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Status of crab collection, fattening and trading in southwest region of Bangladesh

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ABSTRACT

Mud crab collection, hardening, fattening and trading provides livelihood for many coastal communities in the southwestern region of Bangladesh. The present study was carried involving various stakeholders in crab collection, production and trading in the region to know their status and wellbeing. A reconnaissance was carried out at Rampal upazila, Bagerhat district to select the study area and farmers to conduct the study during January to February 2015. Data were collected using PRA tools such as questionnaire interview, focus group discussion (FGD), key informant interview (KI), rapid rural appraisal (RRA) and transect walk (TW) involving 20 participants each from crab collector, fattener and trader to know the prevailing crab venture in the area. The results revealed that most of the participants belonged to the Hindu communities, their average age was 32-40 years and major occupation was crab related activities. The survey also exposed that the crab traders were more educated, well off and dominant than the other two groups. On the other hand, number of family members was higher than the national average (5.05) with the crab fatteners than the collectors and traders. The crab collectors were the poorest among the three groups. A moderate number of crab stakeholders irrespective of groups drink rain and pond water in the region. The crab traders solely depended on the trading for their livelihood; whereas, 15 and 20% fatteners and collectors had secondary occupation to run their family other than the primary occupation. The results of the present study showed that the shrimp farmers have been shifted to crab fattening due to various problems with shrimp farming and all the crab stakeholders are satisfied with their new business than the previous job.

INTRODUCTION

The *Scylla* is one of the most important genus of commercially valuable crabs in the Indo Pacific region, which includes four most traded species, such as *Scylla serrata* (Forskal), *S. tranquebarica* (Fabricius), *S. olivacea* (Herbst) and *S. parmamosain* (Estampador) (Keenan et al. 1998). All the above species widely distributed in Hawaii, Southern Japan, Taiwan, the Philippines, Australia, Red Sea and East and South Africa (Motoh 1979; Aiyun and Silliang 1991; Macintosh et al. 2002). The crab collection and culture is about hundred years old practices in China and three decades throughout South-East Asian countries (Yalin and Qingsheng 1994). It is an important source of income for small-scale fishers throughout the Indo-Pacific region (Gillespie and Burke 1992). In our country, the crab constitutes an important secondary crop in traditional shrimp and fish culture systems with an estimated production of 7707 metric tons in 2013-14 (DoF 2014). It is one of the important seafood items in the country due to its esteemed delicacy, distinct flavor, medicinal value and demand in the local and international market (Ali et al. 2004).

Mud crab belongs to the Portunidae family of the class Crustacean that play vital role in the ecological balance in nature (Lee 1992). It occurs abundantly in the coastal region of Bangladesh particularly in the estuaries, tidal canals and rivers in the Sundarban mangrove swamp, shrimp ghers and polders.

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It is essentially euryhaline, but dies beyond 70 ppt salinity and rarely tolerates turbid water (Khan and Alam 1991). There are 15 species of crab available in Bangladesh, among them 4 inhabit in fresh water while the rest are marine (Ahmed 1991). The maximum number of crabs occurs during spring and neap tide locally known as gon (Uddin 2002). Moreover, due to outbreak of shrimp disease in regular intervals, fluctuating market price, competition in the international market and the impact of climate change has setback the shrimp culture practices in the southwestern coastal region of Bangladesh (Salam et al. 2012). Therefore, with the adverse atmosphere for shrimp farming, crab has emerged as a potential cultural commodity to the farmers in the region who have lost their capital in shrimp farming. Hence, the farmers are shifting to crab farming as it is hardy in nature and resistance to viral diseases, suitable to adverse environmental conditions, household wastes as well as slaughter house wastes can be offered as feed and can be exported as live in the international market.

Hundreds and thousands of poor coastal inhabitants are directly or indirectly are involved as crab collectors, fatteners and traders in the coastal districts of Bangladesh (Zafar 2004; Patterson and Samuel 2005). Among them, most marginalized segment of the coastal population especially landless, widow, orphan and children are involved in mud crab collection for their livelihoods. The living condition of crab collectors is inferior to the fatteners and traders (Uddin 2002). The income level of crab collectors, fatteners and traders fluctuated depending on the season, availability and mode of business (Molla et al. 2009). The crab collectors are vulnerable to the natural disasters like cyclone, tidal surge and unpredictable weather. Therefore, the study was undertaken to ascertain the status of crab collectors, fatteners and depot owners; and to know why the shrimp farmers are shifting from shrimp farming to crab fattening in the coastal area of Bangladesh.

