World Journal of Fish and Marine Sciences 4 (6): 651-656, 2012
ISSN 2078-4589

DOI: 10.5829/idosi.wjfms.2012.04.06.6594

Post-Harvest Handling and Marketing of Shrimp and Prawn in South-Western Region of Bangladesh

[1]M.N. Hassan, [1]M. Rahman, [1]M.M. Hossain, [1]A.A.K.M. Nowsad and [2,3]M.B. Hossain

[1]Department of Fisheries Technology,
Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[2]Department of Fisheries and Marine Science,
Noakhali Science and Technology University, Sonapur-3814, Bangladesh
[3]Biology Group, FOS, University Brunei Darussalam, Brunei BE1410

Abstract: The current study was designed to investigate the post-harvest handling situation in the marketing channel of shrimp/prawn of Bangladesh. A total of 75 farmers, 75 *forias*, 70 depot owners, 30 auctioneers, 30 commission agents and 20 factory owners were interviewed on the post-harvest and marketing of shrimp/prawn from Khulna, Satkhira and Bagerhat district. Most of the farmers and local traders were found to be unaware about the proper post-harvest handling of the products to retain the European Union approved quality. Post-harvest handling and marketing channel of shrimp involved six major stakeholder groups viz. farmers, local *forias*, depot owners, *chatal* auctioneers, commission agents and factory owners. The marketing chain was plagued by various problems at different stakeholder levels. Fish markets were found to be managed, financed and controlled by a group of powerful intermediaries called account holders. The depot owners and the commission agents were found to be rich and powerful in the chain and exploited the farmers and small traders. Icing was adequate in almost all stages of prawn/shrimp marketing chain except in the farmers' level. A concerted effort is needed to upgrade the marketing chain of shrimp in Bangladesh to reduce the marketing cost, stabilize the prices and overall improvement of the marketing efficiency.

Key words: Shrimp % Prawn % Post-Harvest Handling % Marketing Channel % Bangladesh

INTRODUCTION

Among the agro-based products after tea, raw jute, vegetables and fruits shrimp industry is the most expanding sector in Bangladesh. The frozen shrimp industries is the second largest export sector that earned a total of BDT 28852.1 million in 2009-10 financial year [1]. It also provides direct employment to over 600,000 people who in turn support well over 3.5 million dependents. Exportable shrimp requires special care to retain as much as practicable its original physical appearance, odour and organoleptic conditions. It must be free from dirt, filth, pathogenic organisms, uncertified chemicals and any antibiotics even in the minutest quantity. The presence of filth and foreign material and quality deterioration are the major reasons of rejection of shrimp exports from Bangladesh to the US and EU markets. There is an increased pressure from importing countries on the fish processors to establish effective quality assurance systems in their plants [2]. Bangladesh government emphasized mainly two issues: (i) quality and safety (bacteriological quality, contaminants, residues, additives and traceability) and (ii) trade issues (labeling, documentation and Good Safety Practice (GSP). Post harvest losses of shrimp have been reported at different stages of handling and transportation [3]. For cultured shrimp and artisanal catch another problem is the delivery of raw material. Prawn and shrimp are first collected from farmers or fisherman and are brought to the receiving centers without ice partly containing mud and debris. They are exposed to ambient temperature for a long time from capture to receiving at the depots. Ice is used in depots only when a bulk quantity is gathered and finally transported to the plants. Serious quality deterioration

Corresponding Author: M.B. Hossain, Biology Group, FOS, University Brunei Darussalam, Brunei BE1410.

has been reported at this stage [3]. On the other hand, it was reported that the effect of delayed post-harvest handling exerts serious threat on quality of *Penaeus monodon* and *Machrobrachium rosenbergii* [4]. Considerable information is available on the post harvest quality loss of fish under various storage conditions. But very little is known on the volume of post harvest losses at different stages in shrimp value chain. Hazard analysis and critical control points (HACCP) has been introduced in all processing industries of Bangladesh and there is good manufacturing practices exist in all processing establishment. Still then substantial losses in shrimp and prawn have been noticed in shrimp and prawn value chain [5].

