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Marketing channels of mud crab (*Scylla serrata*) at Nijhum Dwip, Noakhali, Bangladesh: A value chain analysis

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Abstract

The study was conducted to assess the marketing and value chain of crab from Nijhum Dwip Island in Noakhali region during July 2015 to December 2015. Data were collected through questionnaire interview and tools of participatory rural appraisal such as focus group discussion. The Meghna estuary, tidal rivers and mangroves were the main sources of crab. Local people including the fishermen can collect the crabs and crab lets. The grading system varied depending on sex and size of the crab. The highest average price was found to be 200 BDT/kg for FF1 grade of female while the minimum price was found to be 500 BDT/kg for XXL grade of male. Crabs were mainly available in April, May, June, July, August, September, and October. It was found that 70% crab catchers were from the age group of 12 -28 years, which were the main working force in the society. In the study area, 60% of the crab marketers had monthly income of BDT 9,000- 20,000, the farmers living conditions were not up to the mark but the survey suggests that most of the crab marketers and exporters increased their income level. If crab fattening can be established, training can be provided, institutional and policy support can be offered to the farmers and good marketing facilities can be developed, crab can be an alternative source of income and sustainable livelihood for the coastal poor people.

Keywords: Marketing channel; value chain analysis; mud crab; Nijhum Dwip

Introduction

Bangladesh is donated with an enormous shoreline belt that provisions the livelihoods of millions primarily through fishing and aquaculture associated accomplishments. While, shrimp tops the index of the treasured aquatic commodities of Bangladesh, but this culture has affected critical environmental as well as socio-economic penalties in the wake of its extension. Such magnitudes have not been assumed by the crab industry; instead of this culture and capture has been approved on to positive destitute groups, in which threatened the livelihoods of millions having no viable substitutes. The *Scylla serrata* being the utmost significant and high demand coastal aquatic species in the international market, due to its nutritional richness, becomes in contemplation of holistic management approach of maintaining the microbial and chemical excellence with variable condition factor to ensure its nutritional proximity in all level of its supply chain. The top five biggest consumers of crab are ranked namely, China, USA, Japan, Korea and Thailand. Female crabs particularly are occupying a significant part in promoting, predominantly in Asian nations for example Japan, Taiwan, Hong Kong and Singapore. However, there is an emergent arcade for mud crab meat as a value added commodity and for frozen soft-shelled mud crab in the USA. More than 50,000 fishers, traders, transporters and exporters are found to be involved in this sector. Bangladesh initiated exporting mud crabs nearby 1977-8 and ever since 1982 the worth of export incomes has been progressively expanding [4]. Cutting-edge 2002, mud crabs placed third in relations of frozen food export commodities. During 2005-2006, Bangladesh earned US\$3,668,000, compared with 2006-2007, when the total export value increased by 65% [10]. Over a period of 100 years, 508 cyclones have affected the Bay of Bengal region, of which 17 % caused serious land erosion [17]. Though the majority of the population has experienced disasters in varying degrees and forms, the coastal populations are the most vulnerable [20]. Throughout the cyclone period in the months of April-May and September-November, these natural and climate-related disasters have a profound and lasting influence on their lives and

