Marketing of small indigenous fish species (SIS) and the socio-economic aspects of SIS producers, intermediaries and retailers with sustainable livelihood approach in three fish markets of Mymensingh

Final Report of A WorldFish Center Funded Research Project

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Executive Summary

A year long survey was conducted in three fish markets of Mymensingh – a rural market (Sutiakhali market), a peri-urban market (KR market, BAU) and an urban market (Notun Bazar market, Mymensingh town) to study the qualitative and quantitative species-wise information of the supply and marketing pattern of small indigenous species of fish (SIS) and to evaluate the socioeconomic status of the people related to SIS marketing. The availability of SIS declined to a great extent over the years and many of them are either rare or at the verge of extinction. The supply of SIS in the experimental markets was merely 30% of the total fish supply. The comparative SIS supply was highest in KR market (37 % of total), and more or less equal supply (25≈27 %)were found in Notun Bazar and Sutiakhali fish market. The total supply of SIS (%) fluctuated from a minimum of 25% to maximum 35% depending on months. About 48 SIS were found in three markets over the survey period. The highest number of species (45) were found in KR market. The number of species found were 42 and 37 in Notun Bazar and Sutiakhali, respectively. Three critically endangered species (bacha, gaura and rita) were found in this survey. Among the SIS found, 11 are endangered and 10 are vulnerable from the biodiversity point of view. The biodiversity of 21 SIS found in three markets are normal (no threat at all), however, three species (beti, chela and darkina) were data deficient as reported by the Red Book.

Chingri, taki, shing, punti, tengra, gulsha, magur and baila were the prominent fish from the supply point of view. Tara Baim, guchi, kajoli, kakila, chela, baim, darkina, catchki, chapila and kholisa were among the least available species found. The amount of SIS found in Notun bazar was the highest and nearly double than other two markets. There was no significant difference found in the supply of SIS in Sutiakhali and KR market. The month-wise average SIS supply was 185, 192 and 467 kg in KR, Sutiakhali and Notun Bazar, respectively; therefore, the cumulative average supply was 844 kg per month in three markets. The price range varied widely (Tk. 50-450 kg^{-1}) depending on species, market, exact time of purchase and the condition of fish. Chingri, titputi, kholisa, bheda, and gutum were, in general, sold at a lower price and these species could be considered at the bottom of the price list and dubbed as poor man's SIS. On the other hand SIS like magur, koi, pabda, dhela and bacha fetched the highest price in SIS market and considered to be fish of rich man.

There is no specific marketing chain for SIS in Mymensingh area. The length and component of marketing channel varied from season to season and from one place to another. The general pattern, however, is - after buying fish from fish farmer/fishermen, middlemen (locally known as *Foria*) bring to wholesale market and sell to the wholesalers. The retailers buy fish from wholesaler through auction with a highest bid. The retailers then bring the fish to particular market where they usually sell the fish to consumers.

By the analysis of livelihood strategy of SIS retailers in three fish markets it was found that socio-economic constraints such as low income, poor educational background, low economic status and lack of capital are the main problems for SIS retailers. Most of the retailers proposed that arrangement should be made by government so that the producers can get reasonable and stable price throughout the year. Strengthening law-enforcing agencies in fish marketing area is suggested by many of the retailers as well. Among the several other points suggested by the retailers notables are construction of cold storage and preservation facility for fish at market site, improvement of road and communication, improvement of physical market facilities and reduction of market chain. It is essential to improve socio-economic condition of SIS retailers such as financial supports as well as increase of credit facilities, raising of their standard of living, health and sanitary condition, housing condition, children education, drinking water facilities etc.

Considering the importance and demand, study on quantitative and qualitative supply of SIS and thorough and countrywide livelihood strategy analysis of people related to SIS marketing in Bangladesh are undeniable. Therefore in depth long-term investigation of SIS is urgently needed not only for the conservation and rehabilitation of SIS but also for creating the awareness among the policy makers to the government and non-government organizations, groups and general mass. This will not only pave the way for better-protected biodiversity of SIS but also help the people who make their living on SIS with a more sustainable livelihood approach in near future.

Introduction

Small Indigenous Species of Fish

The small indigenous species (SIS) of fish in Bangladesh are generally considered to be those which grow to a length of about 25 cm or 9 inches at maturity (Felts *et al.*, 1996; Hossain *et al.*, 1991 and 1999). These fish are commonly referred to as 'Chhotomach'. They are also known as "miscellaneous species of fish and prawn". SIS is popularly known as poor people's fish, and subsistence fishing of SIS provides a cushioning effect on poverty in Bangladesh rural society (FAP 6, 1993).

These small fishes are available in smaller water bodies like drains, ditches, ponds, lakes, beels, haors, baors, rivers, stream and ephemeral water bodies of the inland and estuarine areas. These fish can withstand harsh environmental conditions and are able to reproduce and grow rapidly in favorable conditions.

Small Indigenous Species of Fish in Bangladesh

Bangladesh is blessed with vast inland waters in the form of ponds, canals, ditches, flood plains, haors (natural depression), baors (ox-bow lake), rivers, estuaries etc. covering an area of about 4.34 million hectares which has been considered as the major source of fish production. In spite of the tremendous potential for development, fish production from natural waters in Bangladesh has been gradually declining over the years especially inland open water capture fisheries. This decline is mainly due to over fishing, siltration in the river, the indiscriminate use of agro-chemicals, and destruction of breeding areas of fish. These are causing serious damage either directly or indirectly to the fish population in term of fish mortality, fish diseases and decreased fecundity.

Like other countries of third world, Bangladesh today is faced with the severe and widespread protein-calorie malnutrition problem resulting from low per capita consumption of protein on one hand and low intake of food on the other (Chowdhury, 1981). At present, average fish consumption per capita per day is only 33 g, whereas the minimum requirement is about 49 g for normal growth. To meet up animal protein deficiency of the people, greater emphasis should be given to boost up fish production in this country thorough proper management of open water fishery and aquaculture (Kohinoor, 2000). Rice contributes 64% of the food that is eaten by Bangladeshis, vegetables (30%), followed by fruit, and animal protein (mainly fish) (6%). In such a food system dominated by rice, fish is the main source of protein and nutrients.

Of the 260 species of freshwater fish in Bangladesh, over 140 species have been classified as "small indigenous species (SIS). The term SIS would seem to be recent re-interpretation of the bangla word *chhotomach* (literally, small indigenous fish), as opposed to *boromach* (literally, large fish). *Chhotomach* are generally regarded as the small fish eaten by poorer households as a subsistence food. By contrast, *boromach* are generally considered to be a commercial crop, either wild caught fish like *Hilsa* or cultured in captivity like Indian major or exotic carps.

The fish species are usually categorized under different levels of threat towards extinction, such as, vulnerable (VU), endangered (EN), and critically endangered (CR) and so on. Here VU, EN and CR mean 20, 50 and 80% population declining in 10 years or 3 generations respectively. Such categories of threat levels provide an assessment of the livelihood of extinction under the current circumstances. For example sharputi (*Puntius sarana*) is CR; pabda (*Ompok pabda*) is EN; foli (*Notopterus notopterus*); royna (*Nandus nandus*) and tit puti (*Puntius ticto*) are VU (Amin *et al.*, 2000).

Information known about the biology of these small species indicates that many of them can withstand harsh environmental conditions such as low oxygen levels and are able to reproduce and grow rapidly in favorable conditions. The high nutritional value of SIS triggered some initial researches mainly with *Puntius chola, Amblypharyngodon mola, Rohtee cotio, Colisa fasciatus* and others. Work carried out in Thailand, India and Bangladesh also shows these species are fast growing, easy to culture and highly productive.

In past, such species of fish had a low market value, partly because of their abundance and partly because large fish were preferred as the table fish by those who can afford to purchase them. For these reasons, there has been little attempt to culture these species commercially. The rural poor used to catch small fish from ditches, canals and flood plains at little or no cost. Most of the fish would be eaten to provide a valuable source of protein and micronutrients. Surplus fish could be sold at the local market at low price to generate a little cash income for the household. This is no longer possible. The open water fishery is in decline, partly due to fishing pressure from the increasing population, and partly due to loss of natural habitat. In addition, presently practiced carp and large fish culture always encourages the farmers to remove indiscriminately all the SIS from their water bodies before stocking of large fish. Therefore, now-a-days since the supply of the small indigenous fish is highly fluctuating and far less than the demand the price is increasing alarmingly. There is no difference in price between large table fish like - carps, catfishes and small fish like - pabda, gulsha, batashi etc., furthermore sometimes small fish costs more than large fish. Therefore once easily available small fish is quickly getting out of the reach of poor people.

The open water fishery of Bangladesh is no longer able to satisfy the market demand for small species. This has resulted in part through an increased intensity of fishing due to a rapidly increasing population, and in part due to a reduction in available water bodies. The change in demand is shown by an increase in price of these species relative to the large fish. This means that culture and production of these species is now more attractive.

Nutritional Value of Small Indigenous Species
Fish has traditionally contributed to the diet in Bangladesh and acts as a major source of animal protein. It contributes approximately 6% to the GDP and more than 12% to country's export earnings. Government statistics shows that the per capita intake has declined from 12 kg/annum in 1960 to 7.6 kg/annum in 1986 indicate that fish production could not keep pace with increasing population. The decline in consumption is more evident in rural than in urban areas. The government of Bangladesh has actively encouraged all forms of aquaculture to replace the increasing shortfall of available fish. For economic reasons the fish grown have been the larger species, which are normally too expensive for the rural poor. An increase in malnutrition has been observed in the rural areas. It is hoped that motivation of farmers towards the culture of SIS may partly resolve this problem.

Research has shown that SIS have a high nutritional value in terms of both protein content and the presence of micronutrients, vitamin and minerals not commonly available from other food in Bangladesh. Ahmed (1981) reported that *A. mola* is the richest source of vitamin A among local edible fish. The bone of mola provides a high source of Calcium. Other species such as *P. chola* and other *Puntius* species also have a high protein, vitamin and mineral content making them excellent contributions to the diet of the rural poor. All these species compare favorably with major Carp.

SIS is often eaten whole and contributes a larger range of micronutrients and minerals to the diet. They can be sold in small portion and are therefore more easily accessible to rural poor. These small fish are the main, indeed the only source of animal protein and most of the fat-soluble vitamins for the rural people who represent more than 80% of the total population.

Marketing of Small Indigenous Species of Fish
Presently the marketing system of our country is important because it is often considered to be a limiting factor for fisheries development. The fish market in our country is virtually a cluster of disorganized activities and always remains in the control of influential persons of the surrounding area, depending on a wide range of social, economic and political factors (Nuruzzaman, 1993). Bhuiyan and Chowdhury (1995) reported that control over domestic markets by government officials is only sporadic.

Marketing provides the channel of communication between the producers and consumers. The socio-economic variables, production functions and the consumption of fishes determine the present status of a fish marketing system. Poor infrastructure of most of the markets, rough communications and minimum cold storage facilities, undoubtedly limit the normal distribution and marketing of fish. The role of traders, financiers and local *bepari* also continuously exploits the retailers as well as the consumers or in some cases producers also. Hossain (1996) studied the various aspects of marketing of small indigenous species of fishes in Bangladesh and found that the demand for the fishes remain relatively constant throughout the year but there exists a great variation in the production scale which has impact on market price of the fish.
Justification of the Study

A large number of people, many of whom living below the poverty line, find employment in the domestic fish marketing chain as farmers, traders, intermediaries, day labourers and transporters. Due to high population growth there is an ever-increasing gap between supply and demand of fish and fisheries products in Bangladesh. Narrowing the gap not only requires increasing production but also improving all the aspects of marketing and distribution systems. Fish farming communities and poor market participants are loosing out in the fish distribution chain and to suffer from lack of access to money.

When some large fish are exported to overseas, small indigenous fish, marketing is exclusively limited to the country, and the livelihoods of a large number of people are associated with SIS production and marketing systems. The most serious marketing difficulties seem to occur in remote communities, with lack of transport, ice, poor road facilities and where the farmers are in a particularly weak position in relation to intermediaries. The fluctuating supply and price, increasing consumer demand and initiation of pond culture of these species add even more difficulties in the scenario. The intermediaries in the fish-marketing sector have established a new chain based on the extreme exploitation of the fish farming communities by setting up an artificial pricing at different levels. Therefore, it is very important to evaluate the existing demand, supply, and price and marketing systems of small indigenous fish. Aside from an improved awareness of fish marketing systems, it seems meaningful to identify market inefficiencies that have negative impact on poor farmers and traders, which also affects their livelihoods.

Economic Importance

The research will directly benefit the targeted marginal farmers, retailers and indirectly to numerous. It is expected on completion of the project, more and more farmers will come forward to produce and preserve SIS and new working opportunities will be created for not only marginal farmers but also for land-less and penniless people who are the bulk of the Bangladeshi people. The country's policymakers and researchers will have a clear idea about the present biodiversity of SIS and its' future trend.

