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STATE OF THE SYSTEM REPORT

**THE CURRENT STATE AND POTENTIAL OF
ORNAMENTAL FISH PRODUCTION IN
HO CHI MINH CITY,
VIETNAM**

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List of Abbreviations

DARD	Department of Agriculture and Rural Development
HCMC	Ho Chi Minh City
HH	Household
ML	Malaysia
No	Number
PCA	Participatory Community Assessment
SOS	State of the System
SP	Singapore
SWOT	Strengths – Weaknesses – Opportunities - Threats
TL	Thailand
TW	Taiwan

I. INTRODUCTION

Vietnam has considerable potential for ornamental fish production due to its tropical climate and abundance of natural aquatic resources. Located in the central part of Southeast Asia, Vietnam belongs to one of three world ornamental fish hubs: South America, Africa and Southeast Asia. So far, Ho Chi Minh City, formerly known as Saigon, has been recognized as the ornamental fish centre of Vietnam. The City has a strong position not only as Vietnam's economic hub and commercial centre but also because of its favorable tropical climate, abundance of river and canal systems, and a history of ornamental fish production.

Before 1975 ornamental fish production in Ho Chi Minh City played an important role in the Southeast Asia Region. Between 1967-1974, ornamental fish production reached its development peak with a variety of import-export activities. After re-unification, however, ornamental fish production largely disappeared from the city and the profession has only recently been resurrected with around 300 households involved in fish breeding, nursing and growing-out, and more than 100 ornamental fish shops within the city. Currently annual ornamental fish production is more than 20 million fish, in which 20-25% of production is exported. From 2001 to June 2003, HCM City exported 10 million ornamental fish with a turnover of US\$10 million, accounting for 3 per cent of total export turnover of the municipal aquatic products during the period. Ho Chi Minh City's ornamental fish industry became famous when it recently won 7 out of a total 13 prizes in the 2005 Aquarama ornamental fish exhibition in Singapore. Potential for Vietnamese ornamental fish development therefore is huge with a lot of good quality breeding fish and reasonable prices.

However, in order to become a more significant player in the ornamental fish business, Vietnam in general and Ho Chi Minh City in particular must overcome several problems. Until now, ornamental fish production has not been investigated much in Vietnam. Vietnamese ornamental fish are bred without good planning, on a small and separated scale, while its export volume is well below its potential. Questions have arisen from people concerned with this culture system, e.g., what are the potentials and constraints of this system in terms of market, development policy and technical-economic aspects, and whether it can be developed rapidly in Vietnam. Therefore, it is hoped that this study of the current state and potential of ornamental fish production will provide useful information for development planning of this industry in Vietnam.

II. RESEARCH METHODOLOGY

2.1 Secondary data collection and key informant interviews

Before beginning the study, secondary information sources had been reviewed in order to highlight particular issues and gaps in knowledge. The design of field surveys and Participatory Community Appraisal meetings were partially formulated using this information (as well as identifying what information was missing) from secondary data sources. Visits were made to Ho Chi Minh City Department for Agriculture and Rural Development (DARD), and Extension Centres of the city and main districts such as Districts 8, 12, Binh Chanh, and Go Vap. Secondary data on import-export activities was

also collected. The experienced farmers and traders were also visited and informally interviewed as key informants to review the current state of ornamental fish production and business in Ho Chi Minh City.

2.2 Participatory Community Appraisal (PCA) in two ornamental fish production areas of Ho Chi Minh City

Two Participatory Community Appraisal (PCA) meetings were carried out in District 8 and Go Vap, which are the traditional and new ornamental fish production areas of Ho Chi Minh City, respectively. The main purpose of the PCA meetings was for mutual learning experiences for both the researchers and the farmers/producers. Farmers were encouraged and allowed to express their own thoughts, without imposing views from outsiders' ideas. The PCA meetings generated interesting information from the villages such as the history of ornamental fish production, local resources maps, production timelines, culture seasons, daily activities and problems ranking.

In District 8, the initial step of the PCA was carried out on the 10th August 2005, by visiting the head of Ward 15 to introduce the objectives of the project, PCA activities and the people who would be involved. The head of the ward supplied information on current agricultural production systems and social-economic conditions, etc. The head of the ward was also an important key informant to select farmers for the upcoming PCA meeting. The visits to key informant ornamental fish farmers were carried out between 11-12th August 2005 to overview the current situation of the production systems, then the invitations of ornamental fish farmers to the PCAs were carried out by the head of the ward between 15-17th August 2005. The PCA meeting in District 8 was organized on the 19th August 2005. There were 19 ornamental fish farmers who participated in the meeting, of which two were woman. The age of the PCA participants was in the range of 32 - 60 years old. Two groups of informants were set up according to the two main production areas in the ward. To ensure accuracy of the data gathered, feedbacking and sharing of information with the farmers was carried out before finalizing the data.

In Go Vap, the initial step of the PCA was carried out on the 13th August 2005, by visiting the head of Ward 17 to introduce the objectives of the project and PCA activities. The visits to key informant ornamental fish farmers were carried out between 18-19th August 2005 to overview the current situations of the production systems. The invitations of ornamental fish farmers were carried out by the head of the ward between 20th-21st August 2005. The PCA meeting in Go Vap District was organized on the 24th Aug 2005. There were 20 ornamental fish farmers who participated in this meeting, of which two were woman. The age of the PCA participants was in the range between 21 - 55 years-old. Two groups of informants were set up according to two main production areas in the ward. Validation of data was also made by group discussion and their feedback.

2.3 Primary data collection

Two more formal surveys (using questionnaires) of ornamental fish markets and distribution channels, and ornamental fish production were also carried out to investigate the current activities of the ornamental fish industry in Ho Chi Minh City. These surveys were based on prepared questionnaires and the informants were selected by samples representative for the main production and market areas. The survey of ornamental fish markets was carried out on 36 ornamental fish shops within Ho Chi Minh City between

August – October 2005. The shops investigated were distributed in the peri-urban Districts 3, 5, Go Vap, Tan Binh, Binh Thanh, Phu Nhuan and Thu Duc. The survey of ornamental fish production was carried out on 40 ornamental fish farmers within Ho Chi Minh City between October to December 2005. The main ornamental fish production areas of Ho Chi Minh City were investigated, including Districts 8, 12, 6, 9, Binh Chanh, Hoc Mon, Thu Duc, Go Vap and Binh Thanh.

2.4 Final State of the System meeting

A final State of the System meeting had been organized on 5th May 2006 in Ho Chi Minh City. It had around 50 participants – all key stakeholders, including managers, researchers, traders and farmers. The purpose of the meeting was to verify the collected data as well as to analyze the strengths, weaknesses, opportunities and threats of current ornamental fish production in the city.

III. PARTICIPATORY COMMUNITY APPRAISAL (PCA) IN DISTRICT 8 AND GO VAP

3.1 General information of investigated areas

General information of District 8 and Go Vap District was reviewed through two PCA meetings (Figure 1). So far, District 8 has been known as the original area of ornamental fish production in Ho Chi Minh City, with more than 50 years of history and development. District 8 is located near to the city centre, with high level of urbanization, especially in wards 4,5,6,7 and 16. Under urbanization pressure, agricultural production activities and cultivated areas have been decreasing steadily. The agricultural area of District 8 reduced from 577, 500, 480 and 82 ha in 1996, 2000, 2001 and 2005, respectively. Aquacultural area also reduced from 255, 190, 190 and 60 ha in 1996, 2000, 2001 and 2005, respectively (Peoples Committee of District 8, 2005). In Ward 15 of District 8, before 1995, the main agricultural production systems of local farmers were vegetables and ornamental fish farming. After 2003, due to flooding problems for agricultural production, more farmers moved to ornamental fish production. There are currently around 20 households involved in ornamental fish production in the ward, accounting for 66.7% ornamental fish households in District 8.



Figure 1 Two Participatory Community Assessment (PCA) meetings in Ward 15 of District 8 (left) and Ward 17 of Go Vap District

Different from District 8, Go Vap District is a new ornamental fish production area. Located near to the city centre, Go Vap District also has high levels of urbanization in recent years. So far, Go Vap is more famous as an ornamental tree growing centre. Since the agricultural farming area here is increasingly limited, ornamental fish activities are growing rapidly. Most of the ornamental fish farmers here have less than 5 years of experience. Although Go Vap has abundant surrounding rivers and canals, such as Vam Thuat, Ben Cat, Truong Day Rivers and Cho Moi, Xep Sau Canals, they are currently in seriously polluted conditions.

3.2 History of ornamental fish production

The history of ornamental fish production and its timelines in the investigated areas were reviewed through the PCA meetings (Figure 2). In terms of historical development, ornamental fish production had been started early in Saigon since the 1940s. At that time, an ornamental fish market had also been set up in Luu Xuan Tin Street, the place where there is currently the biggest Vietnamese ornamental fish wholesale market. Import – export activities have developed since the 1960s and the previous development peak of ornamental fish production was between 1967-1974. District 8 was the original place of ornamental fish production in Saigon before 1975. After reunification in 1975, however, ornamental fish breeding largely disappeared from the city and the profession has only recently been resurrected since the 1990s. Between 1975-1990, ornamental fish production along with the popular edible aquatic plant water spinach (*Ipomoea aquatica*) cultivation was being developed in District 8. However, in the early 1990s, besides the local economic development, flooding problems reduced water spinach production in District 8, whilst as a consequence increasing the number of ornamental fish producers. Nowadays ornamental fish production is still popular in its original place of District 8, however, it has also extended into other peri-urban areas of the city, such as Go Vap, Binh Chanh, Cu Chi, Hoc Mon, District 12, etc. An example of Go Vap District, ornamental fish production has just been started since 1986. Before 1986, the main activities in Ward 17 of Go Vap District were ornamental tree production, aquatic vegetation, vegetables, livestock (dairy cows, and pigs) and doing business. Ornamental fish production has been developed on a larger commercial scale in Go Vap since 2000, with most of the ornamental fish producers having no previous experience with fish culture. Nowadays, most ornamental fish producers in Go Vap are newcomers in the last 5-10 years. Between 2000-2005, 15 main ornamental fish farms in Go Vap produced 1 million fingerlings per year, value 0.34 billion VND (21,400 US\$/year).