MATERIALS AND METHODS

Study Area

The study was conducted at Rampal upazila of Bagerhat district, which was devastated by the cyclone SIDR and AILA in the recent past (Figure 1). The area is adjacent to the Sundarban and hence, influenced by the mangrove forest as well as climate induced natural disaster which hampers the agricultural activities. Moreover, shrimp farming has introduced salinity in the vicinity that seriously affects the livelihoods of the local communities (Mahmood et al. 2010). Rampal has a population of 167,070 according to the 1991 population census (BBS 1992). Agriculture is still the major activities followed by fishing and shrimp, prawn and fish culture and fish related trades in the area as literacy rate is lower than the national average (45.5%). In addition, out of 20,858 hectares arable land, most of them are under culture, where a negligible amount of land remains fallow (0.02%). The majority of the land is under single crop (43.26%) followed by a double crop (36.24%) and rest for triple crop (20.50%).

Data Collection Procedure

The present investigation was carried out for a period of 4 months from December, 2014 to March, 2015. A total of 60 stakeholders, 20 each from crab collectors, fatteners and traders in different locations were selected randomly for questionnaire interview. Data were collected using pre-tested questionnaire interviews, rapid rural appraisal (RRA), transect walk (TW), key informant interview (KI) and focus group discussion (FGD). A total of six FGD sessions, two from each group comprising of 6-10 personnel from collectors, fatteners and traders were conducted.

Collected information was validated by the expert personnel. Crosscheck interviews were conducted by a government fisheries officer, agricultural extension workers, researchers, policymakers, and relevant non-governmental organization (NGO) workers. If the collected information seemed contradictory, further assessments were carried out. Collected data were used in tabular as well as descriptive analysis with Microsoft Excel software. Further analysis was carried out using XL-stat extension of Microsoft Excel.

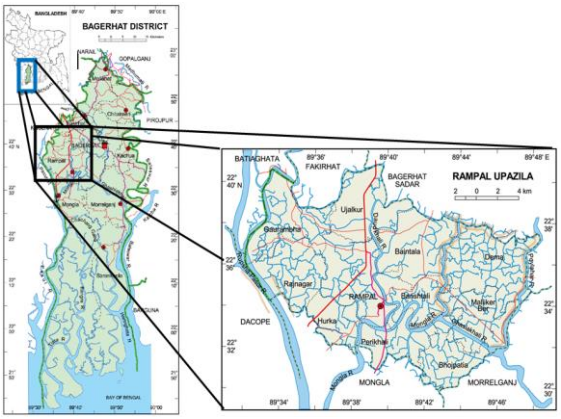

Figure 1. Location of the study area in Rampal upazila under Bagerhat district

RESULTS AND DISCUSSION

Age Distributing, Religious Status, Occupation and Educational Status

Three groups of participants were involved in the present assessment. Data analyses reveal that Hindus were dominated in fatteners and traders group (Figure 2). The average age of the crab stakeholders were 32-40, with the range of 22-54 years among the three groups. Most of the participants were six to nine classes passed, where the crab traders were mostly educated (Figures 3 and 4) among the three groups but the crab collectors were least educated. Ferdoushi et al. (2010) reported that Hindu communities were dominated in crab collection and fattening in the coastal region of Bangladesh. They reported a less number of females (16.7%) were involved in crab catching activities in the locality. Mollah et al. (2009) reported similar results in their study in the coastal districts of Khulna, Satkhira and Bagerhat. They also reported that crab collectors and fattener's average age were 31-40 years. All the above findings signified the present outcomes. However, the family size of the crab collectors and fatteners were larger than the present findings. The livelihoods of the respondents were divided into two categories; primary and secondary. The primary occupation is defined as any activity in which a person is engaged with to lead his livelihood which more than half of the total working hours are devoted.