If this experiment becomes successful all the stake holders will be better known about the fluctuating diversity and species specific availability of SIS and the interest will grow for the less available or rear but comparatively high priced species. The final success will be better-protected biodiversity of SIS and more sustained livelihood of the people who make their living on SIS in near future. These will be immediate and long-term economic importance of this research project.

Objective of the study

The specific objectives of the studies are as follows-

- To identify species-wise qualitative and quantitative availability of SIS in three fish markets of Mymensingh;
- To identify the sources of SIS;
- To evaluate existing demand, supply and its trend, and the price of SIS; and
- To evaluate socio-economic conditions of the people involved in SIS marketing.

Available literatures on small fishes of Bangladesh

On the basis of past records, the literature on the marketing of small indigenous species of fish is scanty. Only recently these fishes have received attention of some researchers. These fish are now considered vitally important because most of them contain a considerable amount of vitamin A, calcium, iron as well as protein. Some fragmentary observations on some aspects of the biology and culture of some small fishes of the Indian-sub-continent are available. The literature reviewed here has been limited to those, which are considered pertinent and related to the scope and objectives of the present study.

Nutritional value of Small Indigenous Species of Fish

Institute of Nutrition and Food Science (1977) worked on the nutritional values of the foodstuff of Bangladesh. According to INFS, some of the freshwater fishes like sharpunti, punti, chela, colisa, pabda, tengra etc. contain high amount of protein, vitamin, iron and minerals, which compare well with those of the major carps. There are many freshwater small fishes that grow in ponds, they are not carnivorous, and so they are not harmful if cultured with fry of carps. Among small fishes, mola, colisa and punti are very popular. They are tasty and nutritious. Bones and heads of these fishes are easily eaten that contain calcium. The nutritional values of these small fishes are similar to that of the bigger sized costly fishes (Mookerjee, 1986).

The importance of mola (*A. mola*) has been highlighted by Ahmed (1981). According to him, mola is the richest source of vitamin-A. Two fish species, *A. mola* and *Rohtee cotio* are remarkably rich in vitamin-A. Eating these fishes may be simple way of meeting the vitamin-A deficiency and thus may be used to cure the night blindness. Zafri and Ahmed (1981) studied vitamin-A content of these two small indigenous fish. According to them, these fishes contain unusually large amount of vitamin-A. They also stated that, 1 to 3 g of mola contained about 8 mg retinol and 12 mg dehydroretinol per 100 mg edible tissues. While dhela weighing 2.7 to 3.0 g, contained about 22 mg retinol and 31 mg dehydroretinol per 100 mg fresh edible tissue. They also mentioned that 80% of the vitamin-A was found to be concentrated in the head of the fish. Alam (1985) also stated that mola and dhela containd more vitamin-A which could prevent xeropthalmia in growing children.

Rahman *et al.* (1982) stated that small fishes like kechki (*Corica soborna*), mola (*A. mola*) are a remarkable source of calcium. Banu *et al.* (1985) studied the protein, riboflavin and iron content of some freshwater fishes of Bangladesh and reported that, mola (*A. mola*), chela (*Chela sp.*), dhela (*R. cotio*) and colisa (*C. fasciata*) have high protein, vitamin and mineral contents. The vitamin-A in mola (*A. mola*), dankina (*Esomus danrica*) and baim (*Mastacembelus sp.*) can help to prevent blindness of the children in Bangladesh.

Sirajuddin (1986) described that small fishes, especially mola, dankina, baim contain vitamin-A in sufficient quantity, which can help to prevent blindness of the children. Thilsted *et al.* stated that many small indigenous fish species are smaller than 10 cm long and these are eaten whole, with organs and bones. Analysis of small indigenous species showed that they contain large amount of calcium and most likely also iron and zinc. In Bangladesh, where 30,000 children become blind each year due to vitamin-A deficiency. Small indigenous species can play a vital role as a source of vitamin-A.

According to Villif and Jorgensen (1993), puti (*Puntius sp.*) contains double the amount of iron compared to Silver Carp (*H. molitrix*) and Rohu (*Labeo rohita*). They also found that mola contain 3 times more calcium and 50 times vitamin than that of Silver Carp and

Rohu. As well as providing an important source of nutrition, fishing of SIS and other species is an important source of income. It also provides the basis for a number of diverse livelihood options, which landless people can fall back on. This is particularly important when other livelihood options fail. FAP 6 (1993) studied the contribution of SIS to household income directly and indirectly. On an average, landless households earned Tk. 484 from direct sales of fish, whilst by the household the value of SIS consumed was Tk. 966. Thus the total income from SIS was Tk. 1,450 per years.
Importance of Small Indigenous Species of Fish

Mustafa *et al.* (1981) reported that due to its low price, colisa (*Colisa fasciata*) to some extent plays an important role to provide protein among the poor people of Bangladesh. In a study on the distribution of colisa, Mustafa and Islam (1984) found the small fish colisa inhabits the stream, ponds, jheels, beels and ditches all over Bangladesh. Ahmed (1994) stated that mola is found in rivers, canals, ponds etc. inhabiting the upper surface of water.

Ameen *et al.* (1984) emphasized that the possibilities of culturing small indigenous fishes in miniponds. According to the authors small fish culture could add social benefit because the farmers and the poor people would consume readily than sale it to the market.

Ameen (1985) pointed out the possibility of producing several indigenous fishes like punti, mola, tengra and others which breed and attain maturity within a short period in the rode-side borrow pits in Bangladesh if properly managed and cultured. The authors also suggested that some extension personnel or volunteers might be employed to train up the local people to culture fish in small water bodies. The volunteers are not likely to receive any income from it but the population of the area would be benefited in having some fish for their consumption. Again, Ameen and Rashiduzzaman (1986) mentioned that the ponds which measured less than .08 acres were not suitable for carp culture, but small indigenous fishes can be cultured in these ponds with similar rates of production as the large ponds.

Haque *et al.* (1997) described the potentiality of small indigenous fish species culture in the baors. They reported that baors an important natural habitat and breeding group for many small indigenous fish species, these fish grow and breed in boars throughout the year and there is no need to stock them further. The harvesting system of SIS is also easy, through using simple and low-cost gear or nets.

Small fish marketing
Dewan (1967) conducted a study on marketing of fresh water fish in Mymensingh town. He analyzed the structure and organizational features of fish marketing and observes that concentration was higher at Aratdar level. He also showed that the marketing channels consisted of Nikeris or carriers, auctioneers, chalanis or dispatchers, Aratdars and retailers.

Shang (1981) noted that the return of fish a farm depends on the production level and market prices of the price usually fluctuate seasonally due to variations in the supply and demand. Various countries have experienced considerable marketing problems that have affected freshwater prawn production without basic marketing information.

Ahmed (1983) analyzed the marketing margins of representative intermediaries between inland producers on one hand, and consumers in the Dhaka and Pabna on the other

hand. The species of fish considered were hilsa, rohu and shingi. In all cases it was found that producer were receiving between 50% and 65% of the retail price. The bulk of the marketing margin was earned by the assemblers and the distributors and retail margin were only 5-10% of the consumer price. Rao and Chowdhury (1988) conducted a study on marketing costs, margins and factors influencing price of inland fish in selected markets. This study examined various aspects of fish marketing in India with a view to suggesting measures to improve the producer's share in the consumer price.

FAO organized a workshop on fishery credit and marketing development in 1989. Issues tackled at the workshop were (i) the relevance of credit and marketing support to small scale fishing communities; (ii) experiences, problems and constraints of fisheries credit and marketing development; (iii) successful fisheries credit programs, with case studier from Asia and Pacific, Africa, the Middle East, Latin America and the Caribbean; (iv) provision of credit for women in fishing communities; and (v) recent development and future trends in appropriate fish technology. Panikkar and Sathiadhas (1989) observed that fishermen's share in consumers money varied from an average of about 40% for cheaper varieties of fish to about 65% for high priced varieties in Kerala, India. Agarwal (1990) suggested that the marketing should not have the object only catching and selling of fish but the fish marketing should have the wide scope for exploitation, production, distribution, preservation and transportation of fish in addition to actual sale of fish by reducing middlemen. Another study was conducted by Biswas (1990) on fish marketing in some selected areas of Netrokona district. He analyzed the existing system of fish marketing in the selected areas and estimated the costs and margin at different stages of fish marketing. The identified problems of fish marketing are as follows -

- Lack of skill in handling
- Lack of weighing and grading facilities
- Lack of public marketing organization
- Inadequate transport facilities
- Inadequate storage facilities
- Lack of institutional credit facilities
- Lack of control of selling space
- System of market tool collection
- Unhygienic market conditions

Quddus (1991) concluded that fish price during harvesting season comes down to the minimum and starts rising up to the maximum in the off-season. Seasonality of demand is also evident in fish product and is related to factors like climate and natural hazards in the five markets in Mymensingh. The lowest fish price was found in December and January and the highest price in June.

According to the FAP17 (1994) there is great deal of seasonal and regional variation in the quantity and type of fish available in local markets. Small fish such as puti, royna and koi dominate the rural markets. The beel harvest beel peaks between January and April, whilst the river harvest peaks during November and December. Floodplain species arrive in the markets between May and December, with a peak between October and December.

Quddus and Akbar (1994) conducted a study to know the existing marketing system of fish and analyzed the problems faced by the fishermen and intermediaries regarding transportation and marketing of fishes. Among the intermediaries, Nikaries and Aratdars seemed to enjoy a better profit. Both marketing cost and margins were the highest for

Chalanees. They also found that the fishermen and intermediaries faced various problems related to transportation, buying and selling of fishes, market condition, storage and credit facilities which adversely affected their fish livelihood.

Khan (1995) studied the fish marketing pattern in selected areas of Bangladesh. The study showed the socio-economic characteristics of the inland fishermen and intermediaries along with the fish marketing system, cost, margins and profit of the fishermen and intermediaries and identified the problem of fish marketing in the selected areas. Moniruzzaman (1995) studied the economics of riverine and haor fishing in Kishoregonj District. This study was conducted to analyze the socio-demographic characteristics of riverine and haor fishermen for variation in catch. Marketing system of fish was also studied. Hossain (1996) studied various aspects of small indigenous species (SIS) of fishes in Bangladesh and found that the demand for the fishes remain relatively constant throughout the year but observed a great variation in the production scale from month to month. Chowdhury (1996) studied on the transportation and marketing system of native and exotic carps such as catla (*Catla catla*), rui (*Labio rohita*), kalibaus (*Labio calbasu*), mrigal (*Cirrhina mrigala*), silver carp (*Hypopthalmichthys molotrix*), common carp (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idellus*) in the fish market of Puthia. Shaheb Bazar and Court Bazar in Rajshahi from July to December 1996. Based on spot-interview of fish traders such as Retailers, Farias, Beparies and Aratdars etc. The author found that the peak season of fish landing specially for major carps in these three markets extended from October to December.

Mia (1996) identified three marketing channels in Mymengingh district, the first one was *fish farmer- bapary- aratdar- retailer-consumer*, the second one was *fish farmer-bapary-retailer-consumer*, and the third one was *bapary-aratdar-retailer-consumer*. Rahman (1997) observed that the price of fish varies with the species and size of fish, season of the year and with the location. He reported that the primary producers hardly get 40-50% of the market price for their products. Ahmad (1997) observed that seasonal fluctuation in the fish species is a normal phenomenon. When the fluctuation is to drastic and wide it affects adversely fishermen and consumers. When the price increases it often produces a beneficial effect for fishermen but not for consumers. In contrast the decrease in price often causes beneficial effect for the consumers but not for the fishermen. Rokeya *et al.* (1997) found that there are five different groups involved in the distribution network from producer to consumer in Rajshahi markets. Local agent (dalal) collect and purchase fish on a commission basis. Mahajans then transport the fish to local market and sell the catch to local retailers (nicary), wholesalers (paiker) and distributors (bepary) through commission agent (aratdar). The packing material used for carrying the fishes were mainly wooden box, bamboo basket, earthen pot, aluminum can, drum etc. Banana leaves and aquatic weed were usually used as ancillary packing materials. Fish transportation in Rajshahi includes boat, head load, shoulder load, bullock cart, pull cart, rickshaw and motor vehicle and often train, bus, truck etc.

