

Full Length Research Paper

Marketing system of wild and hatchery reared fry of *Penaeus monodon* and its value chain in Bangladesh

Sheikh Aftabuddin*, Mohammad Zafar, Md. Abdul Kader

Institute of Marine Sciences and Fisheries University of Chittagong Chittagong-4331 Bangladesh, India.

Accepted 21 July, 2020

A study was conducted between January - August, 2006 concerning the *Penaeus monodon* fry marketing systems in Bangladesh based on the existing one and economic evaluation of marketing activities. In Bangladesh, *P. monodon* fry marketing of the wild and hatchery reared ones is almost exclusively handled by private entrepreneurs. The Government of Bangladesh has no command on this issue except the banning of wild fry catching. The market chain from fry catchers or fry producers to shrimp farmers passes through a number of intermediaries: fry faria, fry traders, fry commission agents and retailers. The existing marketing system is buyer-driven chains where producers that is shrimp hatchery owners have little ability to influence the price, on the other hand, wild fry catchers or small farias dependent on the dominant buyers or larger arathdars. The fry value chain is complex, different intermediaries of each node of the chain is an important actor to determine the fry value. The price differences between hatchery fry producer and the shrimp farmers was 250 BDT while wild fry catcher and shrimp farmers was 450 BDT. The farias, arathdars, traders and commission agents purchase *P. monodon* fry from the fry catchers, hatcheries and from one another and they trade in different volumes across different regions. Moreover, these agents usually run on a commission basis and charged 50 BDT per 1000 fry selling while the price was higher than 250 BDT per 1000 fry and charged 20 BDT while the fry price is lower that is, below 250 BDT per 1000 fry.

Key words: Shrimp fry, arathdar, faria, marketing, retailer.

INTRODUCTION

Bangladesh has great potential for shrimp farming. Shrimp cultivation and export in Bangladesh have undergone rapid expansion over the last two decades. The country's main shrimp production areas are located at Khulna, Satkhira and Bagerhat districts in the Southwest region and Chittagong and Cox's Bazar districts in the Southeast region. Till early 1980s, coastal shrimp farming was almost traditional. The culture system was by trapping shrimp larvae that would enter the farms with tidal water during high tide. In this system, other species of shrimp and fishes including predator fish would enter the farms and thereby the production was very low. Afterwards the traditional culture system was gradually replaced by selective stocking of *Penaeus monodon* fry collected from natural water in the coastal regions. During early 1990, some farmers started semi-intensive shrimp farming at a very small scale. Some 10 - 12 ha farms

were under semi-intensive culture but within a year or two, semi-intensive farms were affected by white spot disease causing heavy damage to shrimp farming. This disease spread out the entire shrimp farming areas of Cox's Bazar and Khulna region and caused a heavy loss to the shrimp industry in the country. The cause of the disease outbreak in Bangladesh was identified to be with the shrimp fries imported from Thailand. Thus, shrimp farmers of Bangladesh became dependent on the supply of natural fries.

Shrimp fry are collected from the coastal areas of 40 upazilas under 12 coastal districts along the 710 km long coast. The huge numbers of by-catch like eggs, larvae and juveniles of non-target fish and shrimp during *P. monodon* fry collection are discarded in the land after sorting of target fry. Thereby, the coastal biodiversity has been decreased day by day. Khan (2002) reported that the total catch amounts of 3000 million post larvae of *P. monodon* together with a further 30,000 million other species, 62% of which was zooplankton, 10.9% other shrimp, 13% caridean prawn and 13% fin fish larvae.

*Corresponding author. E-mail: aftabimsf@yahoo.com.