livelihoods of the extreme poor, predominantly in 12 districts, counting Khulna, *Bagerhat* and *Satkhira* [33]. Khulna and *Satkhira*, in the South-Western coastal belt were among the worst affected districts [32]. *Scylla serrata* is the most wide spread of the four recognized *Scylla* species [28] and it has traditionally been an important fishery in coastal communities throughout its range. The consequence of climate change is worsening food security and livelihood of coastal resource-poor people [26]. Crab culture and fattening are however, still in the experimental stage in South Asia [38]. In Malaysia, floating cages (6m³ with a depth of 1m) are used to fatten mud crab [41]. The six important genera used as food crabs are *Scylla*, *Portunus*, *Charybdis*, *Matuta*, *Varuna* and *Sartorina*. In the *Sundarban*, there are 4 families and 16 species of crab. They are quite abundant in places 40-50 km inland from the Bay, in the creeks and canals of the brackish water estuaries [29]. During 2005-2006, Bangladesh earned US \$ 3,668,000, compared with 2006-2007, when the total export value increased by 65% [10]. The technology of crab fattening feasible in the coastal belt of Bangladesh has been established by the Bangladesh Fisheries Research Institute, Brackish water station, Khulna [37]. *Scylla serrata* has a major ecological significance in mangrove ecosystem. It borrows the mangrove floor which helps to aerate the substratum and provide shelter for many other refuge animals including mud skippers, frogs and sea slugs [9]. The mud crab is an omnivorous and opportunistic feeder that feeds in slow moving and sessile benthic invertebrates and prefers small crabs (mainly *grapsid*), bivalves and detritus [14, 34]. It is also a voracious predator of young fish and prawns [9]. Mud crab is nocturnal in behavior, remaining buried during the day time and emerging at night [14]. The mud crab fishery is unconditionally grounded on wild harvest principally from the swamps of the *Sundarbans* and enormous areas of the outmoded shrimp *ghers* beside the coastal area of Bangladesh [1, 2]. Fattening is a holding operation of short duration to cater for the special needs of the market so as to obtain higher price [13]. Fattening generally entails 2-4 weeks to complete. Within this period, premature crabs glowing fed to mature their gonad abundantly. Bearing in mind the growing demand and value of live crabs in indigenous and international market, it has been obtaining popularity amongst the coastal populations in greater Khulna and Chittagong districts [9]. In Bangladesh crabs are comprehensively harvested only from wild stock, causing in an evident degeneration in their population [11, 23, 31]. The main objectives of the study were to analysis the marketing channel of mud crab; to analysis the distribution and supply chain system of live crab and *Aratder* involved in domestic marketing; to identify the major problems and constraints in crab production and marketing and to suggest policy implication to increase crab production and develop its marketing system.

2. Materials and methods

2.1 Study area and periods

The study was conducted from July to December 2015 in the Nijhum Dwip Island, *Hatiya*, *Noakhali* located in the most south western part of Bangladesh (Figure 1).

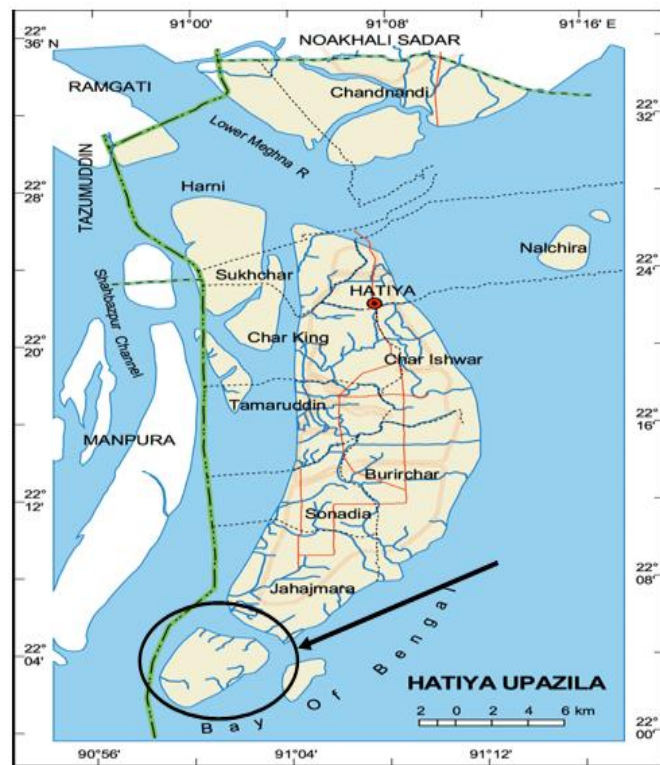


Fig 1: Circular area showing Nijhum Dwip (study area).

2.1. Target groups

The people which are targeted to analysis activities and business for this preset study are crab collector, *bepari*, *aratder*, wholesalers and crab retailers

2.3. Data collection

2.3.1. Primary data collection

A total number of 7 *aratder* were selected and were interviewed throughout the period of study. 10 exporters from Dhaka, 3 local agents from exporters, 50 crab catchers, 10 retailers from different areas in Nijhum Dwip area were selected randomly for the purpose of this research.

2.3.2. Secondary data collection

Secondary data based on information collected from some published reports, papers and some official documents and reviews the existing information on the different aspects of the crab fishery and marketing in Bangladesh.