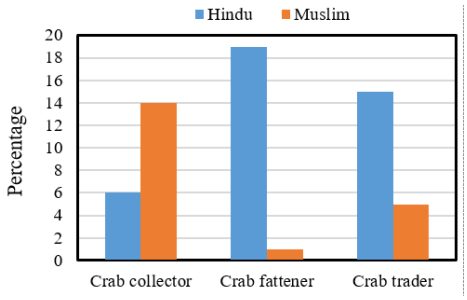

Figure 2. Religious status of the participants at Rampal, Bagerhat

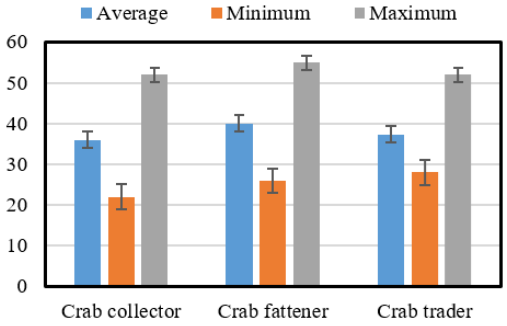

Figure 3. Age structure of the participants at Rampal, Bagerhat

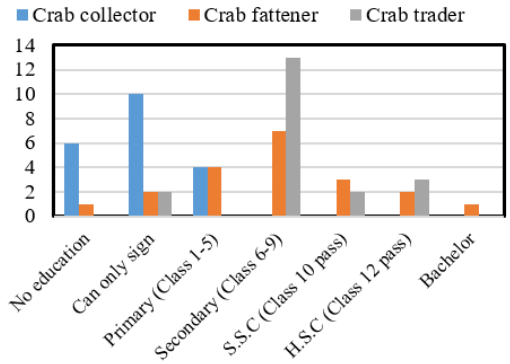

Figure 4. Educational status of the participants at Rampal, Bagerhat

Whereas, secondary occupation is defined as an activity someone engaged in especially for passing time, which less than half of the total working time is devoted (Hartog and Van Staveren 1983). Here, crab farming was considered as primary occupation, while the stockholders having another profession such as agriculture, day laborer, rickshaw pulling, and tea stall operation as minor income sources, was considered as secondary occupation (Figures 5 to 7). Eighty percent of the crab fattener's primary occupation was crab fattening and rest 5, 10 and 5% each were engaged in crab, fish-crab-shrimp trading and tea stall operation respectively as secondary occupations. By contrast, 85% of the crab collector's primary occupation was crab catching and rest 15% were equally involved with raj Mistry, agriculture and day laborers as a secondary occupation. Farid (2013) reported that the highest percentage of crab harvesters (28%) secondary occupation were fishing, whereas the rest were engaged in shrimp culture (8%), wood collection (16%), business (4%), day laborer (24%) and agriculture (20%).

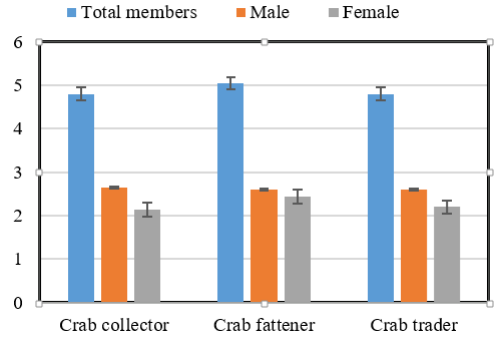

Figure 5. Average family size of the participants at Rampal, Bagerhat.

Housing Condition, Sanitary and Drinking Water Facilities

Housing condition, sanitary and drinking water facilities are very poor in the study area than the other part of the country. The depot owners are better off group among the three groups in the area, so their housing condition and sanitary facilities were much better than the other two groups (Figure 8). Moreover, Kacha house and Kacha sanitary latrine were higher with the crab collectors followed by the crab fatteners group than the depot owners. However, all the three groups still depend on natural water for drinking such as ponds and rain water in varying ranges.

