

INSIGHTS INTO THE EMERGING ORNAMENTAL FISH TRADE IN THE CAPITAL OF BANGLADESH

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Abstract

The ornamental fish trade is a nascent fisheries-oriented trade sector in Bangladesh. The country's ornamental fish trade's centrum is the Katabon Market in Dhaka, Bangladesh's capital. This study portrays the overview of the ornamental fish trade, the constraints associated, and the likelihoods of this trade in Katabon. The study discovered 33 aquarium shops, and the average business experience of traders was around ten years. A total of 41 varieties of fish had been identified as available for selling, and most of them (53.66%) belong to the fish order Perciformes. *Osteoglossum bicirrhosum* (Silver arowana; 68000±27838.82 BDT/Pair) was tracked down as the most expensive fish, followed by *Cyprinus carpio* (assorted koi carp; 8200±2939.19 BDT/Pair). A general marketing channel was identified, initiated with the importers and local hatchery owners, and ended up with the end-users, aquarium keepers. The most sold species was *Carassius auratus*. The research analysis had identified a lack of suitable policy for the expansion of the trade, adequate knowledge on diagnosis and treatment of diseased fish, research on feeding and breeding technology, integration with other trade, skilled staffing's involvement, and accurate quarantine procedure as the key constraints impeding the accrual of the trade.

Keywords: Aquarium, Ornamental fish, Aquatic trade.

Introduction

Ecological, economic, and social consideration determines the sustainability of aquaculture (Giri *et al.*, 2019). Nowadays, aquaculture entrepreneurs and investors are keen to shift their business to more diversified fields such as crab culture, seaweed culture, crocodile culture, pearl culture and ornamental fish culture. (Mostafizur *et al.*, 2009). The sustainable aquaculture sector's diversification comprises increased focus on environmental accountability and sustainability, quality enhancement and product variation, better economic adeptness and welfares to fish farmers, and reinforced business amalgamation along the value chain and economies of scale (FAO, 2018). Aquaculture diversification's key drivers are market demand, less obtainability of a species in natural water bodies, resource accessibility, diseases, government strategies, social stress, and climate change (FAO, 2016). Ornamental fish culture and trading have appeared as an established diversification of aquaculture and an outstretched business worldwide. Over one billion ornamental fish, including more than 4000 freshwaters (Whittington and chong, 2007) and 1,471 marine species, are traded each year internationally (Wabnitz *et al.* 2003). Ornamental fish trade international value, counting accessories such as food, drugs, filters, heaters, tanks, and other elements for fish, raised from USD 7.2 billion in 1980 to USD 20-30 billion in 1997. The approximations elevated from USD 800 million³ to 30 billion in 2004 (Biondo and Burki, 2020; Stevens *et al.*, 2017; Dey, 2016; Andrews, 1990; Surtida, 1999; Penning *et al.*, 2009; Raghavan *et al.*, 2013; Teletchea, 2016; Whittington and chong, 2007; Ploeg, 2007; Saxby *et al.*, 2010; Chidambaran, 2009).

Most ornamental fish lovers typically keep the fishes in the aquarium at their houses and offices to bring an aesthetic look to the place where they are staying. Ornamental fish are also known as aquarium fish globally. The ornamental fish trade is strongly associated with the aquarium trade and the trade of fish feed, drugs, and chemicals used for fish,

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plants, toys, light, and other accessories. That is why this integrated trade of ornamental fish and other accessories can be called ornamental aquatic trade (King, 2019). The aquarium fish trade gives rise to rapid cash generation and is comparatively simple to commence as a hobby, avocation, or small-scale farming endeavor. FAO of the United Nations estimated the worldwide wholesale worth of live aquarium fish in 2000 to be USD 900 million, with a retail value of USD 3 billion (Whittington and chong, 2007). Around 2,000 species are traded annually, with 65% evolving from Asia (Livengood and Chapman 2009; Ling and Lim 2005). It is an encouraging fact for the developing nations that more than 60% of the total world trade goes to their economies (Ghosh *et al.*, 2003). However, the ornamental aquatic industry has consistently divaricated perception in the scientific literature (Raghaven *et al.*, 2013). For example, some authors, Cohen *et al.* (2013), contemplate that the ornamental fish trade keeps being dependent on the application of nonviable practices such as over-exploitation and cyanide fishing. Moreover, the ornamental aquatic industry harms reef fish populations in nature (Kolm & Berglund, 2003). On the contrary, authors such as Tlusty (2002) and Bunting *et al.* (2003) believe that the ornamental fish trade can provide ecological and socio-economic outcomes if done in a reliable and sustainable approach.