2.4. Data analysis

Data from various sources were coded and entered into a database system using Microsoft Excel software. Preliminary data sheets were compared with the original coding sheets to ensure the accuracy of the data entered. Descriptive method of analysis was used to describe the survey results using means and percentage. Some diagrams were also used for describing the findings.

3. Results

3.1. Grade and size variation in Nijhum Dwip

In Nijhum Dwip locally 4 types of grading systems were found. These were cell, grade, pill and *kucha*. Cell ranges was >300 g, grade ranges was 200-300 g, pill ranges was 140-200 g and *khucha* are legless or other damaged crab (Table 1).

Table 1: Local grade wise weight of crab found in Nijhum Dwip.

Local grade name	Size (gm)
Cell	>300
Grade	200-300
Pill	140-200
Kucha	Legless or other damaged crab

3.2. Grade and size variation for local market

International standard for grade wise weight indicates that size XXL must weighted between 500g, XL size should be weighted between 400-500g, L size weighted between 300-400g (Local cell size), M indicates local Grade size weighted to 250-300g. Last one was SM size weighted in between 200-250 gm (Table 2).

Table 2: International standard for grade wise weight

Male	Grade	Weight (gm)
	XXL	>500
	XL	>400
	L	>300
	M	>250
SM	>200	

International standard for crab size according to weight, female crabs are graded due to their gonadal maturation. Weight ranges >200 g are separated as FF1 (ripen gonad), F1 are ranged between 180-200g, KS1 are ranged between 180-200g having partial gonad. F2 weighted 150- 180g, F3 weighted between 120-150g and KS3 are weighted between 120-150g having immature gonad (Table 3).

Table 3. International standard for crab female according to maturation of gonad.

Female	Grade	Weight (gm)
	FF1	>200
	F1	>180
	KS1	>180(Partial gonad)
	F2	>150
	F3	>120
KS3	>120(immature gonad)	

3.3 Grade wise price of crab

The price variation occurs due to weight of the crabs (Cell, Grade, Pill, Kucha). Generally, cells was sold at 70- 80 taka per crab, Grade was sold at taka 35-40 taka per crab, Pills was sold at 8-10 Taka/ crab. Usually Kucha was not sold; they are kept in the local market (Table 4).

Table 4: Local grade wise price

Local grade name	Price/piece (BDT)
Cell	70-80
Grade	35-40
Pill	8-10
Kucha	2-3

Price variation in domestic market or per kg crab was varied due to the collector, aratder and exporter. The collector sold cell at 200-250 BDT /kg to the aratder; aratder sold 500-600 BDT and exporter sold 500-650 BDT, collector sold grade at 180-200 BDT, aratder sold 180-380 BDT and exporter 400-550 BDT. Collector sold pill at 100-

120 BDT, aratder sold 160-350 BDT and exporter sold 350-450 BDT (Table 5).

Table 5: Price variation in domestic market.

Type	Collector/kg (BDT)	Aratder/kg (BDT)	Export center/kg (BDT)
Cell	200-250	500-600	500-650
Grade	180-200	180-380	400-550
Pill	100-120	160-350	350-450

3.4 Monthly selling crab in Nijhum Dwip

In Nijhum Dwip there were many crab businessmen. Daily crab capture of business was 200-1500 pieces. Monthly lower capture of a business was 9000 pieces. Highest capture of a businessman is 25000 pieces. Monthly crab selling range is 9000 to 25000 pieces. In Nijhum Dwip crabs was not found equal all over the year. Some season was peak for crab collector and some was off peak for crab collector. April and May was the peak month to found crab in Nijhum Dwip and December, January and February was the off peak season for crab. In off peak season crabs were found in low amount. In this time the price of crab was high (Table 6).

Table 6: Availability of crab in a year cycle.

month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Peak season				■	■							
Off peak season	■	■										■

3.5 Present condition of cab production

Different types of people were involved in crab business. A 50% person who was involved in crab catching and marketing said that crab was decreasing, 34% people said that crab was increasing and 16% said that it was in stable condition (Figure 2).

