
Monitoring of fish markets in Vientiane and Luang Prabang Province, Lao PDR, using logbooks

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ABSTRACT

This paper presents some of the results from fish trade monitoring in both Vientiane and in Luang Prabang Province carried out by the Assessment of Mekong Fisheries Component (AMFC) from 2004 to 2005. The results show that *Pangasianodon hypophthalmus*, *Wallago leerii*, *Channa micropeltes bagarius bagarius*, *Pangasius conchophilus* and *Wallago attu* are some of the most commercially important Mekong fish species found in fish markets in Vientiane. *Oreochromis niloticus*, *Mystus nemurus*, *Hypophthalmichthys molitrix*, and *Pangasius* spp. are amongst the most commonly cultured species selling in Vientiane markets. Selling prices of wild fish captured from the Mekong, its tributaries and other natural water bodies, appear to be around double the price of cultured fish. High prices of wild-captured fish may result from greater demand for fish in urban areas. Of significance is that the prices of Mekong fish species seem to be constant over a year at city markets whilst the prices of Mekong fish at the landing sites fluctuate with regard to the quantity of fish supply.

In contrast, the price of fish captured from the Mekong and its tributaries in Luang Prabang Province is less than that in Vientiane. The close proximity to fisheries resources, and lower demand for fish, may explain this finding.

KEY WORDS: Lao PDR, Mekong, fish, OAAs, fisheries, markets

INTRODUCTION

Fish is one of the most vital sources of nutrition in the diets of the people in the Lao PDR. Consumers mainly purchase fish from markets and culture ponds. The population of Vientiane increased from 381,000 in 1985, to about 583,000 in 1999 (DOS, 2000). This population expansion led to an increase in demand for basic food items such as rice, meat and also fish. As a result, fish is now brought in from many places outside of Vientiane to fill this increased demand. Transportation and road access are very important as they provide more access to fish sources. In the last decade, transportation systems and main roads have been improved. As a result, it is now more convenient to transport fish to the cities. Many markets now have access to public transportation. This enables many small traders in rural areas to get their fish products to major city markets.

Luang Prabang is a province in the northern part of the Lao PDR, and within the Mekong River watershed. There are two markets where fish can be purchased in the city of Luang Prabang, but only one (Phosy market), that supplies fish on a regular basis.

This paper presents the results from two monitoring surveys carried out in fish markets during 2004; one in Vientiane City, and the other in Luang Prabang City. Thongkhankham and Thatluang markets

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were selected for monitoring in Vientiane because they appeared to be the two largest fish markets in the city. Luang Prabang main market was selected for monitoring in Luang Prabang Province).



Figure 1. Location map

Structure of the markets

The marketing operations of all three locations being monitored appeared to be well organized. Market administration units are primarily responsible for allocating places for fish sales, collecting fees and providing security (Phonvisay, 2001). People interested in selling fish are able to approach the unit for renting a place to sell. They are able to pay market fees on a daily, monthly or annual basis. Therefore, it was easy to spot differences between the types of fish vendors operating at the market. Small or rural fish vendors are likely to have to pay fees on a daily basis, because they usually only come to sell their fish when they have caught enough fish to sell in the market and cover transport costs. In contrast, large-scale fish vendors, who have more capital than the small vendors, usually have larger selling places and pay rent on a monthly or annual basis.

Monitoring fish sales

There has never been a full study of fish market monitoring in the Lao PDR. Phonvisay (2001) conducted an initial fish marketing survey in Thongkham and Thatluang Markets, but it only took place over one day, and was very general in nature. Interviews did not include all fish vendors in the markets. Phonvisay (2003) made a study of fish marketing operations in Luang Prabang Province, but again, this was just a 'snap shot' survey. Attempts to identify the quantities of fish sales covering periods of weeks, months or years were made on that day, but they failed to obtain accurate data on fish sales. This study was aimed at a more systematic approach. That is, the monitoring of fish sales at the three markets in Vientiane and Luang Prabang in 2004.



