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## Studies on supply and marketing channel of fish seeds and observing their condition factors in *Chasra* market in Jessore district, Bangladesh

**M Shahanul Islam, Md. Solaiman Hossain, Md. Tamim Hasan, M Belal Hossain and Md. Abul Hossain**

### Abstract

The present study was conducted to know the fish seed marketing channels with their condition factors in Chasra, Jessore which is the biggest fish seed trading market place in Bangladesh. Three types of horizontally and vertically interlinked marketing channels were found here. 90% of fish seeds are produced in hatcheries and rest brought from rivers. The price of fish seed depends on season, species, quality, size, weight and source of availability. Usually, if the seed size increases, price increases too. The market chains started from producers to user with some intermediaries like local fish seed retailers, agents, seed wholesalers and retailers. The fish seeds in chasra were local carps like *Cirrhinus cirrhosus*, *Labeo calbasu*, *Labeo rohita*, *Labeo bata*, and *Catla catla*; exotic carps like *Aristichthys nobilis*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Cyprinus carpio*, *Mylopharyngodon piceus*, *Hypophthalmichthys molitrix* and other fish like *Pangasianodon hypophthalmus*, *Mystus tengara*, *Puntius gonionotus*, *Anabas testudineus* and *Oreochromis mossambicus*. Based on the present survey on fish seed traders in Chasra market, the prices of most common and the popular farmed fish species e.g. exotic carp fries; catfish fries; tilapia and other fish fries were varied between BDT 3500-4500; BDT 2000-3000, sometimes 8000; BDT 3000-6000 and BDT 1500-3000 per kg respectively. Their prices varied a lot based on demand and availability, sizes and general health conditions. All identified fish seeds showed a healthy condition factor ( $K=1+$ ) during the study. The supply of fish seeds was carried by mechanized vehicle; holding fry in oxygenated polythene bag. The general condition of the market place was not so hygienic. From here, fish seeds were distributed by seed traders to many other districts of Bangladesh.

**Keywords:** Fish seed, 20 fish species, oxygenated polythene bag, *Chasra* market, marketing channel

### Introduction

Fish and fisheries resources play a vital role in the socio-economic development of Bangladesh. There are 260 freshwater fish species, 24 freshwater prawns, 475 marine fish species, 36 marine or brackish water shrimps and 16 exotic species available in this country (DoF, 2008) [10]. In Bangladesh fish marketing is entirely in the hand of private sector where the livelihoods of a large number of people are associated with fish production and marketing systems. Major portion (97%) of the total harvested fish is marketed internally for domestic consumption. About 50% of the inland fish productions are consumed in fresh form due to the strong consumer preference (Chowdhury, 2004) [9]. The fish marketing system in Bangladesh is traditional, complex, and less competitive but plays a vital role in connecting the fish producers, and consumers, thus contributing significantly in 'value add' process of the fish which otherwise would have been unused or underused and consequently in the earnings of the fisher folk (Chowdhury, 2004) [9]. According to Shang (1981) [22], the return of farm depends on production level and market prices, the price usually fluctuating seasonally due to variations in the supply and demand. A fish seed market is a selling and buying place of fish seeds (fry, fingerlings, and juveniles) among traders and customers. A trader also cares for maximum production, best possible quality of commodity and their timely supply to consumers at reasonable cost (Yadav, 2007) [27]. The main customer of the fry is the rural small fish farmers. However, since many big commercial fish farms have been established in the country over the last few years, a large portion of fry are being used by these farms. From mid-1980s, the government has taken programs to release and stock fry in open waters every year and for this purpose a large number of fingerlings are bought from both public and private hatcheries and

nurseries (Sarder, 2007) [21]. Government of Bangladesh as well as many local and international NGOs are working in fisheries sector of Bangladesh. They have taken many steps and programs to increase fish production. However, very few steps have been taken by any organization either GOs or NGOs to improve the fish seed marketing system, which is a major part of fisheries sector. Currently 98% of fish seed is produced by private hatcheries (World Fish, 2010) [25]. Hatcheries and nurseries initially developed in four major clusters in Jessore, Bogra, Mymensingh and Comilla, close to government fisheries stations or where nursing of wild riverine seed was a traditional activity. They have subsequently become established throughout the country as technicians from these centers have been employed to set up new operations or have established their own (Belton *et al.*, 2011) [8]. In the 1980s, hatchlings were produced and supplied from hatcheries in Jessore in Southwest Bangladesh over 100 miles away from the Northwest region (Haque, 2007) [14]. In 1960, fish fry was mainly collected from river. In 1967, Fin fish hatchery was first established in Jessore by Mohoshin Master. (Questioner Survey with his son) Afterwards, by breeding white fish; he started *Sonali* Hatchery in chasra in 1981. Thus, fish seeds become available here round the year. *Rupali* hatchery is the second one which was established at 1984. Since then the number of fish hatchery has increased uninterruptedly reaching over a thousand in 2010 to fulfill the ever increasing demand of the fin fish seeds for aquaculture

industry of Bangladesh. Nowadays, over 33 hatcheries are running their business in chasra area. About 1995, Market of fingerling & juvenile was introduced in chasra area with a large number of nursery ponds. There are 126 govt. hatcheries and rests are private hatcheries most of which are present in Jessore, Comilla and Mymensingh district. In Bangladesh both public and private hatchery produces around 4, 23,986 kg hatchling (DoF, 2008b) [11]. The hatcheries in Jessore were the early movers in Bangladesh in carp seed production and enjoyed first mover advantage in the market in terms of market share. The spawn produced from the hatcheries in Jessore were supplied not only to the southern regions (Barisal, Satkhira and Khulna) but also across Bangladesh (World Fish Center, 2012) [26]. So, the present study was conducted for gathering information about marketing system and supply of fish seed in Chasra bazaar in Jessore.