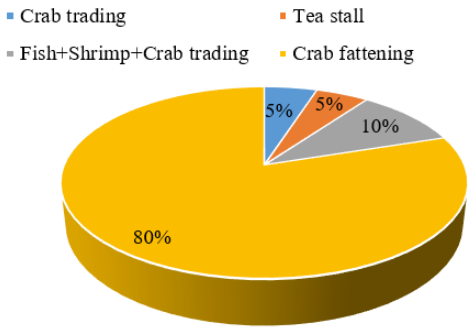

Figure 6. Primary occupation of crab fatteners at Rampal, Bagerhat

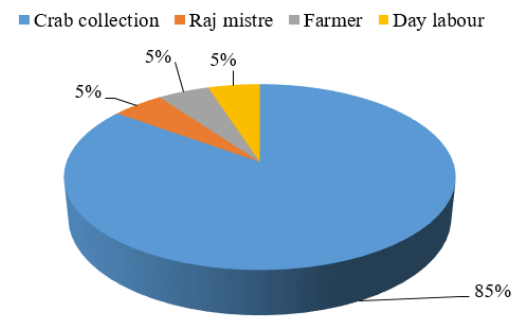

Figure 7. Primary occupation of crab collector at Rampal, Bagerhat

Perception of Crab Collectors' About Their Activities

The crab collectors usually collect crab from the natural water bodies such as shrimp ghers, canals, rivers and the Sundarban mangrove forest. They mentioned their satisfaction in their business and termed it as a good source of livelihood. Among the crab collecting sources, the highest amount of crab are collected from the mangrove forest each year. The collectors have to register themselves with the forest office when they enter into the forest and have to pay 210 tk week^{-1} for crab harvesting in the forest. The collectors catch crabs from the nature round the year except official ban period during the breeding season in January-February. The participants mentioned that winter is the best time for crab collection. They usually collect crab at daytime in summer and at night in winter. On an average, everyone was able to catch 67.5 kg crab in seven day trip to the Sundarban. Among the collected crab, the male was dominated in summer and female in the winter, but more or less equal number of bisexual crab was available in both the seasons (Figure 9). Islam (2013) reported that the highest amount of crab was collected (55%) from the Sundarban mangrove forest among the sources; he also mentioned September to February is the pick season for crab

collection. The collectors used various types of devices for crab collection from the nature, such as bamboo trap, bait, boat, net, rope and topa (Figure 10). The crab collectors mentioned several problems they usually faced during crab collected in the forest. The most of the participants mentioned that robbery (18%) was the foremost problem followed by natural disaster (13%) (Figure 11). On the other hand, the least problems were harassment by the forester, tidal fluctuation and bribe. The collectors preferred crab collection than fishing because it is profitable, higher income, need low investment and it is comfortable than fishing or a day laborer.

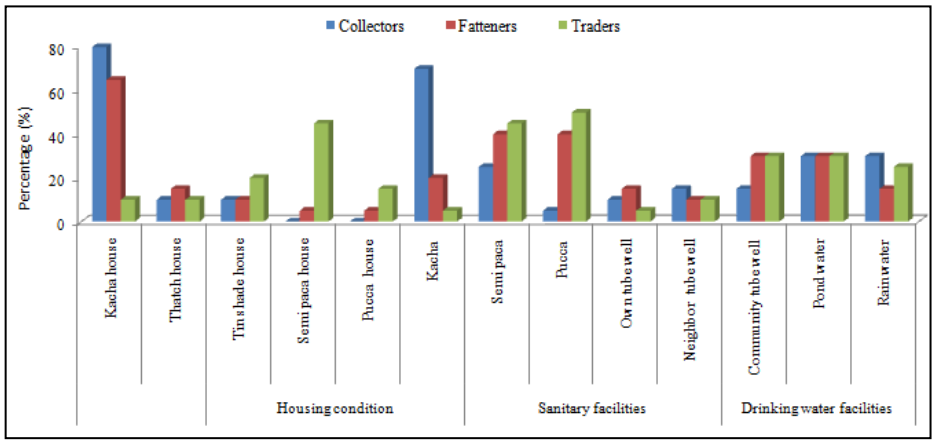

Figure 8. Housing condition, sanitary facilities and drinking water facilities at Rampal, Bagerhat