In Bangladesh, the professional culture of ornamental fish was initiated in 1980. Generally, elite people keep an aquarium in their house or office for their aesthetic satisfaction. Ornamental fish culture practice was increasing gradually. Due to the rising demand, aquarium fish culture was destined in mid-1980 at Kataban in Dhaka (Mostafizur *et al.*, 2009). Initially, colorful fishes were imported to Bangladesh in 1992, and the business was constricted in some scanty shops in the Katabaon area of Dhaka city. However, now this business is quite ordinary all over the country. According to the Bangladesh Aquarium Fish Traders Association (BAFTA), the gross annual native trade is around BDT 30 crores, and it is expanding swiftly at the rate of 20% per year (The Independent, 2019). A large number of aquarium shops are trading in Dhaka city (Galib, 2008). Katabon market is the most prevalent and famous market in Dhaka city for aquariums and other accessories like ornamental fishes, feeds, drugs and chemicals, toys, plants, etc.

Very few or no remarkable studies had been carried out on the integrated ornamental aquatic trade (consisting of ornamental fish trade and other accessories trade) at Katabon Market, Bangladesh. Considering the potentiality of this emerging sector, an attempt has been made to assess the status of ornamental aquatic trade at Katabon Market, Dhaka, Bangladesh. Specifically, the study aimed to portray the status of aquarium shops, available varieties of ornamental fish, marketing channels, available accessories, feeds, drugs, chemicals, and existing constraints in this trade. This research analysis could contribute as baseline information for taking any further steps to advance this ornamental aquatic trade and will add significant knowledge to the ornamental fish trade of Bangladesh.

Materials and Methods

Study area

The study was conducted at Katabon Market in Dhaka, Bangladesh. The market is considered the center of the ornamental fish trade in Bangladesh (Galib, 2008). The market's geographic coordination is 90°23'20.63"E and 23°44'08.60"N.

Data collection

In-depth individual interviews were conducted through separate questionnaire interviews with 90 stakeholders, including 5 importers, 15 wholesalers and retailers, 5 breeders, 60 aquarium keepers, and 5 transporter and promotional associates in direct visits. Due to data inadequacy on this industry's population, purposive sampling was employed, which was geared toward selecting certain personnel as stakeholders, aiming to obtain comparability per stakeholder (Teddlie and Yu 2007). The questionnaire for traders focused on respondents' general information, available varieties, feed, accessories, drugs, trade issues, breeding techniques, keeper's preference, and management issues.

Data analysis

All of the collected data were tabulated, scrutinized, analyzed, and presented graphically in Microsoft Excel (version 2010).

Results and Discussion

Aquarium shopkeeper's status

The present study found 33 licensed aquarium shops (28 wholesalers and retailers and 5 importers) in Katabon Market, Dhaka, while Galib (2008) identified 25 aquarium shops. In another study, they identified 28 aquarium shops in the Katabon Market, Dhaka (Galib and Mohsin 2010). Faruk *et al.* (2012) found only three importers in the study area with licenses for importing ornamental fish, fish feed, and other accessories from different countries (Table 1).

Table 1. Importer details at Katabon Fish and pet animal market

Importer Name	Importing Countries	Supplied product to
Popular Aquarium	Thailand, Singapore, Malaysia, Australia, India	All over Bangladesh
An-noor Aquarium	Thailand, Singapore	Katabon Market
Love and Hobby	Malaysia, Thailand	All over Bangladesh
Ocean World	Singapore, India, Thailand	All over Bangladesh
Tivel Aquarium	Thailand	Katabon Market

The trader's business experiences vary from person to person, and it was found that the average business experience of traders was found 10 years, while Faruk *et al.* (2012) depicted that the average business experience was 9 years.