The shrimp and prawn marketing system of Bangladesh faces serious problems including quality deterioration, physical losses and the delay of transportation. Yet since fish demand generally exceeds supply, there is limited incentive for traders to improve the quality of marketing system [6]. In the marketing system, the remote communities especially who are at the fore end of the chain are at serious difficulties due to lacking of transport, ice and good road facilities. There are irreplaceable intermediaries establishing an artificial pricing policy and the farmers do not get the actual price of their product [7]. Considering the above stated fact, the current study was designed to investigate the post-harvest handling situation in different stakeholder groups of the marketing channel of shrimp and to recommend policies to overcome this existing situation in the South-Western region of Bangladesh.

MATERIALS AND METHODS

The study was conducted during April 2009 to February 2010 in Khulna, Bagerhat and Satkhira district of Bangladesh. Primary data were collected through field survey. The survey also involved the inspection of the study area in terms of post-harvest handling and marketing of shrimp. A total of 300 questionnaire interviews were obtained from six stakeholder groups viz. 75 farmers, 75 *forias*, 70 depot owners, 30 auctioneers, 30 commission agents and 20 factory owners from the three districts. Focus Group Discussions (FGD) were conducted to get an overview on post-harvest handling and marketing situation of shrimp; 6 each on farmers, *forias* and depot owners and 2 on commission agents and factory owners. Relevant annual reports and documents were collected from concerned government and non-government organizations to validate the field observation. All the collected information were accumulated and analyzed by MS-Excel and then presented in textual, tabular and graphical forms.

RESULTS AND DISCUSSION

Marketing Channel: Post-harvest handling and marketing channel of shrimp involved six major stakeholder groups viz. farmers, local *forias*, depot owners, chatal auctioneers, commission agents and factory owners (Fig. 1).

Farmers: Farmers were primary producer and found as the primary stake in the marketing channel of shrimp. Farmers played important role to control the quality of the products during culture period and after post-harvest handling. Duration between harvesting and marketing took 1-4 h in all the study area. Most of the shrimp farms in Khulna and Satkhira district had facilities to keep the shrimp in shadow place after harvesting, whereas these facilities were available among 75% farmers in Bagerhat district. Almost all farms in the study area kept shrimp in clean plastic sheets after harvesting. The initial washing was mainly done using pond water (96% of the farmer). There was an ample scope for contamination. No small scale farmer used ice in shrimp after harvesting but only a few large scale farmers (4%) were found to use ice in case of long distance transportation for marketing. Serious quality deterioration of shrimp occurred in this step. All the farmers separated shrimp from other fish and sold their catch to depot with head-on condition but they did not grade prior to selling. The farmers usually did not use any type of detergent for basket washing. Though bamboo baskets were the main transport material in the recent past but now almost all the farmers used plastic drum (86%), plastic crate (13%) and Styrofoam box (1%) for transportation of shrimp from farm to depot and it took 30 min to 1 h for transporting shrimp to depot, 1-5 km away from the farm. Fishers were not aware about the quality aspect of shrimp. Only 20% of them were found to be aware on the quality of the shrimp (Table 1). The facilities available in the farmer's level regarding storage are shown in Table 1.

Most of the marginal farmers were found to sell their product to the *forias* and some to the depots but in case of large scale farmers the scenery was just reverse. A large number in Khulna and some in Satkhira and Bagerhat were also found to sell their products to the *chatal* auctioneers. No farmers were found trading directly with commission agents. Farmers claimed that

Table 1: Facilities available regarding storage and quality at different stakeholder stages