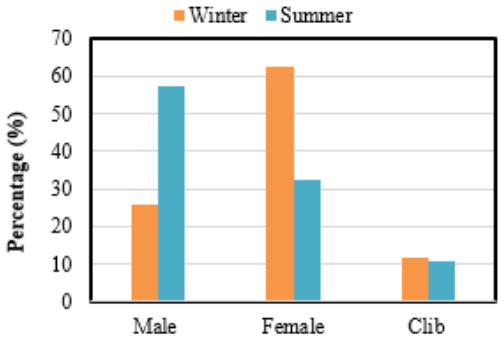

Figure 9. Sex wise crab availability in different season at Rampal, Bagerhat

Perception of Crab Fatteners' on Crab Hardening and Fattening

Crab fattening is a recent practice in our country. The disease outbreak with the shrimp and export ban in the international market, force the shrimp farmers to adopt crab fattening and rehabilitate themselves and alternative use of their land resources. According to the participants it is profitable, less disease prone, low risk, seasonal in nature and environmental friendly than the shrimp farming. The flatterers usually buy the rejected crab from the local depot in cheap price and release in their shrimp ghers for hardening and fattening for a short duration. They offer the crab low cost trash fish, kuchia, mollusks meat, wheat, pop rice and household kitchen wastes as feed. The hardening and fattening gher is usually smaller, ranging from 25 to 300 decimal.

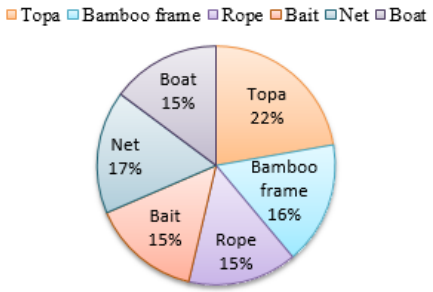

Figure 10. The tools used bythe crab collectors for collecting crab at Rampal, Bagerhat

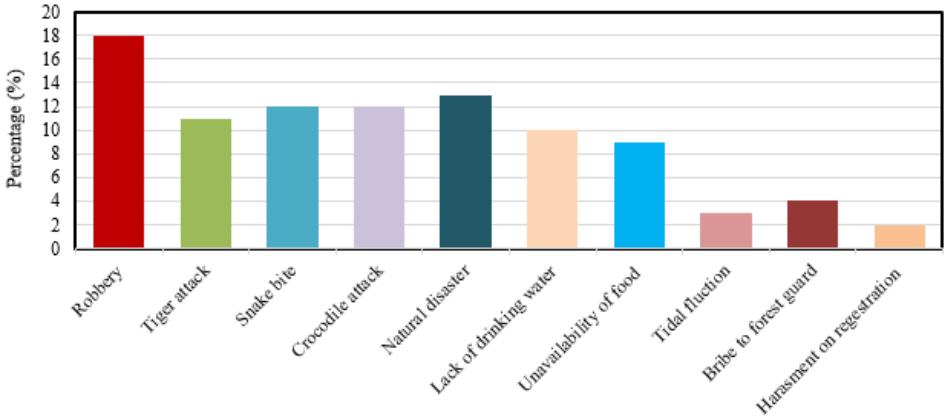

Figure 11. The problems usually the crab collectors encounter during crab collection in the Sundarban mangrove forest area

The farmers usually prefer to harden male crab as it takes less time, however, most of the time it depends on the types of available crab in the locality (Figure 12). According to them, depending on the crab condition, market price and availability of trash fish it took 8 to 60 days to complete a hardening and fattening cycle. Prior to crab fattening, the farmers prepared their ponds with plough, apply lime (197-350 kg ha^{-1}) and fertilizer; usually it took 4 to 7 days to prepare the ghers (Figure 13). Islam (2013) reported that lime, alum and zeolite were used by the crab fatteners in their crab ponds. Following the gher preparation, farmers stock 5-10 kg of crab per decimal pond purchased from local depot. Farid (2013) found that the farmers release 15.72±3.36 kg $decimal^{-1}$ crab irrespective of sex and grade in Satkhira district. Zafar (2004) reported that farmers release 120 crabs (27 kg) in open gher. The participants mentioned that the crab mortality is high in summer (40-50%) and less in winter (20-30%). Occasionally, farmers faced disease problems during the hardening and fattening of crabs which they could overcome applying lime in their ghers. The participants also mentioned that they do not have any formal training for crab farming. Similarly, they mentioned that they do not take loan for crab fattening, but manage the business by themselves with their own fund or lending from relatives and friends. The participants' were more comfortable with the crab fattening than the shrimp/prawn farming since it is a good livelihood option.