Available Species

About 41 varieties of ornamental fish species were recorded to be sold in Katabon fish Market (Table 2). The varieties were belonging to the fish orders- Perciformes (53.66%), Cypriniformes (24.39%), Anabantiformes (7.32%), Siluriformes (7.32%), Characiformes (2.44%), Osteoglossiformes (2.44%), and Gymnotiformes (2.44%) (Figure 1). The study explored the continuous introduction of new species into the market. The recorded number of ornamental fish species was not less in contrast to the number of ornamental fish available in Bangladesh.

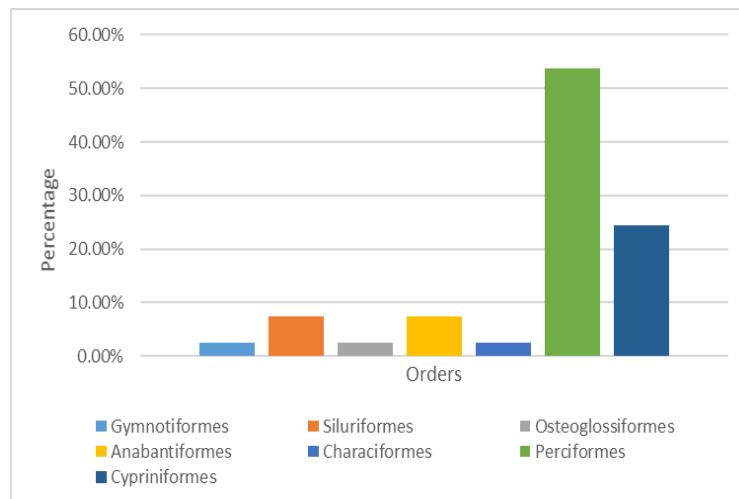


Figure 1. Diversity of different ornamental fish species

A total of 79 varieties of exotic ornamental fish species in Bangladesh were identified by Mohsin and Galib (2013). Galib (2008) found 28 varieties, and Faruk *et al.* (2012) found 26 varieties of ornamental fish species in the Katabon Market respectively. Perciformes were found as the most abundant fish order, followed by Cypriniformes by Galib (2008). These are similar to the present findings.

Table 2. Available Ornamental fish varieties with their order, Family, and Scientific Name

No.	Order	Family	Scientific Name	Common/Variety Name	Importing Countries
1	Cypriniformes	Cyprinidae	<i>Carassius auratus</i>	Common Gold Fish	Singapore, Thailand, Bangladesh (Feni)
2			<i>Cyprinus carpio</i>	Tiger Koi Carp	Thailand, Japan, Bangladesh (Feni)
3			<i>Cyprinus carpio</i>	Assorted Koi Carp	Thailand
4			<i>Balantiocheilos melanopterus</i>	Silver Shark	Thailand, Bangladesh (Feni)
5			<i>Danio rerio</i>	Zebra Fish	Singapore, Bangladesh (Feni)
6			<i>Epalzeorhynchus frenatus</i>	Rainbow Shark	India, Thailand
7			<i>Epalzeorhynchus frenatus</i>	Albino Shark	India, Thailand
8			<i>Barbus tetrazona</i>	Tiger Barb	India, Thailand, Bangladesh (Feni)
9			<i>Carassius auratus</i>	Comet	Singapore, Bangladesh (Feni)
10		Botiidae	<i>Botia dario</i>	Bengal Loach	Bangladesh
11	Perciformes	Cichlidae	<i>Pterophyllum scalare</i>	White Angel	India, Thailand, Bangladesh (Dhaka, Feni)
12			<i>Pterophyllum scalare</i>	Black Angel	India, Thailand, Bangladesh (Dhaka, Feni)
13			<i>Pterophyllum scalare</i>	Silver Angel	India, Thailand, Bangladesh (Dhaka, Feni)
14			<i>Symphysodon discus</i>	Brown Discus	Singapore, Thailand
15			<i>Symphysodon discus</i>	Ghost Discus	Singapore, Thailand

