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Marketing Channels in Ornamental Fish Trade in West Bengal

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A lucrative export market and high domestic demand has made ornamental fish industry in West Bengal a potential source for income generation. The study aimed to identify: (i) the commercially important size groups of main ornamental fish varieties available in the state; (ii) the existing supply chain; (iii) major constraints for development of the industry; (iv) and to anlayse price spread of commercially important varieties; and (v) to evaluate the profitability of operation at different stakeholder levels in the marketing chain. Export market of ornamental fishes in the state followed a single supply channel while three different distribution channels existed in the domestic market. High electricity charges was the major problem faced by breeders (producers/rearers) whereas lack of technical knowledge regarding transportation was the major constraint for wholesalers. Lack of knowledge on proper health management inhibited the growth of retail industry. The fresh water catfish, angel, molly, arowana, gold fish, tetras, and gouramis showed comparatively higher breeders' share in consumers' rupee. Wholesalers were earning comparatively higher annual profit than the other stakeholders due to moderate initial investment and also due to the comparatively lower risk involved.

Key words : Ornamental fish, West Bengal, price spread

In West Bengal, 1.2% of the total population is involved in fisheries and related activity (Korakandy, 2008). West Bengal earned foreign exchange of US $ 0.49 million from export of ornamental fishes during 2007-08 (MPEDA, 2007). Ornamental fish trade can play a significant role in the economy of developing countries like India both as a foreign exchange earner and as a potential source for rural employment generation (Venkatramani & Jayakumar, 2008). The ornamental fish industry of West Bengal comprises of 2 490 units out of which 920 are breeding or rearing farms and 12 are exporters (Anon, 2001). The remaining 1 558 units are involved in domestic marketing and facilitate transfer of fishes from producer to ultimate consumer (Anon, 2001). According to Sekharan (2008), the ornamental fish breeders of West Bengal, were concentrated in five districts *viz.* Uttar Dinajpur, Howrah, South 24 Parganas, Nadia and Murshidabad while rearers were mainly concentrated in Uttar Dinajpur, Nadia and Howrah districts and wholesalers in Howrah district. The retailers in Baranagar and Hatibagan region of Kolkata sold ornamental fishes through separate outlets (Ghosh *et al*., 2003). Co-operatives dealing with ornamental fish were established in the state especially in Howrah and Nadia for promoting infrastructural development and direct marketing (Mukherjee & Dutta, 2002).

In ornamental fish industry, at each stage, some kind of value additions were carried out by stakeholders in the form of grading, quarantine and packing (Mukherjee & Dutta, 2002). Species wise sorting, grading according to size, proper packing and quarantine were the main value addition activities performed by wholesalers. The retailers added value mainly by attractive display, advertising and attractive packing.

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Quarantine, labeling, documentation, packing and transportation were the main value addition activities performed by exporters (Mukherjee & Dutta, 2002).

The pattern of profit sharing of indigenous ornamental fish industry in North Bengal indicates that the benefit of the industry is unequally distributed, highly depriving local collectors of their share (Mandal *et al.*, 2007). The main problems faced by the wholesale market were unorganized supply, lack of standardization and improper bargaining system (Ghosh *et al.*, 2000). Oliver (2001) pointed out that better communication is required between all stakeholders involved in the trade which can improve transparency and ensure general awareness of the problem in the sector and find ways to resolve them.

The major objectives of the study were to identify the commercially important size groups of main ornamental fish varieties available in West Bengal, identify the existing supply chain, conduct Rank Analysis for identifying major constraints involved in the ornamental fish industry in the state, to study the price spread and the profitability of operation of the commercially important ornamental fishes available in the domestic market.