## Materials and Methods

### Site selection

Jessore is a district in the southwestern tip of Bangladesh at Indian border westward ago. Many seed producer, broker, wholesale seeds, seed retailers, day laborers and transporters are involved in seed distribution systems and marketing of fish seeds in this area. The area is particularly important for seed marketing system of some freshwater and some marine fish. *Chasra* in central Jessore (Plate 1) under Jessore district was selected for the study.



Plate 1: Image from Google Earth showing the location of whole Chasra market

### Methodology

There were various methods of data collection for marketing studies. Selection of a particular method depends on many considerations, such as nature of research problem, available literature, primary information, availability of funds and time. And most important was the logistic and laboratory help from local universities, government office, fisheries stations etc. The present study was conducted in two ways:

1. Questioner interview among hatchery owners, nursery pond owners, transport vehicle owners and fish seed retailers about prices according to length and weight of various fish seeds (fry, fingerlings & juveniles) with supply and marketing of those seeds.
2. Measuring weight and length of those particular fish seeds in laboratory to get data accuracy.

Then all data is crosschecked and recorded down in results.

### Seed sample collection & measurement processing

#### Fry collection

Numerous fry of 20 different fish sp. were collected from different hatcheries of that area by a cordial negotiation with hatchery owners. Some labour and technicians were helped to collect sample by plastic medicine spoon and packing them in a tiny polythenebag with a paper labeling (containing local name of that fish); staple outside of the polybag. There was no extra oxygen supply used for the packaging of fry.

#### Fry transportation to laboratory

After collection, the fry were brought in Central Laboratory for Biological Science of Jessore Science and Technology University (JSTU) through local bus; putting them in handbag manually.

#### Fry Length measuring

In JSTU laboratory, the fry bag was being unpacked, poured them in a white medicine spoon. Then collection of one fry

was done carefully by serienne and was put them on a transparent plastic. Then, by using millimeter scale, the length of fry is carefully observed and recorded.

**Fry weight measuring**

It was done by an airtight Electronic Weight Machine (EWM; Model-ATY224. Due to tiny in size, about 10-15 fries were siphoned up by serienne (without niddle) with water and pushed down on a transparent polythene (the weight of polythene was pre-measured and nutralized the EWM to level zero) and put them on measuring plate of EWM. Extra water was siphoned out carefully by serienne with porous niddle. Then arilock door is pulled for closing. Then the digital reading of EMW was carefully observed and recorded.

**Fingerling and juvenile collection**

At least three fingerlings and juveniles of 20 different fish sp. were randomly collected form different nursery pond of that area by a cordial negotiation with nursery pond onners. Some labour and technichians helped to collect them by cast net and packing them in a polybag with a paper labeling (containing local name for that fish); stapple outside of the polybag.

**Transportation to laboratory**

After collection, they brought in Central Laboratory for Biological Science of Jessore Science and Technology University (JSTU) through local bus; putting them in handbag manually.

**Leangth measuring**

In JSTU laboratory, seeds were put on white chopping board and collected one piece manually to put them on a glass framed graph-board. Then, by using centimeter scale, the length of fingerling was carefully observed and recorded.

**Weight measuring**

It was done by an Electronic Precision Balance (EPB; Model-EK1200i) which can measure two digit after decimal. Due to big in size, one fingerling or juveniles was placed on measuring plate of EPB with arilock cubic cover. Then the

digital reading of EPB was carefully observed and recorded. After collecting the data through questionnaire interviews, it was necessary to check the information for justification of the collected data. Crosscheck interviews were conducted with key informants such as Upazila Fisheries Officer (UFO), District Fisheries Officers (DFO), scientific officer of Bangladesh Fisheries Research Institute (BFRI) and relevant NGO workers where information was contradictory or requested for further assessment. The interviewed length and weight from target groups were also crosschecked with laboratory results and accurate data was noted down.

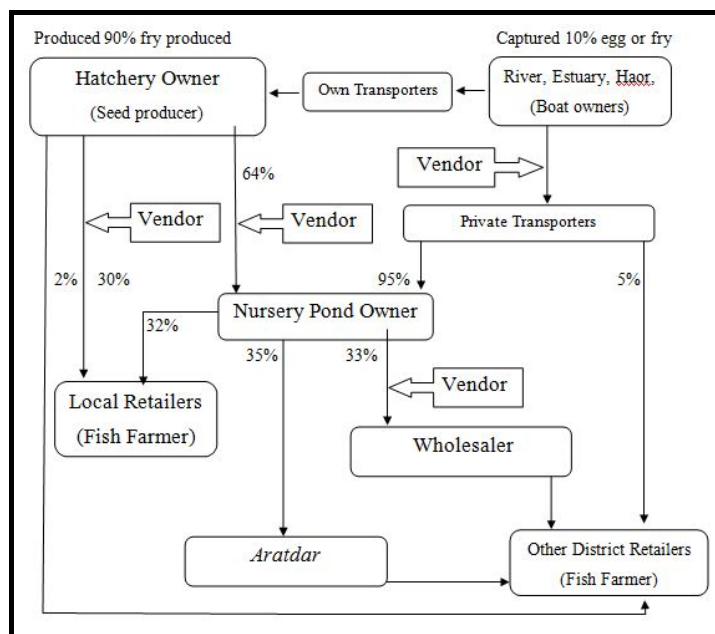
**Data processing and analysis**

The collected data were scrutinized and summarized carefully before the actual tabulation. Some of the collected data were in local units due to respondent’s familiarity with those units. These data of local units were converted into international units before transferring to the computer. The length and weight of 20 different fish seed from questioner survey among seed traders was compared to the length and weight of those fish seeds which were obtained in laboratory measurement. To know the primary health condition (growth, primary seed quality), seed’s condition factors were calculated according to Htun-Han (1978) [15] equation as per formula given below: Condition factor (K) = weight/Length<sup>3</sup> X 100. Preliminary data sheets (in computer) were compared with the original questionnaire and result sheets to ensure the accuracy of the data entry. After data entry, data were processed and finally analyzed with Microsoft Excel version 2007.