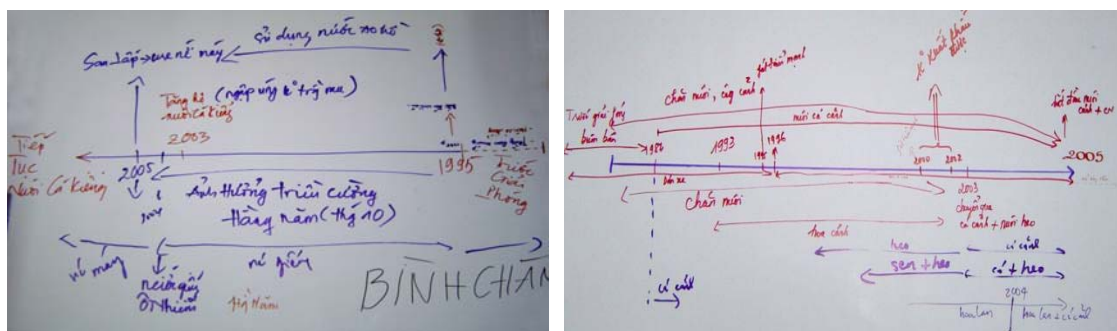


Figure 2 Timelines of ornamental fish production and other activities in District 8 (left) and Go Vap District from the PCA

3.3 Resources maps of Ward 15, District 8 and Ward 17, Go Vap District

Resource maps (inputs/outputs) were drawn by informants to overview all local resources supporting ornamental fish production in two areas (Figure 3). Although both District 8 and Go Vap District are peri-urban areas of Ho Chi Minh City, they are both fairly well developed in terms of urbanization. In District 8, Ward 15 is a small island surrounded by canal systems such as Kinh Doi, Tau Hu and Song Ngang. Its main streets are constructed parallel with the canals, such as Luu Huu Phuoc, Binh Duc, Mai Hac De and Binh Cat. Therefore, this area has a flooding season that comes from the surrounding canals every October. Ornamental fish production was the main agricultural activity in the area, while water spinach (morning glory) cultivation was also practiced from time to time. Due to the less polluted condition from surrounding canals, the main water source for ornamental fish production was from these canals, followed by locally available tap and well waters. However, tap and well waters were also used for other daily domestic activities. The main cultured species are *Poecilia* sp., *Betta splendens* and *Cichlidae* spp. This ornamental fish production area was also surrounded by densely populated areas, thus its infrastructure was in a good condition and business activity was also developed. Therefore, the ornamental fish distribution channels were rather good, with the main output markets being: District 5 (Luu Xuan Tin Market) and District 3 and District 6. Besides, the fish can also be sold to other provinces such as Tien Giang and Dong Nai.

In Go Vap District, Ward 17 is surrounded by Vam Thuat River and Xep Sau Canal. Ornamental tree and fish production were the main agricultural activities in the area. Although this area is surrounded by river and canal, these water sources have been polluted due to a high level of urbanization. Therefore, tap and well waters were used for daily activities as well as ornamental fish production. Main cultured species are guppy, discus, fighting fish (*Betta splendens*), mollies, swordtail and *Cichlidae* sp. Beside ornamental fish production, other popular agricultural activities in this area included floriculture, vegetable cultivation and livestock. Similar to District 8, Go Vap District also had good local infrastructure and business development conditions. The main output markets for the ornamental fish in this area were Luu Xuan Tin Market (Dist. 5), Nguyen Thong Market (Dist. 3), Dist. 12 and other retailers.



Figure 3 Resource maps of Ward 15, District 8 (left) and Ward 17, Go Vap District

3.4 Cultured season of ornamental fish production

In District 8, ornamental fish production is practiced all year-round. The flooding season is from October to March. The main culture season for fighting fish (*Betta splendens*) was from May to December, and for guppies (*Poecilia sp.*) was from October to March. The rest of the time was for fry production. Fish diseases usually occurred in March and October (for fighting fish) and in May, June and August (for guppies).

In Go Vap District, ornamental fish production was also practiced year-round. Another main activity was ornamental tree planting, with its peak season between October - February, thus it may be affect ornamental fish production. During such periods of time, ornamental fish disease broke out, probably due to time limitation to take care of both production systems. Besides ornamental fish and trees, planting of vegetables and dairy cow farming were also practiced as year-round activities in this area.

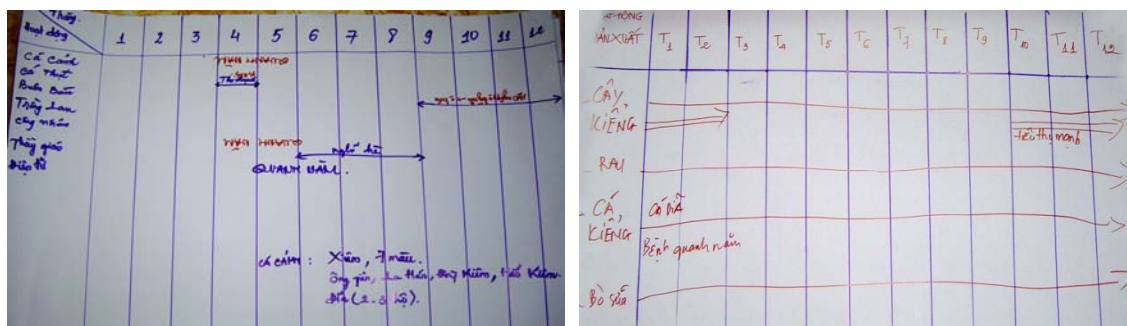


Figure 4 Culture seasons of ornamental fish in District 8 (left) and Go Vap District

3.5 Daily activities of ornamental fish farmers

Daily activities of ornamental fish farmers in District 8 (Figure 5) included mainly tasks related to ornamental fish production and marketing. They started their working day as early as at 06:00-07:00 h to observe and take care of the fish. Then they went to buy the feeds for their fish between 07:00-08:00 h. During 07:00-09:00 h, they fed the fish and cleaned their aquarium tanks. They also fed their fish one more time in the afternoon between 16:00-17:00 h. The fish were normally sold between 06:00-08:00 h and 16:00-17:00 h. The rest of the time was spent for other work such as marketing surveys and other supplementary work. Some farmers were also natural fish feed collectors and their working time was dependent on the tide schedule of the rivers and canals.

Different from District 8, the ornamental fish farmers in Go Vap District had more diversification in their working activities and their working day time was shared for many different activities. For ornamental fish activities, they fed the fish two times per day, at 07:00 h and 14:00 h. The aquarium tanks were cleaned between 17:00-18:00 h. Other daily activities were ornamental tree and vegetable planting and livestock. Dairy cows were taken care of between 04:00-08:00 h and 14:00-18:00 h, and spending time for ornamental

trees was between 07:00-10:00 h and 15:00-18:00 h. Vegetable planting occupied the rest of the time, during the day.

In terms of gender, from our PCA studies and key informant interviews ornamental fish production appeared to be dominated by men. Although there were four women who participated in the PCA meetings, they were small-scale producers and three of them shared the work with other men in the family i.e. as a household activity. PCA participants also stated that the memberships of ornamental fish and tree clubs in the city were also occupied by a majority the men, whilst women are more involved in important roles in the marketing and retail network at ornamental fish shops.

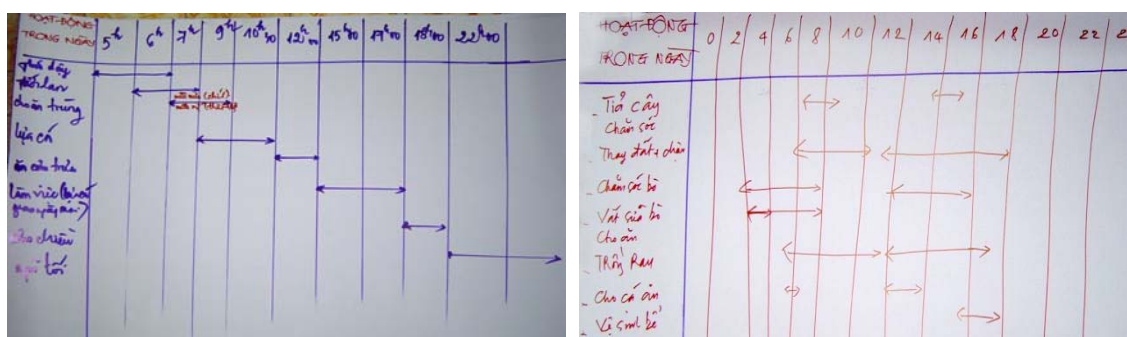


Figure 5 Daily activities of ornamental fish farmers in District 8 (left) and Go Vap District from the PCA

3.6 Problems and constraints of ornamental fish production

Problems and constraints of ornamental fish production were investigated through two Participatory Community Assessment meetings in District 8 and Go Vap, Ho Chi Minh City (Table 1). In the traditional production area of District 8, the main problems were lack of accessibility to capital, lack in new production techniques and fish seed quality, making up 51.4, 22.6 and 15.9% respectively of the participants responses. On the other hand, in the new culture area of Go Vap, the main problems were lack in new production techniques, the sale of the product’s output, lack of capital and the difficulty in natural food production, making up 33.1, 24.6, 18.3 and 14.1% investigated ideas. In general, most problems of product’s sale in Go Vap were related to new producers that lacked experience and information of ornamental fish distribution channels in the city.

Table 1 Problems ranking in two Participatory Community Assessment meetings in District 8 and Go Vap, Ho Chi Minh City

Problems	Ward 15, District 8		Ward 17, Go Vap	
	No. ideas	%	No. ideas	%
Lack of capital	152	51.4	26	18.3
Lack in new production techniques	67	22.6	47	33.1
Fish seed quality	47	15.9	14	9.9
Water source	13	4.4	-	-
Selling price	11	3.7	-	-

Disease	6	2.0	-	-
Consumption of the product	-	-	35	24.6
Difficult in natural food production	-	-	20	14.1

IV. THE ORNAMENTAL FISH MARKETS IN HO CHI MINH CITY

4.1 Ornamental fish markets in Ho Chi Minh City

It is estimated that there are more than 100 ornamental fish shops operating within Ho Chi Minh City. The biggest wholesale market for ornamental fish in Ho Chi Minh City is located on Luu Xuan Tin Street in District 5, namely Luu Xuan Tin Ornamental Fish Market. The second largest ornamental fish one is located on Nguyen Thong Street of District 3, namely Nguyen Thong Ornamental Fish Market (Figure 6).

Luu Xuan Tin Market has been set up since the 1940s. Nowadays, this wholesale market has 23 ornamental fish shops, in which 6 shops sell accessories for aquarium decoration and equipment. On the other hand, Nguyen Thong is a well-known market on for accessories for ornamental fish with around 10 accessories shops and other 8 retailers and wholesalers ornamental fish shops. Besides the two above well-known ornamental fish markets, a wide distribution of ornamental fish shops within the city have been set up. Moreover, a large number of mobile ornamental fish traders on motorbikes are developing rapidly to ensure wide distribution of ornamental fish to the public.



Figure 6 Nguyen Thong (left) and Luu Xuan Tin (right) Ornamental Fish Market in Ho Chi Minh City

4.2 Statistical data on import-export activity of ornamental fish industry

4.2.1 Import activity

In Vietnam, ornamental fish are imported mainly from Taiwan, Thailand, Hong Kong, Singapore, Malaysia, China and the Philippines. According to the HCMC Department of Agriculture and Rural Development (DARD), there were 57 species imported between 2000-2004, making up a quantity of 18,839, 14,200, 59,181, 66,884 and 48,963 fish imported into Vietnam in 2000, 2001, 2002, 2003 and 2004, respectively. In the first nine months of 2005, 32 ornamental fish species were imported, including 43,929 fish. The main imported species are shown in Table 2. It is important to state that most of the species are imported in small quantities of less than 1,000 fish per year. Only 15 species (26.3%) are imported with a large quantity of more than 1,000 fish per year.

4.2.2 Export activity

From 2001 to June 2003, HCM City exported 10 million ornamental fish with a turnover of US\$10 million, accounting for 3 per cent of total export turnover of the municipal aqua products at the period. There were 3,372,000 and 2,125,000 fish to be exported in 2004 and the first nine months of 2005, respectively. In general, export activity has been developed rapidly since 2000 but this growth is still considered to be well under its potential. Beside the exported species that are bred successfully in Vietnam, wild ornamental fish are also exported in large amount such as *Tetraodon sp.*, *Kryptopterus sp.* and *Mastacembellus sp.*, etc (Table 3). Marine aquatic animals are also exported for aquarium displays such as doctor shrimp, soft coral and other fish.