Biswas (2001) noted that transportation facilities like boats, mechanical boats, shoulder load, head load, rickshaw and van were used to carry fresh fish and dried fish by the producer while truck, van, rickshaw, head load, shoulder load were used by the intermediaries in Cox's Bazar and Chittagong districts. Siddique (2001) found that the transportation facilities like boat, push-cart, rickshaw, van etc. are used to carry fishes by the fishermen while train, rickshaw, push-cart, etc. are used by the intermediaries in Mymensingh. He also stated that there are seasonal variation in fish price in Mymensingh region with the highest in summer (March to May) and the lowest in winter (November to December). Rahman (2003) conducted a study on existing fish marketing systems in

Gazipur, economic features of marketing activities and social impacts within and around trader's communities. The market chain from producers to consumers passes through a number of intermediaries local traders, agents/ suppliers, wholesalers and retailers. Virtually most of the fish (80%) is imported from outside, the local supply amount only 20%. He also stated that 7% of the supply is small indigenous species.

Materials and Methods
To study the marketing of small indigenous fish species (SIS) and the socio-economic aspects of SIS producers, intermediaries and retailers with sustainable livelihood approach in three fish markets of Mymensingh, the activities were carried out using different survey tools.

Study site
Data collection will take place in three important fish markets in Mymensingh district, namely:

Rural - Sutiakhali market;
Peri-urban - Kamal-Ranjit (KR)Market, BAU; and
Urban - Notun bazar, Mymensingh town.

SIS come into the said markets from a very wide area - Brahamputra river and adjacent floodplain areas, numerous large and small haors, beels, ditches and aquacultured ponds. A huge number of people depend on the SIS marketing and distribution pathways for their life and livelihood as producers/fishermen, middlemen/*foria*, wholeseller/*Arotdar* and the retailers. The three markets selected for this study represent the wider perspective of the SIS marketing in this area considering the physical location of these markets, difference in qualitative and quantitative supply, demand, price and socioeconomic rank of the consumers.

Methodology
In this study, SIS marketing components were harmonised with the sustainable livelihoods approach of the producers, middlemen and the retailers. Conventional SIS marketing system combined with setting of the livelihood were investigated, concentrating on different primary assets - natural, human, physical, social and financial; vulnerability context - shocks, risks, trend and tendency and seasonality; and infrastructures including institutions, processes and policies.

At the beginning of the project several questionnaire surveys with SIS producers/fishermen, middlemen and retailers were conducted. The activities were the preparation and trying out of questionnaires, determine sample size and sampling method, and use of suitable statistical techniques for data entry, manipulation and analyses. From the preliminary questionnaire survey statistically valid estimates were procured that were representative of target groups so hypothesis could be verified easily. Two graduate students helped in questionnaire survey.

SIS producers/Fishermen
Stratified sampling technique were performed for 100 (50 fish farmers and 50 fishermen) people in Brahmputra floodplain and haor area. Depending on the SIS production/catch the group were divided into 3 sub groups. The secondary data were collected from the extension workers of GOs and NGOs working in this area. Samples were selected from each plate following random sampling technique. Fishermen and farmers were interviewed at the waterbodies and the households (list of questions: attached on a separate sheet).

Intermediaries (Foria and Arotdar), and retailers
Most of the middlemen/*Foria* bring mixed fish (both large and SIS) to the wholesaler (*Arotdar*). The whole sellers sell the large fish and SIS to respective retailers. Sometimes

retailers also buy mixed fish from the wholesaler. The retailers very often buy fish directly from *Foria* or even from the producers. After detailed discussion with SIS producers, intermediaries, retailers, Govt. Officers (Fisheries) and NGO workers, intermediaries were selected for theses study. All the retailers from three markets, however, came under the survey. Interviews were conducted at a time convenient to the pertinent people at the market place and their households.

Participatory Rural Appraisal (PRA) & Rapid Market Appraisal (RMA)
PRA is a bottom up approach contrary of traditional top down procedure of research, conducted to learn from indigenous knowledge directly from on spot interview. It is combination of groups of techniques to acquire information from target people. For the proposed research PRA tools such as focus group discussion (FGD), one to one interview, case studies, seasonal calendar, wealth ranking, social mapping, trend analysis, secondary data and case studies were used to discuss the selected topics with people related to SIS production and trade. It gave not only the real information, also helped to cross check individual opinions as well as allowing the community to discuss the issues that they felt important, rather than responding to a questionnaire. A total of 20 FGD sessions were conducted where each group size of FGD was 5 to 10 target people. The place for FGD were mainly public places, such as school premises, club and other common places. The different FGDs were arranged for the women (mainly wives of the target group). A livelihood strategy combined with ongoing SIS marketing systems were analysed, focusing on different assets (*i.e.* human, social, physical, financial and natural), vulnerability context, policies, and processes.

Under RMA, SIS marketing systems and management were studied through sub-sector study, costs and margins analyses, assessment of the pricing mechanisms (for producers and different middlemen and finally for the retailers), and risk factors such as seasonality were studied. Physical facilities were visited regularly and key informants such as Fisheries Officer, Extension workers from different NGOs will be interviewed using semi-structured guidelines.

Period of the Data Collection
The study was carried out for a period of 12 months (the data on qualitative and quantitative fish supply was collected for 8 months between February and September) between January and December 2003. In KR market traders are engaged in fish trading from early morning (7 am) to noon (1 pm). In Sutiakhali the retailers are engaged from after noon (4.30 pm) to evening (7.30 pm) three days of a week (Saturday, Monday and Wednesday). In Notun Bazar, Mymensingh, fish marketing is an evening event (6.00 - 11.00 pm) 7 days a week.

The study was carried out at KR market between 9.30 and 10.30 am (Sunday and Tuesday), in Sutiakhali market it was done between 5.30 and 6.30 pm (Saturday and Monday) and in Notun Bazar between 7.00 and 9.00 pm (Wednesday and Thursday).

Statistical Analyses
Entry for different types of data was done using Excel Spreadsheet for the computer analyses. Data with locally used unit and percentages were manipulated for further analyses. Proportions were arcsine transformed prior to analysis. Spreadsheets were compared with the notebook where data were collected at the first place. The analyses were done using Microsoft Excel and SPSS (Statistical Package for Social Science).

Problem Encountered During Data Collection

Some problems were encountered during data collection such as: traders were busy in trading and unwilling to talk. The traders thought the researchers could be the government official of tax or other department and scared to talk, language problems or use of local terminologies and data in local units. However, the problems were overcome by the researchers through given extra attention and detail discussion.

Results and Discussion

The survey on fish availability in the markets was carried out for a period of 8 months from February to September 2003 for getting a detail account of species-wise qualitative and quantitative availability of SIS, the sources of SIS, the existing demand, supply and its trend, and price of SIS in three fish markets of Mymensingh- Sutiakhali fish market, K.R. market and Notun Bazar fish market. The three markets play an important role in fish marketing in this district.

Sutiakhali Fish Market

Sutiakhali fish market, Mymensingh was considered as a representative of rural fish market. This market situated at 12 no. Bhabkhali union of Mymensingh, 8 km far from Mymensingh town. The main consumer groups of this market are the local people of this union.

K.R. Market, BAU

K.R. market BAU was considered as a representative of peri-urban fish market. This market was established at 1974 in BAU campus, 4 km far from Mymensingh town. The main consumer groups of this market are the students, teachers, officers and staffs of Bangladesh Agricultural University. A few numbers of local people are also included in the consumer group.

Notun Bazar Fish Market

It can be considered as urban fish market for study. It situated at the middle of Mymensing town. Most of the citty dwellers of Mymensingh town buy fish from Notun Bazar fish market.

Fish Retailers

Retailers are those who buy fishes from intermediaries and sell them to ultimate consumers. The function of retailers is to procure supplies and display them in forms and at times convenient for consumers. Usually retailers buy fish through open auction. Very often retailers buy fishes of different species and categorize the fishes depending on species or size.

Intermediaries

Intermediaries are also fish traders but they do not sell fishes directly to consumers rather they buy fishes to sell to other traders or intermediaries. There are different intermediaries in fish marketing system such as:

Fish Harvester Group

These groups are the group of people who harvest fishes from ponds, canals, ditches, flood plains, haors, baors, rivers etc. In general, harvester group takes 10-20% commission from the market price of fish.

Aratders

Aratders are the agent in the wholesale market. They get commission from fish that is bought by retailers in the market. Sometimes it is paid in cash or retailers pay the commission after selling the fish to consumers.

Auctioneer

Auctioneers are the people involved in fish auctioning. While the intermediaries bring fish into wholesale markets from different sources auctioneers starts fish auctioning. They start from a minimum bid and gradually go for higher. The retailers or others who call for

highest bid get the fish. Generally the auctioneers get a fix amount or 1 to 2 % of sold price.

Beparies
Beparies are the professional traders. Usually buy fish from farmers or fishermen and sell in the wholesale market. The beparies earn profit through buying and selling of fish.

Fish abundance in three markets
At the time of study, about 48 small indigenous species of fish were found in the three markets. The available SIS in the selected three fish markets were given in Table 1 and shown in the Figure 1 with their local names and scientific names. All species, however, were not available in each of the three markets. The highest number of species (45) were found in KR market (Table 2). The number of species found were 42 and 37 in Notun Bazar and Sutiakhali, respectively. The national biodiversity status of the species found were also shown in the same table (Table 2) and Figure 2. It is notable that three critically endangered species (Bacha, gaura and rita) were found in our survey. Among the SIS found 11 are endangered and 10 are vulnerable from the biodiversity point of view. The biodiversity of 21 SIS found in three markets are nor (no threat at all), however, three species (beti, chela and darkina) were data deficient as reported by the Red Book (IUCN-Bangladesh, 2000).

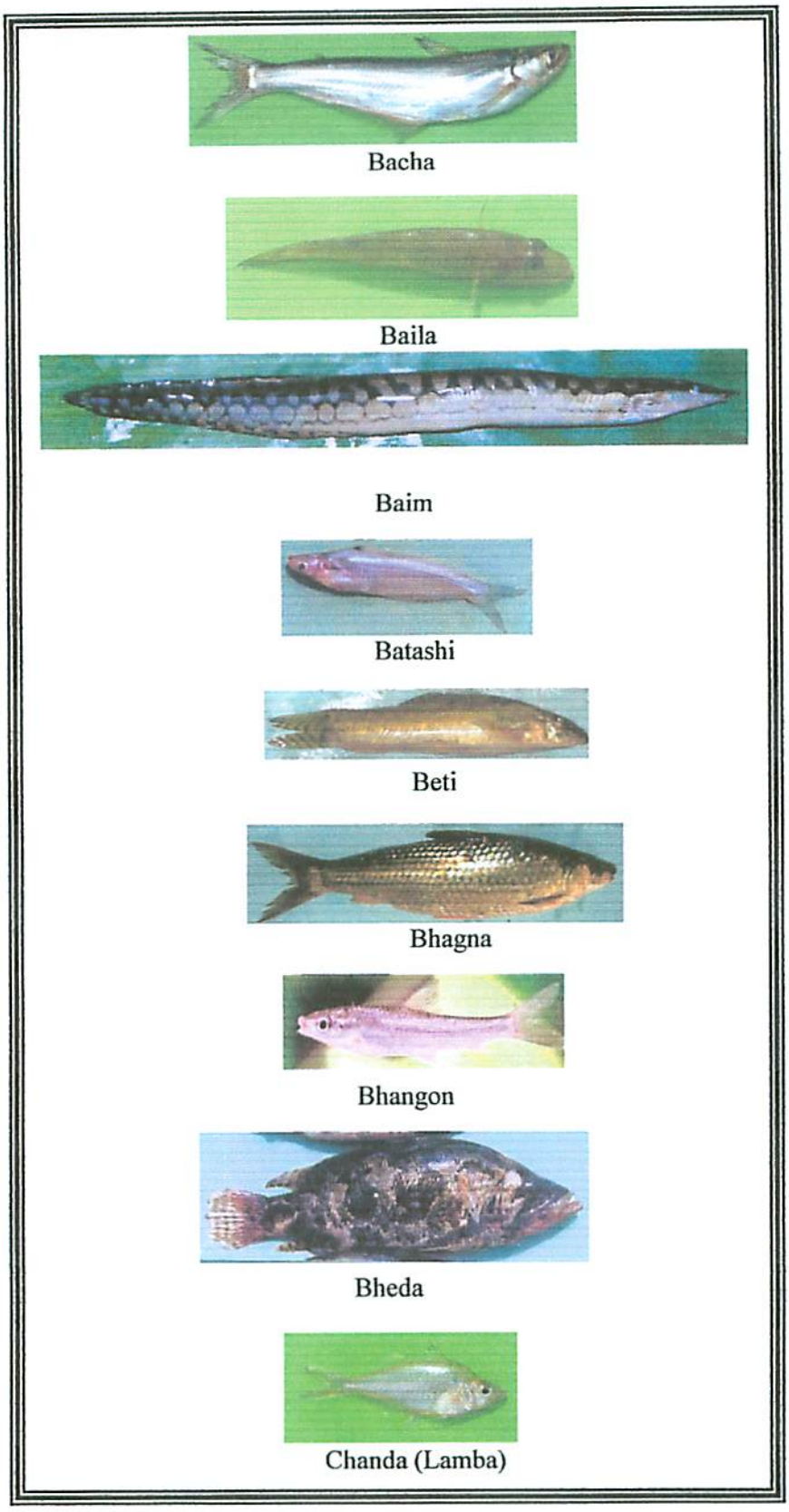
The reasons behind the variation of number of species found in three markets are diversified. Sutiakhali market although is a rural market, most of the caught fish in and around the area comes to the KR and market and Notun Bazar and smaller number and quantity of SIS are found in this market. In general, the number SIS found in the three markets is very poor compared to the total number of SIS available in the country (143). It was not expected that all 143 species would be found in our survey. Nonetheless, an area like Mymensingh which is full of rivers, haors, floodplains, ponds and ditches, 43 observed SIS only proves the alarming decline of the biodiversity of SIS in the surveyed area and in the country as a whole. Species like potka, putul, beti, kanpona were found in very low quantity (most of the times below measurable quantity) and therefore not included in total supply.