**Results and Discussions**

**Fish seed marketing systems in Chasra, Jessore**

We found, the fish seed marketing channel was multi-directional and interlinked. Fish seed were transported to fish farmer from river, haor or from seed hatchery via some intermediaries like nursery pond owner, transporters, seed wholesaler and truck wholesaler. Two types of retailers were found in Chasra seed marketing system i.e local retailers and non-territorial retailers.



**Fig 1:** Fish seed distribution chain from fisherman to consumers in Chasra, Jessore (based on survey)

Two vertical marketing channels were existed in that area; one was hatchery to nursery to local retailers and other was hatchery to direct local retailers. We also found that three different marketing channels (Fig 1) existed in Chasra bazaar for non-territorial retailers. They were (1) hatchery to nursery to seed wholesaler to non-territorial retailers, (2) hatchery to nursery to truck wholesaler to non-territorial retailers, (3) hatchery to direct non territorial retailers. Another marketing channel was observed that seed from river to non-territorial retailers via private transport system but it wasn't attached with the Chasra marketing channel. We found that there were two ways of seed production in hatcheries of Chasra i.e collecting wild egg of fish from river, estuary, hoar and other

was occurring induced breeding between well qualified brood-stock of that particular species like *Cirrhinus cirrhosus*, *Labeo calbasu*, *Labeo rohita*, *Labeo bata*, and *Catla catla*, *Aristichthys nobilis*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Cyprinus carpio*, *Mylopharyngodon piceus*, *Hypophthalmichthys molitrix*, *Pangasianodon hypophthalmus*, *Mystus tengara* *Puntius gonionotus*, *Anabas testudineus* and *Oreochromis mossambicus* according to the present status during survey. The seeds were transported broadly from Chasra to Shatkhira, Jhenidah, Meherpur, Kustia, Dhaka, Khulna, Magura, Norail, Razbari, Faridpur, Madaripur, Gopalgang, Manikgang & Bagherhatvai various size of truck containing seed-full plastic drum.

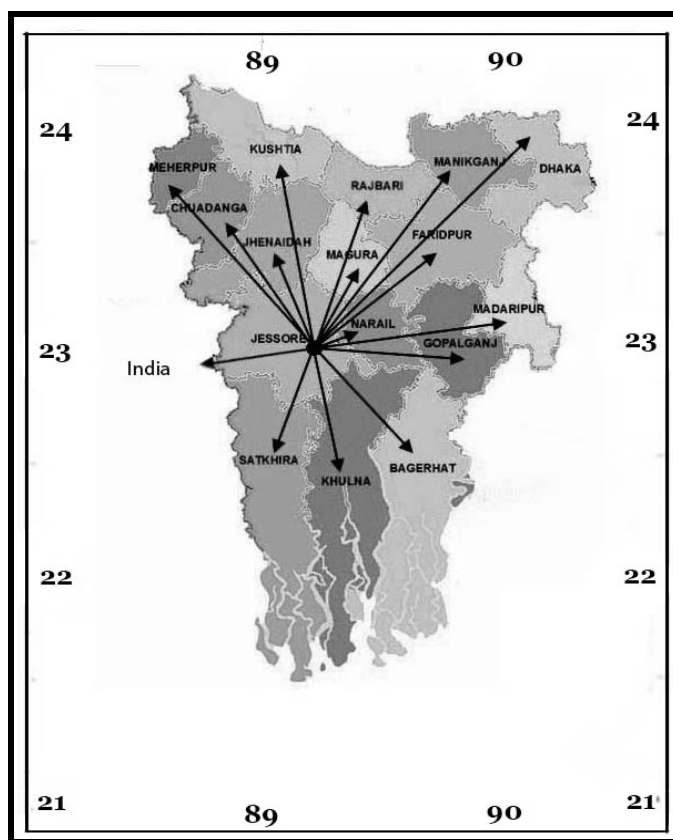


Fig 2: Fish seed supply area from Chasra, Jessore

**The examined fish seed in Chasra Markets**

During the present study, about 20 species of fish were available as form of fry, fingerling and juveniles in different months round the year (Table 1-4). Some other 20 fish species

were available as per-order from traders in form of fingerling at nursery only. Mainly March to August were the season of fish seed trading cause breeding season of many fishes were located among these months in the calendar.