Materials and Methods

The primary data were collected using Personal Interview method (Churchil, 1995) and E-mail survey (Malhotra, 2001) during the month of May to July, 2009. Questionnaire was structured to address the primary objectives of the research (Aaker *et al.*, 1997). Fifty ornamental fish breeders, 50 retailers and 15 wholesalers were randomly selected for interviewing from a population of 920 breeders, 1 448 retailers and 100 wholesalers respectively. Secondary data were collected from published literature and institutions like Marine Product Export Development Authority and Department of Fisheries, Government of West Bengal.

Garret ranking technique was adopted to analyse the constraints faced at different stakeholder level. The respondents were asked to assign the rank for all factors and outcome of such rank have been converted into score value by using the formula:

$$\text{Percentage position} = 100 (R_{ij} - 0.5) / N_j$$

where,

R_{ij} = Rank given for i^{th} facor by j^{th} respondents

N_j = Number of factors ranked by j^{th} respondents

By referring Garret's Table, the percentage position estimated was converted into score. For each factor, individual scores were added and then converted to mean score. Rank was given based on the mean score (Kumar & Kumar, 2008).

Mean value of prices at producer (breeder/rearer), wholesaler and retailer levels of various species and commercially available size groups in the domestic market were used to calculate price spread as per Kumar *et al*. (2008).

Based on the total initial investment, retailers and wholesalers were individually classified into small scale and large scale *viz*., total initial investment < Rs 50 000 as small scale and above Rs 50 000 as large scale. The breeders and rearers were catagorised into three categories *viz*., small scale (total initial investment < Rs 60 000), medium scale (Rs 60 000 to Rs 90 000) and large scale (Rs 90 001 to Rs 1 30 000). The profitability of operation of different farms was studied according to Kumar, (2002) and Shyma & Thomson (2008).

Results and Discussion

The major egg laying ornamental fish varieties available in the domestic market were gold fish, angel, shark, barb, gourami, tetra and catfish. Albino oscar, black oscar, vail oscar, red arowana and green arowana

were considered as the costlier varieties in the domestic market. The commercial varieties of gold fish in the local market were black moor, red calico, red cap and oranda. Along with an ordinary variety three different costly varieties of angels were available in the local market, *viz.* vail angel, diamond cap and silver scratch. Tiger shark, albino shark and silver shark were the major freshwater catfish varieties. Blue, yellow and rainbow were major varieties of gourami and widow, splashing and rainbow were the major tetra varieties. The costly barb varieties available in the domestic market were tiger barb, rosy barb and spotted barb. Among live bearing fishes, five varieties of molly *viz.* black molly, white molly, ballon molly, yellow molly and sundari molly, three varieties of guppy *viz.* cobra guppy, micky mouse guppy and sundari guppy and two varieties of swordtail *viz.*white swordtail and red swordtail were available. The commercially important size groups of different fish varieties available in the domestic market are given in Table 1.

Table 1. Commercially important size groups of major ornamental fishes in West Bengal

Fish variety	Size Class (Length / Diameter) (cm)		
Gold Fish	5.08 - 6.35	7.62-8.89	15.24-17.78
Angel	40	41-60	Above 60
Shark	10.16	12.7	NA*
Gourami	3.81	6.35	10.16
Tetra	5.08-6.35	7.62-12.7	NA
Barbs	3.81	3.81-5.08	NA
Oscar	20.32-25.4	NA	NA
Arowana	27.94-38.1	NA	NA
Molly	2.54-3.81	3.81-7.62	NA
Guppy	2.54-3.81	3.81-7.62	NA
Swordtail	2.54-3.81	3.81-7.62	NA

*NA: Not applicable

The prevailing distribution channel for ornamental fishes in West Bengal is depicted in Fig. 1. In the export market, a single supply chain existed while in the domestic market three different supply chains viz., Channel I, Channel II and Channel III prevailed (Fig. 1). In the domestic market, 50% breeding units were selling fishes to rearing units while 40% to large scale wholesalers. Only 10% breeding units was involved in direct marketing.