Table1. The available SIS in the experimental markets during the survey

Sl. No.	Local Name	Scientific Name
1	Bacha	*Eutropiichthys vacha*
2	Baila	*Glossogobius guiris*
3	Baim	*Mastacembelus armatus*
4	Batashi	*Pseudeutropius atherinoides*
5	Beti	*Botia dario*
6	Bhagna	*Cirrhinus reba*
7	Bhangon	*Labeo bata*
8	Bheda	*Nandus nandus*
9	Chanda	*Chanda nama*
10	Chapila	*Gadusia chapra*
11	Chela	*Chela cachius*
12	Cheng	*Channa gachua*
13	Chingri	*Palaemon sp.*
14	Darkina	*Esomus danricus*
15	Dhela	*Osteobrama cotio*
16	Foli	*Notopterus notopterus*
17	Ghaura	*Clupisoma garua*
18	Gonia	*Labeo gonius*
19	Guchi	*Macrognathus pancalus*
20	Gulsha	*Mystus cavasius*
21	Gutum	*Lepidocephelus guntea*
22	Hiralu	*Barilius bendelisis*
23	Kachki	*Corica soborna*
24	Kajali	*Aillithys punctata*

Sl. No.	Local Name	Scientific Name
25	Kakila	*Xenentodon cancila*
26	Kanpona	*Aplocheilus panchax*
27	Kholisa (Lal)	*Colisa sota*
28	Kholisha (Boro)	*Colisa fasciatus*
29	Khorolla	*Rinomugil corsula*
30	Koi	*Anabus testudinaus*
31	Lal Chanda	*Chanda ranga*
32	Magur	*Clarias batrachus*
33	Mola	*Amblypharyngodon mola*
34	Pabda (Modhu)	*Ompok pabda*
35	Pabda (Boali)	*Ompok bimaculatus*
36	Potka	*Tetrodon cutcutia*
37	Punti	*Puntius sophore*
38	Putul	*Botia lohachata*
39	Rani	*Botia rario*
40	Rita	*Rita rita*
41	Shilong	*Silonia silondia*
42	Shing	*Heteropneustes fossilis*
43	Shulong/Elang	*Bengala elanga*
44	Taki	*Channa punctatus*
45	Tara baim	*Macrognathus aral*
46	Tengra	*Mystus vittatus*
47	Tengra (Buguri)	*Mystus tengara*
48	Tit punti	*Puntius ticto*

Figure 1. The SIS found in three markets during the survey



Chapila

Chela

Cheng

Chingri

Darkina

Dhela

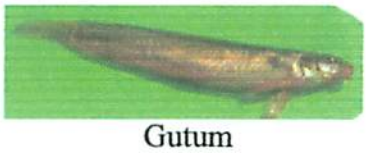
Foli

Gaura

Gonia

Guchi

Gulsha

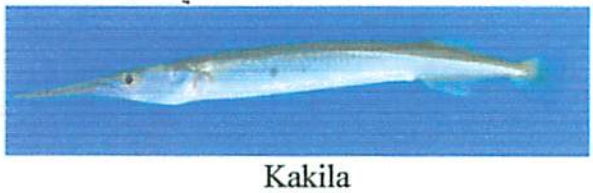


Gutum

Hiralu

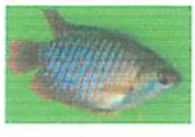
Kachki

Kajoli



Kakila

Kanpona



Kholisa (Lal)

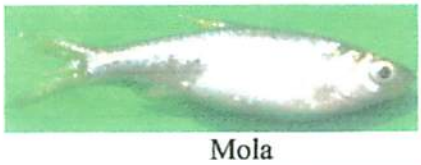
Kholisa (Boro)

Khorolla

Koi

Lal Chanda

Magur



Mola

Pabda (Modhu)

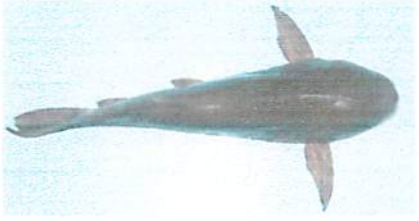
Pabda (Boali)

Potka

Punti

Putul

Rani

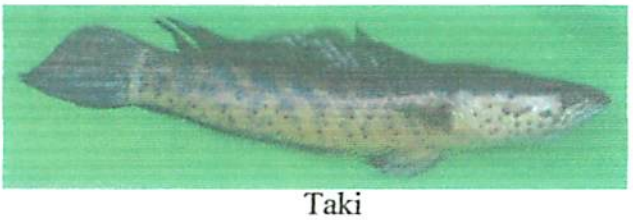


Rita

Shilong

Shing

Shulong



Taki

Tara Baim

Tengra

Tengra (Buguri)

Tit Punti

Table2. SIS available in different market and their national biodiversity status (Red Book, IUCN, 2000). CR: Critically endangered; EN: Endangered; VU: Vulnerable; NO: Not threatened and DD: Data deficient

Sl. No.	Local Name	Sutiakhali	KR	Notun Bazar	Biodiversity Status
1	Bacha	-	+	+	CR
2	Baila	+	+	+	NO
3	Baim	+	+	+	EN
4	Batashi	+	+	+	NO
5	Beti	+	+	+	DD
6	Bhagna	+	+	+	VU
7	Bhangon	+	+	+	EN
8	Bheda	+	+	+	VU
9	Chanda	+	:	+	VU
10	Chapila	+	+	+	NO
11	Chela	+	+	+	DD
12	Cheng	+	+	+	VU
13	Chingri	+	+	+	NO
14	Darkina	+	+	-	DD
15	Dhela	-	+	+	EN
16	Foli	+	+	+	VU
17	Ghaura	+	-	+	CR
18	Gonia	+	+	+	EN
19	Guchi	+	+	+	NO
20	Gulsha	+	+	+	VU
21	Gutum	+	+	+	NO
22	Hiralu	-	+	+	EN
23	Kachki	+	+	+	NO
24	Kajoli	-	+	+	VU
25	Kakila	+	+	+	NO
26	Kanpona	-	+	-	NO
27	Kholisa (Lal)	+	+	-	NO
28	Kholisha (Boro)	+	+	+	NO
29	Khorolla	-	+	-	NO
30	Koi	+	+	+	NO
31	Lal Chanda	+	+	-	VU
32	Magur	+	+	+	NO
33	Mola	+	+	+	NO
34	Pabda (Modhu)	-	+	+	EN
35	Pabda (Boali)	-	-	+	EN
36	Potka	+	+	-	NO
37	Punti	+	+	+	NO
38	Putul	-	+	+	EN
39	Rani	+	+	+	EN
40	Rita	-	+	+	CR
41	Shilong	-	-	+	EN
42	Shing	+	+	+	NO
43	Shulong/Elang	+	+	+	EN
44	Taki	+	+	+	NO
45	Tara baim	+	+	+	VU
46	Tengra	+	+	+	NO
47	Tengra (Buguri)	+	+	+	NO
48	Tit punti	+	+	+	VU

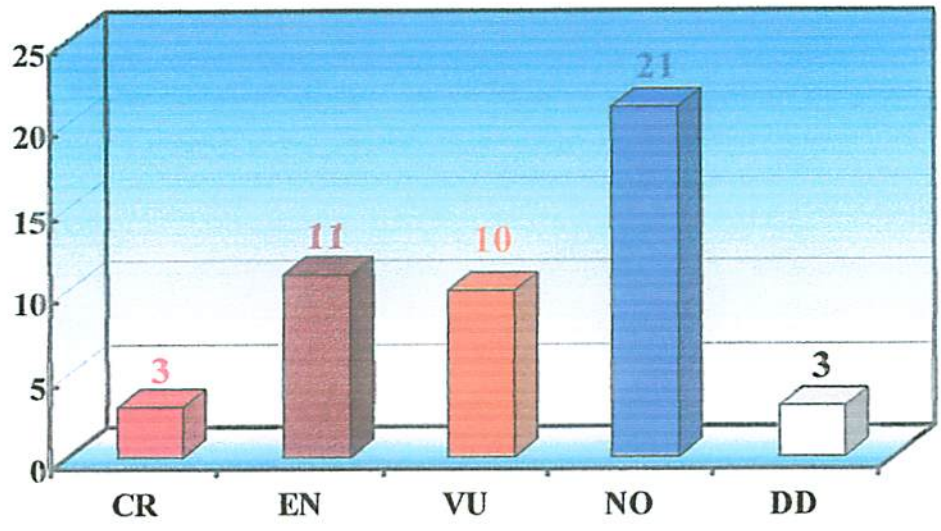


Figure 3. The number of different groups of SIS found in the survey with their biodiversity status

The average supply of SIS was merely 30% of total fish supply in three markets. The comparative SIS supply was highest in KR market (37 %), whereas more or less equal (25≈27 %) supply were found in Notun Bazar and Sutiakhali fish market (Figure 4). The total supply of SIS (%) fluctuated between 25% and 35%. It declined gradually from March to July and then started to increase again. The highest % of SIS was observed in March and April (35%) and it was the least (25%) in July. (Table 3 & Figure 5)

Five highest available SIS found in three markets were shown in Figure 6. Chingri, taki, shing, punti, tengra, gulsha, magur and baila were the prominent fish from the supply point of view. Total in three markets, the 5 highest available SIS were tengra, taki, chingri, shing and punti. Both in Sutiakhali and KR market, the most available SIS was chingri and found more than 300 kg in each of the market during the survey period. In Notun Bazar, however, tengra was found in highest quantity (750 kg). When calculated total in three market, again tengra was the highest and found more than a ton over the survey period. When three markets are compared, the availability of individual SIS was more than double in Notun bazar than what was available in KR market and in Sutiakhali Market.