Table 2 The main imported ornamental fish species in Ho Chi Minh City (2001-2005)

No	VNese name	Scientific name	Source**	Years / Quantity (fish)				
				2001	2002	2003	2004	2005*
1	Long ga	<i>Apteronotus albions</i>	TW, HK	1000	3050	2730	3410	530
2	Chuot 3 soc	<i>Botia macra cantha</i>	TW	450	-	4100	250	-
3	Hong ket	<i>Cichlasoma citrinellum</i>	TW	1670	1950	4911	1640	1152
4	Chuot trang	<i>Corydoras aeneus</i>	TW	1300	15830	5705	400	2716
5	Hoang tu Phi Chau	<i>Labeotropheus caeruleus</i>	TW	1370	3350	6885	1105	100
6	Chim	<i>Monodactylus sebae</i>	TW	1550	2300	1850	4590	150
7	Ngan long	<i>Osteoglosun ferreirai</i>	TW	2800	-	2620	4750	1680
8	Neon	<i>Paracheirodon innesi</i>	TW	350	3700	1400	8640	6720
9	Aly	<i>Sciaenochromis ahli</i>	TW	1700	5800	3650	2410	970
10	Guppy	<i>Poecilia reticulata</i>	TL	-	-	-	-	12600
11	La han	<i>Cichlasoma bifasciatum</i>	ML, TL	-	100	-	340	6218
12	Da beo trang	<i>Balantiochelus melanopterus</i>	TL	-	-	495	2455	1440
13	Ve sinh trang	<i>Gyrinocheilus aymonieri</i>	TL			1700	1900	950
14	Ve sinh vang	<i>Epalzeorhynchus frenatus</i>	TL			1330	1454	1200
15	Chep	<i>Cyprinus carpio</i>	TW, SP			1340	400	1509

Sources: HCMC Department of Agriculture and Rural Development (DARD)

* in 2005, the data is updated until September 2005

** Abbreviation: TW (Taiwan), TL (Thailand), ML (Malaysia), SP (Singapore)

Table 3 Main exported ornamental fish species in Ho Chi Minh City

No	Vietnamese name	Scientific name	In 2004		Jan – Sep 2005	
			Fish	%	Fish	%
1	Chep Nhat	<i>Cyprinus carpio</i>	223,883	6.64	243,154	11.44
2	Dia	<i>Symphysodon sp.</i>	67,772	2.01	54,412	2.56
3	Vang	<i>Carrasius auratus</i>	99,129	2.94	45,060	2.12
4	Ong tien	<i>Plerophyllum scalare</i>	139,253	4.13	93,521	4.4
5	Bay mau	<i>Poecilia reticulatus</i>	443,383	13.15	321,371	15.12
6	Xiem	<i>Betta splendens</i>	322,338	9.56	269,935	12.7
7	Noc	<i>Tetraodon sp.</i>	826,076	24.5	232,739	10.95
8	Tren	<i>Kryptopterus sp.</i>	153,077	4.54	115,838	5.45
10	Chach	<i>Mastacembellus sp.</i>	78,899	2.34	157,497	7.41
11	Hoa Lan	<i>Xyphophorus maculatus</i>	79,910	2.37	87,569	4.12
12	Hong kim	<i>Xyphophorus helleri</i>	74,515	2.21	45,485	2.14
TOTAL			3,372,000	100	2,125,000	100

Sources: HCMC Department of Agriculture and Rural Development (DARD)

V. THE SURVEY OF ORNAMENTAL FISH SHOPS IN HCM CITY

5.1 General information of investigated ornamental fish shops

The survey was carried out using questionnaires on 36 ornamental fish shops within Ho Chi Minh City between August – October 2005. The shops surveyed were distributed in Districts 3, 5, Go Vap, Tan Binh, Binh Thanh, Phu Nhuan and Thu Duc (Figure 7). Most of these shops have retail trade even though they are wholesale traders. The investigated shops included 15 retail shops (Group A) and 21 wholesale combining with retail trade (Group B) (Table 4). While most of retail shops have more than 5 years experience in their marketing (73.3%), wholesale shops that have less than 5 years experience in their marketing accounted for 61.9% (Table 5). It indicated that most of traditional shops are retailers, while many newcomers are wholesale shops with high capital and investment. All of the investigated shops have no previous experience working with fish culture.

Table 4 Categories of marketing methods for various ornamental fish shops

Category	Marketing method	Number of shops	%
A	Retail trade only	15	41.7
B	To sell both wholesale and retail	21	58.3
C	Wholesale trade only	0	0
Total		36	

Table 5 Years of experience in marketing of investigated shops

Years of experience	Group A Retail		Group B Wholesale/retail	
	No. of shops	%	No. of shops	%
> 10	5	33.3	3	14.3
5-10	6	40.0	5	23.8



Figure 7 Investigated ornamental fish shops in Ho Chi Minh City

General information of the labour force and operating time of various ornamental fish shops are presented in Table 6. The average number of people working in each shop is 3, in which retailers and wholesalers have 2 and 3 staff for each shop, respectively. This indicated a relatively small scale of traders.

In terms of gender, the percentages of women staff in the two groups were rather high (59.5% in Group A and 46.2% in Group B), indicating how relatively important women are in ornamental fish trading in HCMC. However, the percentage of women owners of the shops in Group B - wholesale/retail (52.4%) was higher than in Group A – just retailers (46.7%), indicating that women are fairly equally involved in the business of wholesaling of ornamental fish. It is also important to point out that there was a trend to employ women staff in retailing shops (68.2%) while wholesaling shops generally required male staff to carry out heavier work (lifting boxes/tanks etc) of wholesalers.

The average age of the staff in ornamental fish shops was rather young in both two groups, around 33-34 age years old. The operating time is also similar in both of the two groups, in which most of shops operated 7 days per week and 12-13 hours per day.

Table 6 General information of labour force and operating time of shops

Items	Group A	Group B	General
	Retailers	Wholesalers/retailers	
Average no. of staff working per shop	2.5	3.3	3
Average age of the staff	33	34	33
Percentage of women (both employed and owners) (%)	59.5	46.2	51.0
Owners of the shops:% of women	46.7	52.4	50.0
The percentage of women employed as staff (%)	68.2	39.6	48.6
Daily operating time (hrs)	12	13	12
Weekly operating time (days)	7	7	7

5.2 Business types of ornamental fish shops

A special characteristic of ornamental fish shops is the variety aspect of its business types. Besides ornamental fish, surveyed shops in Ho Chi Minh City are also involved in selling of fish feeds, aquatic plants, accessories and even birds or ornamental trees (Table 7). As the main target of this investigation is freshwater ornamental fish shops, 100% of shops are involved in trade with the fish. After the fish, fish feeds are also sold in most of these shops. Pellet feed is sold widely in both two groups of shops, making up 93.3 and 95.2 % in Group A and Group B, respectively. Natural food (tubifex, moina, small fish etc.) is sold a little bit less, making up 73.3 and 71.4% in Groups A and Group B, respectively. The percentage of shops trading with aquatic plants is rather similar to those which trade in natural food, probably due to their similar storage conditions and business types. Although aquariums play an important role in the ornamental fish business, the percentage of shops that are selling aquariums, accessories and design is rather low, making up 46.7 - 53.3 and 66.7 – 71.4 % in Groups A and Group B, respectively. This is simply due to a large number of other aquarium shops which have been set up to sell only aquariums, accessories and design services. Beside the fish, birds and ornamental trees are also traded in some ornamental fish shops in Ho Chi Minh City.

Table 7 Business types of various ornamental fish shops in Ho Chi Minh City

Items	Group A Retailers		Group B Wholesalers/retailers	
	No. of shops	%	No. of shops	%
Freshwater ornamental fish	15	100	21	100
Natural food	11	73.3	15	71.4
Pellet feed	14	93.3	20	95.2
Aquatic plants	11	73.3	18	85.7
Aquariums and accessories	8	53.3	14	66.7
Aquarium design	7	46.7	15	71.4
Birds / Ornamental trees	1	6.7	1	4.8

5.3 Main fish species to be sold in ornamental fish shops in Ho Chi Minh City

5.3.1 Ornamental fish species successfully bred domestically

The main ornamental fish species successfully bred domestically that were sold at the surveyed shops are presented in Table 8. Goldfish and koi carp are the most common fish to be sold (95-100%) at both two groups of shops. Other common fish to be sold (>80%) are guppies and swordtail in Group A, and guppies, fighting fish, discus, mollies and oscars in Group B. The species that are sold from 40 to 80% of surveyed shops in Group A were oscars, fighting, angel, mollies, discus and Sumatra barb. The species that are sold from 40 to 80% of surveyed shops in Group B were angel, swordtail and Sumatra barb. The other species that are sold from 10 to 30% in both investigated groups were gourami, *Pleco hypostomus* and *Cichlasoma citrinellum*.

Table 8 Main ornamental fish species successfully bred domestically in and around HCMC.

Fish species			Group A Retail		Group B Wholesale/retail	
Scientific name	Common name	Vietnamese name	No.	%	No.	%
<i>Symphysodon sp.</i>	Discus	Dia	7	46.7	18	85.7
<i>Cyprinus carpio</i>	Koi carp	Chep Nhat	15	100	20	95.2
<i>Carassius auratus</i>	Goldfish	Vang	15	100	21	100
<i>Pterophyllum scalare</i>	Angel	Ong tien	9	60.0	16	76.2
<i>Astronotus ocellatus</i>	Oscar	Tai tuong Phi Châu	11	73.3	17	80.9
<i>Betta splendens</i>	Fighting	Xiem	11	73.3	19	90.5
<i>Poecilia reticulata</i>	Guppy	Bay mau	15	100	19	90.5
<i>Poecilia latipinna</i>	Mollies	Binh tich	10	66.7	18	85.7
<i>Xyphophorus helleri</i>	Swordtail	Hong kim/ hac kim	14	93.3	15	71.4
<i>Puntius tetrazona</i>	Sumatra barb	Tu van	10	66.7	9	42.9
<i>Colisa sp.</i>	Gourami	Tai tuong	3	20.0	1	4.8
<i>Hypostomus sp.</i>	Pleco hypostomus	Ty ba	4	26.7	6	28.6
<i>Cichlasoma citrinellum</i>	Golden cichlid	Hoang kim	2	13.3	5	23.8

5.3.2 Wild native ornamental fish species to be sold in surveyed shops

The trend to stock wild native ornamental fish in aquariums has been increasing significantly in recent years. There are a variety of wild native species to be selected for aquarium displays, ranging from especially valuable and rare species to even food fish such as barb, gourami and pangasius. The main wild native ornamental fish species to be sold in investigated shops are presented in Table 9. Unlike species successfully bred domestically, not more than 50% of any wild native species were sold from the surveyed shops. The most common wild native species that were sold were *Tetraodon fluviatilis*, making up 42.9-46.7% followed by *Toxotes chatareus* (27-33%), *Chilata ornate* (24-33%), *Pangasius sutchi* (24-27%), *Datnioides quadrifasciata* (13-19%) and *Monodactylus rebae* (13-19%). *Bostia sp.*, *Kryptopterus sp.*, *Scatophagus agus*, *Trichogaster sp.* and *Mastacembelus sp.* were also sold from less than 10% of the surveyed shops.