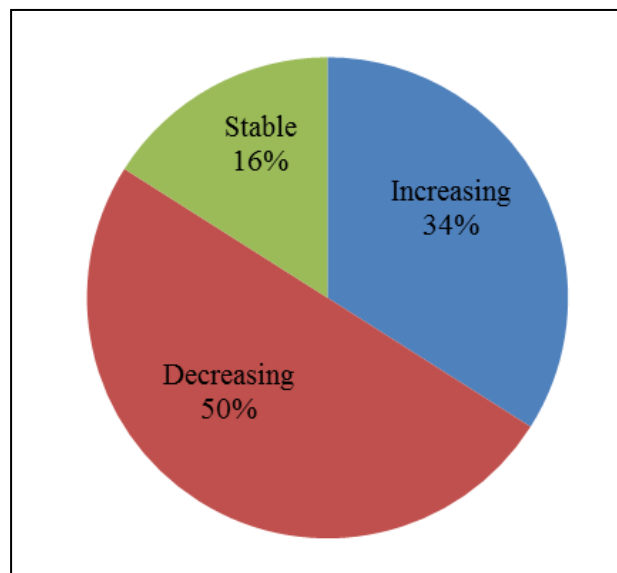


Fig 2: Present condition of crab production.

Various types of people were involved in crab marketing and catching. 33% people in Nijhum Dwip region took crab catching and marketing as their primary occupation (crab catching, selling, marketing, and exporting). Whereas 67% of people took crab related occupation as their secondary profession (Figure 3).

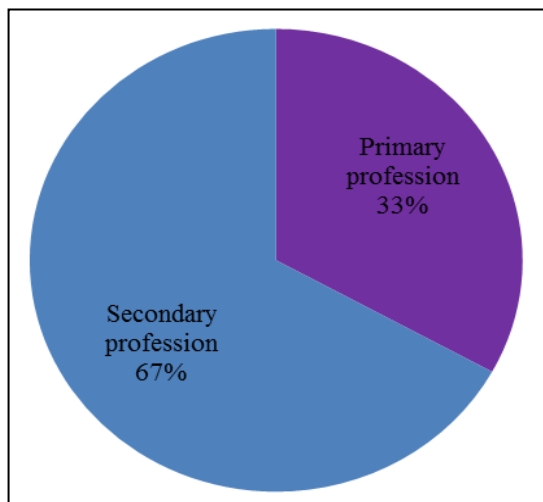


Fig 3: People involved in crab marketing.

3.6. Marketing channel of crab

The marketing channel of crab in Nijhum Dwip was two types. First direct Dhaka and second one was others place. About 90% crab was exported in Dhaka whereas 10% was other places. In Dhaka, the crab exporting center is situated in Uttara 12 no sector. There were many crabs exporting center in Uttara 12 no sector (Figure 4).

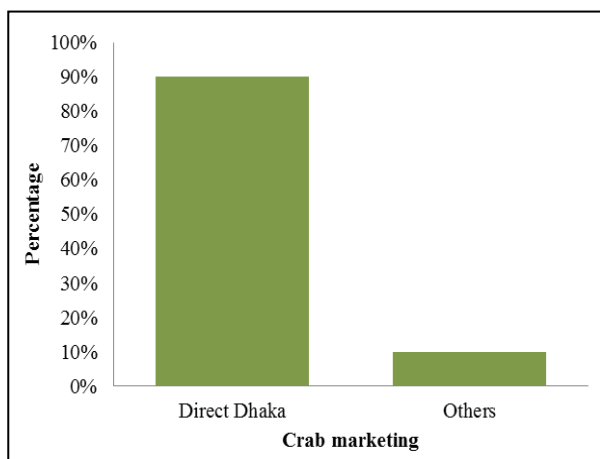


Fig 4: Chart showing local marketing channel.

Crab was collected from local habitat such as mangrove, canal etc. Then it goes to *arat* or *gher* (*bondortila*, *namarbazar*). Then it was transported in Uttara, Dhaka, finally it goes to international market (China, Taiwan, Malaysia etc.) (Figure 5).

