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**Dr. Hasneen Jahan**

Associate Professor,  
Department of Agricultural  
Economics, Bangladesh  
Agricultural University,  
Mymensingh, Bangladesh.

**Dr. M. Serajul Islam**

Professor, Department of  
Agricultural Economics,  
Bangladesh Agricultural  
University, Mymensingh,  
Bangladesh

**Correspondence**

**Dr. Hasneen Jahan**

Associate Professor,  
Department of Agricultural  
Economics, Bangladesh  
Agricultural University,  
Mymensingh, Bangladesh.

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## Supply chain and distribution channels of mud crab (*Scylla serrata*) in Bangladesh

**Hasneen Jahan, M. Serajul Islam**

### Abstract

During the present study, the marketing and distribution channels of live crab (*Scylla serrata*) at Paikgachha upazila under Khulna district of Bangladesh were analyzed. Mud crab production is considered as a profitable and feasible business by most of the marketing operators. The supply chain of mud crab primarily focuses on the foreign export earning of Bangladesh. The main contributors involved in the live crab supply chain are the crab collectors, fatteners, depot owner, suppliers and exporters. It was found that more than 50 percent of exportable crabs comes from natural sources with rest being from the fattening sector. For the male crab, five grades were observed namely extra-extra-large (XXL), extra-large (XL), large (L), Medium (M) and small (SM), whereas three grades were observed for female crab namely F1, F2 and F3 both in descending order of live gross weight. Price of female crab was higher than that of the male crab. Considering the total export earnings from mud crabs, this sector has a bright future and for achieving this, development and support should come from government and different nongovernment organizations to improve this sustainable sector in Bangladesh. Based on the findings of the study some recommendations were made for the development of this business ensuring more contribution to Bangladesh economy.

**Keywords:** Mud Crab, Supply Chain, Grading, Bangladesh

### 1. Introduction

Large amounts of coastal belt location makes Bangladesh one of the notable growers of a vast range of mud crabs of impeccable quantity. Mud crab can be identified as a significant fisheries product for our economy for its noteworthy contribution in raising the exchange earnings and occupies an important position among the items exported from Bangladesh. The mud crab (*Scylla serrata*) is widely distributed in the Indo-West-Pacific region as mangrove associated fauna <sup>[1]</sup>. Mud crabs occur abundantly in the coastal region of Bangladesh particularly in the estuaries, tidal rivers of the Sundarban mangrove swamps and coastal *ghers* <sup>[2]</sup>. Crabs belong to the family *Portunidae* of the class *Crustacea* play a vital role in the ecological balance. Live crab is very delicious and edible like shrimp. In recent years, there has been increasing interest in crab farming due to growing markets and international demand. The importance of live mud crab as an export commodity has opened up great opportunities for crab farming.

The crab business received due recognition only recently because of creative role in income, employment and foreign exchange earnings. The coastal districts have been witnessing a steady rise in crab exports in a race with shrimp, ushering in a new hope for a boost in the country's seafood exports. Bangladesh earns millions of dollars in foreign currency by exporting crab. In 2013-14, Crab exports from Bangladesh fetched \$22.91 million in 2013-14 Fiscal Year by exporting 8,520 tonnes of live crabs <sup>[3]</sup>. Considering the increasing demand and price of live crabs in local and international market, it has been gaining popularity among the coastal communities in greater Khulna and Chittagong regions <sup>[4]</sup>. The export of live mud crab from Bangladesh has increased many folds in the last decade. China, USA, Japan, Korea and Thailand are ranked as the top five biggest consumers of crab <sup>[5]</sup>. Crab growing has proved to be a safe and profitable venture. The country can utilise this opportunity to earn more forex from crab exports if the cultivators are provided with necessary supports. In this context, the present study is an attempt to examine the existing supply chain and distribution system of mud crab and find out the problems of collectors and traders which will help to formulate effective supply chain.