Table 9 Main wild native ornamental fish species to be sold at surveyed shops

Scientific name	Vietnamese name	Group A Retail		Group B Wholesale/retail	
		No.	%	No.	%
<i>Datnioides quadrifasciata</i>	Thai ho	2	13.3	4	19.1
<i>Scatophagus agus</i>	Nau	1	6.7	1	4.8
<i>Toxotes chatareus</i>	Mang ro	5	33.3	6	28.6
<i>Tetraodon fluviatilis</i>	Noc da beo	7	46.7	9	42.9
<i>Pangasius sutchi</i>	Map nuoc ngot	4	26.7	5	23.8
<i>Mastacembelus sp.</i>	Chach	0	0	1	4.8
<i>Trichogaster sp.</i>	Sac	1	6.7	0	0
<i>Kryptopterus sp.</i>	Tren	1	6.7	2	9.5
<i>Bostia sp.</i>	Heo	1	6.7	1	4.8
<i>Monodactylus rebae</i>	Chim bon soc	2	13.3	4	19.1
<i>Chilata ornata</i>	Nang hai	5	33.3	5	23.8

5.3.3 Imported ornamental fish species

Every year, Vietnam has imported various ornamental fish species from Taiwan, Thailand, Hong Kong and Singapore, etc. The main imported ornamental fish species to be sold at investigated shops are presented in Table 10. Flower horn (*Cichlidae sp.*) was the most common species to be sold at 93-100% investigated shops. It is important to state that flower horn can also be bred domestically, but the most valuable higher quality fish are from imported sources. Other imported ornamental fish were usually sold at less than 50% of the investigated shops. Dragon fish (*Osteoglossum sp.* and *Scleropage formosus*) and ahli (*Sciaenochromis ahli*) were the next common imported fish to be sold at 30-50% of the investigated shops. *Phractocephalus hemiliopterus*, *Apteronotus albifrons*, *Cichlasoma citrinellum*, *Paracheirodon innesi* and *Corydoras aeneus* were also sold at less than 15% of surveyed shops.

Table 10 Main imported ornamental fish species to be sold at investigated shops

Scientific name	Vietnamese name	Group A Retail		Group B Wholesale/retail	
		No.	%	No.	%
<i>Osteoglossum bicirrhosum</i>	Ngan long	6	40.0	11	52.4
<i>Osteoglossum ferrerae</i>	Hac long	7	46.7	12	57.1
<i>Scleropage formosus</i>	Kim long	5	33.3	10	47.6
<i>Cichlidae sp.</i>	La han	14	93.3	21	100
<i>Phractocephalus hemiliopterus</i>	Hong vi mo vit	1	6.7	3	14.3
<i>Sciaenochromis ahli</i>	Ali	5	33.3	9	42.9
<i>Apteronotus albifrons</i>	Long ga	1	6.7	3	14.3
<i>Cichlasoma citrinellum</i>	Hong ket	1	6.7	2	9.5

<i>Paracheirodon innesi</i>	Neon	2	13.3	3	14.3
<i>Corydoras aeneus</i>	Chuot trang	0	0	1	4.8

5.3.4 Main ornamental fish species to be sold in terms of quantity

The main ornamental fish species to be sold in terms of quantity are presented in Table 11. Questions have arisen for investigated shops regarding the top four best selling species. In terms of each unit shop, flower horn was the best selling fish at 10 shops, followed by koi carp and guppy at 7 shops. However, in general, the best selling species in terms of quantity were koi carp, guppy, fighting fish, flower horn, golden cichlid and goldfish, making up 152, 75, 45, 33, 32 and 17 fish/day/shop, respectively (Figure 8).

Table 11 Main ornamental fish species to be sold in terms of quantity

Top four species (order in quantity)		Flower horn	Koi	Guppy	Gold	Fighting	Golden cichlid	Others*
Species	No shops	10	7	7	1	4	6	1
1	Fish/day	54	371	86	10	86	27	7
Species	No shops	7	8	3	5	6	5	1
2	Fish/day	24	145	68	21	55	75	10
Species	No shops	3	9	7	8	2	4	2
3	Fish/day	14	97	54	19	68	18	14
Species	No shops	5	7	3	4	7	7	2
4	Fish/day	17	12	107	10	6	13	5
In	No shops	25	31	20	18	19	22	6
general	%	69.4	86.1	55.6	50.0	52.8	61.1	16.7
	Fish/day	33	152	75	17	45	32	9

* Other fish are dragon, discus, angel, mollies and gourami.

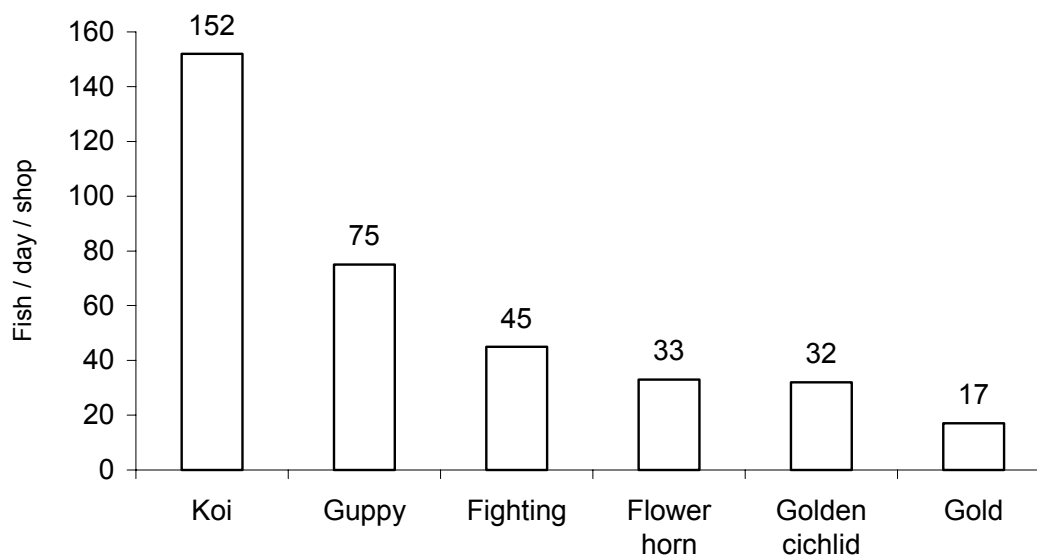


Figure 8 Best selling ornamental fish species in terms of quantity (wholesalers and retailers)

5.4 The distribution and marketing network of ornamental fish in Ho Chi Minh City

5.4.1 Supplying areas of ornamental fish in Ho Chi Minh City

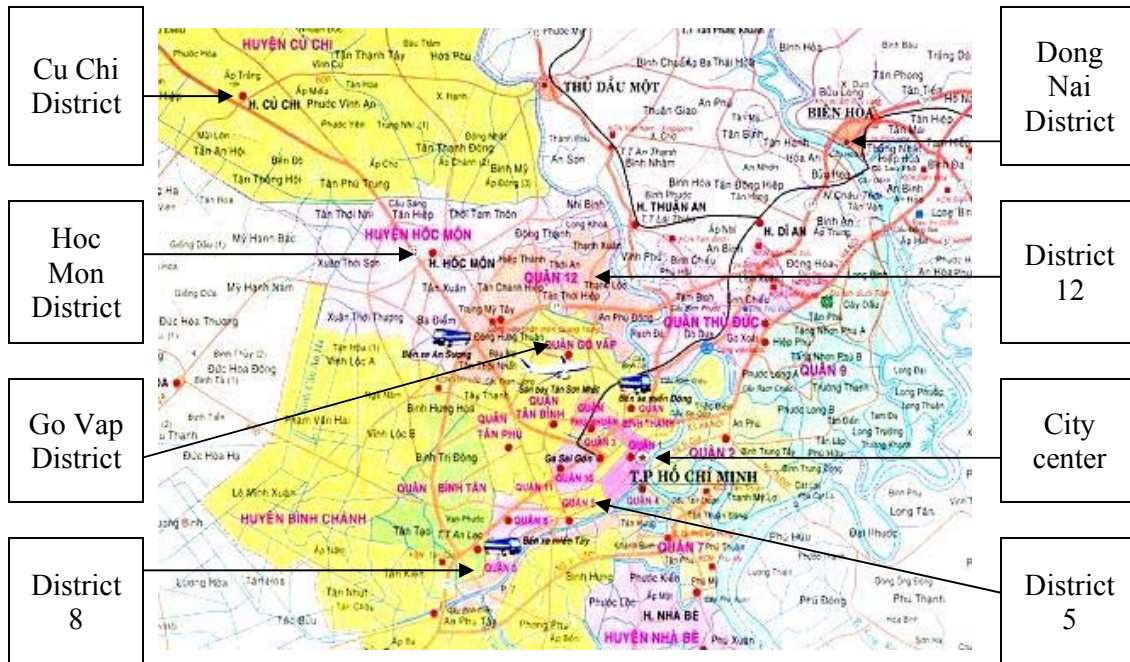


Figure 9 Map of main ornamental fish production areas of Ho Chi Minh City

The main ornamental fish supplying areas for Ho Chi Minh City's markets were District 5, 8, 12, Go Vap, Hoc Mon, Cu Chi, Dong Nai Province and the Mekong Delta (Table 12 and Figure 9). So far District 5 has been recognized as the biggest wholesalers with its Luu Xuan Tin wholesale market, where 77.8% shops take their fish directly. Other areas which are the main ornamental fish producers of Ho Chi Minh City include Districts 8, 12, Go Vap, Hoc Mon, etc. while the Mekong Delta is the main supplier of wild native ornamental fish. Nowadays, 11-33% shops can buy their fish directly from producers in Districts 8, 12, Go Vap, Hoc Mon, Cu Chi and Dong Nai, etc. However, there were still 25-75% of the shops who buy fish from such supplying areas but through middle men. This indicated an important role of the middlemen in the distribution channels of ornamental fish in Ho Chi Minh City, especially for wild native fish and imported fish.

Table 12 Supplying areas of ornamental fish to be sold at investigated shops

Supplying areas	No. of shops the fish taken to directly	%	No. of shops the fish taken indirectly	%
District 5	28	77.8	28	77.8
District 8	12	33.3	27	75.0
District 12	11	30.6	19	52.8
Go Vap District	10	27.8	12	33.3
Hoc Mon District	9	25.0	14	38.9
Cu Chi District	5	13.9	9	25.0
Other districts	6	16.7	6	16.7
Dong Nai Province	4	11.1	11	30.6
Mekong Delta	3	8.3	21	58.3
Importer	3	8.3	35	97.2

5.4.2 Source of various ornamental fish species

The source of different ornamental fish species to be sold at investigated shops is presented in Table 13. As a main wholesaler, District 5 plays an important role in supplying most of the ornamental fish species. Other areas that supply more than 6 species from each area are Districts 8, 12, Go Vap and Mekong Delta. Although discus and koi carp are recognized as common species in the market, however they can be produced in some specific areas such as Districts 8, 12 and Go Vap.