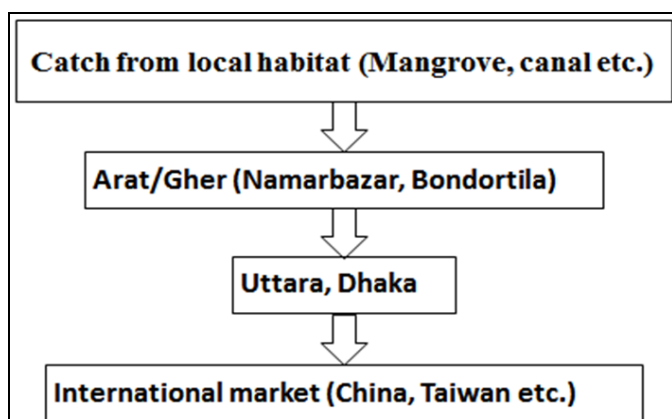


Fig 5: Exporting system of crab marketing.

Crab collector sold per kg crab in 250 BDT to *aratder*. *Aratder* sold per kg crab in 500 BDT to exporter and thus he benefited 100%. then exporter sold it 600 BDT to international market thus the price increase 20% (Figure 6).

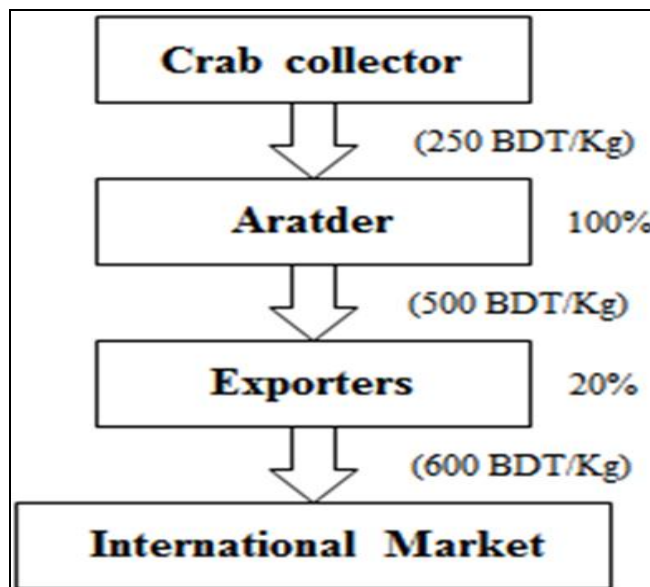


Fig 6: Value chain analysis of crab marketing in Nijhum Dwip.

3.7 Transportations

For exporting purposes of crabs into different countries, various types of container are used for transportation, usually specified by the importers, such as plastic baskets, Styrofoam cartons and bamboo baskets. The weight of each box varies from 14 to 20 kg of crabs. Sometimes they keep a long tube, made of bamboo, in the centre of the plastic boxes to prolong the shelf life of the exported crabs. Crab transporting equipment's was bamboo baskets, Styrofoam cartons and plastic baskets. Usually these were rectangular and eclipse shaped, capacity varied from 17 to 30 kg and price ranged from 90 to 120 BDT per basket (Table 7).

Table 7: Equipment's / transport materials.

Equipments	Shape	Size	Capacity (kg)	Price (BDT)
Bamboo baskets	Eclipse	13''×16''×14''	30	120
Plastic	Rectangular	16''×10''	17	90

4. Discussions

In the context of crab 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 [30]. In national market the crab cell ranges was >300 g, grade ranges was 200-300 g, pill ranges was 140-200 g and *khucha* are legless or other damaged crab. International standard for crab size according to weight, female crabs are graded due to their gonadal maturation. Weight ranges >200 g are separated as FF1 (ripen gonad), F1 are ranged between