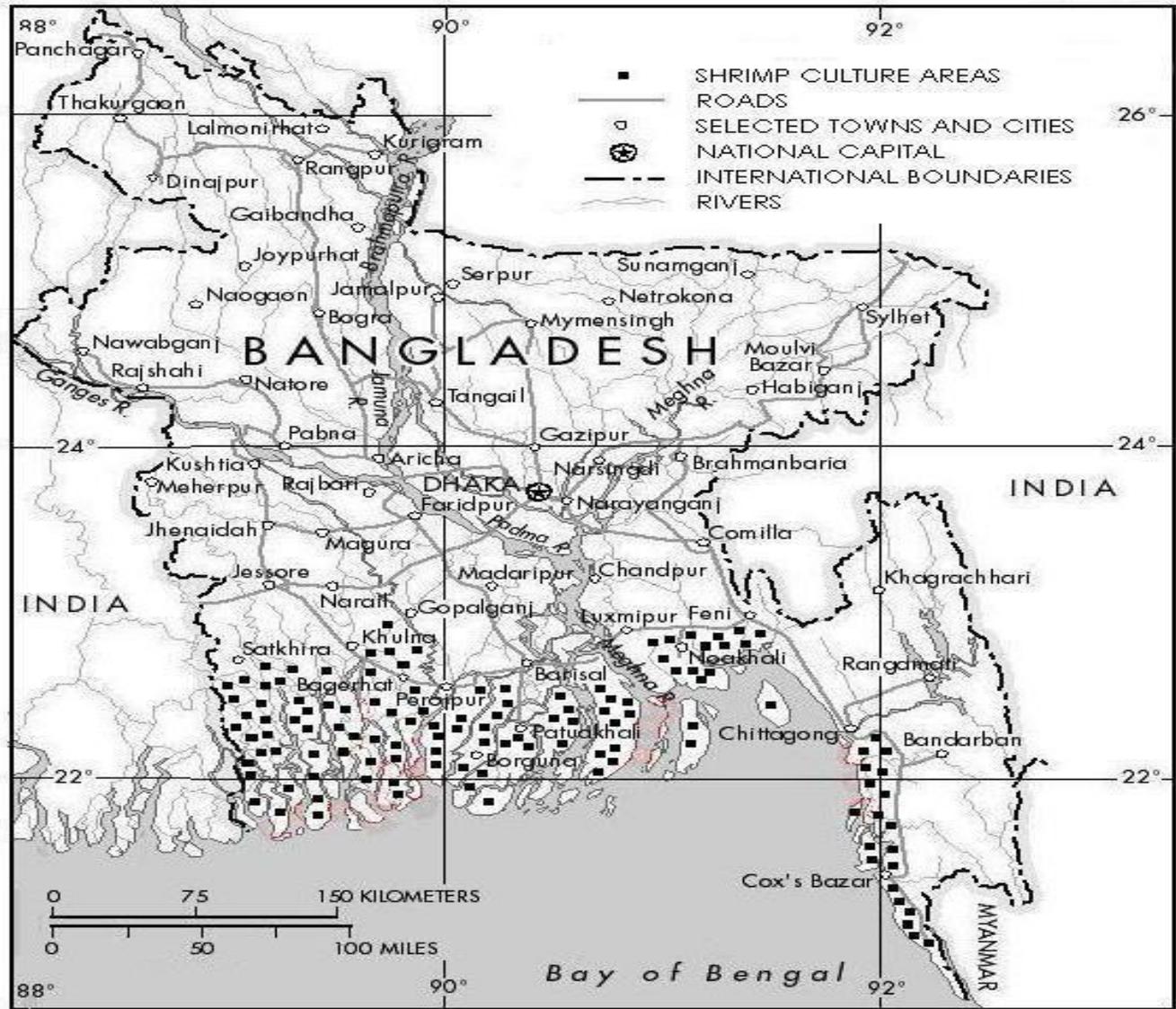


Figure 1. Investigated area where the present study was done.

Therefore, the government of Bangladesh banned wild fry collection in 2002 in order to protect the coastal fishery biodiversity.

The potential demand and scarcity of wild *P. monodon* fry initiated special attention to the development of hatchery technology in order to produce *P. monodon* fry in 1998 - 2001. According to the shrimp hatchery association of Bangladesh 50 shrimp hatcheries (at various stages of operation and management) produced nearly 7 billions post larvae in 2004 (SHAB, 2005) which was sufficient to supply the entire shrimp culture industry in Bangladesh. Moreover, many of those hatcheries had to stop production in the last two years due to market over-supply and consequent price falls. Bangladesh stood eighth position among the shrimp producing countries of the world in terms of production (WB, NACA and FAO,

2002). In 2003 - 2004 fiscal years, export of shrimp and fish products was 54141.47 metric tons and earning was 350 million US dollar (EPB and DOF, 2004). Shrimp alone contributed about 84% of total export earning from fishery product. However, the average production was only $200\text{kg}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ (2001) (Islam et al., 2003). This production level can easily be doubled with a little improvement of fry quality and farming practices. Currently, three different culture systems are being practiced. These are known as traditional, improved traditional and semi-intensive culture systems. More than 90% of the total farms still practises the traditional system. Santiago (2002), reported that the development of improved trading, transport, handling and storage methods of fry can increase the shrimp production of Bangladesh. Shrimp farming is a capital intensive venture. Credit

Table 1. Number of Individuals interviewed in this study.