Table 13 Sources of various ornamental fish species to be sold at surveyed shops (wholesalers and retailers)

Species	Supplying areas						
	Dist. 5	Dist. 8	Dist.12	Go Vap	Hoc Mon	Dong Nai	Mekong
Discus	x	x		x			
Koi carp	x		x	x		x	
Guppy	x	x	x		x	x	x
Goldfish	x		x		x	x	x
Fighting fish	x	x	x	x			x
Angel	x	x	x	x			x
Oscar	x	x		x			x
Swordtail	x	x	x	x			x
Sumatra barb	x				x		
<i>Pleco hypostomus</i>	x					x	x
Mollies	x			x			
Gourami	x				x		
Wild fish						x	x
Imported	x						

Besides wild fish, the Mekong Delta also contributes seven other cultured species and thus has prominent development potential for farming ornamentals in the future due to

its abundant availability of less polluted water, land, and a labour force with skills and expertise already involved in the culture of food fish. The weak points of the Mekong Delta are that it is further away from Ho Chi Minh City and lack of good quality breeding fish.

5.4.3 Ornamental fish suppliers for investigated shops

Ornamental fish suppliers for investigated shops are presented in Table 14. There were 90.5% shops in Group B (wholesalers/retailers) and 73.3% shops in Group A (just retailers) that buy the fish directly from producers. Wild fish collectors however were difficult to trade directly with shops, making up only 6.7 and 9.5% investigated shops. Middlemen that were trading with shops were 80 and 66.7% in Groups A and B, respectively. The middlemen thus are important connectors between the shops and collectors, importers and producers. Besides, some wholesalers and retailers can supply their own shops with fish from their own farms. Such self-suppliers were found in 20 and 19% of shops in Groups A and B, respectively.

Table 14 Ornamental fish suppliers for surveyed shops in Ho Chi Minh City

Suppliers for the shops	Group A		Group B	
	Just retailers		Wholesalers/retailers	
	No. of shops	%	No. of shops	%
Producers	11	73.3	19	90.5
Collectors	1	6.7	2	9.5
Middle man	12	80.0	14	66.7
Self-producers	3	20.0	4	19.0
Importers	0	0.0	3	14.3
Other stores	3	20.0	0	0

5.4.4 Ornamental fish consumers of investigated shops

Ornamental fish consumers (e.g. the customers) of investigated shops are presented in Table 15. All of investigated shops sold the fish directly to the public even though they are wholesalers. Besides the public, there were 81, 38.1 and 23.8% of shops in Group B that sold the fish to middlemen, other stores and exporters, respectively.

Table 15 The customers/buyers from investigated shops in Ho Chi Minh City

Consumers of shops	Group A		Group B	
	Just retailers		Wholesalers/retailers	
	No. stores	%	No. stores	%
Public	15	100	21	100
Middle man	0	0	17	81.0
Exporter	0	0	5	23.8
Other stores	0	0	8	38.1

5.4.5 The distribution and marketing network

The stakeholders involved in ornamental fish distribution and its marketing network are shown in Figure 10 and are organized as follows:

(1) Importers: Ornamental fish are imported from Thailand, Taiwan, Hong Kong and Singapore. They are then distributed to breeders, nursing and grow-out farmers directly or through middlemen. Imported fish are also distributed to wholesalers, exporters and retailers by middlemen.

(2) Wild-fish collectors: Wild-fish collectors are small-scale fishermen, mostly in the Mekong delta. Most of them are men, whose livelihoods are primarily based on fishing activities. The fish are collected all year round according to the demand and requirement of the orders and the market. No initial advance payments are involved prior to delivery of the fish, except for special value fish such as the Siamese tiger fish. The middleman then comes to the field to collect the fish and distribute to wholesalers, exporters and retailers.

(3) Breeders, nursing and grow-out farmers: Ornamental fish producers can be a breeder, nursing or grow-out farmer, or combine some or all of these activities. Broodstock and fingerlings are also exchanged within other farms or from importers and wild collectors. The fish produced are then distributed to wholesalers, exporters or even retailers, directly or through a middleman.

(4) Middle-man or supplier: Middlemen play an important role in the distribution and marketing network. They are the connectors of most key stakeholders in the distribution channel.

(5) Wholesalers: Wholesalers are the main distributors to retailers and exporters. Although many wholesalers can take the fish directly from producers or importers, middle men also offer them special wholesale prices thus they are still connectors in this network. Wholesalers can also sell their fish to other provinces of Vietnam through the middlemen or provincial secondary wholesalers.

(6) Exporters: Vietnamese ornamental fish are exported to various countries such as America, Canada, Europe and other Asian countries. Exporters collect the fish from producers or wholesalers, directly or through a middleman.

(7) Retailers: Retailers are the main distributors to public consumers. They collect the fish not only from middlemen or wholesalers but also directly from producers and wild fish collectors.

(8) Public consumers: Most of final consumers buy their fish at the retailers that are widely distributed throughout the city.

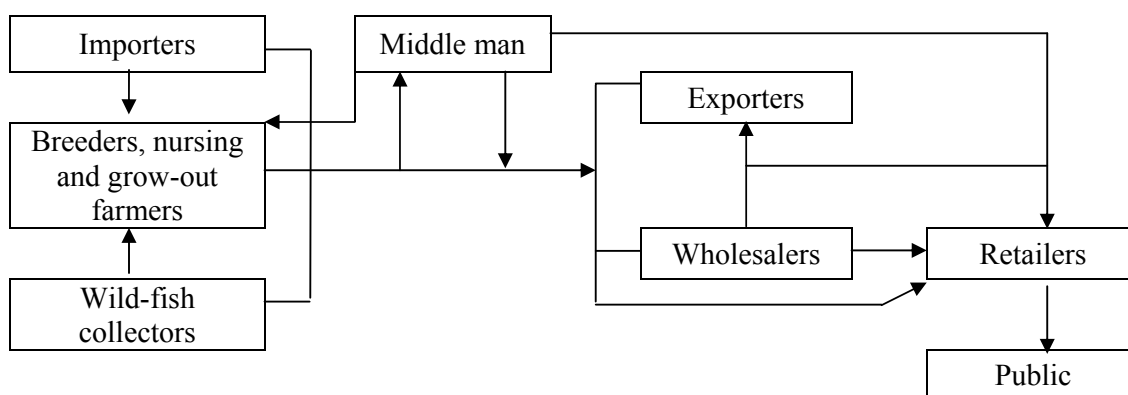


Figure 10 The distribution and marketing network for the ornamental fish in HCM City

5.5 Trends and perceptions of stakeholders in the ornamental fish business

Regarding the ornamental fish business in comparison with previous years, 50% of investigated shops stated it was increasing whilst 30.6% thought that it had not changed (Table 16). A similar ratio was recognized for ornamental fish turnover in comparison with previous years. This would suggest that currently the ornamental fish business is becoming more lucrative than previous years in Ho Chi Minh City. There were also 69.4% of shops who believed that such business will improve further in the future. Although 11-19% investigated shops didn't agree with such brightly painted business trends, probably to be explained by their particular problems in business in general.

Table 16 Trends in ornamental fish business and turnover

Trends of business	Increase		Same		Decrease	
	No shops	%	No shops	%	No shops	%
In comparison with previous years (in business)	18	50.0	11	30.6	7	19.4
In comparison with previous years (in turnover)	17	47.2	13	36.1	6	16.7
To foresee future business	25	69.4	7	19.4	4	11.1

5.6 Main problems of ornamental fish business

The most common constraint of 20% of shops in Group A (retailers) and 23.8% shops in Group B (wholesalers/retailers) was the lack of capital followed by lack of shop space (13-14% shops) and the competition from other shops (7-14%) (Table 17).

Table 17 Main problems of the ornamental fish business according to retailers and wholesalers

Constraints	Group A		Group B	
	Retailers		Retailers/Wholesalers	
	No. stores	%	No. stores	%
Lack of capital	3	20.0	5	23.8
Lack of shop space	2	13.3	3	14.3
Competition	1	6.7	3	14.3
Disease	1	6.7	0	0

VI. SURVEY OF ORNAMENTAL FISH PRODUCTION IN HO CHI MINH CITY

6.1 General information of ornamental fish producers in Ho Chi Minh City

It was estimated that around 300 farmers are currently producing ornamental fish in Ho Chi Minh City. According to the survey of Ho Chi Minh City Department of Agriculture and Rural Development (personnel communication), 106 investigated farms produced 34.4 million ornamental fish in 2005 (Table 18). However, the official annual ornamental fish production data recorded around more than 20 million fish in 2005 (DARD, 2005). The difference probably comes from the production data of Saigon Aquarium, a new huge foreign invested farm in Cu Chi District that is expected to produce 15 million ornamental fish per year for export. This illustrates the promise and future development of ornamental fish production in the city.

Table 18 Ornamental fish production of 106 main farms in Ho Chi Minh City in 2005

No	Districts	No. of farms	Total area (ha)	Total production (fish/year)
1	District 8	30	12.3	7,204,350
2	District 12	24	1.83	1,577,500
3	Cu Chi	8	4.95	16,083,000
4	Hoc Mon	6	0.9	2,875,000
5	Binh Chanh	6	1.8	853,650
6	Go Vap	10	2.1	947,500
7	Other districts	22	5.15	4,858,000
	Total	106	29.03	34,399,000

Source: HCMC DARD (2005).

This investigation of ornamental fish production was carried out through a questionnaire survey of 40 ornamental fish farmers within Ho Chi Minh City between October to December 2005. The distribution of investigated households is presented in Table 19. The main ornamental fish production areas of Ho Chi Minh City were investigated, including Districts 8, 12, 6, 9, Binh Chanh, Hoc Mon, Thu Duc, Go Vap and Binh Thanh. So far, District 8 has been known as an original place of ornamental fish production in Ho Chi Minh City, with more than 30-50 years of history development. In this survey, 12.5% of investigated farmers had more than 30 years of experience in ornamental fish production, mostly staying in District 8 (Table 20). It is important to state

that ornamental fish production largely disappeared from the city between 1975-1995 thus only 10% of households had 11-30 years of experience. The production then has been developing rapidly in the last ten years, with 45 and 32.5% households having 5-10 and <5 years of experience in ornamental fish production, respectively. There were 28-39% of newcomers in ornamental fish production that have previously worked in table fish culture. This trend indicated an attractive option of ornamental fish production for food fish farmers in peri-urban areas of Ho Chi Minh City who are increasingly suffering from water quality problems, land pressures, and health and consumer food safety issues associated with their produce.

Table 19 Distribution of investigated households

Investigated districts	No. of investigated households	%
District 8	12	30
District 12	8	20
Binh Chanh	8	20
Hoc Mon	3	7.5
Thu Duc	3	7.5
District 9	3	7.5
District 6, Go Vap, Binh Thanh	3	7.5
Total	40	100

Table 20 Years of experience in ornamental fish production

Years of experience	No. of HHs	%	No. of HHs have previous work in fish culture	%
< 5	13	32.5	5	38.5
5-10	18	45	5	27.8
11-30	4	10	0	0
> 30	5	12.5	0	0

52.5% of households surveyed selected ornamental fish production as their main and only occupation (Table 21). This is an important indicator to show the significance of economic effect in ornamental fish production of the investigated households. Beside ornamental fish production, some farmers (5-10%) also combined work that had a relation with their main occupation, such as middleman or trader in ornamental fish, or to culture moina for supplying and selling as fish feed. 5 and 10% of producers were also working as businessmen and workers in other occupations, respectively. In general, ornamental fish production plays an important role in the studied household's overall financial strategy and generated 84.5% of total income of the ornamental fish producers we surveyed.