Figure 2. Mekong fish displayed for sale by a fish vendor in Thongkhankham Market (left) and a fish vendor who sells live tilapias in Thatluang Market (right)

Methods of trial monitoring

During 2004, we decided to carry out two types of survey in these markets. The completed surveys included:

Five-day interview survey

The survey teams carried out five-day surveys of the three markets during 2004. These surveys were an attempt to estimate the type and amount of fish products sold within a five-day period. During the five-day survey period, interviews were conducted four times at the two markets in Vientiane, and twice at the market in Luang Prabang. Interviews were carried out during morning periods, and included all vendors who sold fish products in the markets. The survey team conducted interviews on five consecutive days. This type of monitoring took place every three months in Vientiane, and twice in Luang Prabang in 2004.

Logbook survey

Together with the five-day surveys, we conducted fish market monitoring using logbooks. The purpose of this survey was to obtain data on daily fish sales from individual vendors within a period of one year. Prices and quantities of fish fluctuated throughout the year. We selected three vendors in each market in Vientiane and six vendors in Luang Prabang to record data in logbooks. Each fish vendor sold fish that were obtained from different sources; mainly aquaculture and capture fisheries. Data recorded were primarily concerned species, quantities of sale, prices and sources of fish. Each month, the survey team collected data from each logbook vendor. Data were stored in Microsoft Access prior to analysis.

RESULTS

Sources of aquatic products in Vientiane markets

Sources of aquatic products were classified into three main types in Vientiane. These three main sources were:

1. Cultured fish sold in Thongkhankham and Thatluang markets mainly imported from Thailand and from fish farms in Vientiane Province. Thailand supplied a large number of cultured fish to the Vientiane markets. Large fish vendors appeared to have more access to these sources of fish, especially those fish from Thailand.
2. Wild captured fish from rural areas throughout Vientiane Province were found to be the most important in the markets being studied. The fish were mainly captured from natural ponds, swamps, rice fields and small rivers. A large number of fish vendors selling these fish appeared to be small or part-time fish vendors. These part-time vendors usually bought fish from the main bus stations in Vientiane. Some vendors were from rural areas and had collected enough fish to sell in the markets and spent only a few hours at the markets. Some fish traders collected fish from many different villages in rural areas, and sold these to part-time vendors at the bus stations.
3. A large number of wild captured fish from Champasack Province, in the south of the country, were also found in the markets in Vientiane. Most of these fish were from the Mekong River in the Siphandone area, famous for its highly productive fisheries (Bush, 1999). Buses and private vehicles were found to be the main forms of transportation for bringing fish to the markets in Vientiane, a distance of some 800 kilometers or more. Mekong fish from Champasack Province were mostly found in the Thongkhankham Market.

Fresh fish products from aquacultural operations accounted for approximately 61 and 60 per cent of total sales in the Thongkhankham and Thatluang Markets respectively (Table 1). In contrast, fresh fish products from wild capture fisheries accounted for almost 40 per cent of the total fresh fish products in both markets. High levels of purchase of cultured fish may be partly due to the lower prices paid compared to wild captured fish. All processed fish products found during the five-day surveys originated from wild captured fish.

Sources of aquatic products in Luang Prabang

Local wild captured fish supplied to Luang Prabang Markets are mainly caught from the Mekong River and its tributaries such as Ou, Xieung and Khan Rivers. These fish are collected by fish traders from fish landing sites along the rivers, and sold directly to restaurants and markets in Luang Prabang. Some fish are also from Vientiane Province and Vientiane City (Phonvisay, 2003).

Table 1. Sources of fish at Thongkhankham (ML1) and Thatluang (ML2) Markets during the five-day survey from 12 to 16 January 2000

Market	Source	Product name			
		Fresh fish (kg)	%	Processed fish (kg)	%
ML1	Aquaculture	2,865	61.1%	0	0%
	Capture	1,826	38.9%	1,219	100%
	Total	4,691	100.0%	1,219	100%
ML2	Aquaculture	2,000	60.3%	0	0%
	Capture	1,316	39.7%	236	100%
	Total	3,316	100.0%	236	100%

Note: Data collected between 12-16 Jan 2004 ML1: Thongkhankham; ML2: Thatluang

Fish market monitoring at Vientiane and Luang Prabang

Fish market monitoring provided an understanding of the daily consumption level of fish on selected days at markets. Table 2 shows the total numbers of fish vendors during the five-day surveys at the three markets. Thirty-four, and 22 fish vendors were present at the Thongkhankham and Thatluang Markets respectively in January 2004. Twenty-six fish vendors were active at the Luang Prabang Market in March 2004. About 15 per cent of the total numbers of fish vendors operating within the three markets studied used logbooks to record data during the monitoring process

Table 2. Number of fish vendors at the three markets selected for monitoring. Data from Vientiane were collected from 12 to 16 January 2004, and from Luang Prabang from March 2 to 6 2004.