At the breeders' level, high cost of electricity was identified as the most important problem (Mean Garret score 62.00) inhibiting the growth of breeding sector (Table 2). Electricity charge for ornamental fishery activity was Rs 5.50 per unit whereas that for agricultural activity was only Rs 3.50

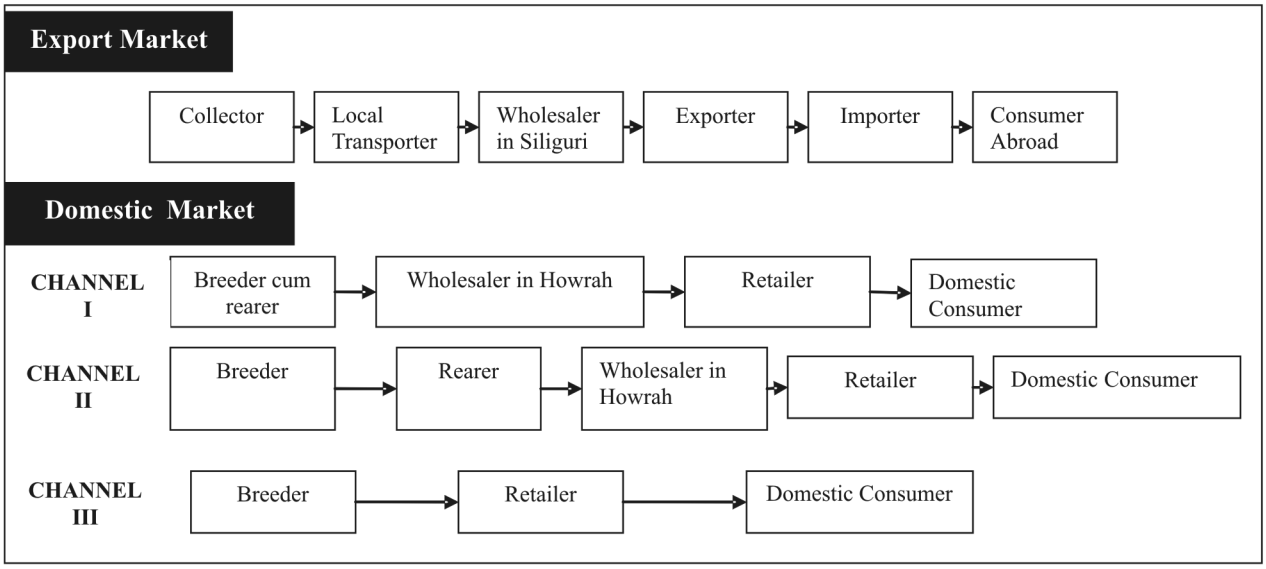

Fig. 1. Prevailing distribution channel of ornamental fishes in West Bengal

Table 2. Major problems inhibiting the growth of ornamental fish traders in West Bengal

Rank*	Factors	Mean Score
	Fish Breeding and Rearing Units	
1	Electricity not subsidized as for agriculture	62.00
2	Lack of technical advice and appropriate training	54.74
3	No steady demand	53.80
4	Insufficient infrastructural facility	47.22
5	Space constraint	47.40
6	Shortage of quality brood stock	46.84
7	Lack of market information	43.92
8	Difficulty in getting finance from institutions	37.84
	Wholesale Outlets	
1	Improper transportation	57.80
2	Lack of standardization in grading of fishes	54.20
3	Inadequate supply of certain fish	53.13
4	Inappropriate quarantine by breeders	46.80
5	Lack of good colouration	44.13
6	Lack of good strains	40.07
7	Unsteady demand	36.27
	Retail Outlets	
1	Improper health management practice	66.04
2	Lack of technical advice	56.98
3	Unsteady demand	53.16
4	Seasonal fluctuation in price	48.44
5	High wholesale price	41.34
6	Lack of finance	37.52