Table 1: Seasonal availability of Local Carp (Fry & Fingerling)

Local Carp [ Fry (√) & Fingerling (≡) ]		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	<i>Cirrhinus cirrhosus</i>			√	√≡	√≡	√≡	√≡	√≡				
2	<i>Labeo calbasu</i>				√	√≡	√≡	√≡	≡				
3	<i>Labeo rohita</i>				√	√≡	√≡	√≡					
4	<i>Labeo bata</i>				√	√≡	√≡	√≡	√≡				
5	<i>Catla catla</i>				√	√≡	√≡	√≡					

**Table 2:** Seasonal availability of Exotic Carp (Fry & Fingerling)

Exotic Carp [ Fry (√) & Fingerling (≡) ]													
SL	Scientific name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	<i>Aristichthys nobilis</i>			√	√≡	√≡	√≡	√≡	≡				
2	<i>Ctenopharyngodon idellus</i>		√	√≡	√≡	√≡	√≡						
3	<i>Cyprinus carpio</i>					√≡	√≡	√≡	≡				
4	<i>Cyprinus carpio</i>			√	√≡	√≡	√≡	√≡					
5	<i>Mylopharyngodon piceus</i>		√	√≡	√≡	√≡	√≡	√≡					
6	<i>Hypophthalmichthys molitrix</i>			√	√≡	√≡	√≡	√≡					

**Table 3:** Seasonal availability of Catfish (Fry & Fingerling)

Catfish [ Fry (√) & Fingerling (≡) ]													
SL	Scientific Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	<i>Pangasianodon hypophthalmus</i>				√≡	√≡	√≡	√≡	√≡	√≡			
2	<i>Mystus tengara</i>			√≡	√≡	√≡	√≡	√≡					
3	<i>Clarias gariepinus</i>	≡	√≡	√≡	√≡	√≡	√≡	√≡	√≡	√≡	≡	≡	≡
4	<i>Heteropneustes fossilis</i>				√	√≡	√≡	√≡	√≡				

**Table 4:** Seasonal availability of Tilapia and other fishes (Fry & Fingerling)

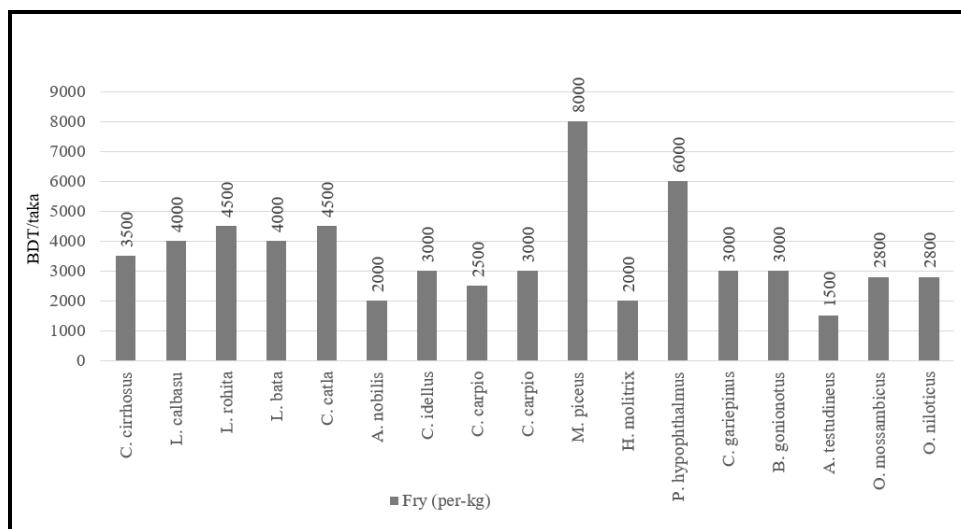
Tilapia and other fishes [ Fry (√) & Fingerling (≡) ]													
SL	Scientific Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	<i>Puntius gonionotus</i>		√	√≡	√≡	√≡	√≡	√≡	√≡	≡			
2	<i>Anabas testudineus</i>		√	√≡	√≡	√≡	√≡	√≡	√≡	≡			
3	<i>Oreochromis mossambicus</i>		√	√≡	√≡	√≡	√≡	√≡	√≡	√≡	√≡		
4	<i>Oreochromis niloticus</i>					√≡	√≡	√≡	√≡				
5	<i>Chitala chitala</i>			√	√≡	√≡	√≡	√≡	√≡	≡			

The marketing season of fry started with Java Barb, walking fish (Table 4), Grass carp & Black carp (Table 2) fry at the ending of winter. Later on, middle of February, Hatcheries were started with Java Tilapia fry production in every year. Fingerlings abundance of other fish in the Chasra market was quite related with the fry availability of that particular species.

**Price of fish seed in Chasra Market**

The Price of different fish seeds were dependent on species, size (length), seasonal abundance, order type, production cost,

rearing cost, transportation cost, infrastructural cost, labor cost, taxes etc. Minimum fluctuations were occurred in this seed price trend from year to year or in on-season (March to August) to off season (September to October). Sometimes, price would be higher when the external environment is tuff and seed abundance is low. On the other hand, in the middle of the season, price would be low when seeds were available in different hatcheries and nurseries. The average price of them is quite fixed and maintained all over the market.



**Fig 3:** Price variation of different fish fry.

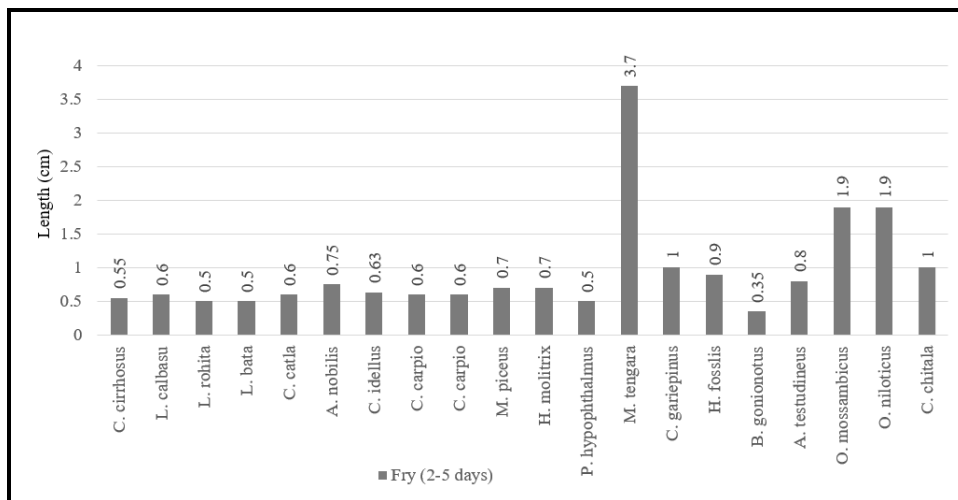


Fig 4: Length variation of different fish fry.