	Thongkhankham	Thatluang	Luangprabang	Total	%
Vendor					
Logbook	3	3	6	12	14.6%
Interview	31	19	20	70	85.4%
Total	34	22	26	82	100.0%

Note: Data collected between 12-16 Jan 2004 for the markets in Vientiane; Data collected between 2-6 Mar 2004 for the markets in Luangprabang

A summary of the five-day monitoring survey of fish and other aquatic animals (OAAs) sold in the two markets in Vientiane is shown in Table 3. Data were collected between January 12 and 16 2004. During the five-day survey, almost six tons of aquatic products were sold at Thongkhankham Market. This was valued at approximately US\$ 9,000. At this market, fresh fish accounted for almost 79 per cent, whilst processed fish and other aquatic animals accounted for 20.6 per cent and 0.7 per cent respectively.

In Thatluang Market, the amount of fish and OAAs sold within the five-day survey period was just over half of that sold in Thongkhankham Market. Fresh fish accounted for about 85 per cent of total aquatic products sold at Thatluang Market. More OAAs were sold in Thatluang Market compared to that sold in Thongkhankham Market. Overall, Table 3 shows some level of the importance of

aquatic animals for protein consumption of people living in the in the capital city of the Lao PDR, but these figures need to compared with the consumption of other protein food sources.



Figure 3. Fermented fish on sale at Thongkhankham Market

Table 3. A summary of the data collected during a five-day survey on the sale of fish and OAAs at the two main markets in Vientiane from January 12 to 16 2004.

Market	Sub-category	Total (kg)	%	Value (Kip)	Value (US\$)	%	Mean (US\$/kg)
Thongkhankham	Fresh fish	4,649	78.7%	81,275,000	7,525	83.4%	1.6
	OAA	42	0.7%	960,000	89	1.0%	2.1
	Processed fish	1,219	20.6%	15,244,000	1,411	15.6%	1.2
	Total	5,910	100%	97,479,000	9,026	100%	1.5
Thatluang	Fresh fish	3,027	85.2%	44,418,000	4,113	73.1%	1.4
	OAAs	289	8.1%	2,753,000	255	4.5%	0.9
	Processed fish	236	6.6%	13,555,000	1,255	22.3%	5.3
	Total	3,552	100%	60,726,000	5,623	100%	1.6

Notes: Data collected between 12-16 Jan 2004. US\$ 1.00 = Kip 10,800; OAA – other aquatic animals

Figure 4 displays the total sales of aquatic animal products during the five-day surveys in Thongkhankham and Thatluang Markets in Vientiane. The surveys were carried out within a series of five-day periods in January, April, August and November 2004. Figure 4 shows that total sales of aquatic animal products in Thongkhankham Market varied from about 4.7 tons to 6.3 tons, whilst the total sales in Thatluang Market varied between approximately 2 to 3.5 tons.

In Luang Prabang Market, total sales of fresh fish within a five-day period was almost 3.8 tons and valued at \$US 5,331. During the monitoring period, there were no other aquatic animals sold in the market. Fresh fish products were most important at 98 per cent of total sales (Table 4).

Logbook analysis

Logbooks have provided interesting information and data on fish sales obtained from fish vendor's records throughout one year. Analysis of logbooks has revealed information on the sales of different fish species and their total composition regarding sales, and the variety of fish sold by the vendors.