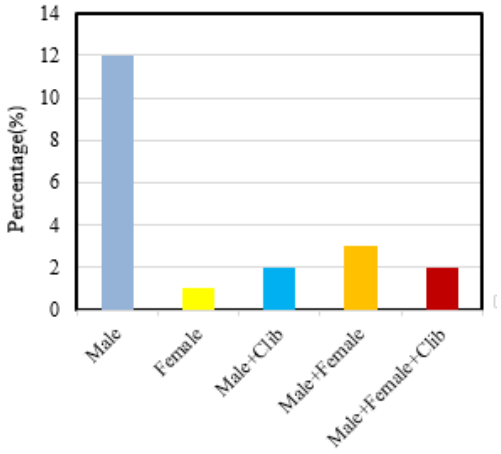

Figure 12. Male, female and clib crab used for hardening and fattening by the farmers at Rampal, Bagerhat

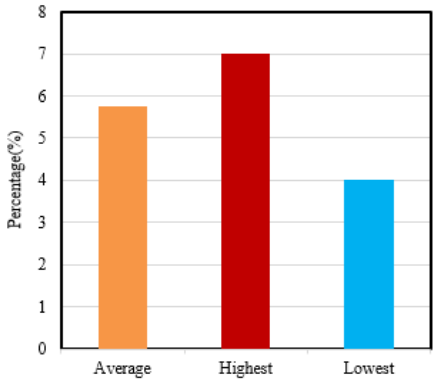

Figure 13. Duration of land preparation for crab hardening and fattening at Rampal, Bagerhat

Crab Traders' Perception on Crab Trading

Crab trading is recent businesses that have started during the nineties. Most of the surveyed traders started their business after 2000. The majority of the depots were operated by single proprietorship (84%) and the rest were multi ownership. On an average seven workers worked in a depot, four of them are permanent who received 5500 taka average salary per month and 3 temporary who worked daily basis during the peak season. Each and every deport have 11-14 designated crab collectors who receives dadon about 14,000 to 30,000 tk from the depot owners in advance and are compel to sale their catch to that particular depot without having bargaining power. A collector in a trip depending on the season and the weather can bring about 63-138 kg crab to the depot. Most of the cases, the collectors brought the crab by themselves to the depot, however, there are some middle man who buys the crab from the collectors at the collection point and brought to the depot for sale. The highest amount (88 kg) of crab was collected by an individual collector from the Sundarban mangrove forest in winter, followed by the shrimp gher in summer and tidal canals/rivers in the rainy season (Table 1). When the catchers brought their catch to the depot, the workers grade and weight them and pay accordingly (Table 2). The price of the crab depends according to the season, grade and maturity. Kamal (2002) reported similar results in his study that the price of crab varies with the grade and season. Farid (2013) stated similar crab grading system that's found in the present study (Table 2). The collectors brought the crab to the depot by boat or van using bamboo or plastic cages. Usually it took 10-20 hrs to carry the crab to the depot from the area they caught. On the other hand, it took 8-14 hrs to reach Dhaka city by truck. Forty six percent depot owners mentioned that the crab mortality is the highest in summer, followed by the rainy season and the least in winter. An individual depot handles 665-1213 kg of crab per week. Most of the depot owners' perception (65%) is that the availability of crab is not decreasing, whereas, 35% mentioned the crab population is decreasing in the nature due to fishing through poisoning, indiscriminate catching of crab irrespective of size and over exploitation. The traders encountered several problems like lack of transport, fluctuating supply, high mortality and rejection by the exporter, natural disaster, lack of capital to run the business, too many traders and syndicate to dominate in the market that prevent to get enough crabs for sustainable running the business (Figure 14). The crab traders are the members of a trade union which look after their welfare and provide loans to the members. The majority of the crab depot owners mentioned that they are ready to cooperate with their friends if they want to come to the crab business as because it is a low risk, profitable and good option of livelihood.

Table 1. Amount of crab an individual crab collectors could collect from various sources in three designated seasons.