Type	Number
Fry catcher	40
Fry faria	10
Fry arathdar	10
Commission agent	15
Fry retailer	10
Shrimp hatchery manager	25
Shrimp farmer	15
Transporter	5
Cargo flight operator	2
Total	132

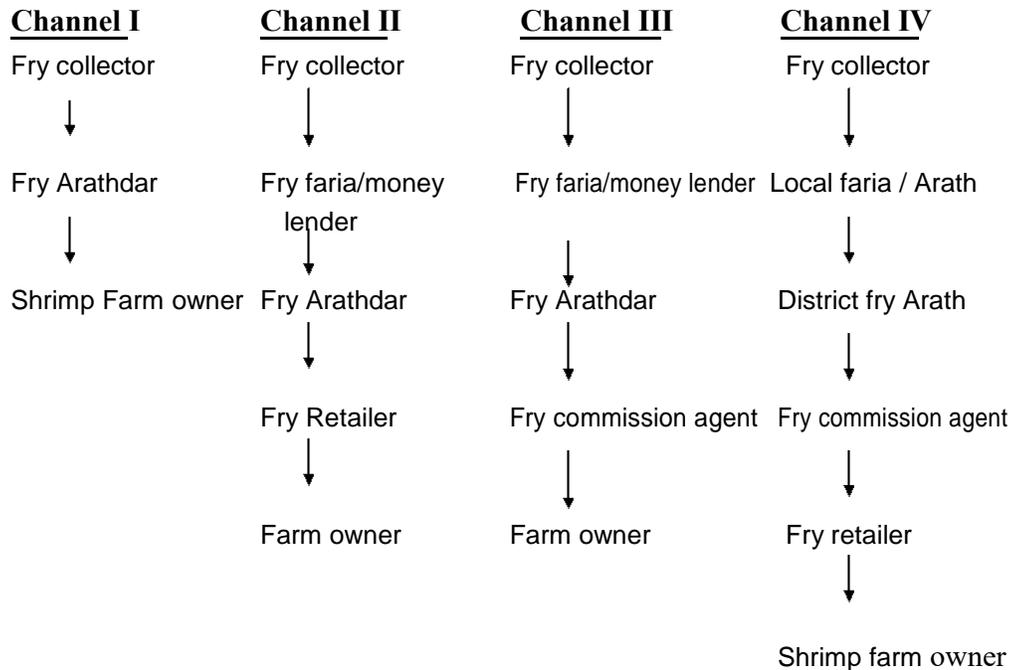


Figure 2. Different marketing channels of wild post larvae of *P. monodon*.

infrastructures are insufficient for the small farmers in the country. The rich arathdars, commission agents, hatchery owners and farmers enjoy the loan from institutional banks. Other people have to depend on informal institutions e.g. moneylenders, friends and relatives. Presently, the wild and hatchery reared fries are abounding to shrimp farmers through a chain of intermediary fry traders, fry arathdars and commission agents. Few works have been done on wild *P. monodon* fry transportation and management. There is no report on wild and hatchery reared fry marketing system in Bangladesh. Therefore, the present study is to observe the marketing system of *P. monodon* fry, distribution chain, price determination and their ultimate impact on our shrimp industry.

MATERIALS AND METHODS

The wild post larvae of *P. monodon* (local name Bagda) are available for about 9 months but the peak period is March to August. Fry catcher, collect the post larvae depending on low and high tide by using push nets and set bag nets. The present study was carried out in the coastal regions of Bangladesh. The selected sites were Kolatoly and Teknaf of Cox's Bazar while Satkhira and Paikegacha were of Khulna region (Figure 1). Surveys were conducted with fry catchers, fry farias and fry traders. Considering the peak fry collection period, the 180 day study was conducted from March - August, 2006. A total of 25 fry collectors were interviewed at Cox's Bazar and 15 fry collectors at Khulna region.

The hatchery reared post larvae are available throughout the whole year but here in Bangladesh it is available from January to June due to salinity and temperature variation. Of the 40 operating

Table 2. The range of prices by different intermediaries in 2006.