	Facility available (%)										
	Fish container					Wash- water					
Stakeholder	BB	PD	PC	SB	Ice	TW	PW	Ice crusher machine	Wooden ice crushing pestle and box	Cemented slab	Awareness level (%)
Farmer	0	86	13	1	4	4	96	0	0	2	20
Forias	0	92	7	1	30	68	32	0	0	0	10
Chatal auctioneers	0	55	45	0	100	94	6	6	94	100	72
Commission Agents	0	82	18	0	100	100	0	0	0	100	90
Factory owners	0	0	100	0	100	100	0	100	0	100	100

BB=Bamboo basket, PD= Plastic drum, PC= Plastic crate, SB= Styrofoam box, TW= Tube well water, PW= Pond water

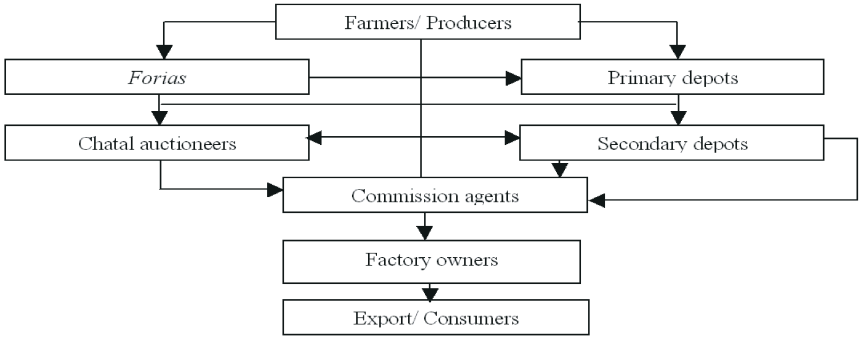

Fig. 1: Shrimp marketing channel in Bangladesh

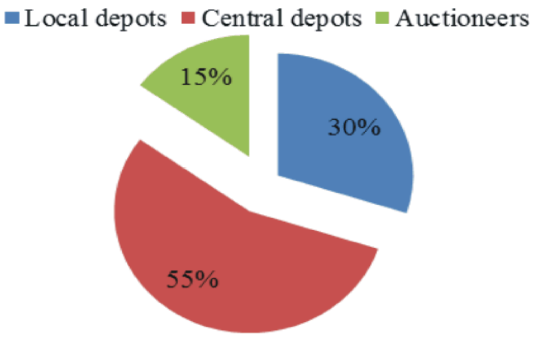

Fig. 2: Farmers (%) sold their products to different stakes

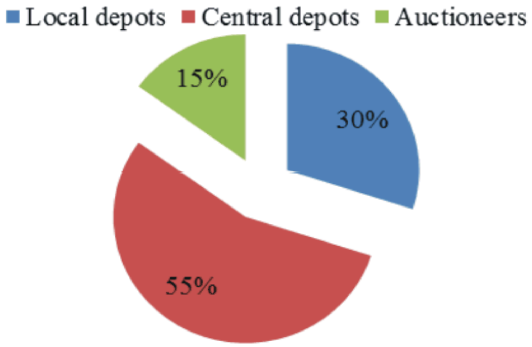

Fig. 3: Forias (%) sold their products to different stakes

though they get comparatively low price to the *chatal* auctioneers; they often like to sell the product to them because of cash money but the *forias* or depot owners offer partial payment or full on credit. It was found that farmers sold shrimp to *forias*, depots and auctioneers by 45, 35 and 20% respectively (Fig. 2). The identified common constraints of shrimp farmers were lack of technical knowledge, high cost of feed, lack of good quality feed and seed, inadequate packaging and transportation system, disease out-break, natural disasters like flood, tidal boar and cyclone, shrimp price controlled by the syndicate, nitrofuran and traceability issues, low quality of products due to unavailability of ice and ice box, etc.