*Ranking Based on Garret Ranking Selection Factor

per unit. Lack of appropriate training and unsteady demand were the other major constrains with mean Garret score 54.74 and 53.80 respectively. In a quest to increase production, many vital technical parameters were not given attention, which resulted in the flooding of domestic market with inferior quality fishes not conforming to international standards (Bojan, 2005). The other factors identified were lack of steady demand, insufficient infrastructure, space constraints, shortage of quality broodstock, lack of market information and difficulty in getting finance from institutions. Mukherjee, *et al.* (1999) provided a detailed list of problems faced by ornamental fish industry in West Bengal and pointed out lack of training as major constrains for the breeders. Shyma (2008) reported lack of finance as a major constraint for expansion of breeding units in Kerala.

Most of the breeding units had no training or experience in packing and transportation of ornamental fishes which caused high mortality during transportation and in the post transportation period. This was considered as the major factor, inhibiting the growth of wholesale industry (Table 2). Inaccessibility of oxygen packing and improper knowledge about conditioning before transportation cause substantial death of the fishes (Lukram, 2007). Lack of standardisation in grading of fish and inadequate supply of high valued variety like arowana and oscar with mean Garret score 54.20 and 53.13 respectively were the other two important constraints identified. Inappropriate quarantine of the stock, lack of good colouration, lack of good strain and unsteady demand also affected the wholesalers (Table 2).

Improper health management practice was considered as the most significant problem inhibiting the growth of retail industry with mean Garret score of 66.04 (Table 2). Other major problems were lack of technical advice and unsteady demand. Other factors identified in this study include improper health management practice, lack of technical advice, unsteady demand, seasonal fluctuation in price, high wholesale rate and lack of finance. According to Mukherjee & Dutta (2002) lack of finance, uncertain demand and lack of proper health management were the major problems inhibiting the growth of the retail industry of ornamental fishes in West Bengal.

The price spread of commercially important egg laying and live bearing ornamental fish varieties was studied for the three prevaling marketing channels in the

domestic market (Fig. 2). In the domestic market, Channel II is the longest supply chain with comparatively lower breeders' share in consumer rupee (35.57%) for all commercial varieties due to higher number of middlemen. Variety wise highest breeders' share in consumer rupee was observed for fresh water catfishes in Channel III (84.02%) and the lowest for oscars in Channel II (35.57%). Along the marketing channel, angel (61.44 - 78.72%), molly (62.13-76.92%), arowana (55.31- 68.09%), gold fish (53.70 - 64.44%), tetra (54.44 - 68.76%) and gourami (54.82 - 69.45%) showed comparatively higher breeders share in consumer rupee than barbs (41.85 - 60.45%) and guppy (45.63 - 56.58%).