Intermediaries	Average price in BDT/1000 fry purchasing	Average price in BDT/1000 fry selling
Fry catcher	--	250 - 300
Fry faria	250 - 300	325 - 400
Fry arathdar	325 - 400	450 - 550
Fry whole seller/commission agent	450 - 550	650 - 700
Shrimp farm owner	700 - 800	--

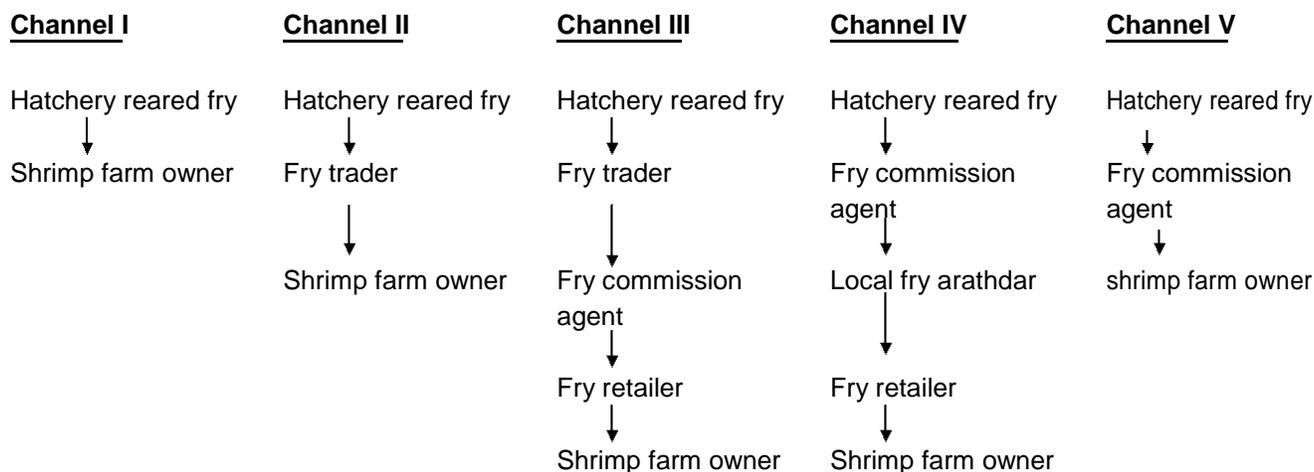


Figure 3. Different marketing channels of hatchery reared post larvae of *P. monodon*.

hatcheries in Bangladesh 25 were surveyed. Information relating to the marketing system of wild and hatchery reared fry of *P. monodon* was collected based on structured questionnaire, direct observations, literature reviews and interviews with hatchery managers, fry traders, commission agents and shrimp farmers. This investigation was conducted during January - June, 2006.

RESULTS

A total of 132 (Table 1) individuals were interviewed. The collected information revealed that post larvae of wild *P. monodon* reach the gher owners or farm owners through different intermediaries concerned with buying and selling at various stages of marketing channel. During the present study, four different marketing channels were found (Figure 2).

The simplest way was channel I in which the collectors of the post larvae of *P. monodon* directly sold their catches through fry arathdars to the shrimp farm owners. The remaining three channels comprised of different types of intermediaries like moneylender, fry faria, commission agent and fry retailer. The present study revealed that about 8% of the wild fry collected reached the farm owners through the direct channel that is, channel I and the rest through indirect channels. It was revealed that about 15% of PL collectors sold their seeds through

channel II, 22% through channel III and the remaining 55% through channel IV respectively (Figure 2).

According to this field survey, about 90% of the wild shrimp fry caught in the Southeast zone (Cox's Bazar region) were transported to the South-west zone (Khulna region) because approximately 82% of the total *P. monodon* shrimp farms are in Khulna region. Caught shrimp fry were usually kept in a Gamla (plastic bowl) with coastal water or river water. Later the fry was sorted with a Bati (small white pot) and kept in a "Pateel" (aluminum container) with fresh coastal water or river water. Then the fries were transported to preferred destination in a plastic drum by van, pickup or truck. Now, the fry catchers have been adversely affected due to banning on wild fry collection. Despite the ban, wild fry collection continued and fry catchers paid bribes to police and local law enforcement officials to enable them to continue their collection. Due to marketing complexity, many fry catchers came under agreements where they borrowed money from fry faria in advance of collection and committed to sell their catch to a specific intermediary at a price determined by that buyer. The contract was enforced by strong social codes. Some fry collectors received fishing capital in the form of nets and buckets from the fry farias escalating their dependence upon a particular buyer. Table 2 shows average cost and benefit