Forias: *Forias* were the second stake in the marketing channel of shrimp. They purchased shrimp from farmer with either partial payment or on credit. Most of the *forias* lend money from depot owners to purchase shrimp and became obliged to sell products to the depot owners. In the recent past most of *forias* used bamboo made baskets but now almost all of them used plastic drum (92%), plastic crate (7%) and Styrofoam box (1%) to carry the products due to immense inspection of EU team with Department of fisheries (DoF) officials (Table 1). Use of ice is mandatory during transportation of shrimp but a very small number of *forias* (30%) were found to use ice during carrying shrimp and some were found to use very poor quantity. As a result, during transportation of shrimp

from remote areas product often gets deteriorated in quality. All adulteration in shrimp/prawn like filthing, injecting water or tapioca, etc. was performed at the *foria's* custody. Only 10% of the *forias* were found to be aware about the quality aspect of the shrimp (Table 1). Shrimp were injected with fluids and other substances or immersed in super chilled water to increase their weight. *Forias* sold shrimp to local depots, central depots and auctioneers by 30, 55 and 15% respectively (Fig. 3).

Depot Owners: The depot holders were the permanent shopkeepers having their own premises and staffs in markets. They were the middle functionary between farmers and commission agents or processing plants. Their shops were called 'depot'. Depot owners, small scale holder known as primary depot owner and the large scale holder known as central or secondary depot owner, were found to be most important group and prominent as well in the marketing chain of shrimp. Both the farmers and *forias* sold their most of the products to the depot owner. Farmers and *forias* often took advance locally known as *dadon* from depot owners and remained bound to sell their product to them even at lower price than the contemporary market price. The same scenario was also found in case of depot owners who took *dadon* from commission agents and remained bound to sell their product to those agents. Local depots sold their product either to the central depots or directly to the commission agents. The entire depot owners used ice for storing the product but the quantity of ice used were not enough to maintain the perfect quality of the product. During full harvest season, bulk amount of shrimp comes into the depot and shrimp were piled on the floor with a minimal amount of ice or no ice was used if there was a crisis of ice in the locality. Most of the post-harvest loss and quality deterioration and contamination of the product took place in that time. Though beheading outside the processing plants is strictly prohibited, for fresh water prawn it was a common practice in the study areas. Chlorinated water was frequently used in the secondary depots but in case of primary depots detergent was common to clean floor and handling materials. Most of the adulteration in shrimp/prawn like filthing, injecting water or tapioca, etc. was performed on the depots or sub-depots. Shrimps were injected with fluids and other substances or immersed in super chilled water to increase their weight.

Lack of knowledge of workers on sanitation and hygiene, lack of separate working clothes, boots and gloves for shrimp handling, lack of clean space and potable water, lack of trained manpower and lack of capital were identified as "weakness", while unauthorized import of shrimp from Myanmar and India, nitrofuran issue, lack of adequate government service, small size and frequency of collection of shrimp, complex distribution chain and influence of account holder in price fixation were identified as the "threats" of the depot holder by the SWOT analysis. The facilities which were found in depots regarding quality control are shown in Table 2.

Table 2: Facilities in depots regarding quality control

	Region		
Major aspects (% of depots)	Khulna	Satkhira	Bagerhat
Mosaic/ tiles fitted floor	100	85	95
Cemented floor	0	15	5
Use of stainless steel grading table	100	100	100
Use of plastic materials	100	100	100
Use of deep tube-well water	75	60	60
Use of shallow tube-well water	20	25	25
Use of pond water	5	15	15
Use of chlorine water to clean floor and handling materials	85	70	65
Use of chlorine water to clean floor and handling materials	15	30	35
Use of ice	100	100	100
Beheading (shrimp)	0	0	0
Beheading (prawn)	80	60	80
Use of gloves during beheading	15	0	0
Drainage facilities			
Good	60	55	45
Up to the Mark	30	25	40
Bad	10	20	15

Chatal Auctioneers: *Chatal* auction system was a new intervention in shrimp marketing. They were run under multiple ownership; the number of owners varied from 4 to 10 in the areas. *Chatals* were more frequent in Khulna, few in Satkhira and Bagerhat. White fish was the major component of sale in *chatals*. However, during June to December shrimp became the major item of auction sale. This was the only stake in the shrimp marketing channel that needs no capital to continue their business. *Chatal* auctioneers sold the product of the farmers with 2-3% commission. Because of getting immediate payment, farmers preferred selling at the *chatals* even at some lower price than to the depots. Both the commission agents and central depot owners were found as buyer of these auction markets. As the product was kept for a very short period of time, deterioration of product quality was not a major concern in the auction market. The *chatal* auctioneers used plastic drum (55%) and plastic crate (45%) for transportation of shrimp (Table 1). All the *chatal* auctioneers (100%) were found to use ice for the storage of shrimp. 72% of them were found as concerned on the quality aspects of the product (Table 1).