**Price of Local carp seeds**

About five local carp seeds were available here with different price ranges like fries from BDT 3500 to BDT 4500 per kg (Fig 3). Both fingerlings and juveniles were priced per individual and sale with an amount of 500 to 1000 or more at once in a plastic drum or tin-pot. In that case, the whole price of lot was accumulated and fixed in a round rate among traders (wholesaler and retailers).

**Price of Exotic carp seeds**

About five local carp seeds were available here with different price ranges like fries from BDT 2000 to BDT 8000 per kg (Fig 3). Both fingerlings and juveniles were priced per individual (Fig 6) and sale with an amount of 500 to 1000 or more at once in a plastic drum or tin-pot. In that case, the whole price of lot was accumulated and fixed in a round rate among traders (wholesaler and retailers).

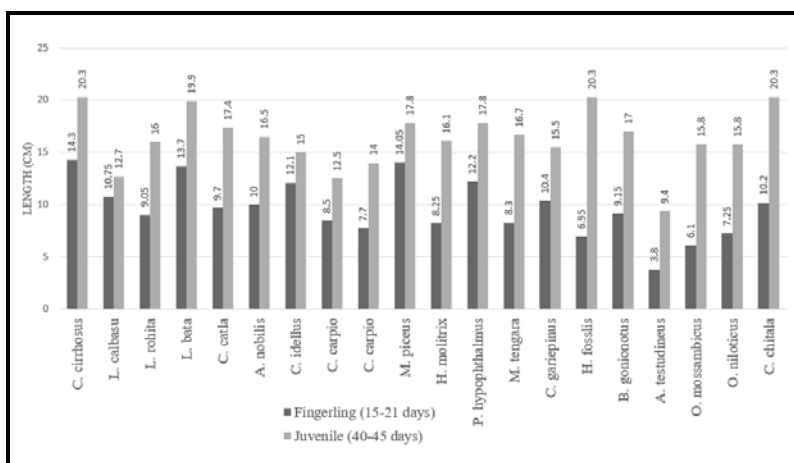


Fig 5: Length variations of fingerlings & juveniles.

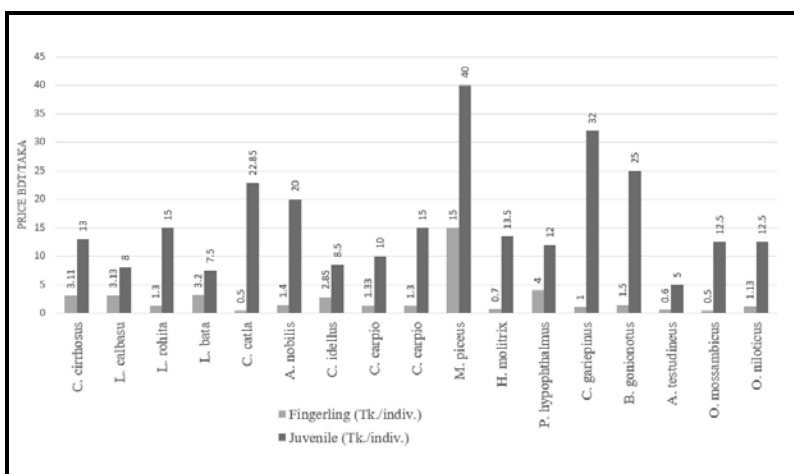


Fig 6: Price variations of fingerlings & juveniles.

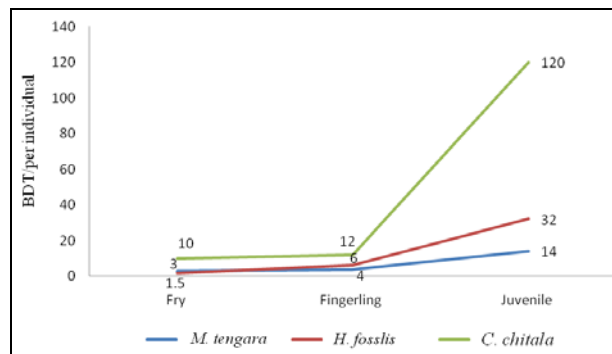
**Price of Catfish seeds**

About five local carp seeds were available here with different price ranges like fries from BDT 3000 to BDT 6000 per kg (Fig 3). Pricing system of both fingerlings and juveniles were as same as Exotic ones. (Fig 6)

Pearl Catfish and Liver Catfish were priced per individual even for fries also; because of their high demand and difficult seed production and rearing system.