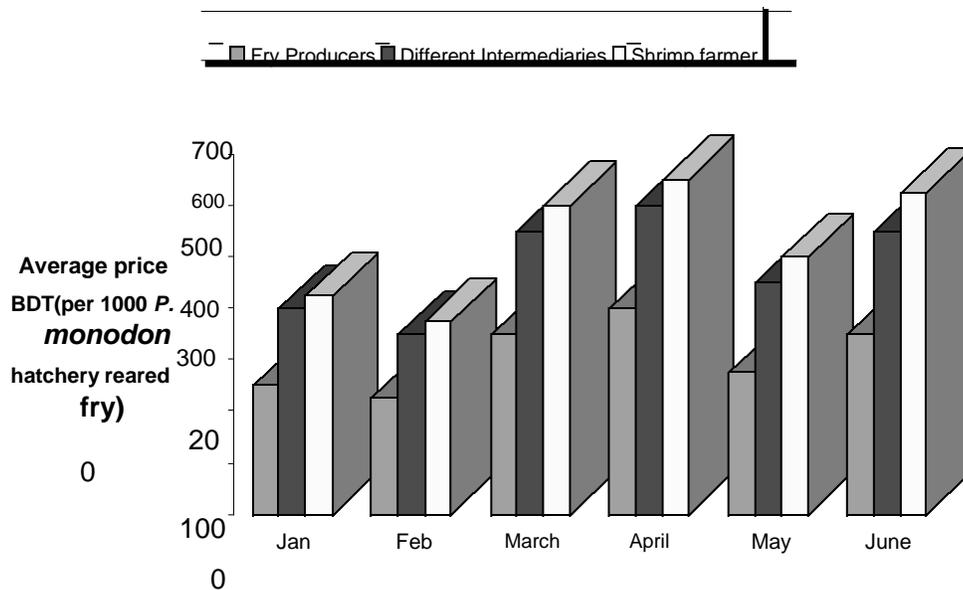


Figure 4. Price variation between different intermediaries and hatchery fry producers.

of different intermediaries for marketing the wild *P. monodon* fry.

Marketing of hatchery reared fry

Shrimp hatcheries produced *P. monodon* fry from mother shrimps under controlled condition. Most of the shrimp hatcheries were located in the Cox's Bazar region and the fries were transported by air or road to the south-west regions. About 85% of the hatchery-produced fries were transported to the Satkhira and Khulna region by airfreight. The present study found that six cargo airbuses transported approximately 35 million fry day⁻¹ and 6 days in a week to Jessore airport between February and June 2006. Figure 3 showed that an extended chain of intermediaries were also involved in selling the post larvae from hatcheries to shrimp farm owners through different channels. The present study revealed that about 5% hatchery reared fry reached the shrimp farmers through direct channel that is channel I and 10% through channel II, 15% through channel III, 58% through channel IV and 12% through channel V respectively (Figure 3). Figure 4 shows that the price of hatchery reared *P. monodon* fry varied between BDT 250 to BDT 625 reaching from the hatchery producers to shrimp farmers through different intermediaries during the investigation period. The value of fry was dependent on new moon and full moon and the farmers demand and hatchery supply capacity.

DISCUSSION

Fry faria buy fry either from fry catchers or from hatcheries throughout the year. In Khulna, fry faria were also

engaged in buying and selling both shrimp and prawn fry, while in Cox's Bazar, the fry faria were almost exclusively trading in shrimp fry. Fry faria borrow money from fry arathdars or moneylenders that lock them into a contract to sell all fry to the lender. If they try to sell their products to other arathdars to get high price they are often facing verbal or physical abuse. Similar situation was observed in West Bengal, India where the fry catchers borrowed money (locally known as dadun) from the money lenders, (Raz and Hull, 1993). However, no written contract is done if the loan money is below 25,000 BDT, but for loans above 25,000 a written contract is done and that is stamped. As part of the loan requirements, the farias are bound to sell their fries to those arathdars who gave them advance money. If anybody breaches the contract, he is fined and sometimes he is tortured physically. The approximate net annual earning of a fry catcher varies between 24,000 BDT to 60,000 BDT and of a fry faria 150,000 to 840,000 BDT depending on the volume of fry sold. Most of the fry faria prefer to buy wild fry because they think that wild fries are apparently stronger and more resilient than hatchery reared fries. This preference is reflected in prices where wild fry are valued at comparatively higher prices.