## 2. Materials and Methods

Paikgachha upazila of Khulna district in the southwest region of Bangladesh was purposively selected for the present study considering concentration of mud crab production and collecting from natural source. Keeping in view the objectives of the present study, the crab collectors and traders (depot owners, suppliers and exporters) involved in crab trading and procedures have been interviewed. Both personal interview and Focus Group Discussion (FGD) were used to collect necessary information. In total 30 intermediaries (Depot owner (10) + Bepari (10) + exporter (10)) were selected to examine their involvement in crab marketing and distribution. The data was processed through editing, coding and tabulation.

### Supply chain and distribution:

Analyzing supply chains includes identifying all the function performed in a specific commodity sector, organizing them into a sequence, and analyzing, each function in relation to both the preceding steps and subsequent ones. The supply chain analysis involves the following aspects.

- The promotion of commodity production and marketing through chain formation and supply chain management.
- The identification and development of new service function for specific commodities. In either case, supply chain analysis helps articulate demand and identifies new tasks.
- The promotion of agriculture innovations. High-value commercial products require constant technical improvements. This is a consequence of changing market demand and consumption patterns under conditions of strong competition.
- Quality management and control. Food safety programs regularly use the supply chain concept to check on the factors relevant for the final product quality all the way along the chain.

The supply chain study is particularly concerned with the resources, value addition activities and persons involved within the mud crab supply chain. Supply chain analysis of mud crab has given a picture of collectors' and traders' position and contribution in the supply chains.

## 3. Results and Discussion

Whereas marketing channels connects the marketer to the target buyers, the supply chain describes a longer channel stretching from raw materials to components to final products that are carried to final buyers. The supply chain represents a value delivery system. Each component of supply chain captures only a certain percentage of the total value generated by the supply chain. When a company acquires competitors or moves upstream or downstream, its aim is to capture a higher percentage of supply chain value <sup>[6]</sup>. Supply chain is the coordination of production, inventory, location and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served.

### 3.1 Sources of crab

In the study areas, it was observed that 55 percent of the total crabs were collected from Sundarbans, whereas 22 percent and 11 percent were collected from *ghers* and rivers respectively. The sources of mud crab production vary with season. The Sundarban mangrove swamp and tidal rivers are the main sources of mud crab production during post monsoon (October to January) and traditional shrimp ponds (*ghers*) are the major

source during monsoon (May to September). The maximum catching is obtained during spring tides of full moon (*purnima*) and new moon (*amaboisha*) phases (locally called "goon"). Juvenile crabs enter into the traditional shrimp *ghers* during pre-monsoon and grow up there until harvest. In the study area, 40 percent of crabs were collected from wild sources.

After getting the expected weight they supply these crabs to the local or international markets through different marketing channels or supply chains.

### 3.2 Contributors involved in mud crab supply chain

The main contributors involved in the mud crab supply chain are discussed below.

#### i) Catch by Fisherman/Collectors

Crab collectors are the key contributors, and play dominant role in the crab supply chain. They collected crabs from Sundarbans, rivers, canals, estuary and shrimp *ghers*. They sold their collected crabs to the Faria or brokers, depot owners and suppliers. Wild crab collectors in most of the cases did not get actual price of their products due to intervention of brokers and loan burden. The wild collectors were bound to sell the crabs at a low price to the specified brokers or traders who provided them loan in their lean period. The wild collectors play dominant role in the sense that they collect 55 percent of the total crabs from Sundarbans areas.

#### ii) Faria/Broker

The second contributor of the supply chain is Faria. Faria purchased crabs from the collectors and sold their product to certain depot owners or suppliers. Faria purchased small amount of crabs from different collectors, assembled those and sold to the small or large depot owners or suppliers in large volume.