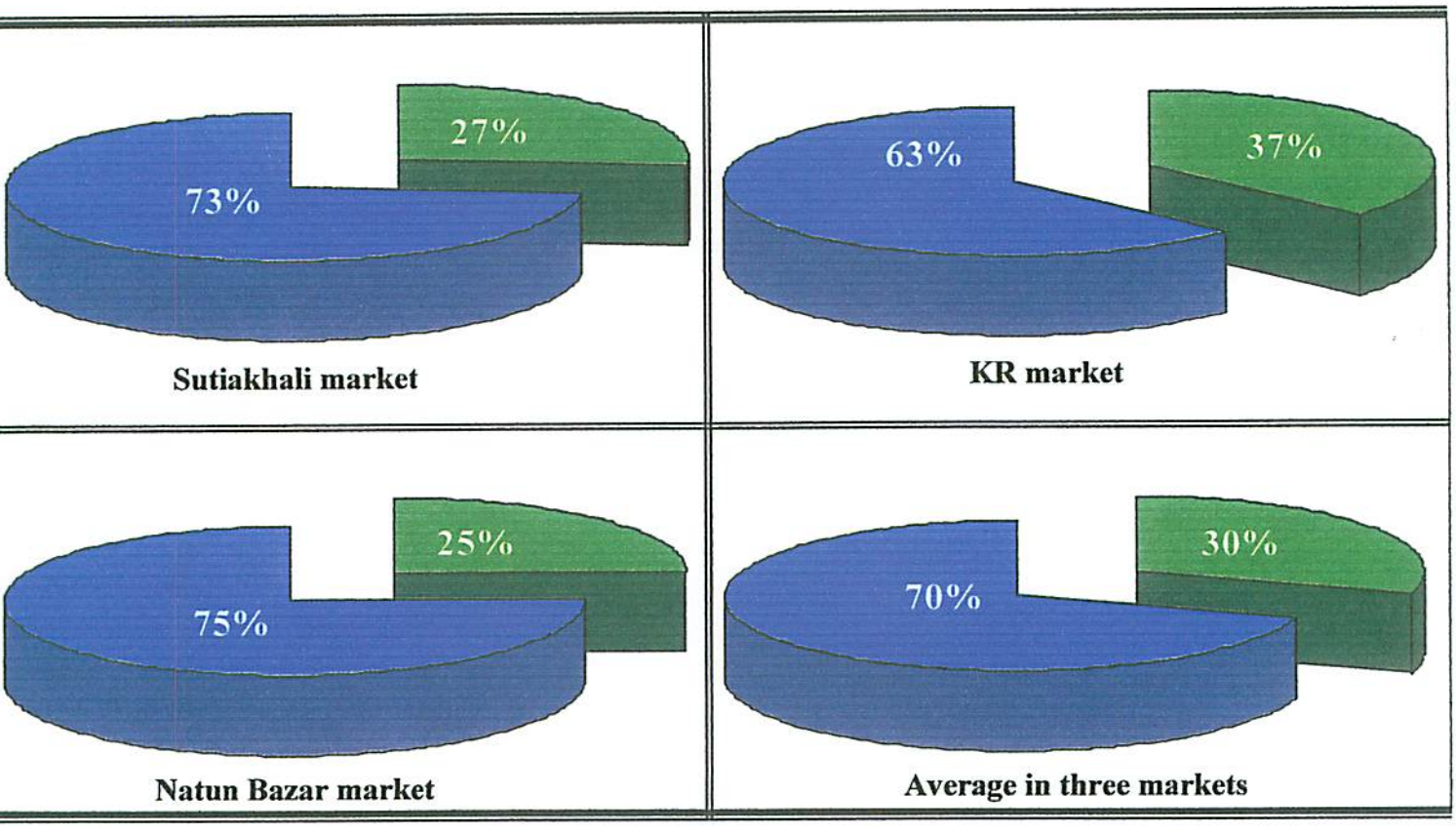


Figure 4. Percentage of available SIS and large fish in three fish markets

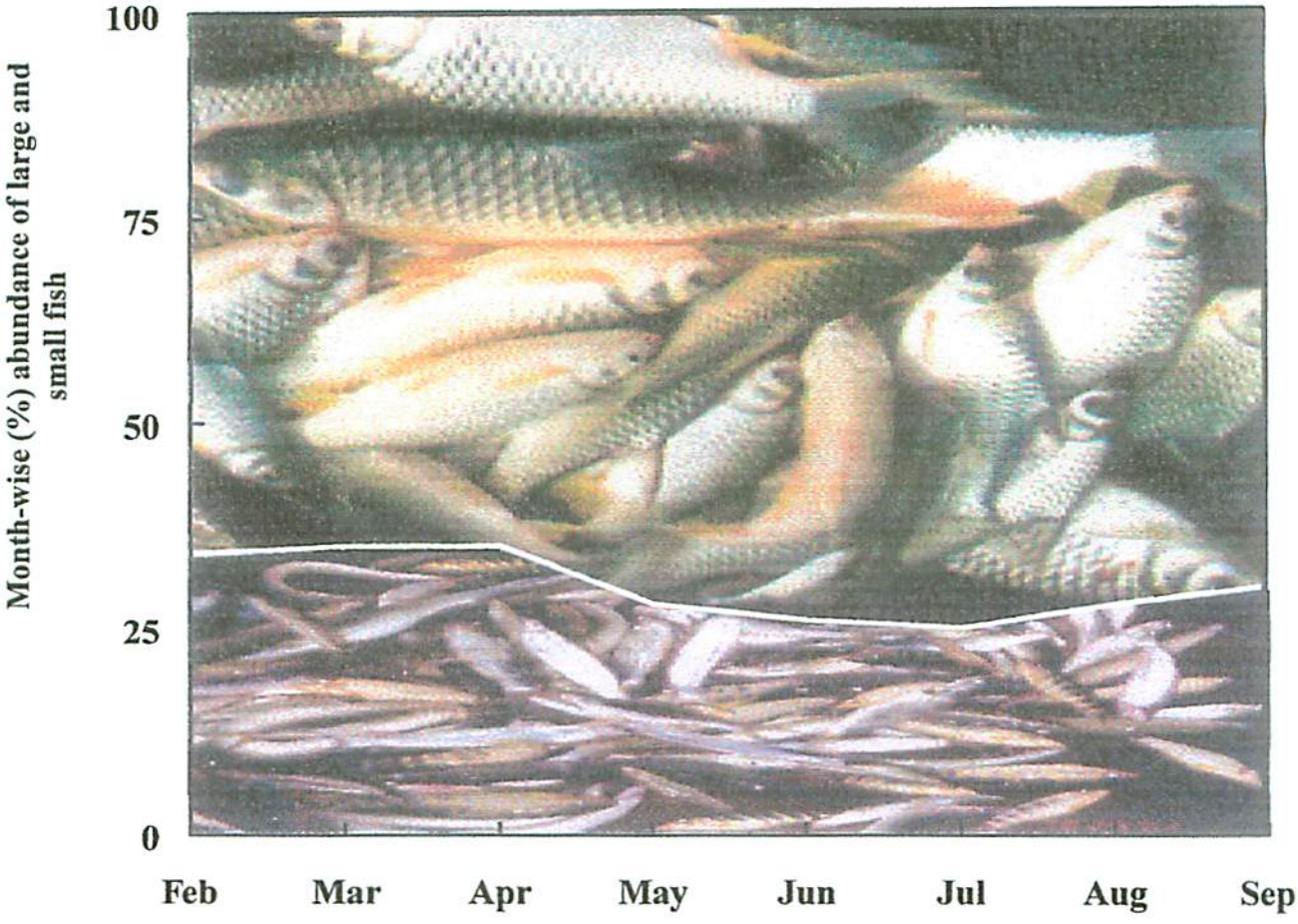


Figure 5. The fluctuating quantity (%) of SIS over the survey period compared to large fish

Table 3. Percent (%) of SIS and large fish over the survey period

Month	% of SIS	% of large fish
February	34	66
March	35	65
April	35	65
May	28	72
June	26	74
July	25	75
August	28	72
September	30	70
Average	**30**	**70**

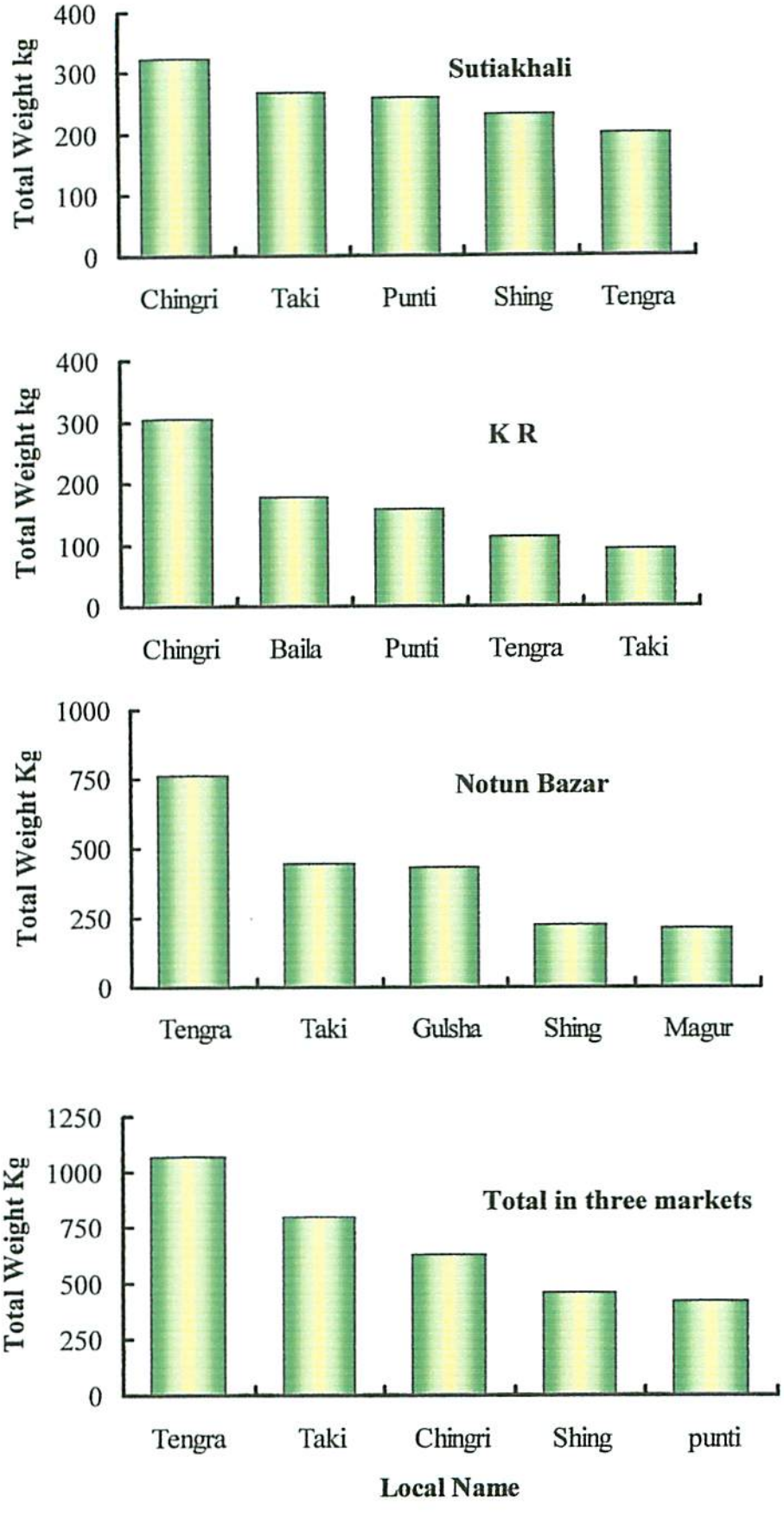


Figure 6. Five highest available SIS in different markets over the experimental period

Five least available SIS found in three markets are shown in Figure 7. Tara Baim, guchi, kajoli, kakila, chela, baim, darkina, catchki, chapila and kholisa were among the least available species found in three markets. Chela, kajoli and bhagna were found in the least among the available species. Total in three markets, darkina, tara baim, kajoli, bhagna and chela were found in the least amount. Many of the species which found below measurable quantity were not considered in calculating the highest and lowest amount of individual weight.

Month-wise availability of SIS were shown in Figure 8 for individual markets and as cumulative for three markets. The amount of SIS found in Notun bazar was the highest and nearly double than other two markets. There was no significant difference found in the supply of SIS in Sutiakhali and KR market. From the figure 8 it is also clear that the supply of SIS was its lowest in the three market during June and July and the highest in March-April.

The average month-wise SIS supply in three markets and in total are presented in Figure 9. The month-wise SIS supply was 185, 192 and 467 kg in KR, Sutiakhali and Notun Bazar, respectively. The total average supply was 844 kg.