16			<i>Symphysodon discus</i>	Red Discus	Singapore, Thailand
17			<i>Cichlasoma citrinellum</i> <i>x C. synspilum</i>	Red/Blood Parrot Fish	Thailand
18			<i>Cichlasoma citrinellum</i> <i>x C. synspilum</i>	White Parrot	Thailand
19			<i>Astronotus ocellatus</i>	Golden Oscar	Thailand
20			<i>Astronotus ocellatus</i>	Red Oscar	Thailand
21			<i>Astronotus ocellatus</i>	White Oscar	Thailand
22			<i>Vieja synspilus</i>	Flowerhorn cichlid	Thailand
23			<i>Hemichromis bimaculatus</i>	Jewel Fish	Thailand
24		Poeciliidae	<i>Xiphophorus maculatus</i>	Platy	Singapore, India, Thailand, Bangladesh (Dhaka)
25			<i>Xiphophorus helleri</i>	Sword Tail	Singapore, Thailand
26			<i>Poecilia reticulata</i>	Guppy	Thailand, Singapore, Sweden, Bangladesh (Feni)
27			<i>Poecilia sphenops</i>	Black Molly	India, Thailand, Singapore
28			<i>Poecilia sphenops</i>	White Sail Fin Molly	India, Thailand
29			<i>Poecilia sphenops</i>	Balloon Molly	Singapore, India, Thailand
30		Helostomatidae	<i>Helostoma temmincki</i>	Kissing Gourami	India, Thailand, Bangladesh (Feni)
31		Ambassidae	<i>Parambassis ranga</i>	Glass Fish	India, Thailand, Singapore
32		Scatophagidae	<i>Scatophagus argus</i>	Argus	Bangladesh (Feni)
33	Characiformes	Characidae	<i>Metynnis hypsauchen</i>	Silver Dollar	Thailand, Bangladesh (Feni)
34	Anabantiformes	Osphronemidae	<i>Betta splendens</i>	Siamese fighting fish	Thailand, Singapore
35			<i>Trichogaster leeri</i>	Pearl Gourami	Thailand, Bangladesh (Feni)
36			<i>Trichogaster lalius</i>	Dwarf Gourami	India
37	Osteoglossiformes	Osteoglossidae	<i>Osteoglossum bicirrhosum</i>	Silver Arowana	Thailand
38	Siluriformes	Heteropneustidae	<i>Heteropneustes fossilis</i>	Shing	Bangladesh (Feni)
39		Loricariidae	<i>Hypostomus plecostomus</i>	Sucker Fish	Thailand, Bangladesh (Dhaka, Feni)
40			<i>Pangasius hypophthalmus</i>	Tiger Shark	Singapore, Bangladesh (Myemensing)
41	Gymnotiformes	Apterontidae	<i>Apterontus albifrons</i>	Black ghost Knife	Thailand

The available varieties of ornamental fish in the Katabon market are imported from several countries. However, local breeders in Bangladesh have done the breeding of some exotic fishes commercially. Most of the hatcheries are located in Feni, Dhaka, Mymensingh, and Jessore districts of Bangladesh. The present study found only three native species (*Trichogaster lalius*, *Botia dario*, *Heteropneustes fossilis*) to be sold in Katabon Market. Traders of the Katabon market were not interested in exhibiting indigenous ornamental species in the shop. Panigrahi *et al.* (2009) found 30 species of indigenous fishes with potentiality as aquarium fishes belonging to 22 genera and 13 families from the four districts of West Bengal, India. However, Satam *et al.* (2018) stated that India's share of the global ornamental fish trade is less than one percent, but still, it is projected as a "sleeping giant" because potential resources are not exploited.

Pricing and selling status

The price of fish depends mainly on species, varieties, demand, and supply (Table 3). The varieties had different sizes and lengths, and the retail prices varied with size.