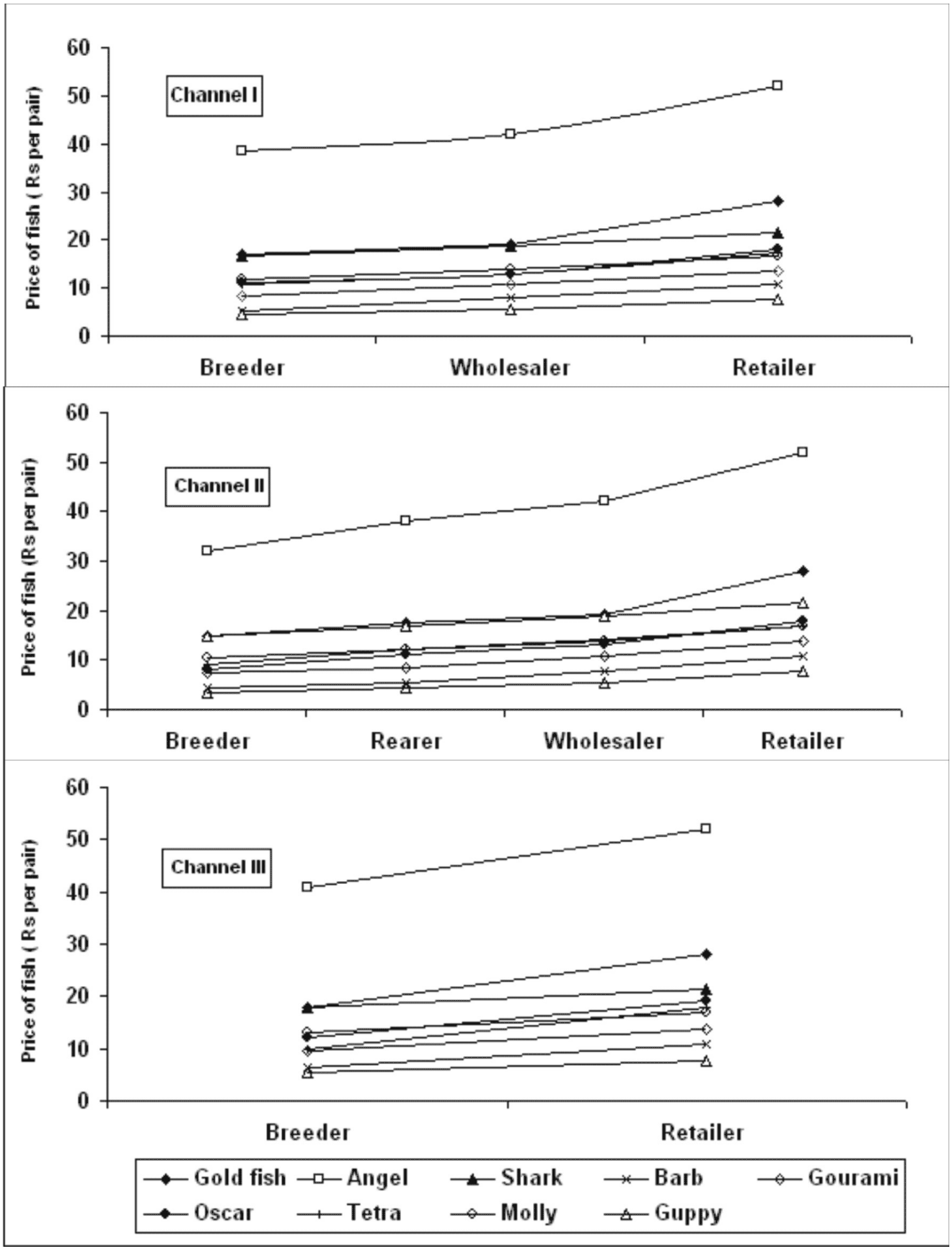

Fig. 2. Prices at different stakeholder levels of ornamental fish industry in West Bengal

Table 3. Profitability of operation of ornamental fish retail outlets in West Bengal

Factors	Small scale (Rs)	Large scale (Rs)
A. Initial investment		
1. Shops, storage, Electrical, Aeration filtration unit	8000 (9 sq. m)	40,000 (70 sq. m)
2. Small glass tanks (23 sq. m)	9000 (40 sq. m)	42 000
3. Packing facilities	7000	10 000
Total Investment	24 000	92 000
B. Operating cost (Electricity, water, fish and feed)	40 000	1 00 000
C. Fixed Cost		
(Depreciation @15%)	3600	13 800
Total cost (B+C)	43 600	1 13 800
Annual sales	60 000 (15000 piece)	1 50 000 (40000 piece)
Net Profit	16 400	36 200

Table 4. Profitability of operation of ornamental fish wholesale farms in West Bengal

Factors	Small scale (Rs)	Large scale (Rs)
A. Initial investment		
1. Office, Storage, Electrical, Aeration Filtration Unit	10 000 (18 sq. m)	40 000 (46 sq. m)
2. Small glass tanks	6000 (9 sq. m)	30 000 (23 sq. m)
3. Quarantine and Other facilities	50 000	1 00 000
Total Investment	66 000	1 70 000
B. Operating cost (electricity, water, fish and feed)	50 000	1 00 000
Depreciation @15%	9900	25 500
Salary (calculated for one staff) @1500/ month	18 000	18 000
C. Total Fixed Cost	27 900	43 500
D. Total cost (B+C)	77 900	1 43 500
E. Annual sales	97 000 (10000 piece)	4 50 000 (50000 piece)
F. Net Profit	1 91 100	3 06 500