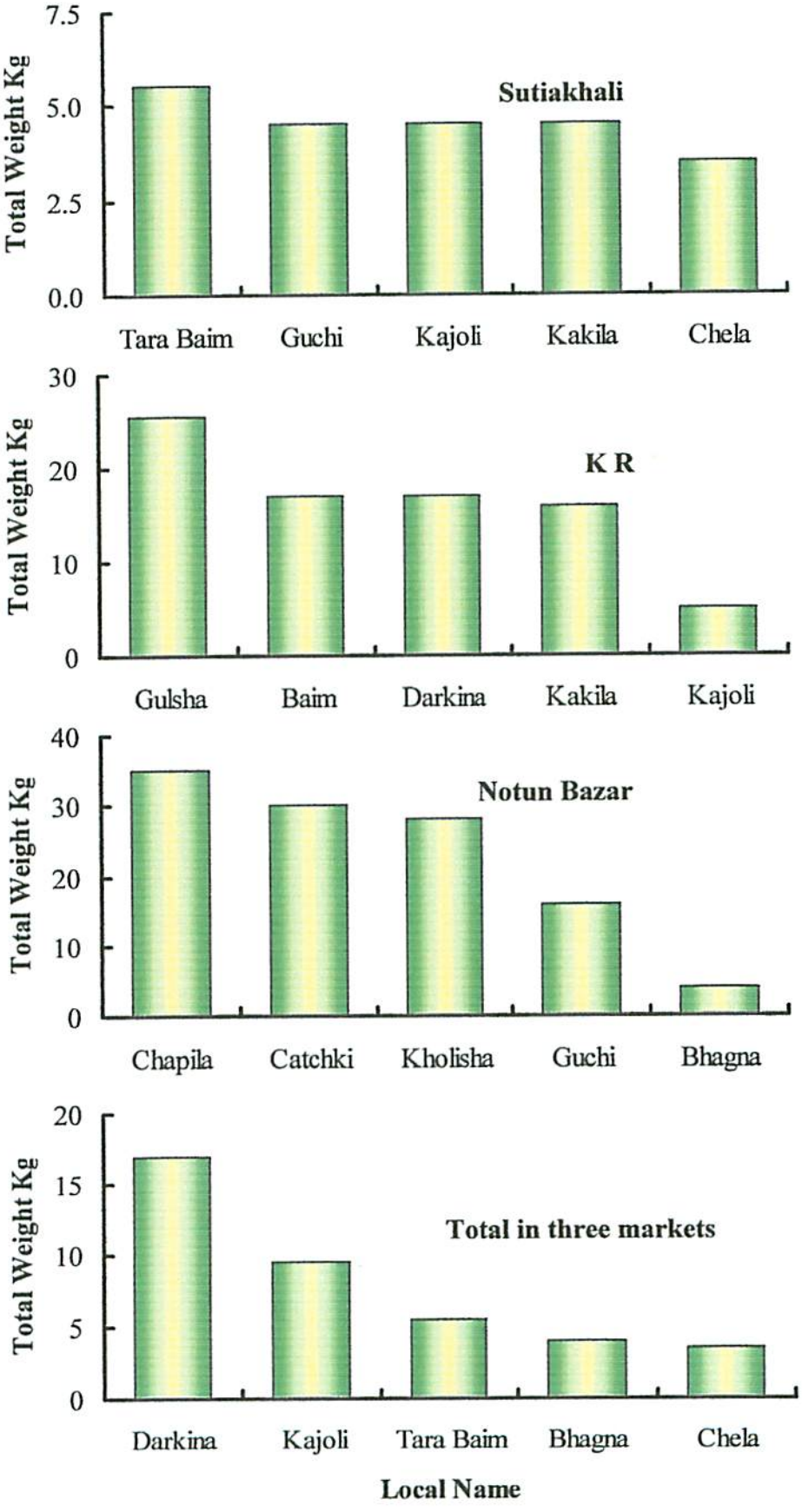


Figure 7. Five least available SIS in different markets

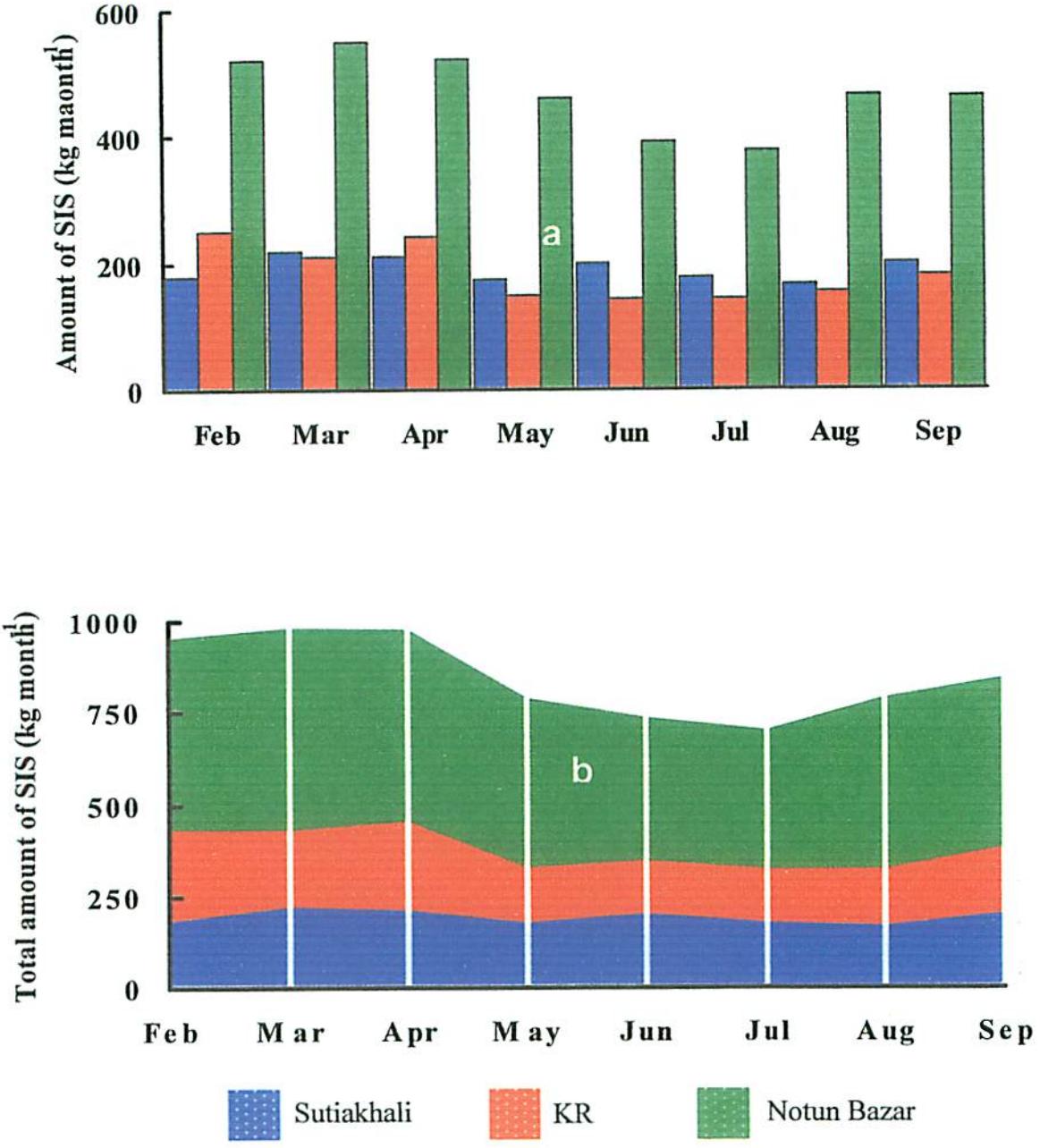


Figure 8. a. Month-wise availability of SIS in three fish markets individually and b. (cumulative) over the experimental period

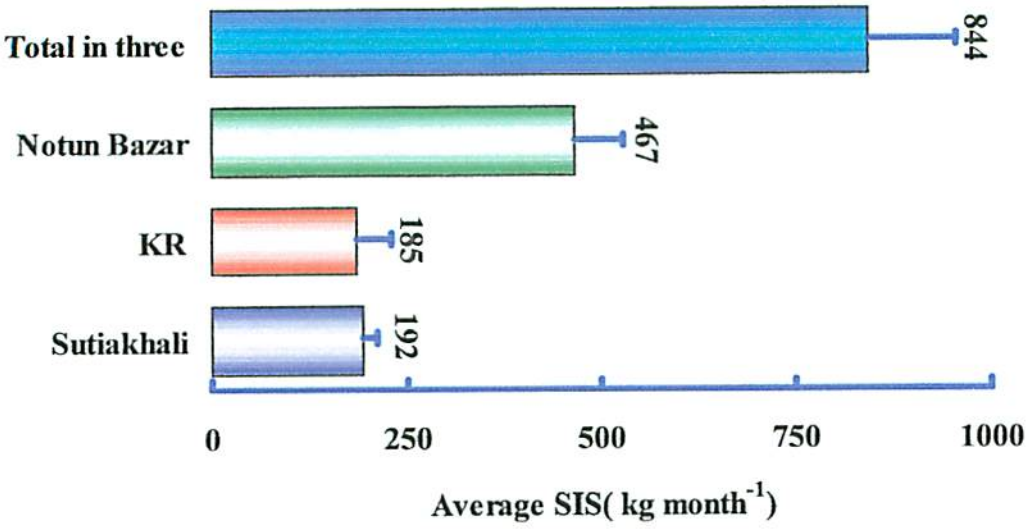


Figure 9. Average month-wise SIS supply in three markets and in total. Error bars are standard deviation

Market price of SIS

The average price (Tk kg^{-1}) of all the available SIS in three markets are presented in Table 4 (except potka and putul). The price range varied widely (50-450) depending on species, market, exact time of purchase and the condition of fish. Even the price of a single species varied a lot depending on the said factors. Chingri, titputi, kholisa, bheda, gutum etc were in general sold at a lower price and these species could be considered at the bottom of the price list and dubbed as poor man's SIS. On the other hand SIS like magur, koi, pabda, dhela and bacha fetched the highest price in SIS market and considered to be fish of rich man.

Figure 10 shows the price range of least priced and highest price five SIS for each. The difference is very wide. As it is seen that by the price of one kg most expensive fish one can easily buy 4-9 kg of cheapest fish. Having said that, price of individual species either cheap or costly varied a lot and variation often larger than the minimum price. Price fluctuation was also closely related with fluctuating supply. In general the price was lower when supply was higher in the month of March and April. This, however, was always not true and price fluctuated with day to day supply.

Poor and middle class consumer bought their fish at the end hour of the market after a considerable time of bargaining and rarely approached for the expensive fish like pabda, koi or magur. During survey, it was noticed that many rich consumer hardly care about the price and bought their SIS without any bargaining with the retailers. During the interview and PRA session many poor and middle class consumers mentioned this as one of the main cause of increasing price of SIS.

In the markets, there was a clear difference observed among the SIS retailers based on what type of (cheap or expensive) SIS they were selling. The retailers who sell expensive SIS they never sell the cheap SIS and vice versa. Economic difference of two types of retailers were also visible. Many of the SIS retailers who sell expensive SIS have their fixed consumers. These retailers do not like bargaining and often ignore the poor consumers. Though the price of their goods are cheaper, cheap SIS retailers always struggle with their SIS and have to wait for longer time to sell out all their SIS.

Table 4. The average price list of SIS found during the survey arranged in ascending order

Local Name	Price (Tk kg^{-1})
Chingri	50-100
Tit punti	60-100
Kholisa (Lal)	60-100
Bheda	60-100
Gutum	60-100
Kanpona	60-100
Kholisha (Boro)	60-100
Tengra (Buguri)	60-100
Guchi	60-120
Kakila	60-120
Cheng	60-130
Kachki	60-130
Punti	60-130
Taki	60-140
Chapila	60-150
Gonia	60-150
Bhagna	70-100
Bhangon	70-120
Chanda	70-120
Foli	70-150
Lal Chanda	70-150
Baila	75-150
Tara baim	75-150
Beti	80-100
Rita	80-150
Shulong/Elang	80-150
Darkina	100-150
Gulsha	100-150
Hiralu	100-160
Tengra	100-180
Baim	100-200
Shing	100-250
Chela	120-250
Ghaura	120-250
Rani	120-250
Mola	120-250
Batashi	120-270
Kajoli	120-270
Shilong	120-270
Khorolla	150-280
Magur	150-280
Koi	150-280
Pabda (Modhu)	150-300
Dhela	170-300
Bacha	200-450
Pabda (Boali)	200-450
Potka	-
Putul	-

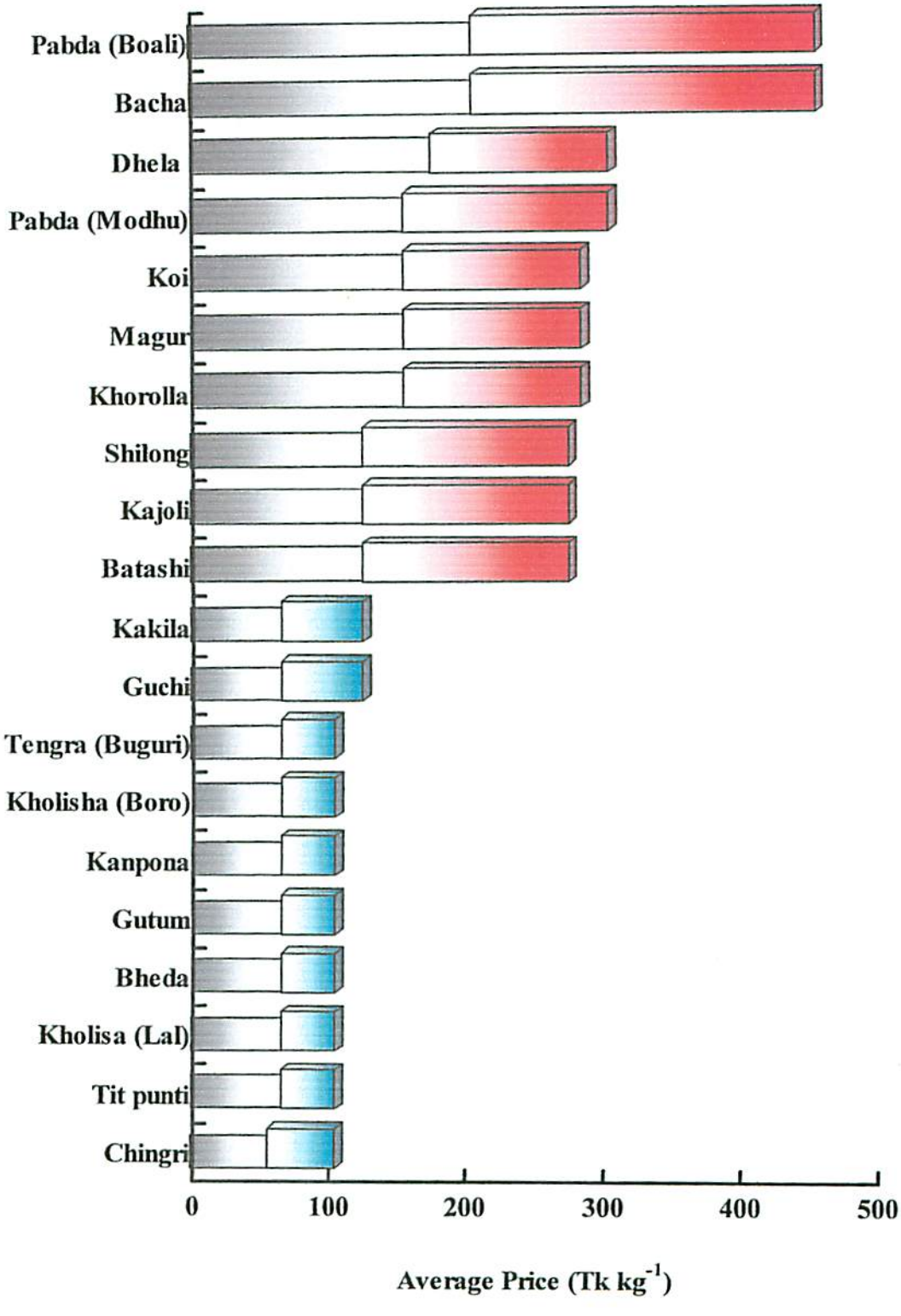


Figure 10. Price range of 5 least and 5 highest priced SIS found during the survey