**Price of Tilapia & other fish seeds**

About five local carp seeds were available here with different price ranges like fries from BDT 2800 to BDT 5000 per kg. Pricing system of both fingerlings and juveniles were as same as Exotic ones. *C. chitala* fish is priced per individual even for fries also; because of their high demand and difficult seed collection, transportation and rearing system. (Fig 7)



**Fig 7:** Price variations of some costly fish seeds in Chasra seed market, Jessore

**Price of Some extra fish seeds**

Some non-popular fish fingerlings were also available in Chasra seed market as per special pre order only. They were listed with their average length and demanded price (Table 5). Most of them were costly because of extra labor in collection of them.

**Table 5:** Some other Fish fingerlings (length of Fingerling & price per individual)

SL	Scientific name	Average Length (cm)	Price (BDT per individual)
1	<i>Lepidocephalichthys guntea</i>	04.50	3
2	<i>Channa striatus</i>	05	60
3	<i>Mastacembelus armatus</i>	04	5
4	<i>Wallago attu</i>	03.50	3
5	<i>Channa punctatus</i>	05	10
6	<i>Macrogathus pancalus</i>	03	1
7	<i>Sperata seenghala</i>	15	50
8	<i>Ompok bimaculatus</i>	20.30	100
9	<i>Awaous guamensis</i>	03.70	10
10	<i>Amblypharyngodon mola</i>	03.70	6
11	<i>Ompok pabo</i>	05	5
12	<i>Eutropiichthys vacha</i>	03.70	1
13	<i>Gudusia chapra</i>	03.70	1
14	<i>Nandus nandus</i>	03.70	4
15	<i>Rhinomugil corsula</i>	07.50	7
16	<i>Lates calcarifer</i>	03.70	7
17	<i>Mugil cephalus</i>	02.50	3
18	<i>Liza parsia</i>	05	6
19	<i>Amblypharyngodon microlepis</i>	05	20
20	<i>Cirrhinus reba</i>	10.20	1.80

We observed that transportation cost, cost for extra oxygen for fries, labor cost and commission of agents were charged to traders separately from channel level to another level in horizontal marketing chain. We also confirmed by hatcheries that the average price of fries, fingerlings and juveniles remain same in Chasra seed market during a marketing season even the whole year.

**Condition and capacity of Chasra market**

The Chasra seed bazaar considered as the largest South Asian fingerling market. The Ponds are spread over the area and the hatcheries are cluster in a broad place of Chasra. Strategies include the stocking of *baor* (ox-bow lakes) and *beel*, (low lying depressions) with hatchery seed, stocking sections of ‘dead’ river (Ahmed, 2011)<sup>[2]</sup>, and damming streams to create new water bodies. In Chasra, open field were dig-out for pond because the soil has a good water retention capability. Milwain *et al.*, (2002)<sup>[20]</sup> have reported that in Jessore, the large-scale development of hatcheries and nurseries occurred due to favorable soil and water quality, proximity to rail

communication, high demand for seed from pond fish producers, and access to essential materials (e.g. pituitary glands, insecticides, net, etc) from West Bengal. In a list of Private Fish Hatcheries in Bangladesh (2009), DoF (2009)<sup>[12]</sup> mentioned that unpublished DoF statistics list 802 fish hatcheries in Bangladesh (it is now a legal requirement that hatcheries are registered with the Department), with the capacity to produce 818 mt of hatchlings per year and an actual output of 487 mt of hatchlings in 2009 (59% of capacity). The present survey it was found that over 33 hatcheries and 400 nursery pond owners are able to supply fish seed according to the demand of traders in Chasra. At least 98% of seed supplies now derived from private hatcheries. Whilst seed and feed supply has grown rapidly in recent years, quality remains a major concern for both inputs (Belton *et al.*, 2011)<sup>[8]</sup>.

Ali (2010)<sup>[3]</sup> founded that a cluster of pangasius farms in Narsingdi district (which receives 13% of the fingerlings distributed from Bogra), with approximately 300 farms in Narsingdi Sadar and a similar number in surrounding

upazilas. Barman *et al.*, (2002) [6] noted that in Northwest Bangladesh fry traders are poor, they have little money and they do not have cash to purchase seed from seed producers. It is not easy to purchase fish seed on credit from government centralized hatcheries (Barman *et al.*, 2002) [6] as well as from wholesalers (Lewis *et al.*, 1996) [18]. Some fry traders can also purchase seed on credit from centralized hatcheries (Lewis *et al.*, 1996) [18].

But, in Chasra, the scenario is quite different. The fry traders are wealthy enough and some of them have nursery pond of farm. In Chasra, pick time of fish seed availability is March-August for local carps, February-August for exotic carps, March-September for catfish and February-September for Tilapia and others. The Hatcheries and nurseries are able to provide any amount of fish seed per order. ADB (2004) [1] also reported that individual traders typically sell between 1,000 and 2,000 fingerlings per day (averaging 1,360) with net incomes of Tk.136-275, and those surveyed reported seed trading to have improved their socioeconomic conditions. The prices of fish seed varies with the size of fish. During study, it was found that fry and fingerlings of local carp species are close in length with slide fluctuation (Fig 4-5). They only differ in juveniles greatly (Fig 5). Rohu and Catla fingerling is less costly than other Local Carp fingerlings where their juveniles are priced higher than rest of species. Seeds of Mrigal, Orange-fin Labeo and Bata are showed average cost among them. The prices of Catla seeds are raised dramatically with its growth. Similarly it was also observed in the length of exotic carp seeds but prices are fluctuated. Here, seed price of Black carp (Fig 6) is very high where other seeds are showed lower price and average price differences among them. Fry and fingerlings of Bighead Carp, fry, fingerlings and juveniles of Common Carp, Silver Carp, Mirror Carp and Grass Carp are found at reasonable price through the on-season. Length similarity as well as price similarity is founded between Nile Tilapia and Java Tilapia in case of fry, fingerlings and juveniles. Ali *et al.*, (2010) [4] report that 80% of pangasius fingerlings produced in Adam dighi are exported to India through Hilli and Jessore. The remaining 20% is distributed throughout Bangladesh through five or six agents; 30% to Mymensingh, and 70% to other regions of Bangladesh where

in this study, a questioner survey denote that some fish seed like Sutchi Catfish (Thai Pangas), Black Carp, Liver Catfish, Walking fish and Clown Knifefish are also exported manually through black marketing by seed traders to India via Benapole border or some other adjacent places of Bangladesh or governmentally by auctioning system via waterway through Bay of Bengal.