Commission Agents: The account holders act as the commission agent and constitute the major profit making actors in the shrimp value chain with the least risk. They were the penultimate agent in the marketing chain helping to buy products for the factories, from intermediaries at the back end of the chain, for commission at certain percentage. They had the agent-ship of multiple factories. They were very influential in the value chain and determined prices. They often stayed behind the scene and controlled both farmers as well as depot holders. Shrimp industries were found to buy most of their raw material through the account holder or agents, who in turn bought from subagents or traders dealing directly with the fishermen and farmers. They were mainly situated near the factory sides; however, often they were located at a place in the remote areas having cluster of depots and production farms. In Rupsha of Khulna, the largest shrimp processing zone, about 20 commission agents were engaged. However, they purchased shrimp mainly from depot owners and auction markets but usually not directly from farmers. All the agents reported that they transported product from purchasing place to factories through truck, pick-up van and even by engine van with adequate ice using the plastic drums (82%) and plastic crate (18%), often coated with clean polythene sheet (Table 1). 100% of the commission agents were found to use ice for storage and 100% of them used tube well water for washing (Table 1). Account holders were found to finance sub-agents and giving credit to the processing plants, receiving payment only after the processor has shipped to his overseas customer. So, in turn they had influence on the processing plants too. Due to their influence in the market, the farmers or depot holders cannot sell the product directly to the processing plants. Most of the market actors deliberately wanted to remove account holder from the shrimp value chain.

Factory Owners: Factory owners were found to be the final stake in the shrimp marketing channel of Bangladesh. They purchased shrimp only from their selected account holders/commission agents and have no contact with the other stakes in the chain. After processing shrimp they export shrimp to the international market through national and international buyers. Almost all the processing plants possessed very standard post-harvest handling and processing environment. It was observed that there was no chance of deteriorating a little bit of quality of the product inside the factories because all of the facilities regarding quality control were found in all of the factories and they (100%) were concerned about the quality aspects of the shrimp (Table 1).

Harvesting, Post-Harvest Care and Transportation of Shrimp: Harvesting of shrimp and prawn started as soon as it reached marketable size. Most farmers harvested shrimp by themselves, although a few large farmers depended on commercial harvesters. Normally, shrimp were harvested at night or very early hours in the morning. Most farmers practiced partial harvesting by using cast nets and traps. After harvest only 20-25% of shrimp farmers were found to use ice for preservation. They used pond water for initial washing of shrimp. No farmers were found to practice grading and beheading of shrimp (Table 3).

Table 3: Harvesting, post-harvest care and transportation of shrimp

	Region		
Major aspect	Khulna	Satkhira	Bagerhat
Harvesting			
Harvesting time	Night/Day	Night/Day	Night/Day
Harvesting method	Cast net, Trap	Cast net, Trap	Cast net, Trap
Duration between harvesting and marketing (hour)	½ - 3	1 – 4	½ - 4
Post-harvest care			
Initial washing after harvesting	Pond water	Pond water	Pond water
Ice used (% of farmer)	20	25	20
Grading of shrimp (% of farmer)	0	0	0
Beheading (% of farmer)	0	0	0
Basket washing and detergent used	wash regularly without detergent	wash regularly without detergent	wash regularly without detergent
Transportation			
Distance of depot for selling product (km)	1 – 3	1 – 6	1 – 5
Transportation time (hour)	½	½ - 2	½ - 2
Materials used for transportation	Plastic drum or plastic basket	Plastic drum or plastic basket	Plastic drum or plastic basket