Market chain of SIS

Many of the retailers of Sutiakhali market collect SIS mainly by direct fishing from the Brahmaputra river, ditch, bill etc. some times they collect from the local fishermen. In KR market and Notun Bazar fish come from Mohongonj, Thakrakona, Dak Bajar, Mach Bajar or some times from local fish market. There is no specific marketing chain for SIS in Mymensingh area. The length and component of marketing channel varied from season to season and from one place to another. Any body can purchase fish from anybody and anybody can sell to any body in this country. The general pattern is - after buying fish from fish farmer/fishermen, middlemen (locally known as Foria) bring to the wholesale market and sell to the wholesaler (Figure 11). The retailers buy fish from wholesaler through auction with a highest bid. The retailers then bring the fish to particular market where they usually sell the fish to the consumers. In Bangladesh, there is no licensing system of fish retailer and middlemen. Fish farmers/fishermen can sell fish directly to the wholesaler or even to the consumers. SIS value increases in every stage 20-40%.

In SIS marketing systems, there are a number of middlemen involved in Mymensingh. The market chain from farmers to consumers passes through a number of intermediaries: local fish traders, agents, wholesalers and retailers. The demand of SIS is high in Mymensingh markets but supply is limited and develops a strong network with brokers and traders intervening between farmers or fish catcher at one end and the consumers, at the other end. With a few exceptions, farmers never directly communicate with consumers, market communication normOally being made through middlemen. The middlemen usually buy fish from the farmers or fish catcher but do not seem to have formal agreements with particular producers. Farmers directly sell their fish to wholesalers, or through local traders and agents. Local traders are normally based in local markets near to the fish farming communities.

Local traders usually sell the fish to consumers in village market and also wholesale market. It appears that local traders first like to sell fish in village markets and that only excess quantities are destined to Mymensingh markets in order to keep local prices at the desirable level. Besides, local traders may have informal agreements with wholesalers in Mymensingh markets obliging them to supply certain quantities in spite of the lower profit margins.

Based on survey report SIS distribution chain from farmers / Catcher to consumer in Mymensingh district are as follows—

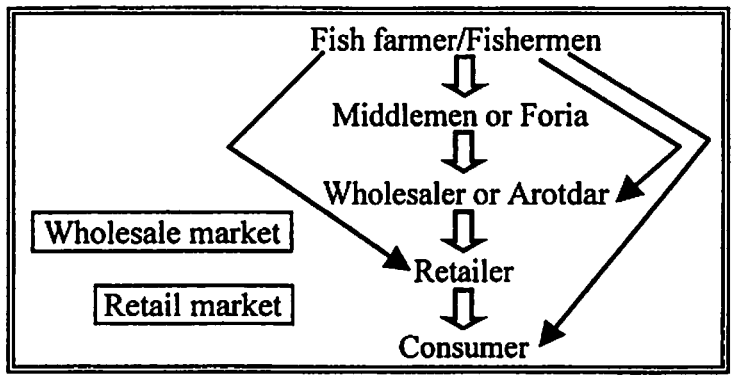


Figure 11. Marketing chain of SIS in Bangladesh

Season and Time of Trading

The season of fish trading is year round. In KR market, traders are engaged in fish trading from early morning (7am) to noon (1 pm) every day in a week, while in Sutiakhali the traders are engaged from afternoon (4.30pm) to evening (7.30 pm) and in Notun bazar fish selling goes on from 6 pm until midnight everyday.

Supply and demand of SIS

Like other consumer goods, the supply, demand and price of SIS are interrelated with each other. When supply of a particular SIS decreases, the demand increases which ultimately increases the price. When the demand and price increase, the producers (fish farmers/fishermen) increase the fishing pressure on that particular SIS. Eventually that particular species becomes vulnerable from the point of biodiversity (Figure 12)

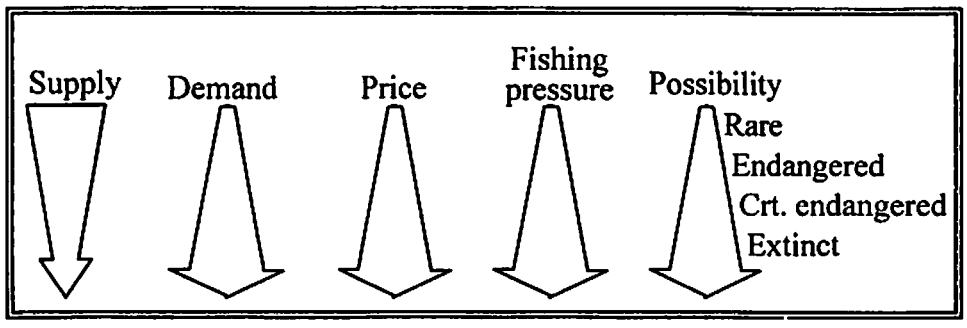


Figure12. Biodiversity status of SIS in relation with supply and demand

Harvest season of fish

There is a great regional and seasonal variation in the amount of supply and type of SIS all over Bangladesh. The main sources of SIS in Bangladesh are the flood plain and rivers. Nov-Dec. is the peak harvesting season of reverine SIS. Between May and Dec. SIS come from flood plain with a pick in Oct- Dec. SIS from other water bodies are harvested between January and April and the least availability of SIS causes at that time (Figure 13). With a low supply and high demand, price of SIS become much higher during this time. The rural poor people can not provide SIS to their family member. There is a strong possibility that occurrence of various types of diseases such as night blindness, anemia etc during this time and the absence or near absence of SIS from rural diet are interrelated. This, however, needs further nation-wide survey over the years.

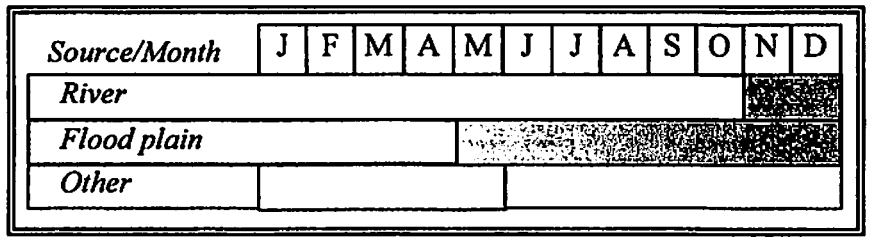


Figure 13. Harvesting season of SIS from different sources in a year

Socioeconomic characteristic of SIS Retailers in three fish markets

Socioeconomic characteristics of any group of people affect their business activities. Age, education, annual income, family member and the educational status of SIS retailers of are discussed and compared with three market in the following subsection.

Age distribution

The selected retailers were grouped into four categories according to their age. The first category includes less then 18 years old, second category includes 18 to 30 years old, third category includes 31 to 50 years and the fourth category includes above 50 years of age.

Table 5. Age distribution of SIS retailers

Age group	Notun Bazar		KR market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Less than 18	2	16	2	13	3	21
18 to 30	7	28	3	20	5	36
31 to 50	15	60	9	60	4	29
Above 50	1	4	1	7	2	14
Total	25	100	15	100	14	100

Table 5 shows that 16 per cent, 28 per cent, 60 per cent and 4 per cent of retailers were in the age group of less than 18 years, 18 to 30 years, 31 to 50 years and above 50 years respectively in Notun Bazar. It is observed that most of the retailers belonging to the age group of 31 to 50 years in urban fish market. The table shows that 13 per cent, 20 per cent, 60 per cent and 7 per cent of retailers were in the age group of less than 18 years, 18 to 30 years, 31 to 50 years and above 50 years respectively in K.R. market. It also observed that most of the retailers belonging to the age group of 31 to 50 years in pere urban fish market. Again 21 per cent, 36 per cent, 29 per cent and 14 per cent of retailers were in the age group of less than 18 years, 18 to 30 years, 31 to 50 years and above 50 years respectively in Sutiakhali Bazar. It observed that the highest percentages of retailers were in the age group of 18 to 30 years in rural fish market. Thus we can concluded that middle aged people are involved in this type of trade.

Level of education

Education of any group of people plays an important role in doing business efficiently. Information on the educational levels of the retailers is presented in Table 6.

Table 6. Level of education of retailers

Level of education	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Illiterate/ Signature	5	20	9	60	11	79
Up to primary level	18	72	6	40	3	21
Up to secondary level	2	8	0	0	0	0
Above secondary level	0	0	0	0	0	0
Total	25	100	15	100	14	100

Table 6 shows that 20 per cent, 72 per cent, 8 per cent of retailers were illiterate, up to primary level and up to secondary level respectively while no retailers was found above secondary level in Notun Bazar. It is observed that most of the retailers were up to primary level in urban fish market. The table shows that in K.R. market 60 per cent and 40 per cent were illiterate and up to primary level respectively while no retailers was found up to secondary level and above secondary level. It observed that most of the retailers were illiterate in peri urban fish market. Again 79 per cent and 21 per cent were illiterate and up to primary level respectively while no retailers were found up to secondary level and above secondary level in Sutikhali Bazar. It is revealed that most of the retailers in rural level are illiterate compared with peri urban and urban fish market.

Experience in fish trade

The experience of retailers in fish trade was categorized according to their experience. Table 7 shows that 12 per cent, 28 per cent and 60 per cent or retailers were involved in fish trading up to 5 years, 6 to 10 years and above 10 years respectively in Notun Bazar. Table 2.3 also shows that 7 per cent, 33 per cent and 60 per cent of retailers were involved in fish trading up to 5 years, 6 to 10 years and above 10 years respectively in K.R. market. But in Sutiakhali Bazar no retailers found engaged in fish trade up to 5 years and the majority (71 per cent) of retailers were involved in fish trading for above 10 years. Table 7 reveled that most of the retailers in rural level engaged with this profession solely comes from their parents and no retailers take this profession immediately.

Table 7. Experience of retailers in fish trade

Level of experience	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Up to 5 years	3	12	1	7	0	0
6 to 10 years	7	28	5	33	4	29
Above 10 years	15	60	9	60	10	71
Total	25	100	15	100	14	100

Annual income

Level of income and sources of income are important socioeconomic characteristics. On the basis of income the selected retailers were categorezed into six groups. Up to Tk 15000, Tk 15001 to Tk 25000, Tk 25001 to Tk 35000, Tk 35001 to Tk 45000, Tk 45001 to Tk 55000 and above Tk 50000 were respectively first, second, third, fourth, fifth and sixth category.

Table 8 Annual income of retailers.

Level of income	Notun Bazar		K.R. market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Up to 15,000Tk	1	4	2	13	2	14
15001 to 25,000 Tk	2	8	2	13	4	29
25,001 to 35,000 Tk	2	8	3	20	5	36
35,001 to 45,000 Tk	4	16	5	34	2	14
45,001 to 55,000 Tk	5	20	3	20	1	7
Above 55,000 Tk	11	44	0	0	0	0
Total	25	100	15	100	14	100

Table 8 shows that the majority of retailers (44 per cent) in urban market (Notun Bazar) belonging to sixth category of income. On the other hand most of the retailers in peri urban market (34 per cent) and rural market (36 per cent) belonging to fourth and third

categories. Thus we can say that the retailers of rural fish market relatively poor compared with retailers of peri urban and urban fish market.