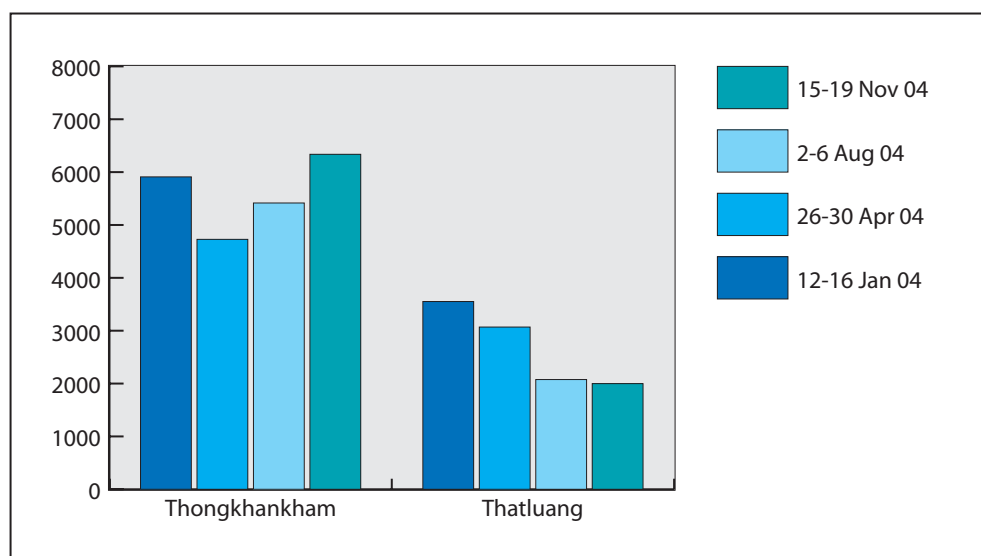


Figure 4. Total weight of fish and OAAs during the five-day monitoring periods at the Thongkhankham and Thatluang Markets in Vientiane in 2004.

Table 4. A summary of a five-day survey of fresh fish and processed fish on sale at Luang Prabang Market between March 2 and 6 2004

Market	Sub-category	Total (kg)	%	Value (Kip)	Value (US\$)	%	Mean (US\$/kg)
Luangprabang	Fresh fish	3,720	98.0%	55,093,000	5,101	95.7%	1.4
	Processed fish	76	2.0%	2,480,000	230	4.3%	3.0
	Total	3,796	100%	57,573,000	5,331	100%	1.4

Notes: Data collected between 2-6 Mar 2004. US\$1.00 = Kip 10,800

Sales of Mekong wild fish

In Vientiane, the Mekong fish sold in markets were mostly from the Siphandone area in Champasack Province. According to the survey, these fish were sold almost exclusively at Thongkhankham Market. There were only two vendors in this market that sold Mekong fish from Champasack Province (Table 5). Table 5 shows the average weight of fish sold daily by Vendor 1-8. The average weight of fish sold each day by this vendor was almost 70 kg. Range divided by daily average of fish sold provided an estimate of error.

P. hypophthalmus (Pa Souay) was the most important species, and represented about 17 per cent of total sales. This was followed by *W. leeri* (Pa Khoun) at around 16 per cent and *C. micropeltes* (Pa Doh) at around 15 per cent (Table 5). Other important species not shown in Table 5 were *H. wyckioides* (Pa Kheung), *B. truncates* (Pa Khob), *C. harmandi* (Pa Jok) and *N. notoapterus* (Pa Tong).

Table 5. Average weight of fish sold daily by vendor 1-8 at Thongkhankham Market based on data recorded from logbooks.

Scientific Name	Weight (kg/day) from all sampling on days								Percent of total	Range	Error
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	All days			
<i>Pangasianodon hypophthalmus</i>	13.0	11.5	11.8	10.0	12.9	11.7	13.0	12.0	17.15%	3.1	25.68%
<i>Wallago leerii</i>	11.6	9.0	10.6	10.8	13.5	12.3	13.1	11.6	16.56%	4.5	38.64%
<i>Channa micropeltes</i>	11.4	9.3	9.5	9.5	13.9	10.7	12.5	11.0	15.73%	4.6	41.85%
<i>Bagarius bagarius</i>	6.2	8.5	8.2	10.2	8.9	7.3	8.0	8.2	11.69%	4.0	48.73%
<i>Pangasius conchophilus</i>	8.2	6.0	4.2	2.9	6.7	6.1	5.3	5.6	8.05%	5.4	95.37%
<i>Wallago attu</i>	4.4	4.7	5.6	4.9	4.9	4.3	5.8	4.9	7.07%	1.4	28.55%
Others	16.6	21.1	17.6	14.6	16.9	14.7	14.7	16.6	23.74%	6.5	39.30%
Grand Total	71.4	70.1	67.4	62.7	77.8	67.1	72.4	69.9	100.00%	15.0	21.50%
No. of days	52	52	52	52	53	53	52	366			