Table 21 Other occupations of ornamental fish farmers

Other occupations	No. of surveyed households	%
None	21	52.5
Worker in other occupations	5	12.5
Middle man in ornamental fish trade	4	10
Ornamental fish selling	2	5
Natural fish food production (moina, etc.)	2	5
Agricultural activity	4	10

6.2 Culture facilities of ornamental fish farms in Ho Chi Minh City

6.2.1 Average size of ornamental fish farms in and around Ho Chi Minh City

Average sizes of the surveyed farms are presented in Table 22. In general, investigated farms have an average size of 2,165.4 m²/farm, in which 22.5, 35, 27.5 and 15% of households having their farm areas of <300, 300-800, 801-5000 and >5000 m², respectively. There was a relatively equal distribution of the proportions of the four farm area groups: A, B, C and D that are equivalent to small, medium, large and very large farm scales, respectively.

Table 22 Average sizes of ornamental fish farms in Ho Chi Minh City

Groups of farms	Area of farm (m ²)	No. of HHs	%	Average area / HH (m ²)
A	< 300	9	22.5	211.2
B	300 - 800	14	35	508.2
C	801 - 5000	11	27.5	1872.7
D	> 5000	6	15	9500.0
Total	53,174	40	100	2165.4

6.2.2 Pond culture system

Pond culture systems of investigated households are presented in Table 23 and Figure 11. All small-scale farms have no ponds for culturing ornamental fish. There were 35.7, 72.7 and 100% of farms in groups B, C and D that have pond systems for their ornamental fish production, respectively. The average pond number per farm was 4. In general, the larger scale farms tended to have more pond area and proportion of pond culture systems. In pond culture systems, hapas are often used to store the fish in short periods, or even to culture different species in a common pond.



Figure 11 Pond systems and hapas used for ornamental fish production

Table 23 Pond systems for ornamental fish production

Groups of farms	No. of HHs having ponds	% of HHs having ponds	No. of ponds / HH	Average pond area / HH (m²)
A	0	0.0	0	0
B	5	35.7	4	314.8
C	8	72.7	4	1387.5
D	6	100.0	5	6750.0
Total	19	47.5	4	1329.4

6.2.3 Cement tank culture systems

Cement tank culture systems of investigated households are presented in Table 24 and Figure 12. Cement tanks were popular with any of the different farm scale groups, making up from 90-100% of investigated households. They were rather similar of average tank size in each farm (6.1 m²), ranging from 4.6 to 8.3 m². However, there were 8-10% of households in groups A, B and C that haven't got any cement tanks for ornamental fish production. The average number of cement tanks per household were 21, 43, 19 and 6 for groups A, B, C and D, respectively.



Figure 12 Cement tanks for ornamental fish production

Table 24 Cement tank systems for ornamental fish production

Groups of farms	No. of HHs having tanks	% of HHs having tanks	No. of tanks / HH	Average tank area / HH (m²)
A	8	88.9	21	7.8
B	13	92.9	43	4.6
C	10	90.9	19	5.1
D	6	100.0	6	8.3
Total	37	92.5	26	6.1

6.2.4 Glass aquarium culture systems

Glass aquarium culture systems of investigated households are presented in Table 25 and Figure 13. Different from cement tank system, glass aquaria were not used popularly in all groups. The higher proportion of glass aquarium practices was in groups B and D with 57.1 and 33.3% households, respectively. There were only 11.1 and 18.2% households using glass aquaria in groups A and C, respectively. In general, there was no relation between glass aquaria use and the scale of farming of investigated farms, indicating such a specific culture system was usually used for specific ornamental fish species such as discus and flower horn.

Table 25 Glass aquarium systems for ornamental fish production

Groups of farms	No. of HHs having tanks	% of HHs having tanks	No. of tanks / HH	Average tank area / HH (m ²)
A	1	11.1	100	0.3
B	8	57.1	40	0.4
C	2	18.2	3	0.6
D	2	33.3	100	0.3
Total	13	32.5	48	0.4



Figure 13 Glass aquaria for ornamental fish production

6.3 Labour force for ornamental fish production

General information on the labour force for ornamental fish production is presented in Table 26. The average number of staff/workers for each farm was 3, ranging from 2.3 to 3.3 for different groups. Different from ornamental fish traders, the proportion of women working in ornamental fish production was rather low, ranging from 13 to 26.3% of investigated households. In general, women usually had a minority role in ornamental fish production systems and most of them are the farm owners or relatives of the farm owners. Most of the farms usually hire the workers to help in various heavy works on the farms. There were between 23.8 - 43.5 % of the workers that were hired in the various groups. The average age of the labourers was 36.5 years old, ranging from 32.6 to 40.

Table 26 General information on the labour force for ornamental fish production

Groups of farms	Ave. no. of labor	Ave No. of woman per HH	% women	Av nos of hired labour per HH	% Hired labour	Age
A	2.3	0.6	23.8	0.6	23.8	34.1
B	3.3	0.4	13.0	1.4	43.5	32.6
C	2.9	0.5	15.6	1.0	34.4	39.1
D	3.2	0.8	26.3	1.0	31.6	40.0
Total	3.0	0.5	19.7	1.1	33.3	36.5

6.4 Ornamental fish production systems in Ho Chi Minh City

6.4.1 Ornamental fish production systems

Ornamental fish production systems including fish breeding, nursing and grow-out of investigated households are presented in Table 27. The most popular fish species to be bred were goldfish (37.5% of HHs surveyed), followed by Siamese fighting fish (35%), swordtail (35%), guppies (30%), koi (20%) and discuss (17.5%) respectively. Fewer proportions of species to be bred were 15, 12.5, 5 and 5% of flower horn, angel, mollies and Sumatra barb, respectively. The three basic stages of ornamental fish production were fish breeding, nursing and growing-out, in which only Sumatra barb producers had such a closed cycle. Although fighting fish, guppies, swordtail and mollies were grown out by 100% producers, only 50-66.7% of them bred and nursed the fish. Koi carp, angel and goldfish were bred by 80-87.5% producers and grown out by 93.3-100% of them, indicating a relatively closed production cycle. On the other hand, discus and flower horn were bred by 66.7-71.4% producers but only 57.1-83.3% of them continued to nurse and grow out the fish to market size. This indicated a high division of work between fish breeders, nursery operators and grow-out farmers for these specific species.

Table 27 Ornamental fish production systems of investigated households

Fish species	No. of HHs				Proportion (%)			
	Total	Breeding	Nursing	Grow-out	Total	Breeding	Nursing	Grow-out
Discus	7	5	4	4	17.5	71.4	57.1	57.1
Koi	8	7	6	8	20	87.5	75.0	100.0
Gold	15	12	12	14	37.5	80.0	80.0	93.3
Fighting	14	9	8	14	35	64.3	57.1	100.0
Guppy	12	8	8	12	30	66.7	66.7	100.0
Swordtail	14	7	7	14	35	50.0	50.0	100.0
Flower Horn	6	4	4	5	15	66.7	66.7	83.3
Angel	5	4	4	5	12.5	80.0	80.0	100.0
Mollies	2	1	1	2	5	50.0	50.0	100.0
Sumatra barb	2	2	2	2	5	100.0	100.0	100.0

Table 28 presents culture facilities for different ornamental fish species. Pond systems were popular for koi carp, angel, swordtail, flower horn and Sumatra barb, making up from 50-62.5% of investigated producers. Cement tanks, however, were recognized as a most popular culture facility for ornamental fish production, except in discus culture, making up from 66.7 to 100% of investigated producers. Glass aquaria were used for valuable species such as flower horn, discus and angel, making up 66.7, 42.9 and 80% of producers, respectively. Hapas were used by 62.5% of koi carp producers, but were not common for other species.

Table 28 Culture facilities for different ornamental fish species

Fish species	No of HHs	Culture facilities				Proportion (%)			
		Pond	Cement tank	Glass aquaria	Hapas	Pond	Cement tank	Glass aquaria	Hapas
Discus	7	2	2	3	2	28.6	28.6	42.9	28.6
Koi	8	5	7	2	5	62.5	87.5	25.0	62.5
Gold	15	7	11	4	4	46.7	73.3	26.7	26.7
Fighting	14	6	11	5	1	42.9	78.6	35.7	7.1
Guppy	12	4	10	2	2	33.3	83.3	16.7	16.7
Swordtail	14	7	12	3	1	50.0	85.7	21.4	7.1
Flower Horn	6	3	4	4	0	50.0	66.7	66.7	0.0
Angel	5	3	5	4	1	60.0	100.0	80.0	20.0
Mollies	2	0	2	0	0	0.0	100.0	0.0	0.0
Sumatra barb	2	1	2	0	1	50.0	100.0	0.0	50.0

6.4.2 Annual production of ornamental fish

Annual production of ornamental fish from investigated households is presented in Table 29. The highest production (numbers of fish per year) belongs to goldfish producers, with average and total production of 101,400 fish/year/household and 1,521,000 fish/year, respectively. Next popular species were swordtail (830,450), guppy (569,450), koi carp (513,500) and fighting fish (500,690 fish/year), respectively. Lower productions were flower horn (182,750), Sumatra barb (113,150), discus (76,900), angel fish (92,200) and mollies (48,500 fish/year), respectively.

Table 29 Annual production of ornamental fish from investigated households

Fish species	No. of HHs	Ave. production (fish/HH/yr)	Min pro. (fish/HH/yr)	Max pro. (fish/HH/yr)	Total production (fish/yr)
Discus	7	10,985	100	30,000	76,900
Koi	8	64,187	12,000	109,500	513,500
Gold	15	101,400	6,000	730,000	1,521,000
Fighting	14	35,764	240	109,500	500,690
Guppy	12	47,454	2,100	109,500	569,450
Swordtail	14	59,318	21,900	182,500	830,450
Flower Horn	6	30,458	2,000	120,000	182,750
Angel	5	18,440	400	48,000	92,200
Mollies	2	24,250	12,000	36,500	48,500
Sumatra barb	2	56,575	21,900	91,250	113,150

6.5 Feeding and management in ornamental fish production

6.5.1 Feeding practices in ornamental fish production

Feeding practices of investigated households are presented in Table 30. Natural food was the most popular one in most cultured species, making up 50-100% and 21-60% of investigated producers using tubifex and moina, respectively. Prey fish (small and live fish) were used for discus (14%) and flower horn (33%). After natural foods, home-made feed was also popular at 50-100% investigated producers for all of the species. Pellet feed however was popular for flower horn (67%) and goldfish (47%). The main reason for the popular use of home-made feed is for better colour and performance of the cultured fish.