Housing condition

House of the fish traders are main three types: 1) Katcha- house are made of bamboo and tree leaves with mud flooring, 2) Semi pucca- made of wood or/ and tin shade, 3) pucca- made of brick.

Table 9. Housing condition of retailers.

House type	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
kacha	4	16	6	40	8	57
Semi pucca	18	72	9	60	6	43
Pacca	3	12	0	0	0	0
total	25	100	15	100	14	100

Family size

In the present study, family size is defined as total number of persons living together and taking meals from the same kitchen under the administration of the same head of the family. The family members include husband, wife, son, daughter, brother, sister, parents, servant and caretaker.

Table 10. Family size of retailers

Family member	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
1-4	5	20	1	7	2	14
5-6	14	56	7	47	6	44
7-8	4	16	4	26	3	21
9 & above	2	8	3	20	3	21
Total	25	100	15	100	14	100

Religious status

Religion can play a vital role in the socio-cultural environmental life of people of given area, and can act a notable constraint or modifies in social change.

Table 11 Religious status of retailers

Religion	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Islam	21	84	10	66	8	57
Sonaton (Hindu)	4	16	5	34	6	43
Total	25	100	15	100	14	100

Intention to involve their descendent in this profession
If any business support sound food security, mitigate prime needs of human beings and up grade their status then they will intend to involve their descendents in that business.

Table 12. Intention of retailers to involve their descendent

Retailers wish	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	%of total	Number	% of total
Wish to involve	3	12	5	34	5	36
Not	22	88	10	66	9	64
Total	25	100	15	100	14	100

Financing the business and Bank Loan

Table 13. Sources of finance of retailers

Sources	Notun Bazar		K.R.market		Sutiakhali Bazar	
	Number	% of total	Number	% of total	Number	% of total
Own	16	64	7	46	7	50
Institutional	6	24	3	20	1	7
Non-institutional	3	12	5	34	6	43
Total	25	100	15	100	14	100

To run any kind of business, the main element is money before skill, manpower etc. Few people invest their own capital but most of them have to depend on Bank loan.

Table 14. Dependency of retailers on Bank

Dependency	Notun Bazar		K.R.market		Sutiakhali Bazar	
	No.	% of total	No.	% of total	No.	% of total
Take Bank loan	6	24	3	20	1	7
Not	19	76	12	80	13	93
Total	25	100	15	100	14	100

Health facilities
The study showed that 40% of traders households were dependent on village 'doctors' (unqualified practitioners), who did not have any understanding and knowledge of medical science, while 37.5% and 22.5% got health service from the *upazila* health complex and MBBS (Bachelor of Medicine and Bachelor of Surgery) doctor respectively.

Livelihood constraints of people pertinent to SIS marketing
There are 20-30 retailers involved in each market. A number of people also work with the traders as day laborers. Most of the retailer in Sutiakhali market are mixed seller they sell both large fish and SIS but in the KR market about 40% retailers sells only SIS, 40% sells large fish and while the rest (10%) are mixed seller and in Notun Bazar the ration is nearly 50:50. This category also depends on the availability of fish. Retailers in Mymensingh typically operate with capital of around Tk. 2,000-10,000 per day. The retailers of Notun

Bazar operate with more capital than the retailers in KR market and Sutiakhali. From the survey report it was found that around 60% retailers used their own money for fish trading, while the rest (40%) received loans from different sources. Among the traders who received loans, 70% obtained from the moneylenders (wholesalers also play role as moneylenders), and rest 30% from various NGOs, banks and other organization. The average rate of interest for moneylenders was estimated at least 120% per year (10% interest per month). The average daily net profit of a fish retailer in the KR market (Tk. 4,000 - 5,000)was estimated 4 times higher than the retailers in Sutiakhali market and in Notun Bazar retailers earn nearly double profit that the retailers in KR market.

Almost all the retailers are facing many problems and going through a very vulnerable livelihood. Low income (with daily and seasonal variation) is the most common and severe. Among others, lack of capital, very poor or no preservation and processing facilities, uncertainty in SIS marketing and pricing system, very poor educational background and ill health are also very important. Almost all the fish retailers are poor but if one compares the large fish retailers with SIS retailers, the later group are even poorer.

Problem faced by retailers
Price fluctuation and low price: Price fluctuation and low price was the major problem of fish marketing as reported by all retailers.

Political Unrest: Political unrest like strike, hartal etc, is a great problem to run any kind of business activities efficiently. Most of the retailers stated it.

Storage facility: Inadequate storage facility increases marketing costs due to high preservation charges. Notunbazar fish market has storage facilities but not adequate. But in K.R. market and Sutiakhali Bazar has no storage facilities.

Inadequate transportation facility: Inadequate and inappropriate transportation system create unusual spatial price variation. Most of the retailers of Notunbazar fish market reported this problem.

Lack of physical facility: In the study area, most of the retailers mentioned lack of physical facilities eg. space in the market, drainage, water supply, electricity supply, pucca floor, shade etc. as a problem.

Lack of adequate market information: Market information influenced the retailers in taking their decisions regarding purchase, sales and the price of product. In modern economy, market information was very important element to operate a business smoothly. Lack of adequate market information was a problem as reported by few retailers.

Lack of education: Without education no nation car prosper. Most of the retailers and their family member's were illiterate. They reported that it is the great problem for them.

Lack of capital: To run any kind of business they need capital. Most of the retailers faced this problem.

Illness and medicinal treatment: They live in poor health environment. Sometimes they have no ability to medicine to care from diseases. They mention it as a problem.

Conclusion

The supply of SIS in the market is far below than demand. The price is now competitive with large fishes, even sometimes more than large fish and increasing day by day. Pabda and bacha are bow being sold at Tk. 450 kg^{-1}, exactly the same price of freshwater export quality prawn in local market. On the other hand many nutrient-rich SIS are being sold at a very low price. The high demand and low supply are making many SIS gradually endangered. If the effective conservation measures including all the stakeholder are not being taken at this very moment many of these valuable SIS will be extinct in near future.

Once small indigenous fish species were naturally abundant in our water body but now this resource is declining gradually. Without concrete and significant changes in the process of accessing fisheries resources for fishermen, ensuring their tenure, and financial, technological and marketing support, little positive change can be expected in the living condition of fishing communities. By the analysis of livelihood strategy of SIS retailers in different fish markets it was found that socio-economic constraints such as low income, poor educational background, low economic status and lack of capital are the main problems for SIS retailers. Most of the retailers proposed that arrangement should be made by government so that the producers can get reasonable and stable price throughout the year.

Strengthening law enforcing agencies in fish marketing area is suggested by many of the retailers as well. Among the several other points suggested by the retailers notables are construction of cold storage and preservation facility for fish, improvement of road and communication, improvement of physical market facilities and reduction of market chain. It is essential to improve socio-economic condition of SIS retailers such as financial supports as well as increase of credit facilities, raising of their standard of living, health and sanitary condition, housing condition, children education, drinking water facilities etc.

Considering the importance and demand, quantitative and qualitative supply study of SIS and thorough and country-wide livelihood strategy analysis of SIS retailers in Bangladesh are undeniable. Therefore in depth long term investigation of SIS is urgently needed not only for the conservation and rehabilitation but also the cerate awareness among the policy makers to the government and non-government organizations, groups and general mass. This will not only pave the way for better protected biodiversity of SIS but also help the people who make their living on SIS with a more sustainable livelihood approach in near future.

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Appendices

Appendix 1
Sample Questionnaire for SIS producers/fishermen

Personal details

Name: Age: Education:
Property: Land: Ponds: Others:
Profession:
Annual Income:
Family member: Boy: Girls:
Profession of family members:

SIS production

Total annual catch: Number of harvest:
Number of SIS: Species-wise amount:
The mode of harvest, process (if any) and transport:
Amount of family consumption: Amount sold:
Where and how the fish be sold:
How the price be decided:
Average price: Species-wise price:
Who are the buyers:
How are the payments settles:
Rank of SIS according to demand:
Rank of SIS according to price:
Rank of SIS according to availability:
Income (Cost - benefit) from SIS selling:
Do you borrow money for the cost related to SIS production/catch:
Where do you borrow from: Interest rate:
Problems with production and selling of SIS:

Appendix 2
Sample Questionnaire for intermediaries and retailers

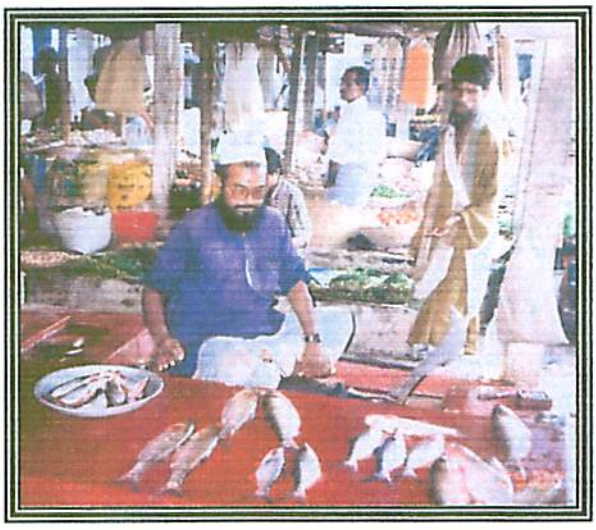
Personal details
Name: Age: Education:
Property: Land: Ponds: Others:
Profession:
Annual Income:
Family member: Boy: Girls:
Profession of family members:

On SIS (buying and selling)
How much fish you buy annually:
The amount of large fish: Amount of SIS
Species wise SIS amount:
Month wise SIS buying:
Where do you buy SIS from
Who do you sell SIS to:
Rank of SIS according to demand:
Rank of SIS according to price:
Rank of SIS according to availability:
Average SIS Sell price: Species-wise SIS sell price:
Average SIS sell margin: Species-wise SIS sell margin:
Do you process the SIS in between buying and selling:
What are the means of transport?
Problems with processing and transport
The credit system (if any): Interest rate:
How are orders placed during auction?
How have things changed during last five years (price/volume/customers)?
Is it difficult to find enough quantity of SIS?

How is the markets organogram (producers-middlemen-wholesalers-retailers.....)?
What are the profit margins at the different levels in the distribution chain?
How many fish wholesalers are there?
How many retailers are there and how do they operate?
How many suppliers of SIS?
Who are the most important suppliers?
From where do the *forias* bring the fish?

Appendix 3
Some of the photographs of SIS trading in the markets

A SIS seller



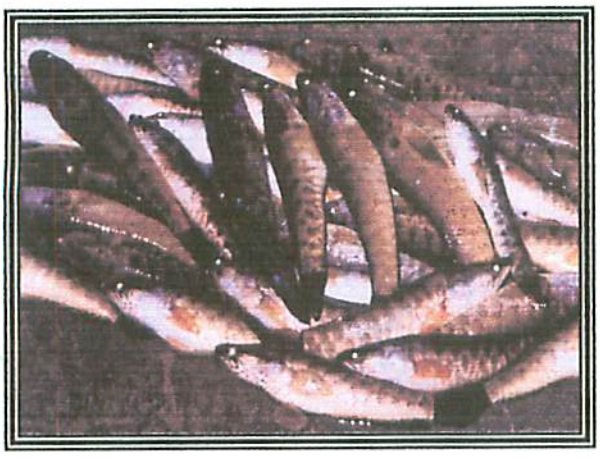
A large fish seller

A boy arranging his SIS

A live SIS seller

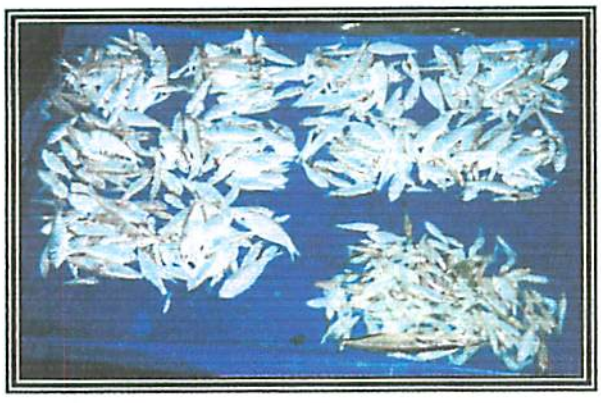
A plateful of Kajoli

Mixed SIS- freshwater eel



Green snakehead – Taki

One of the endangered SIS - Bheda



Mixed SIS – Chapila and others

One of the endangered species - Rita

A SIS seller selling mixed SIS

A parchlet- Boro Kholisa