#### iii) Depot owners

Depot owners play an important role in mud crab marketing in Bangladesh, not only by being the key link between catchers and fatteners, but also through financing the initial stages of the market chain directly to the catchers and to the middlemen. All of the surveyed depot owners conducted privately owned businesses and had contract with crab catchers or Faria. Along with some of the real crab fatteners, most of the depot owners (100 percent) were found to have fattening ponds where they kept their underweighted rejected crabs. They purchased crabs from collectors, Faria, small depot owners, fatteners and sold to the suppliers or commission agents.

#### iv) Suppliers

Suppliers were big merchants and also licensed traders having fixed business premise and godown. Their business premises usually were situated in the well communicated areas such as Paikgachha, Shyamnagar, and Kaligonj. They have some hired labourers or part time/full time salaried persons for performing various marketing activities. They purchased large volume of crabs from large depot owners, small depot owners, Faria, farmers, fatteners, and collectors and sold to the exporters in Dhaka.

#### v) Retailers

Generally the retailers collected the under grade and rejected crabs (which were rejected for export) from different depots and sold in the local market for domestic consumption. They

also sold the crabs door to door. Retailers were found to have fattening ponds and most of them buy crabs from depots and others from both fattening ponds and depots. According to them, lack of interest in consuming crabs in Bangladesh is the main cause of their low profit.

**vi) Exporters**

Most of the exporters are residing in the capital Dhaka. In the supply chain process, exporters were the last point of the domestic marketing channel. They purchased crabs from suppliers, commission agents and sold to the foreign buyers. After procurement, crabs were finally sorted, graded and packed in bamboo baskets in the exporters' processing centers. They had fixed offices which were located at different areas of Dhaka city. Exports were done on consignment basis.

It was found that the crab trading pattern involved a series of intermediaries from harvesters to consumers. In the whole region, five major types of marketing channels (flow channel 1) were observed. Similar types of marketing channels were also found in earlier studies [7, 8, 9].

**Flow channel 1:** Supply chains of live crab in Paikgachha upazila

<b>Chain-1:</b> Crab produced in gher (Fattener)→Small depot→Large depot→Supplier →Exporter →Foreign consumer=20%
<b>Chain-2:</b> Crab produced in gher (Fattener)→Faria/Bepari→Small depot→Large depot →Supplier →Exporter→Foreign consumer=15%
<b>Chain-3:</b> Crab produced in gher (Fattener)→Faria/Bepari→Large depot→Supplier →Exporter →Foreign consumer=20%
<b>Chain-4:</b> Crab produced in gher (Fattener)→Faria/Bepari →Retailer→Local consumer=5%
<b>Chain-5:</b> Crab produced in Sea→Crab collector→Crab fattener/farmer →Faria /Bepari →Large depot →Supplier →Exporter →Foreign consumer=40%

**3.3 Grading system**

The grades of the mud crab depend on sex, size, body weight, gonadal maturation and hardness of the carapace of the animal. Two types of grading systems (local and international) were found in the southwest coastal region of Bangladesh.

**i) Local grading system**

Mud crab traders use several types of grade on the basis of body weight, sexual maturity, broken swimming and chelate legs, hardness of external shell of the animal. All the mud crabs reached at depots, sorted into two groups; accepted and rejected ones. Male crab with broken claw, any crab with broken two swimming legs and broken shells were rejected. Accepted crabs were graded into some fixed categories. In the study area, there were 5 grades for the male crabs namely extra-extra-large (XXL), extra-large (XL), large (L), medium (M) and small (SM), whereas 3 grades for female crabs namely F1, F2 and F3 both in descending order of live gross weight as presented in Table 1. The female crabs having over 180g in weight with full hepatopancreas were called F1, over 150g with poor hepatopancreas were called F2 and over 120g without hepatopancreas were called F3. For male crabs, the grading system was the same for all locations. Male crabs having body weight over 500g, 400g, 300g, 250g and 200g with hard shell were called extra-extra-large (XXL), extra-large (XL), large (L), medium (M) and small (SM), respectively. The fatteners were fattening five grades for the male crabs namely extra-extra-large water crab (XXLPD), extra-large water crab (XLPD), large water crab (LPD), medium water crab (MPD) and small water crab (SMPD), whereas three grades for female crabs for the same namely KS1, KS2 and KS3 respectively as presented in Table 2.

