proper post harvest handling knowledge and development of live preservation techniques for crab are deemed necessary that might add extra value to the total catch of individual poor collectors.

## Recommendation

- The primary producers need to be integrated with domestic and international markets by forming collectors' association through GO/NGO initiatives so that the crab collectors can have an idea about the up to date market price of crab..
- The government should invest a part of export revenue generating from crab trading for market infrastructure development to minimize the post harvest loss.
- All intermediate players in crab trading should be brought under a single apex body or wing of the Department of Fisheries so that the players who do have a genuine stake should remain in the business.
- Institutional intervention is necessary to control conditional trading through providing pro-poor micro credits facilities to the collectors.
- Participatory research should be carried out immediately to address post harvest handling and live preservation issues of crab and the results should be disseminated through concerned GOs and NGOs.
- Research should also be carried out with regard to the stocking density, optimum salinity level, feeding and other physiological parameters to develop a scientific base for fattening and/or rearing of undersized and soft shell crabs so that they can attain a marketable size/grade within the shortest possible time.
- 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 not eating crab has no religious or scientific basis.

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