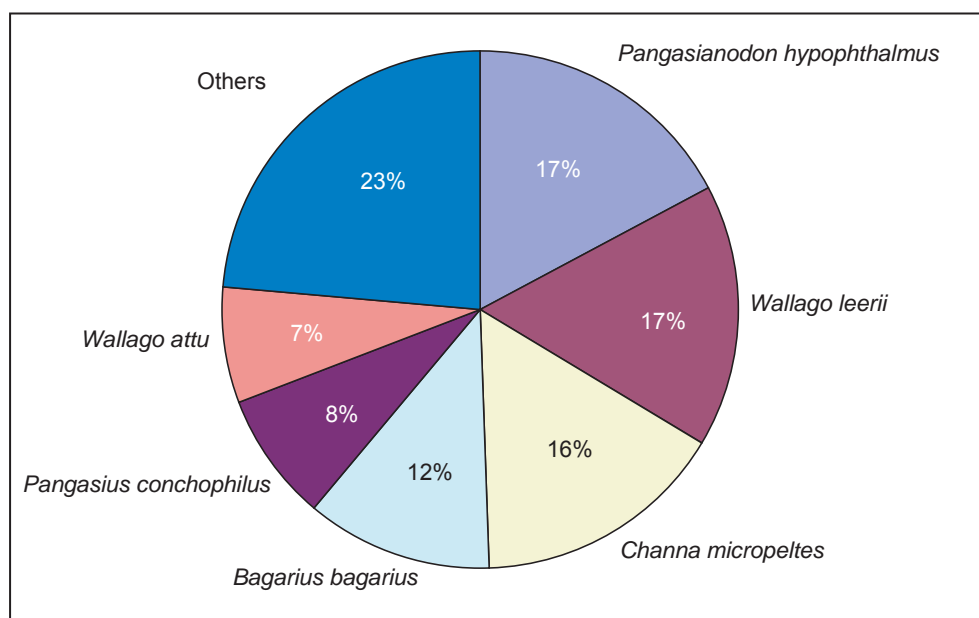


Figure 5. Fish composition sold by Vendor 1-8

From the logbook analysis, we looked at the most important species (*P. hypophthalmus*) sold by a vendor throughout the study year. It can be seen that the price of *P. hypophthalmus* varied from 21,000 Kip/kg to 30,000 Kip/kg. Weight of fish sold by Vendor 1-8 seemed to fluctuate highly throughout the year. The highest weight of *P. hypophthalmus* sold by this vendor was 639 kg in June. This is at a time when fish are migrating upstream in the Mekong from Cambodia to Lao PDR.

Sales of cultured fish

There are a large number of cultured fish sold in the markets in Vientiane. These fish are mainly from aquaculture farms close to the city or imported from Thailand. Vendor 1-19 at Thongkhankham Market was a vendor who sells cultured fish. From Table 6, it can be seen that Vendor 1-19 sold almost 83 kg of fish per day of which 28.6k g was *Oreochromis niloticus* (Pa Nin).