Table 30 Feeding practices of investigated households

Fish species	No. of HHs	Natural foods			Pellet feed	Home-made feed
		Tubifex	Moina	Prey fish		
Discus	7	5 (71)	2 (29)	1 (14)	2 (29)	5 (71)
Koi	8	8 (100)	3 (38)	0 (0)	3 (38)	8 (100)
Gold	15	8 (53)	6 (40)	0 (0)	7 (47)	13 (87)
Fighting	14	13 (93)	7 (50)	0 (0)	0 (0)	13 (93)
Guppy	12	9 (75)	4 (33)	0 (0)	3 (25)	11 (92)
Swordtail	14	10 (71)	3 (21)	0 (0)	1 (7)	13 (93)
Flower Horn	6	3 (50)	0 (0)	2 (33)	4 (67)	3 (50)
Angel fish	5	5 (100)	3 (60)	0 (0)	1 (20)	3 (60)
Mollies	2	1 (50)	1 (50)	0 (0)	1 (50)	2 (100)
Sumatra barb	2	2 (100)	0 (0)	0 (0)	0 (0)	2 (100)

Note: the percentage to be put in brackets

6.5.2 Water quality and disease management

The status of water quality and disease management of investigated households is presented in Table 31. In general, the skills to manage water quality and in the control of disease varied for every cultured species. The species that were in good management of water quality were discus and swordtail, with 71% and 50% investigated producers. On the other hand, water quality problems were usually met with koi carp, goldfish, guppies and mollies. Regarding the control of fish diseases, discus producers were also successful with 71% households that were satisfied with their disease management. Guppy was the species that was complained about its disease by 25% of producers. Other species that are in not good control of the diseases were goldfish, mollies, fighting fish, flower horn and koi carp.

Table 31 The status of water quality and disease management of investigated households

Fish species	No. of HHs	Water quality management			Disease management		
		Good	Average	Bad	Good	Average	Bad
Discus	7	5 (71)	2 (29)	0 (0)	5 (71)	2 (29)	0 (0)
Koi	8	2 (25)	6 (75)	0 (0)	3 (38)	5 (63)	0 (0)
Gold	15	4 (27)	10 (67)	1 (7)	4 (27)	10 (67)	1 (7)
Fighting	14	5 (36)	9 (64)	0 (0)	4 (29)	10 (71)	0 (0)
Guppy	12	4 (33)	7 (58)	1 (8)	4 (33)	5 (42)	3 (25)
Swordtail	14	7 (50)	7 (50)	0 (0)	7 (50)	7 (50)	0 (0)
Flower Horn	6	2 (33)	4 (67)	0 (0)	2 (33)	4 (67)	0 (0)
Angel fish	5	2 (40)	3 (60)	0 (0)	2 (40)	3 (60)	0 (0)
Mollies	2	1 (50)	0 (0)	1 (50)	1 (50)	0 (0)	1 (50)
Sumatra barb	2	0 (0)	2 (100)	0 (0)	0 (0)	2 (100)	0 (0)

Note: the percentage to be put in brackets

6.6 Distribution channels from ornamental fish producers

The most popular distribution channels for ornamental fish producers were middlemen (75%) and ornamental fish shops (62.5%) (Figure 14). There were 25% and 10% of producers selling their fish for public consumers and exporters, respectively.

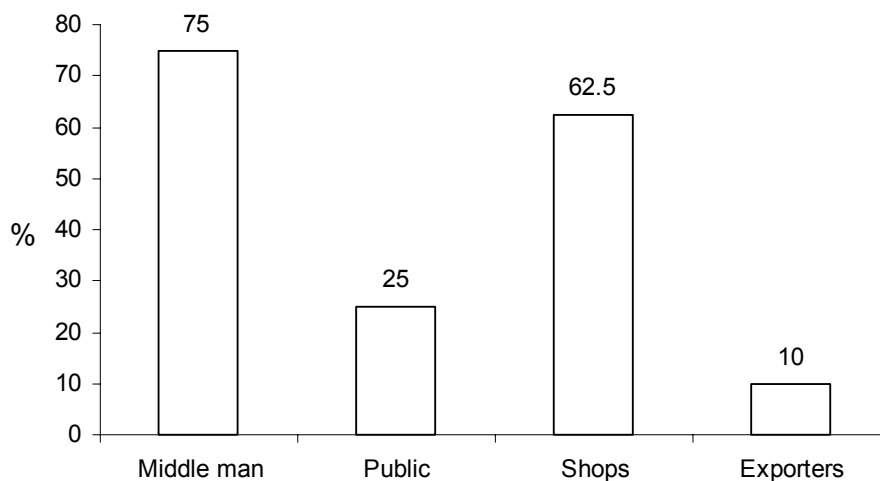


Figure 14 Distribution channels from investigated producers (note %'s indicate selling to more than one category of buyer)

6.7 Trends and perceptions of ornamental fish production and turnover

Trends of ornamental fish production and turnover of surveyed households are presented in Table 32. Regarding ornamental fish production in comparison with previous years, 40% of households surveyed believed that it was increasing and 50% thought it was remaining the same. Only 10% of investigated households had lower production in comparison with the past. The similar proportions were received for turnover of ornamental fish production in comparison with previous years. However, 60% of investigated households planned lower production levels in the future. This is probably due to a large amount of new producers coming in recent years creating competition and worrying for some existing producers about their future markets.

Table 32 Trends of ornamental fish production and turnover

Items	Increase		Same		Decrease	
	HHs	%	HHs	%	HHs	%
In comparison with previous years (in production)	16	40.0	20	50.0	4	10.0
In comparison with previous years (in turnover)	17	42.5	18	45.0	5	12.5
To foresee future production	13	32.5	3	7.5	24	60.0

VII. STATE OF THE SYSTEM (SOS) MEETING AND SWOT ANALYSIS

A State of the System meeting was organized on 5th May 2006 to verify all of our findings from the PCA meetings, primary and secondary data collected as well as to analyze the strengths, weaknesses, opportunities and threats (SWOT) of current ornamental fish production in the city. Such SWOT analysis has been presented in Figure 15. In general, it is recognized that there are several advantages of ornamental fish production in Ho Chi Minh City, such as its favorable tropical climate, good water sources and abundance of natural foods. Besides, production costs for ornamental fish are also rather low in Ho Chi Minh City, including labour and feed costs. Professional skills of the experienced producers are also an advantageous condition. Moreover, ornamental fish production can allow small-scale investment level of producers, thus it encourages more people to join and become a potentially significant agricultural production system in terms of income for people in peri-urban areas. As a distribution and production centre, Ho Chi Minh City is also in a strong position of diversified ornamental fish species that can be produced and supplied for the local and international markets.

There are various opportunities for ornamental fish development in Ho Chi Minh City. As a Vietnam's economic hub and commercial centre, Ho Chi Minh City has become a huge domestic consumer market with more than 5 million people. Moreover, the city leaders have recognized ornamental fish production as a priority profession in peri-urban development of the city. Several advantageous conditions have been created by the city's leaders for ornamental fish development, including development policy and to assist

import – export activity. So far, ornamental fish production has been receiving a special tax policy to assist poor farmers in peri-urban areas. In 2005, the establishment of HCMC Ornamental Fish Association has played an important role for ornamental fish development in the city. Up to now, it has attracted at least 800 public players and thus promoted the development of ornamental fish production in the city.

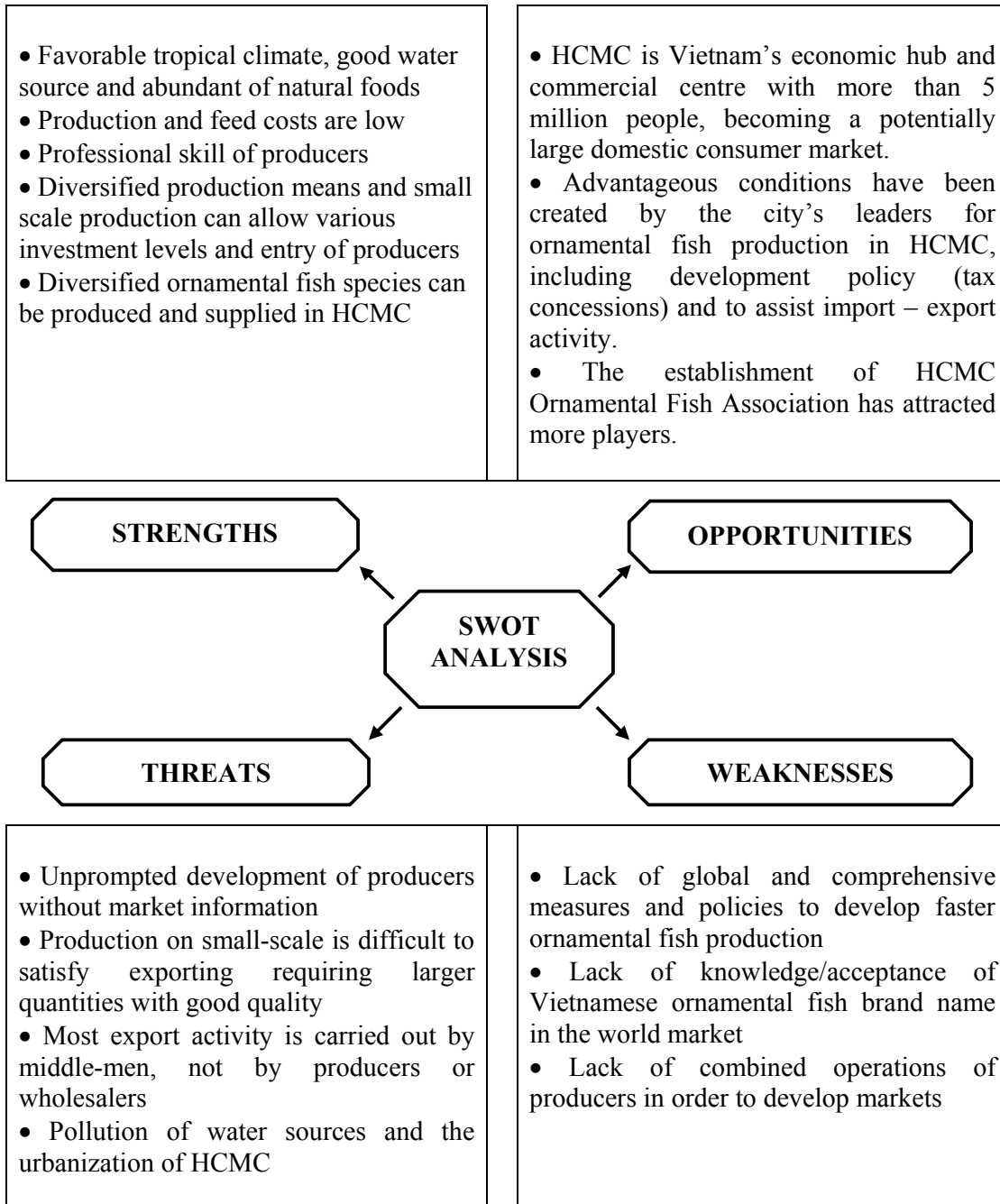


Figure 15 SWOT analysis for ornamental fish production in Ho Chi Minh City, Vietnam

However, there are some threats to the future of ornamental fish development in Ho Chi Minh City. Firstly, most of the new producers and production sites have been

developed in an unprompted and unregulated way. Lack of information on market size and demand can make difficult for producers to plan their outputs. Moreover, most of the producers are operating on a small-scale thus it is difficult to satisfy the exporting requirements of large quantity and good quality. Therefore most export activity has been carried out by middlemen, those who collect ornamental fish from various producers and wholesalers for export. The uniformity of exporting quality thus may be difficult to control for all fish being sold overseas. Otherwise, pollution of water sources and the urbanization of Ho Chi Minh City are also important threats to ornamental fish production in the city.