Fish seed is transported via truck and pick-up from Chasra because of non-availability of quality fish seed in some areas (Fig 2). So, seed production need to decentralize from Chasra. About this issue, Little *et al.*, (1999) [19] said that through decentralized fish seed production systems, employment and income generation would be localized and the monopolistic tendencies that lower returns and increase risk for poorer workers in the existing fish seed networks be reduced. In Chasra, seed wholesaler and local fish farmers purchase fish seeds at the side of nursery pond and retailers from other district often purchase fish seeds from seed wholesaler or truck wholesaler. On the other hand, Barman *et al.*, (2002b) [7] note that in Northwest Bangladesh almost 70% of farmers purchase fingerlings from fry traders. In Chasra, a kind of commission agents (*Dalal*) have a small entrance in every rout of fish seed trading in Chasra.

The present study calculated that from hatcheries fry were distributed like 64% to nurseries, 30% to local fish farmers and 2% (Fig 1) to other district retailers directly through personal order. From nurseries, fingerlings are distributed like 32% to local retailers, 35% to truck wholesaler and 33% to seed wholesaler in Chasra. Where Sarder (2007) [21] said that nowadays, there are many hatchery owners and nursery operators who stock the nursery ponds with the late seasoned fry (at the time when the fry got lowest price), rear them over the winter season (called over-wintered fry). The price of over-wintered fry is quite high (10 cm fry, BDT 1000 per 1000 piece ) as they grow faster than new fry and reach marketable size within few months.

A comparative assessment (Table 6) of present studied seed prices with the seed price table of Siriwardena (2007) [23] showed that the price of seeds was raised up more than before in Chasra as well as in Bangladesh.

**Table 6:** Price table of fish seed by Siriwardena (2007) [23]

Species	Price of Spawn per kg (BDT)		Price of fingerlings per 1000 (BDT)	
	FAO (2007)	This Study (2013)	FAO (2007)	This study (2013)
Rohu	500-2500	4500	200-300	1300
Mrigel	500-2500	3500	200-300	3110
Catla	1000-3500	4500	300-500	500
Calbaush	1000-2500	4000	500-1000	3130
Silver carp	500-2500	2000	100-200	700
Grass carp	1000-3000	3000	250-400	2850
Bighead carp	2000-4000	2000	500-1000	1400
Silver barb	300-1000	3000	100-500	1500
Common carp	1000-3000	2500	300-1000	1330

#### Condition Factors of different seeds in Chasra

The condition factor (K) of a fish reflects physical and biological circumstances and fluctuations by interaction among feeding conditions, parasitic infections and physiological factors (Le Cren 1951) [17]. This also indicates the changes in food reserves and therefore an indicator of the general fish condition. Moreover, body condition provides an alternative to the expensive in vitro proximate analyses of tissues (Sutton *et al.* 2000) [24]. Therefore, information on condition factor can be vital to culture system management

because they provide the producer with information of the specific condition under which organisms are developing (Araneda *et al.* 2008) [5]. On the basis of comparison of the K value with general appearance, fat content etc., some standards have been adopted by the department for trout and salmon according to Fulton, T. (1902) [13] and table 8-11 shows the symbolic comments on the condition factors of all studied fish seeds according to table 7.



**Table 7:** Comments on condition factors from Fulton, T. (1902)<sup>[13]</sup>

K value	Comments	Symbol
1.60	Excellent condition, trophy class fish.	Ex
1.40	A good, well-proportioned fish.	G
1.20	A fair fish, acceptable to many anglers.	F
1.00	A poor fish, long and thin.	P
0.80	Extremely poor fish, resembling a barracuda; big head and narrow, thin body.	EP

**Table 8:** Condition factor (K) of Local carp (On the basis of studied length & weight)

Name	Fry	Fingerling	Juvenile
<i>Cirrhinus cirrhosus</i>	0.80 (EP)	0.75 (EP)	01.20 (F)
<i>Labeo calbasu</i>	0.93 (P)	0.97 (P)	01.95 (Ex)
<i>Labeo rohita</i>	0.91 (P)	01.03 (F)	02.44 (Ex)
<i>Labeo bata</i>	01.06 (F)	0.80 (EP)	0.63 (EP)
<i>Catla catla</i>	0.84 (P)	01.05 (F)	02.66 (Ex)