180-200g, KS1 are ranged between 180-200g having partial gonad. F2 weighted 150- 180g, F3 weighted between 120-150g and KS3 are weighted between 120-150g having immature gonad [4] justify the crab grades in Khulna region. Price variation in domestic market or per kg crab was varied due to the collector, *aratder* and exporter. The collector sold cell at 200-250 BDT /kg to the *aratder*, *Aratder* sold 500-600 BDT and exporter sold 500-650 BDT, collector sold grade at 180-200 BDT, *Aratder* sold 180-380 BDT and exporter 400-550 BDT. Collector sold pill at 100-120 BDT, *Aratder* sold 160-350 BDT and exporter sold 350-450 BDT. Daily crab capture of business was 200-1500 pieces. Crabs can survive in air for about 4 to 5 days using improved packaging. Post-harvest handling has a significant effect on profit, particularly since crabs are sold live. Due to their territorial nature, harvested crabs are tied with coarse twine to avoid injury to handlers and physical damage to themselves. This helps to reduce mortality during transportation. From survey, about 150 tons of crabs were collected per year. So the abundance of crabs is moderately good. [2] Also reported that are found in coastal region of Bangladesh. From present study, average temperature found in *Nijhum* Island about 33 °C in April-October and 30.1 °C in November-March. Temperature 26 °C to 31 °C was generally acceptable levels for mud crab culture [12]. From present survey, rainy season occurred at June-September, winter at November-December and April to October was the suitable season for crab culture in this area. *In present study, it was found that people involved in crab business was lower than khulna region. It was also found that there was very few depot owner than southwest region of Bangladesh. The marketing system also different from southwest region of Bangladesh. In Nijhum Dwip there was crab intermediators are very few than khulna region.* From study area, it was found that, the physical water bodies of the area contained tilapia, shrimps, bivalves, soft snails, mussel and animal entrails. Crab food is usually raw, fresh and consists of crushed fish, small crab, oysters, mollusks, and shrimp or fish heads [2]. In the *Nijhum* Island, there was a potential marketing system found, that was started from crab collectors and closed to exporters. Also a good transportation system was found both water and road way. From present survey, it was found that depot owner didn't take money from exporter but an opposite finding was reported by [43]. Low demand in the domestic market was also reported by the marketing operators as being a major factor discouraging growth of the industry. In Bangladesh, the social and religious restrictions on the consumption of crab is hindering the business and prevents the operators from obtaining realistic prices in the domestic market. From present study, it was found that no one was involved in crab fattening but [15] reported that in southwest region of Bangladesh there was huge number of crab fatteners. In present survey, different grading systems were found for marketing of crab in *Nijhum* Dwip. Grading may vary due to sex, weight and also for the domestic and international markets. [21] Also found graded mud crab on the same basis. From the present study a number of constraints were found such as natural disasters like flood, drought, cyclone, *attack virous in gher*, difficult to get pass without bribe enter in to *forest* for crab collection, muscleman, theft, piracy, marketing problem, lack of money, higher production costs, lower market price and poor quality of crab seed of technical knowledge [36]. Stated in his report that the major constraints of carp farming were lack of money and production cost. Several recent studies examined crab

markets worldwide and suggested that the market was very large and increases day by day [8, 16]. Monthly lower capture of a business was 9000 pieces. Highest capture of a businessman is 25000 pieces. Monthly crab selling range is 9000 to 25000 pieces. No available published data were not found in regards of *Nijhum* Dwip aspects for crab fattening. In the present study, 33% people in *Nijhum* Dwip region took crab catching and marketing as their primary occupation (crab catching, selling, marketing, exporting). Whereas 67% people took it as their secondary profession which is similar with the study of [3, 5, 7, 19, 20, 22, 24, 25, 27, 35, 39, 42, 44]. In the present study about 90% crabs was exported in Dhaka whereas 10% was other places, in case of tilapia [35] found the similar results. From Bangladesh only live crabs are exported. At first crabs are carried to the local depot by wooden boats, bicycle or by van. Following this, all collected crabs from different small and local depots are transported to Dhaka by truck or launch usually at night however, these transport system is similar with the fish transport which is founded by [6, 18, 40]. For exporting crabs to different countries, various types of container are used for transportation, usually specified by the importers, such as plastic baskets, Styrofoam cartons and bamboo baskets. The weight of each box varies from 14 to 20 kg of crabs. Sometimes they keep a long tube, made of bamboo, in the center of the plastic boxes to prolong the shelf life of the exported crabs. Crab transporting equipment's was bamboo baskets, Styrofoam cartons and plastic baskets. [42] Noted the limitation factors having with transportation. Usually these were rectangular and eclipse shaped, capacity varied from 17 to 30 kg and price ranged from 90 to 120 BDT per basket.

5. Conclusions

The present study focused on mud crab marketing channel from *Nijhum* Dwip to international markets. 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. 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 level. Lowering the marketing chain length, proper transport facilities, technical assistance, institutional intervention pro-poor micro credits facilities and artificial propagation of mud crab can enhanced the socio-economic status of the people and maximizes foreign currency earning.

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