Most of participants in the SOS meeting stated the main constraint of ornamental fish development that was the lack of global and comprehensive measures and policies to promote ornamental fish production. Traders and exporters also complained about their Vietnamese brand name of ornamental fish. Obviously, it is necessary to invest more efforts to construct a better trade name for the export market. Besides, many producers also agreed their collective weakness in combining their operations to promote ornamental fish development and to better explore their consumer markets.

VIII. CONCLUSIONS

1. As an ornamental fish centre of Vietnam, ornamental fish production in Ho Chi Minh City has strong position in terms of favorable natural conditions (tropical climate, good water sources, etc.), low production cost, professional skills of producers with a long history of ornamental fish production.
2. The ornamental fish marketing and distribution channels were developed well in the city, with the main stakeholders of the system such as importers, wild-fish collectors, breeders, nursing and grow-out farmers, middle-men, wholesalers, exporters, retailers and public consumers.
3. There was variety of freshwater ornamental fish species being sold in HCMC's market, which are made up of three main categories: those species successfully bred domestically in Vietnam, wild native caught species and imported species.
4. From our survey of peri-urban HCMC ornamental fish producers the most commonly produced species are gold fish, fighting fish, swordtail, guppy, koi carp and discus. The main areas of production are Districts 8, 12, Cu Chi, Hoc Mon and Go Vap etc. The most commonly sold species are koi carp, guppy, fighting fish, flower horn, golden cichlid and gold fish. These are sold through more than 100 retailing and wholesaling shops in HCMC.
5. Ornamental fish production from our survey of producers appeared to be dominated by men, whilst women are more involved in important roles in the marketing and retail-wholesale network at ornamental fish shops.
6. From our production survey 28-39% of newcomers in ornamental fish production have previously worked in table fish culture, indicating that ornamental fish production can be an attractive option for existing food fish farmers in peri-urban areas of Ho Chi Minh City who are increasingly suffering from water quality problems, land pressures, and health and consumer food safety issues associated with their farming system.
7. Many ornamental fish producers exhibit plural activity in their income earning activities and are also involved in other work such as raising dairy cows and pigs, and growing ornamental trees. From our survey for 52.5% of those growing

ornamental fish it is their main income earning activity, while ornamental fish production may generate 84.5% of total income in surveyed farms.

8. Currently annual ornamental fish production of HCMC is more than 20 million fish, in which 20-25% of production is exported. The city also has around 300 households involved in fish breeding, nursing and growing-out and more than 100 ornamental fish shops. The ornamental fish industry is predicted for faster development in the near future.
9. The development of such ornamental fish industry has been receiving strong encouragement and assistance from the city's leaders. Development strategies have been set up to push this industry into becoming one of main income earning agricultural activities in peri-urban areas of HCMC.
10. However, there are still some threats and weakness for sustainable ornamental fish development in the city. Such constraints come mainly from the lacking management skills of the ornamental fish business and production, urbanization environment issues and the types of policies required for ornamental fish development.

IX. RECOMMENDATIONS

9.1 Research

1. To develop cross-breeding techniques to improve the variety of different ornamental fish species
2. To implement fish breeding for popular wild-fish species
3. To develop planting techniques of aquatic plants for aquariums
4. To identify exact scientific names and classification systems for current ornamental fish species in Ho Chi Minh City's market
5. To improve culture techniques for different ornamental fish species
6. To review the disease occurrence and the treatment solution for ornamental fish
7. To identify market channels and potential development of markets for selling ornamental fish in other Vietnamese cities
8. To study the potential of using and recycling urban waste water in producing certain ornamental fish species.
9. To explore synergies and possibly mutually beneficial connections with the ornamental fish sector in Thailand.
10. To carry out a comparative feasibility study of ornamental fish cultivation against food fish farming systems for lower income households in the Mekong Delta.

9.2 Implementation / Policy

1. To set up a suitable policy for a faster and more sustainable development of ornamental fish production in HCMC.
2. To construct and develop a better brand name for Vietnamese ornamental fish in the world's market.
3. To produce simple, short, user friendly dissemination methods eg Policy Brief documents and DVD video outputs for dissemination of relevant information to senior level urban planners and policy makers on the status and potential of culturing and selling ornamental fish in and around HCMC.

4. To set up a sub department and information centre resource within the Department of Agricultural and Rural Development of HCMC to provide specialist knowledge and investigate and supply information on the market, distribution channel, culture techniques, etc. for people concerned with ornamental fish.

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REFERENCES

HCMC Department of Agriculture and Rural Development (DARD), 2003. Development strategies for ornamental fish production in Ho Chi Minh City to 2010. 8 pp.

HCMC Department of Agriculture and Rural Development (DARD), 2005. Report on import-export activities of ornamental fish in Ho Chi Minh City between 2000-2005. 7 pp.

Peoples Committee of District 8, 2005. The state of agricultural activity during 1996-2005. Memo 129/BC-UBND. 2pp.

Annex 1

QUESTIONNAIRE FOR THE RETAILERS AND ORNAMENTAL FISH STORES

Interviewer name:	Date:	ID:
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1. Information about the retailers and their market:

1	Name of the retailers or ornamental fish store:
2	Respondent name and position in business:
3	Address (Ward/District):
4	Name of the market / area:
5	Scale classification of your business: wholesale [. . .] and / or retailer [. . .]
6	How many similar retailers / stores doing business in your area?
7	Time for doing this business: years
8	Previous experience working with fish: . . . years, where?

2. Labor force:

1	No. of people to be employed:
2	No. of man / woman:
3	Age of labors: from to

3. Operating method:

1	Time for opening (. AM) and closing (. PM) each day.									
2	Time for operating per week: days / week.									
3	Business types:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">freshwater ornamental fish [. . .]</td> <td style="width: 50%; padding: 5px;">natural feeds [. . .]</td> </tr> <tr> <td style="padding: 5px;">aquarium tanks and equipments [. . .]</td> <td style="padding: 5px;">pellet feeds [. . .]</td> </tr> <tr> <td style="padding: 5px;">Other activities (selling the birds / trees) [. . .]</td> <td style="padding: 5px;">Aquatic plants [. . .]</td> </tr> <tr> <td style="padding: 5px;">Others:</td> <td style="padding: 5px;"></td> </tr> </table>	freshwater ornamental fish [. . .]	natural feeds [. . .]	aquarium tanks and equipments [. . .]	pellet feeds [. . .]	Other activities (selling the birds / trees) [. . .]	Aquatic plants [. . .]	Others:	
freshwater ornamental fish [. . .]	natural feeds [. . .]									
aquarium tanks and equipments [. . .]	pellet feeds [. . .]									
Other activities (selling the birds / trees) [. . .]	Aquatic plants [. . .]									
Others:										

4. Main fish species to be sold:

No	Types	Species	Sources of fish
1	Ornamental fish species successfully bred domestically		
2	Wild fish species		
3	Imported species		

5. State of the business

1	Main species (in quantity) to be sold	Species 1:	No. fish / day:
		Species 2:	No. fish / day:
		Species 3:	No. fish / day:
		Species 4:	No. fish / day:
2	Main types (fish / feed / equipments ...) of your business (in sales): range in order	Activities 1:	
		Activities 2:	
		Activities 3:	
3	Trends of selling: <ul style="list-style-type: none"> - Compared to the past : Increase [...] – Decrease [...] – No change [...] - Any specific species with different trends: - Predicted for future: Increase [...] – Decrease [...] – No change [...] - Any specific species with different trends: 		
4	Trends of returns compared to the past: Inc. [..] – Decrease [..] – No change [..]		

6. Information of the suppliers / distributors:

6.1 Distribution channel to the store:

No	From ... to store:	Fish species:	Where? (source of fish)
1	Producers		
2	Collectors		
3	Middle man		
4	Self-production		
5	Importer		

6.2 Distribution channel from the store:

No	From store to ...:	Fish species:	Where the fish go?
1	Consumers		
2	Middle man		
3	Exporter		

7. The main problems or constraints in selling ornamental fish:

.....

QUESTIONNAIRE FOR ORNAMENTAL FISH FARMERS

Interviewer name:	Date:	ID:
-------------------	-------	-----

1. General information of ornamental fish farmers:

1	Name of farmer / farm:
2	Respondent name and position in the farm:
3	Address:
4	How many ornamental fish farms in this area?
5	Years of experience in ornamental fish culture:
6	Previous experience working with fish: ... years, where?
7	Other occupation:
8	How many percent of ornamental fish's income compared with total income? ... %

2. Culture facilities of ornamental fish farms

1	Total area of the farm: m ²
2	No. of ponds: ; Average area per pond: m ²
3	No. of cement tanks: ; Average area per tank: m ²
4	No. of glass tanks: ; Average area per tank: m ²
5	Other equipments:

3. Labor force

1	Total number of labor: ; No. of employed labor:
2	No. of man / woman:
3	Age of labors: from to
4	Education level:

4. Methods of production

1	Seed production: [...]; species
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2	Nursing: [. . .]; species:
3	Grow-out: [. . .]; species:

5. Production techniques

5.1 Species 1:

1	Culture season:
2	Production: fish / year
3	Production facility: pond [. .]; ciment tank [. . .]; glass tank [. . .]; hapa [. . .]
4	Natural food [. . .]; details:
5	Pellet feed [. . .]; details:
6	Water quality management: Good [. . .]; Average [. . .]; Bad [. . .]
7	Fish disease and health management: Good [. . .]; Average [. . .]; Bad [. . .]
8	Problems / constraints:

5.2 Species 2:

1	Culture season:
2	Production: fish / year
3	Production facility: pond [. .]; ciment tank [. . .]; glass tank [. . .]; hapa [. . .]
4	Natural food [. . .]; details:
5	Pellet feed [. . .]; details:
6	Water quality management: Good [. . .]; Average [. . .]; Bad [. . .]
7	Fish disease and health management: Good [. . .]; Average [. . .]; Bad [. . .]
8	Problems / constraints:

5.3 Species 3:

1	Culture season:
2	Production: fish / year
3	Production facility: pond [. .]; ciment tank [. . .]; glass tank [. . .]; hapa [. . .]
4	Natural food [. . .]; details:
5	Pellet feed [. . .]; details:
6	Water quality management: Good [. . .]; Average [. . .]; Bad [. . .]
7	Fish disease and health management: Good [. . .]; Average [. . .]; Bad [. . .]
8	Problems / constraints:

5.4 Species 4:

1	Culture season:
2	Production: fish / year
3	Production facility: pond [. .]; ciment tank [. . .]; glass tank [. . .]; hapa [. . .]
4	Natural food [. . .]; details:
5	Pellet feed [. . .]; details:
6	Water quality management: Good [. . .]; Average [. . .]; Bad [. . .]
7	Fish disease and health management: Good [. . .]; Average [. . .]; Bad [. . .]
8	Problems / constraints:

6. The output market

1	Main species (in quantity) to be sold	Species 1:	fish / year:
		Species 1:	fish / year:
		Species 1:	fish / year:
2	Trends of selling:: - Compared to the past : Increase [. . .] – Decrease [. . .] – No change [. . .] - Any specific species with different trends:		
3	Trends of returns compared to the past: Inc. [. .] – Decrease [. .] – No change [. .]		

6. Information on distribution channel

6.1 Selling the fish for middle man

No	To district/province:	Fish species:
1		
2		
3		
4		
5		

6.2 Selling the fish for: public consumeri [. . .]; stores [. . .]; export [. . .]

No	To . . . (area):	Fish species:
1		
2		
3		
4		
5		

7. Problems / constraints:

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