Seasons/ source of crab	Sundarban (%)	Tidal canals/rivers (%)	Shrimp *gher* (%)
Summer	34.50	15.50	51.00
Rainy season	9.00	47.50	42.75
Winter	87.50	4.50	8.00

Table 2. The grading system of crab and their corresponding weight adopted by the crab traders in the surveyed market in Rampal, Bagerhat district

Grade of Male	Weight (g)	Grade of Female	Weight (g)
XXL	>500	F-1	180-250
XL	>400<500	F-2	140-170
L	>300<400	F-3	130
M	200-290	KS-1	100-120
SM	100-190	KS-2	<100
PS	<90	-	-

Reason behind Farmers Shifting To Crab Fattening From Shrimp Farming

The crab was an unconventional and secondary product of shrimp culture in the country (Salam and Ross 2000). Moreover, shrimp disease outbreak has been a regular phenomenon since 1994; farmers lost their crops, partly or fully and became helpless with the shrimp culture (Begum and Alam 2002). They left the land fellow for some time and gradually shifted to crab fattening as the land in the area is unsuitable for rice and vegetable cultivation. Therefore, crab culture areas are escalating with the time as farmers are switching over to crab culture from shrimp culture due to high market demand, hardy nature of the crab, easy to handle during culture operation compare to shrimp, less susceptive to disease outbreaks, can be exported as live and less competition in the international market than shrimp (Overton and Macintosh 1997 and Salam et al. 2003). The crab fatteners in the region explained why they have switched over to crab farming. Eighty percent of them mentioned that it is highly profitable, followed by low disease risk and less time required to market it than the shrimp. Forty five percent fatteners mentioned it is low labor intensity, seasonal and the low cost involved in culture operation (Figure 15).

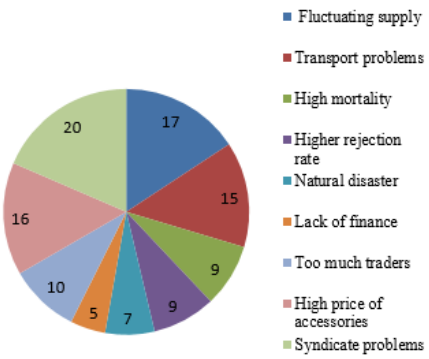

Figure 14. The factors affecting smooth crab trading at Rampal, Bagerhat

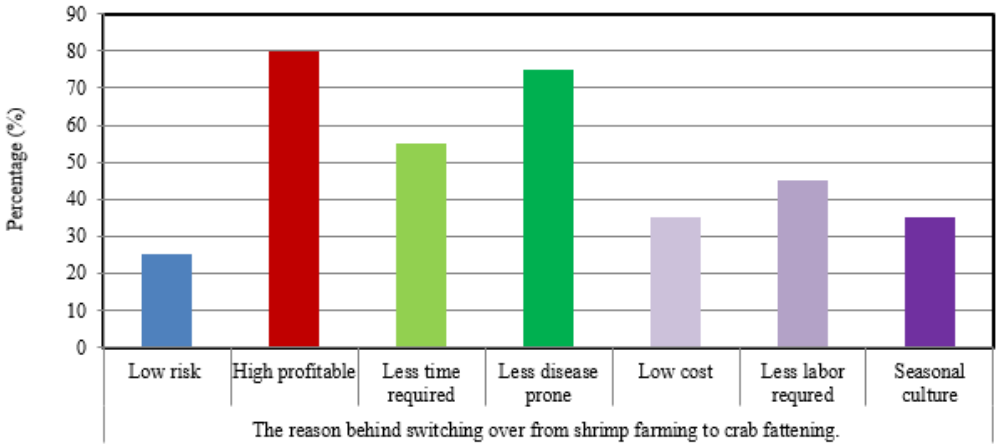

Figure 15. The impression of the stakeholders regarding switching over to crab farming from shrimp culture at Rampal, Bagerhat

CONCLUSIONS

The crab collection, fattening and trading was evolved as a new occupation in the coastal area of Bangladesh due to disease outbreak, natural disaster and ban on shrimp export in the international market. Moreover, many shrimp farmers have been shifted to crab culture due to higher profit and with low investment than shrimp culture. The social and economic condition of crab stakeholders are better off than the shrimp farmers.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

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