**Table 9:** Condition factor (K) of Exotic carp (On the basis of studied length & weight)

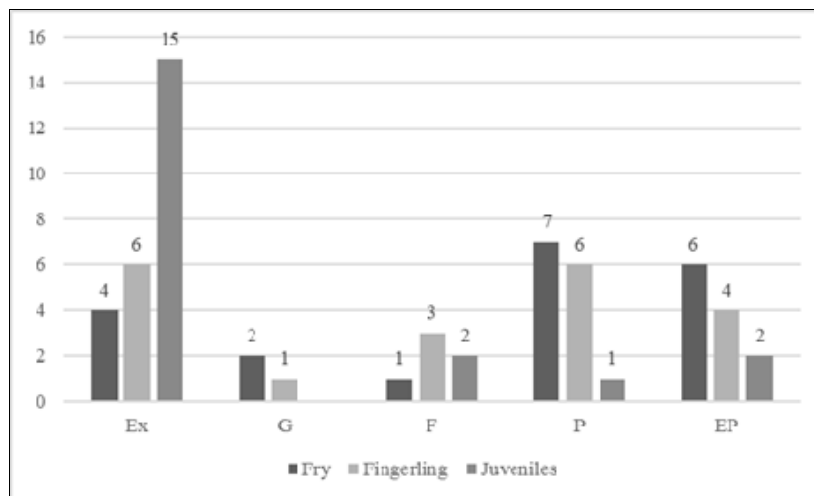
Name	Fry	Fingerling	Juvenile
<i>Aristichthys nobilis</i>	0.91 (P)	0.89 (P)	02.78 (Ex)
<i>Ctenopharyngodon idellus</i>	1.00 (P)	0.86 (P)	01.48 (Ex)
<i>Cyprinus carpio</i>	0.62 (EP)	01.41 (Ex)	03.41 (Ex)
<i>Cyprinus carpio</i>	0.93 (P)	01.41 (Ex)	03.64 (Ex)
<i>Mylopharyngodon piceus</i>	0.97 (P)	0.85 (P)	02.13 (Ex)
<i>Hypophthalmichthys molitrix</i>	0.49 (EP)	01.47 (Ex)	02.68 (Ex)

**Table 10:** Condition factor (K) of Catfish (On the basis of studied length & weight)

Name	Fry	Fingerling	Juvenile
<i>Pangasianodon hypophthalmus</i>	01.30 (G)	0.74 (EP)	02.31 (Ex)
<i>Mystus tengara</i>	0.16 (EP)	0.86 (P)	0.86 (P)
<i>Clarias gariepinus</i>	01.67 (EP)	0.68 (EP)	01.07 (F)
<i>Heteropneustes fossilis</i>	01.37 (G)	02.07 (Ex)	0.48 (EP)

**Table 11:** Condition factor (K) of Tilapia and other fish in Chasra (On the basis of studied length & weight)

Name	Fry	Fingerling	Juvenile
<i>Puntius gonionotus</i>	0.77 (EP)	01.11 (F)	03.39 (Ex)
<i>Anabas testudineus</i>	03.91 (Ex)	01.82 (Ex)	04.01 (Ex)
<i>Oreochromis mossambicus</i>	01.82 (Ex)	01.93 (Ex)	02.11 (Ex)
<i>Oreochromis niloticus</i>	01.82 (Ex)	01.26 (G)	02.11 (Ex)
<i>Chitala chitala</i>	01.70 (Ex)	0.96 (P)	01.51 (Ex)



**Fig 8:** Number of different conditioned fish seeds

We found that the excellent condition (Ex) is higher in number among those seeds (Fig 8) and mostly the condition of exotic carp fries were poor (P). Ighwela (2011)<sup>[16]</sup> reported that the condition factor computed for *Oreochromis niloticus* were 1.64, 1.77, 1.74, 1.72 and 1.79, which indicated good health condition during the experiment. In our study, we found that fry, fingerlings and juveniles of *O. niloticus* (Table 11) was 1.82, 1.26 and 2.11 which also indicate a good conditioned seed.

**Conclusion**

In fish seed marketing system of Chasra, Jessore, a number of intermediaries were involved actively for selling fish seeds. The market chain from seed producers to fish farmers passes through a number of intermediaries: local fish seed retailers, agents, seed wholesalers and retailers. Fish seed selling communication normally being made through mobile or direct contract of with seed producer or nursery pond owner. A pre

order for fish fry should be made for seed trading. Both traders and retailers arranged transportation for seed. Statistics on fish seed sale and supply were not available but according to market survey, about 20 species of fish seeds and 40 species of fingerlings are available in Chasra market. The hatcheries with a reputation for producing better quality seed experience very high customer demand and are able to obtain a premium for the spawn they produce, suggesting that economic incentives for good hatchery management do exist (World Fish, 2010)<sup>[25]</sup>. Even though, A number of constraints for fish seed marketing were reported by retailer, including higher transport cost, defected root and transport facilities, exploitation by intermediaries, inadequate nursery pond drainage system, poor water supply, lower sanitary facilities and unhygienic condition around the production or rearing area. Infrastructure facilities are important for easy marketing of good quality seed domestically and for the physical development of markets.

## Recommendations

On the basis of the findings of the present study specific suggestions for improving seed marketing systems in *Chasra*, Jessore should include

- a) Improvement of seed transport, handling and shipment facilities,
- b) Establishment of Deep water pump for sufficient water supply,
- c) Introduction of modern wholesaling and retailing facilities with internet,
- d) Training of seed market operators in areas of seed production, handling, packaging and curing,
- e) Introduction of seed quality control measure,
- f) Improvement of hygienic conditions of hatcheries, nurseries and markets,
- g) Provision of governmental, institutional and banking assistance,
- h) Prevention of sudden price raises and also falls of price during any season.

Beside all these, physical space in seed markets (including nursery pond dick) needs to be expanded by the appropriate authorities to allow more intermediaries and vehicles to enter into seed trade and trading area. Hatchery owners should maintain quality of fries by controlling external environmental factors and supply more seed to nursery pond owner. Standardization of price according to its weight and length is needed for the easy trading system and should keep in every seed trading center for serving a cooperative marketing in *Chasra*, Jessore.

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