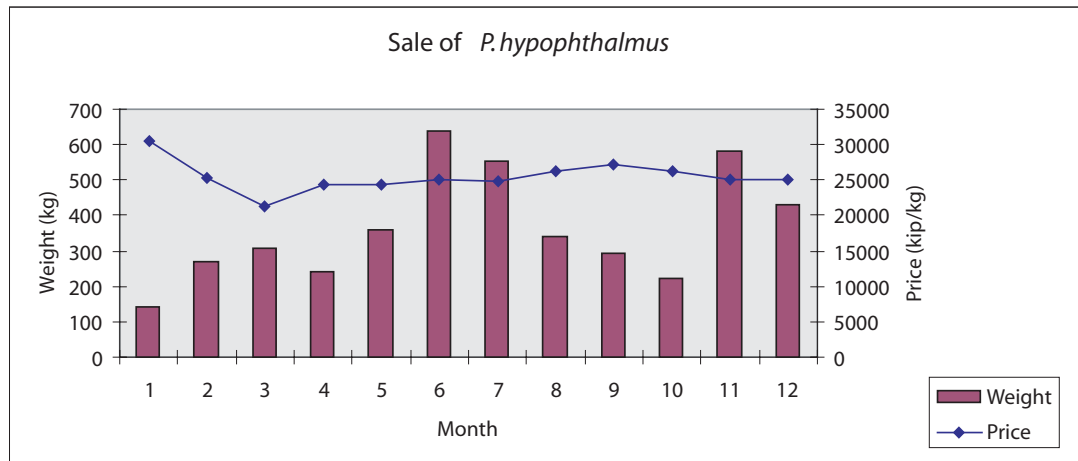


Figure 6. Sale of *P. hypophthalmus* by Vendor 1-8

Table 6. Average weight of cultured fish (and wild caught marine species) sold daily by Vendor 1-19 at Thongkhankham Market

Scientific Name	Weight (kg/day) from all sampling on day								Percent of total	Range	Error
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	All days			
<i>Oreochromis niloticus</i>	28.3	27.7	29.9	27.7	27.9	29.2	29.2	28.6	34.4%	2.21	7.7%
<i>Cirrhinus cirrhosus</i>	17.0	13.2	15.3	16.5	14.8	19.1	17.4	16.2	19.5%	5.88	36.3%
<i>Mystus nemurus</i>	14.0	16.1	16.8	16.6	14.3	17.5	17.1	16.0	19.3%	3.49	21.8%
Tuna sp.	13.6	13.3	13.0	14.2	11.4	14.3	14.6	13.5	16.3%	3.20	23.7%
<i>Pangasius</i> spp.	10.1	7.6	7.3	9.4	7.6	9.0	8.8	8.5	10.3%	2.79	32.6%
Other	0.0	0.0	0.0	0.3	0.4	0.0	0.0	0.1	0.1%	0.38	394.6%
Grand Total	83.0	77.8	82.4	84.7	76.4	89.1	87.2	82.9	100.00%	12.64	15.2%
No. of days	52	52	52	52	53	53	52	366			

Figure 7 presents fish composition sold by Vendor 1-19. The most important species sold by Vendor 1-19 was *O. niloticus* (Pa Nin) at about 34 per cent. This was followed by *C. mrigala* (Pa Regal, or Pa Nuan Jan) at about 20 per cent and *M. nemurus* also at about 20 per cent. A small species of Tuna (Pa Tu) represented about 16 per cent of sales and *Pangasius* spp. about 10 per cent of sales

Figure 8 shows the sale of *O. niloticus* by Vendor 1-19 in 2004. The price of *O. niloticus* varied from about 14,000 Kip/kg to 16,000 Kip/kg. The weight of this fish sold by the vendor appeared to be low during the first few months of the year, but it started to increase to around 400 kg in

February to about 1,000kg in May. After this time, the sales weight of this fish seemed to be constant. It can be seen that price and weight of this species do not seem to be related.