Table 3. Available Varieties of ornamental fish with total length and price (Tk/Pair)

Scientific Name of Varieties	Total Length (inches)	Mean Price±SD (Tk/Pair)
<i>Carassius auratus</i> (Common Gold Fish)	1-8	370±143.52
<i>Cyprinus carpio</i> (Tiger Koi Carp)	1.5-12	2840±1312.40
<i>Cyprinus carpio</i> (Assorted Koi Carp)	20-40	8200±2939.19
<i>Balantiocheilos melanopterus</i>	0.5-6	480±228.52
<i>Danio rerio</i>	1-2	81±17.42
<i>Epalzeorhynchus frenatus</i> (Rambo/Rainbow Shark)	2-5	105±13.04
<i>Epalzeorhynchus frenatus</i> (Albino Shark)	3-5	90±9.86
<i>Barbus tetrazona</i> (Tiger Barb)	1-3	73.6±7.11
<i>Carassius auratus</i> (Comet)	2-4	77±14.06
<i>Apteronotus albifrons</i>	1.5-5	1290±621.60
<i>Botia dario</i>	1-3	93.6±7.11
<i>Pterophyllum scalare</i> (White Angel)	0.5-8	320±153.29
<i>Pterophyllum scalare</i> (Black Angel)	0.5-8	334±153.77
<i>Pterophyllum scalare</i> (Silver Angel)	0.5-8	324±154.99
<i>Symphysodon discus</i> (Brown Discus)	4-5	6860±4165.99
<i>Symphysodon discus</i> (Ghost Discus)	2-5	6740±5065.70
<i>Symphysodon discus</i> (Red Discus)	3-5	6800±3180.88
<i>Cichlasoma citrinellum</i> x <i>C. synspilum</i> (Red/Blood Parrot Fish)	3.5-4	1820±859.10
<i>Cichlasoma citrinellum</i> x <i>C. synspilum</i> (White Parrot)	2-5	1530±544.98
<i>Astronotus ocellatus</i> (Golden Oscar)	3-10	396±117.85
<i>Astronotus ocellatus</i> (Red Oscar)	3-12	398±131.86
<i>Astronotus ocellatus</i> (White Oscar)	3-10	430±104.72
<i>Vieja synspilus</i>	3	4640±453.21
<i>Hemichromis bimaculatus</i>	2.5-3	179±18.57
<i>Xiphop horus maculatus</i>	0.5-2	122±54.89
<i>Xiphophorus helleri</i>	0.5-2	136±55.37
<i>Poecilia reticulata</i>	0.5-1	70±9.86
<i>Poecilia sphenops</i> (Black Molly)	1.5-5	1150±745.43
<i>Poecilia sphenops</i> (White Sail Fin Molly)	1.5	93.6±7.11
<i>Poecilia sphenops</i> (Balloon Molly)	0.5-1	310±96.72
<i>Helostoma temmincki</i>	1.5-4	224±75.42
<i>Parambassis ranga</i>	0.5-1.5	330±103.98
<i>Scatophagus argus</i>	3	113.6±7.11
<i>Metynnis hypsauchen</i>	1.5-3.5	394±143.49
<i>Betta splendens</i>	0.5-2	162±37.15

<i>Trichogaster leeri</i>	2-5	113.6±7.11
<i>Trichogaster lalius</i>	1-5	96±9.86
<i>Osteoglossum bicirrhosum</i>	12-35	68000±27838.82
<i>Heteropneustes fossilis</i>	3-6	94±7.36
<i>Hypostomus plecostomus</i>	2-5	115±55.35
<i>Pangasius hypophthalmus</i>	3-6	123±38.77

The maximum retail price was recorded for Silver Arowana; 68000±27838.82 BDT/Pair, followed by assorted koi carp; 8200±2939.19 BDT/Pair and Brown discus; 6860±4165.99 BDT/Pair. *Osteoglossum bicirrhosum* was the most expensive species (1,20,000 BDT/pair), followed by large-sized *Cyprinus carpio* (12,000 BDT/pair) and *Astronotus ocellatus* (500 BDT/pair) found by Galib (2008). Faruk *et al.* (2012) found *Cichlasoma citrinellum x C. synspilum*, *Apteronotus albifrons*, and *Scleropages formosus* were the most expensive fishes.