**Table 1:** Grading system of mud crab by sex and weight in local market in Bangladesh

Male crab					
Grade	XXL	XL	L	M	SM
Weight (gm)	>500g	>400g	>300g	>250g	>200g
Claw condition	Full	Full	Full	Full	Full
Shell condition	Hard	Hard	Hard	Hard	Hard
Female crab					
Grade	F1	F2	F3		
Weight (gm)	>180g	>150g	>120g		
Claw condition	Full	Full	Full		
Shell condition	Hard	Hard	Hard		
Ovary condition	Full	Poor	Poor		

**Table 2:** Grading system of mud crab in fattening

Male crab					
Grade	XXL PD	XLPD	LPD	MPD	SMPD
Weight (gm)	>500	>400	>300	>250	>200
Claw condition	Full	Full	Full	Full	Full
Shell condition	Soft	Soft	Soft	Soft	Soft
Female crab					
Grade	KS	KS2		KS3	
Weight (gm)	>180	_>150		>120	
Shell condition	Hard	Hard		Hard	
Ovary condition	Nil	Nil		Nil	

**ii) International grading system**

In international grading system, male crabs having body weight greater than 500g, 400g, 300g, 250g, 200/150g are called XXL, XL, L, M and SM respectively. The female crabs having over 200g in weight with full hepatopancreas were called FF1, over 180g in weight with full hepatopancreas were called F1, over 180g in weight with partial hepatopancreas were called KS1, over 150g with poor hepatopancreas were called F2, over 120g in weight with no hepatopancreas were called F3 and the females having body weight less than 120g were called KS3. The grading system for international market is presented in Table 3.

**Table 3:** Grading system of mud crab by sex and weight in international markets

Male						
Grade	XXL	XL	L	M	SM	
Weight (gm)	>500	>400	>300	>250	>200/150	
Female						
Grade	FF1	F1	KS1	F2	F3	KS3
Weight (gm)	>200	>180	>180	>150/100	>120	>120

**4. Conclusion and recommendations**

The supply chain of mud crab primarily focuses on the foreign exchange earning of Bangladesh. The sources of crab are Sunbardans, river, canal, estuary, traditional shrimp gher, etc. The collectors collected crabs from those areas and sold to the Farias, depot owners and suppliers. Depot owners sold crabs to the suppliers after marketing activities. Suppliers sold crabs to the exporter. Finally, exporters performed all marketing activities such as clearing, grading and packaging and sold to the foreign buyers. The depot owners and suppliers rejected underweight and soft shell crabs. Then the fatteners purchased those soft shell crabs, fattened them and sold at a higher price to the depot owners or suppliers again. The underweight crabs were also sold to the local consumers of the local markets. Considering the total export earnings from mud crabs, this sector shows future potential. To achieve this, development and support from government and different non-governmental

organizations needs to be greater and perceptions regarding the activity needs to improve for more sustainable mud crab farming and marketing in Bangladesh. For a sustainable crab business some recommendations have been made under this research.

- All intermediate players in crab trading should be brought under a single apex body under the Department of Fisheries so that the players who do have a genuine stake should remain in the business.
- Market demand and market price of different graded of crabs should be monitored throughout the year so that the farmers can sell crab with higher price when demand is high.
- Institutional intervention is necessary to control conditional trading through providing pro poor micro credits facilities to the collectors.
- The primary producers need to be integrated with domestic and international markets by forming collectors' and fatteners' association through GO/NGO initiatives.
- The government should invest a part of export revenue generating from crab trading for market infrastructure development to minimize the post-harvest loss.

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