Fry arathdars also purchase fry that comes from hatcheries as well as natural sources. Many fry arathdars buy directly from fry faria, aggregating the volumes of fry. Some fry arathdars are also farmers who have their own ghars and they maintain them according to their own knowledge. The present study revealed that the arathdars sell approximately 85% of shrimp fries to the shrimp farmers of Satkhira and Khulna, and the remaining 15% are sold in different parts of Cox's Bazar including Moheshkhali, Chakoria and Mathertek area.

Generally, natural fry is delivered in two types of

containers that vary in size: the "Pateel," or earthenware dish, and "Plastic drum". There are on the average 10,000 to 12,000 fry per "Pateel" and 20,000 to 22,000 fry per "Drum". Hatchery reared fry is delivered in an oxygenated polythene bag containing 2500 - 3200 fry per bag and two bag in a Styrofoam box. According to the present investigation, some prominent fry arathdar at Paikegacha in Khulna region said that an arathdar sells approximately 50 - 80 drums of natural fry and 450 - 500 Styrofoam box of hatchery reared fry per day. Net annual income of a fry arathdar may be around 10,000,00 BDT to 30,000,00 BDT per year. Usually, the arathdars sell the fries quickly, often within few hours.

Commission agents receive the fries from the arathdar as well as hatchery owner and sell them to the retailers and farmers. The commission agents hold the fry for short periods. Large containers, usually plastic drums and aluminum container are used to carry wild fries. *P. monodon* fries are transported by air and road, and no food is provided during transportation, storage, and trading. The commission agents are generally medium- to large-scale entrepreneurs.

Commission rates vary between 20 and 50 BDT per 1000 fry. Fry commission agents sell wild fry at higher prices than hatchery reared fry. Buyers willingly pay this premium as they believe that the wild fry have higher survival rates. They claim that they lose 10 to 12 thousand fry on average per one lakh (100,000) wild fry. The mortality rate depends on both the quality of net used in catching the fry and the type of management during transportation. However, survival rate of wild fries are 70 - 80%. These agree with the report of Angell (1994), who also found 80% survival rate in wild fry.

Conclusion

One of the major problems of *P. monodon* fry marketing is that the fry collectors and hatchery owners are often deprived of fair prices for their catches and production. This is perhaps the effect of high price spread among the different market intermediaries. The high price spread enables the intermediaries to reap the maximum benefit from the marketing operation. At lower ends of the chain among fry collectors and faria, bargaining is limited but the arathdars, commission agents and big farm owners can bargain among themselves and get more profit. The price of fries is a sensitive issue and it affects the buying and selling process of shrimp fry marketing. Market margin is the gap between the price received by the fry catcher or hatchery owner and the price paid by the ultimate shrimp farm owners. If the fry producers or catchers would sell their product directly to the shrimp farmers, the price of the fry might go down compare to the existing market price. Thus, the production cost of shrimp would be lesser.

REFERENCES

- Angell CL (1994). Cage nursery rearing of shrimp and prawn fry in Bangladesh BOBP/WP/92. Bay of Bengal Programme, Madras, India. P. 16.
- DOF (2004). Annual Report, Department of Fisheries, Ministry of Fisheries and Livestock, Dhaka, Bangladesh P. 120.
- EPB (2004). Statistical Year Book, Export Promotion Bureau of Bangladesh. pp: 1-150.
- Islam MS, Wahab MA, Miah AA, Mustafa KAHM (2003). Impacts of shrimp farming on the socioeconomic and environmental conditions in the coastal regions of Bangladesh. Pakistan J. Biol. Sci. 6(24): 2058-2067.
- Khan MG (2002). Impact of fry catching on commercial fisheries. Paper presented on Management options for the shrimp fry fishery, A regional stakeholder workshop in Cox's Bazar p. 1-25.
- Raz MM, Hull R (1993). Market study of tiger shrimp fry in West Bengal, India. BOBP/WP/87. Bay of Bengal Programme, Madras, India p. 30.
- Santiago A (2002). Shrimp fry quality: Key issues. Paper presented on Management options for the shrimp fry fishery, A regional stakeholder workshop in Cox's Bazar p. 1-25.
- SHAB (2005). Annual report, Shrimp Hatchery Association of Bangladesh, Kolatoly, Cox's Bazar, Bangladesh p. 50.
- World Bank, NACA, WWF, FAO (2002). Shrimp Farming and the Environment, A World Bank, NACA, WWF and FAO Consortium Program, To Analyze and Share Experiences on the better Management of Shrimp Aquaculture in Coastal Areas, Synthesis Report, Work in Progress for Public Discussion.