Marketing channel

A general marketing channel was specified as in the ornamental fish business in Katabon Market (Figure 2). The channel was set in motion with the importers and local hatchery owners and ended up with the aquarium keepers. Importers of Katabon Market import ornamental fish species from several countries such as Thailand, Singapore, Malaysia, Sweden, and Australia. Then they deliver brood fish to the local hatchery owners. Traders receive fish from local hatcheries and also directly from the importers. The study also discovered numerous local breeders in Dhaka city who bred and sold fish to Katabon Market's traders. Wholesalers supply fish to the retail shops of Katabon Market and the retail shops of other districts of Bangladesh such as Khulna, Rajshahi, Sylhet, Barishal, Chittagong, Bogra, Jessore, and Comilla. Aquarium keepers purchase ornamental fish from the retail shops.

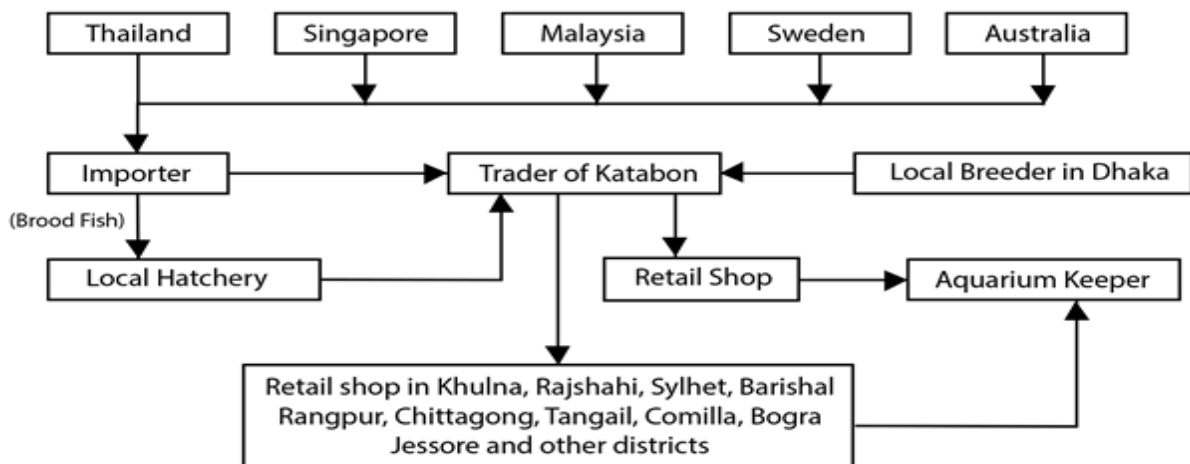


Figure 2. Marketing channel of Ornamental fish trade in Katabon Market, Dhaka

An average of 75% of ornamental fish in Katabon Market come from local hatcheries, and 25% are imported from other countries. Faruk *et al.* (2012) also found four marketing channels in Katabon Market, similar to the present finding. However, the study discovered that the marketing channels of individual fish varieties were not well organized. The price sharing was not equal in different levels or units such as importer, wholesaler, breeder, and retailer. The importer responded that the quarantine procedure was too indigent during importing fish from other countries. Previously, there was no legislation in Bangladesh to regulate exotic fish imports to prevent any pernicious pathogens' intrusion into the country. In 2018, a law titled 'The Fisheries Quarantine Law, 2018' was passed in the Bangladesh Parliament. As per the law, the Department of Fisheries (DoF) would perform as the Fish Quarantine administration to surveillance the import of any fish or aquatic species by water, road, air, and other ways (UNB, 2018).