Table 4: Ice used in shrimp value chain

	Ice Used (shrimp : ice)				
Stakeholder	5:1	2:1	1.5:1	1:1	No ice
Depot holder (%)	10	6	4	80	-
Transporter (%)	10	20	40	30	-
Prawn farmer (%)	-	-	4	-	96

Transportation played an important role in the shrimp/prawn marketing chain because most of the segments were found to be interlinked through transportation in the shrimp/prawn industry. Every segment required substantial transportation expenditures. Usually plastic drum or plastic basket was used for the transportation of shrimp (Table 3).

Present Icing Practice: Shrimp and prawn was found to be iced adequately in almost all stages of marketing chain except in the farmers. Majority of the depot holder (80%) and transporter (40%) were found to use a shrimp-ice ratio of 1:1 and 1.5:1 respectively (Table 4). However, 10% of the depot holders/transporters were found to use very minimal quantity of ice (shrimp-ice ratio of 5:1). Block ice, after carried to the landing/marketing spots, were crushed into pieces. Different methods were being used to crush ice blocks. Common methods found were the block ice was crushed by a wooden pestle on bamboo basket, on soil floor, on *pacca* (cemented) floor, on wooden petty, on steel petty, by traditional out-fashioned ice crusher, etc. Use of bamboo basket in crushing ice block into small pieces was found to be dominant (55%). Sixteen to eighteen percent of the blocks were crushed on soil or *pacca* (cemented) floor, 26 to 48% of the ice blocks were found to be un-tempered or partially frozen and 16 to 32 % of ice blocks were contaminated with iron, debris, algae or clay.

CONCLUSIONS

Assurance of good quality shrimp product as per the FAO-CCRF for responsible utilization of fish is a great challenge in Bangladesh. As shrimp is a perishable food, it requires proper handling, processing and distribution if it is to be utilized in a cost effective and efficient way. A concerted effort is needed to upgrade the marketing chain of shrimp in Bangladesh to reduce the marketing cost, stabilize the prices and overall improvement of the marketing efficiency.

REFERENCES

1. DoF (Department of Fisheries), 2011. Fisheries fortnight compendium 2011, Ministry of Fisheries and Livestock. The Government of Peoples republic of Bangladesh, Dhaka, pp: 102.
2. Hussain, M.M. and M.H. Uddin, 2004. Quality control of marketing fish products: Needs of infrastructure and legal support. Paper presented in the national workshop on fisheries resources development and management, held on 29 October to 01 November, Dhaka, Bangladesh.
3. Kamal, M., M.M. Rahman, L. Yasmin, S.U. Ahmed and M.N. Islam, 2000. Studies on the post-mortem changes in shrimp and prawn during ice storage: II. Biochemical aspects of quality changes. Bangladesh J. Fisheries Res., 4: 91-96.
4. Rahman, M., L. Yasmin, M. Kamal, M.N. Islam and Y. Ochiai, 2001. Quality changes in freshwater prawn *Macrobrachium rosenbergii* during ice storage. Bull. Fac. Edu. Ibaraki Univ. Nat. Sci., 50: 39-49.
5. Nowsad, A.K.M.A., 2010. Post-harvest loss reduction in Fisheries in Bangladesh: A Way Forward to Food Security. Final Report PR no. 5/08. Food and Agriculture Organization (FAO) of the United Nations, Dhaka, pp: 171.
6. World Bank, 1990. Bangladesh, Third Fisheries Project, Staff Appraisal Report No.8392-BD, Asia Country Department-1, The world Bank, Washington, DC.
7. Ahmed, S.U., P.K. Sarker, M.N. Islam, M. Kamal and M.A. Mazid, 2001. Identification of cause of shrimp quality loss due to farm operation and post harvesting handling at depots and markets of Bangladesh. Online J. Biological Sci., 1: 188-191.