Table 5. Profitability of operation of ornamental fish breeding and rearing units in West Bengal

Factors	Small scale Farm (Rs)	Medium scale Farm (Rs)	Large scale Farm (Rs)
A. Initial investment			
1. Land with compound wall	30 000 (46 sq. m)	60 000 (92 sq. m)	1 80 000 (139 sq. m)
2. Office, storage, Electrical, Aeration filtration unit	8000 (9 sq. m)	16 000 (18 sq m)	40 000 (45 sq m)
3. Tanks (cement)	75 000 (13 sq. m)	1 75 000 (32 sq. m)	5 00 000 (46 sq. m)
4. Small glass tanks	4500 (6 sq. m)	12 000 (18 sq. m)	30 000 (45 sq. m)
5. Other facilities	30 000	40 000	50 000
Total Investment	1 47 500	3 03 000	8 00 000
B. Operating cost			
(Electricity, water, fish and feed)	50 000	70 000	1 00 000
Depreciation @15%	22 125	45 450	1 20 000
Salary (calculated for one staff) @1500/ month	18 000	18 000	18 000
Total Fixed Cost	40 125	63 450	1 38 000
Total cost (B+C)	90 125	1 33 450	2 38 000
Annual sales	1 50 000 (100000 piece)	3 00 000 (200000 piece)	6 50 000 (500000 piece)
Net Profit	59 875	1 66 550	4 12 000

In ornamental fish trade, price is determined as "rate per piece" and this caused a high difference among producer's price, wholesaler's margin and retailer's margin of same species (Swain *et al*., 2008).

The small scale retail outlets earned very low annual profit of Rs 16 400 for a total initial investment of Rs 24 000 (Table 3). In comparison to that large scale retail outlets were earning higher profits to the tune of Rs 36 200 per annum for an initial investment of Rs 92 000. Wholesalers were earning comparatively higher annual profit than the other stakeholders due to moderate initial investment and also due to the comparatively lower risk involved. The small scale and large scale wholesalers earned net profit in the tune of Rs 1 91 100 and Rs 3 06 500 for initial investment of Rs 66 000 and Rs 1 70 000 respectively (Table 4). A small scale breeding/rearing unit earned annual profit of Rs 59 875 while medium scale breeding/rearing unit earned net profit of Rs 1 66 550 for an initial investment of Rs 3 03 000 (Table 5). In contrast, large farms with initial investment of Rs 8 00 000 earned very high net profit to the tune of Rs 4 12 000 due to large and modern infrastructural facility. Ghosh & Sureshbabu (2006) discussed the financial viability of different breeding cum rearing unit based on cost and return analysis in West Bengal and pointed out that small scale farmers were incurring loss or earning only marginal profit. Mandal *et al.* (2007) critically analysed the profitability of ornamental fish farms and pointed out that rearing of exotic ornamental fishes is likely to fetch higher and steady returns than collection of fishes from wild catch due to their better quality and lower risk of mortality during transport. Chapman & Livenghood (2007) stated that even though traditionally not recognized as a form of aquaculture, ornamental fishery is one of the major economically profitable areas among different fish farming activities.

The State Government can take initiative for developing new schemes to provide electricity at subsided rate for ornamental fish breeders in West Bengal. A proper transportation protocol and quarantine facility throughout the marketing chain needs to be established and all the stakeholders are required to train in packing, transportation and quality enhancement techniques for ornamental fishes. Government can fix minimum prices at different points in the supply chain for different species and regulatory agencies are required for controlling the pricing system.

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