Demand for species

The most sold species among all varieties of ornamental fish was *Carassius auratus* (Common Goldfish), followed by *Cyprinus carpio* (Koi carp), *Poecilia sphenops* (Molly), *Poecilia reticulata* (Guppy), *Pangasius hypophthalmus* (Tiger sharks). Faruk et al. (2012), Arif et al. (2018) also exposed *Carassius auratus* as the most sold species. The present investigation revealed that aquarium keepers also had particular desires about shape, size, and fish color. Besides, traders sell fish to aquarium keepers according to their demand by importing from other countries through the marketing channel. The species, size, color, shape, survivability of fish, availability, price, and other factors influence demand. Children and teenagers were generally the main customers of ornamental fish.

Sale promoting strategies

The study identified some strategies for promoting the sale employed by the traders of Katabon Market. Most of them had a business card for boosting their sale, followed by social networks and e-commerce websites (Figure 3). Sharma et al. (2015) found business promoting strategies mainly through hoardings, TV ads on local cable networks or newspapers. Arif et al. (2018) found that 40% of the shopkeepers used Facebook for business promotion, 40% Bikroy.com, and the rest (20%) used visiting cards.

Health management and available drugs

Ornamental fishes were found to be invaded by various diseases and suffer from numerous health issues. The traders of Katabon Market identified several clinical signs in diseased fish such as stop feeding and movement, breathing problem, excessive mucus production, fin and scale missing, ulcers, swollen abdomen, fungus attack, and protruding eyes. Respondents identified that fungus, poor water quality, parasite infestation, and nutritional deficiency are the causes of disease. Most of them responded that Goldfish was the most susceptible species. Traders used multiple drugs and chemicals for the treatment of diseased fish. The present study found a couple of available drugs and chemicals used for ornamental fish treatment in the Katabon Market (Table 4). Traders prescribed the drugs and doses to the aquarium keepers based on their experience. They had recommended that the aquarium keepers maintain good water quality in the aquarium, ensuring continuous air supply by using an aerator. Arif et al. (2018) and Faruk et al. (2012) also found similar types of available drugs for ornamental fish treatment.

Table 4. Available Drugs in Katabon Market with Disease name, dosage, and mode of application

Disease/Sign	Name of Drug	Dosage	Mode of Application
Fungal disease/Slim disease/ White spot disease/ Fin rot/ Dropsy	Aqua Spot Blue	1 drop/liter of water	Directly in Aquarium water
Disease caused due to poor water quality	Water care	3 drops/liter of water	Directly in Aquarium water
Vibriosis, Pseudomonas Infections/ Columnaris/ Gill disease/ Septicemia/ dropsy/ fin and tail rot/ saprolegniosis/ cotton wool disease	Star 100 Gold	1 gm/50 liters of water	Directly in Aquarium water
Parasitic disease	Anti-parasite	2-3 pellets/day	Used as feed
All disease	Aquarium salt	10 gm/4 liters of water	Directly in Aquarium water
Bacterial disease	Renamycine	1 tab/10 liters of water	Supplied into feed after grinding into powder
Fungal disease	Tokyo Blue	1 cork/5 liters of water	Directly in Aquarium water
Nutritional Diseases/Vitamin deficiency	Star Fish Vitamin	Few drops in dry feed	Used with live tubifex or dry feed

Aquarium and available accessories

Most of the medium-sized aquariums (50.00%) were selling at a price range of BDT 2000-10000. Whereas small-sized aquariums (35%) were selling at a price range of BDT 400- 2000, and large-sized aquariums (15%) were selling at a price of more than BDT 10000 (Table 5). The aquarium accessories' prices varied based on size, type, color, and other factors. Arif *et al.* (2018) also found similar types of accessories with varied prices.

Table 5. Available Aquarium accessories in Katabon Market, Dhaka

Items	Price
Rock	125±55.90/kg
Light	175±103.07/piece
Power filter	1075±621.99/piece
Aerator	625±303.10/piece
Plants	352.30±248.81/piece
Thermometer	337.5±155.62/piece
Toy	421.05±320.95/piece

Available fish feeds

The feed is essential for the rearing of ornamental fish. There were different available fish feeds of different brands in Katabon Market (Table 6).

Table 6. Available fish feed for ornamental fish in Katabon Market

Feed Name	Price (BDT/100gm)
Nova	43.25±4.65
Optimum	52.5±5.59
Beta Fish	132.5±23.84
Inch Gold	98.75±7.39
Osaka Green 1	56.25±4.14
Osaka 2	47.75±2.86
Sky	38.75±7.39

During the study period, Nova, Optimum, Beta Fish, Inch Gold, Osaka Green 1, Osaka 2, and Sky were sold. The most used ingredients in these feeds were the fish meal, shrimp meal, astaxanthin, soybean meal, corn gluten meal, wheat grain, rice bran, cassava pellet, lecithin, synbiotics, yellow corn, antioxidants, food coloring, vitamins, and minerals. Alam *et al.* (2016) and Arif *et al.* (2018) also found a similar type of feed for ornamental fish.

Constraints in the trade

The sub-industry of breeding and culture of aquatic organisms for ornamental purposes is a mainstream trade and industry widely distributed globally. However, there is a deficiency of data on ornamental fish' yield and trade (FAO, 2020). The present study revealed significant constraints, impeding further expansion of the ornamental fish trade based in Katabon Market, consequently in Bangladesh.

- Adequate studies were not conducted to gather a deep understanding of Bangladesh's ornamental fish trade trends, its potentiality, economics, and export value, centered in the Katabon Market. Trade data deficiency was observed during the study. It is almost impossible to analyze commerce (export and import) data to improve trade because of a lack of adequate data (Biondo and Burki, 2020).

- Previously, Bangladesh had no law on quarantining for imported fish. Consequently, except for formalin tests, importers had not to quarantine any imported fish and obtain any clearance in the past. Although lately, the Bangladesh government has formulated new law to regulate imported fish quarantine in 2018. It is a groundbreaking step as considerable damages had already been done without such a law (The Daily Star, 2014). The execution of the law is crucially necessary to secure the particular trade sector.
- Proper management approaches were not noted in Katabon Market's ornamental fish trade to maximize the potential profit and minimize the risk factors.
- Trade policy can be explained as the formulation and implementation of national laws and international contracts to regulate the cross-border movement of tradable. A dedicated trade policy is a crucial one to improve the trade condition. There was no dedicated trade policy for Bangladesh's ornamental fish trade, which is already emerging.
- A general integration with other aquaculture trades was missing in the Katabon Market's ornamental fish trade. The absence of this integration considerably affects the ornamental fish trade's advancement since it was not in focus as emergent trade industry.
- Like other confined animals, ornamental fish are susceptible to various diseases. Stakeholders associated with the ornamental fish trade at different stages, ranging from production to retail selling, were mostly unskilled. They had no technical or institutional background in effectively handling ornamental fish products. Only they had experience-based knowledge, which in most cases was faulty. The stakeholders did not consult with fish health management experts or graduate to diagnose and treat diseased ornamental fish species.
- Promotion indicates functions and procedures intended to alter or strengthen the consumer's behavior or indications through an announcement to entice them to buy what they might not or else buy (Marmorina and Marmorina, 1997). Computable and proper promotional strategies contributed to the advancement of the ornamental fish trade in other countries. However, such well-structured promotional strategies to attract potential customers had not been perceived in any stages of the ornamental fish trade of Katabon Market.

However, based on the literature review, observations, and interviews with relevant stakeholders, the research analysis has identified that developing cross-breeding techniques, better culture systems, formulating better trade policy and marketing channels, and also by training the farmers and traders on the constraints in the ornamental fish culture and trading could be minimized. Government and non-government approaches also could bring some positive changes in the livelihood through ornamental fish rearing and trading

Conclusion

Bangladesh has already become a self-sufficient country in fish production. At present diversified aquatic trades that are fisheries oriented have the potential to succeed. Required measures should be adopted to ameliorate the potential ornamental fish trade sector. The government of Bangladesh should prepare a well-structured master plan to develop this trade and ensure proper implementation.

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