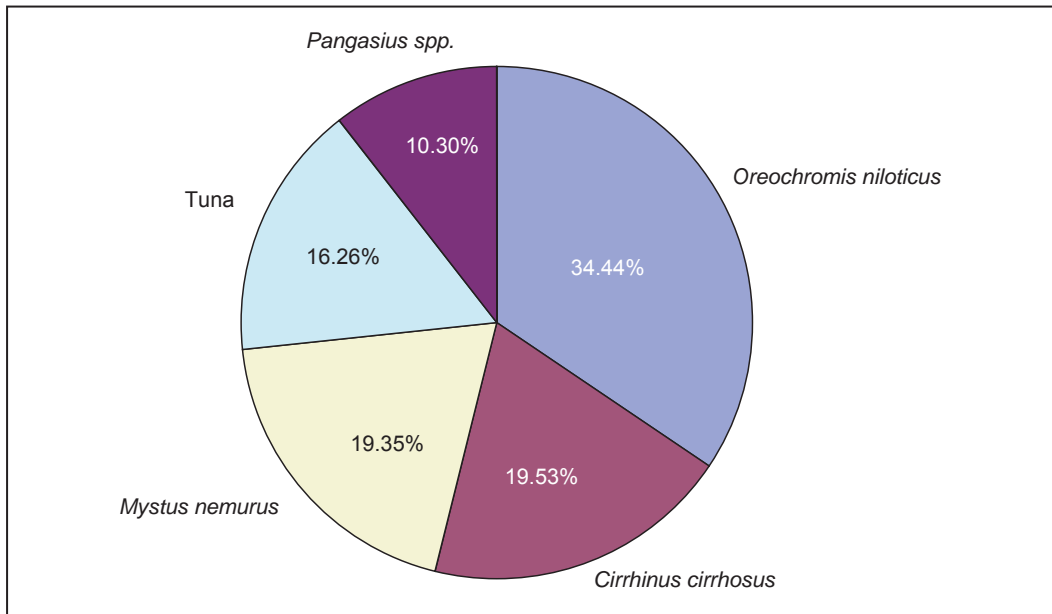


Figure 7. Fish composition sold by Vendor 9-19

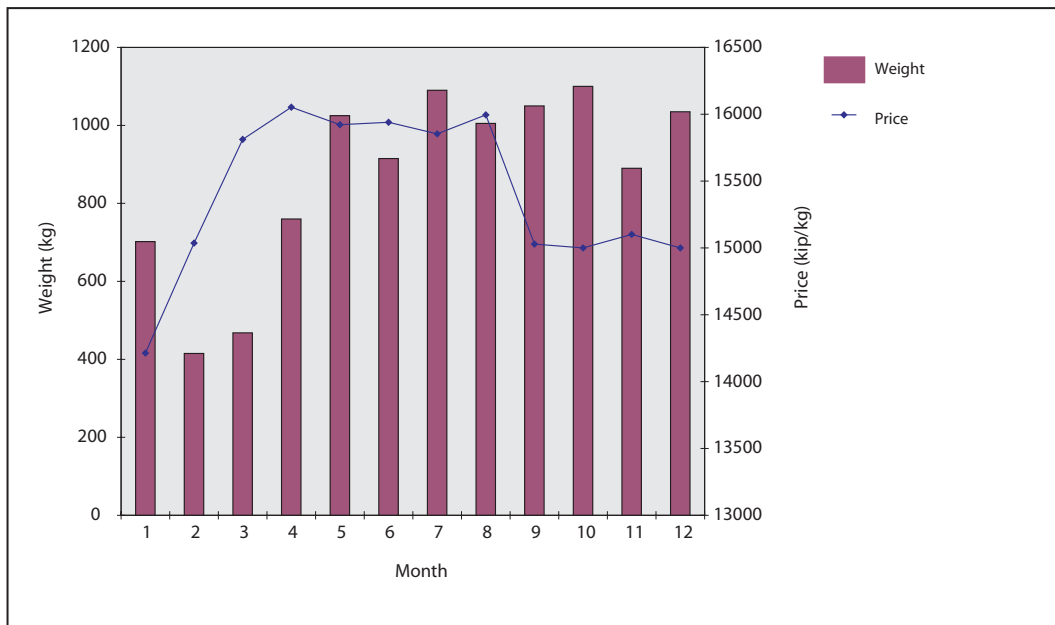


Figure 8. Sale of *O. niloticus* by Vendor 1-19

Sales of wild captured fish from rural areas

A large number of wild captured fish from rural areas close to the cities of Vientiane and Luang Prabang are also sold in major markets. Fish are mainly sold from small or part-time vendors. Table 7 shows the average weight of fish sold daily by Vendor 2-3 at Thatluang Market. The average daily sale of fish from this vendor was about 17 kg. Important fish species include *Hemibagrus* sp., *N. notopterus* and *Hypsibarbus lagleri*.

Table 7. Average weight of fish sold daily by vendor 2-3 at Thatluang Market

Scientific Name	Weight (kg/day) from all sampling on days:								Percent of total
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	All days	
<i>Hemibagrus</i> sp.	2.75	3.08	3.33	2.67	2.79	3.32	3.15	3.01	18.01%
<i>Notopterus notopterus</i>	2.71	2.69	2.77	2.27	2.87	3.11	2.98	2.77	16.57%
<i>Hypsibarbus lagleri</i>	2.94	2.37	3.77	2.81	1.45	2.57	2.63	2.64	15.80%
<i>Cyprinus carpio</i>	1.83	1.92	1.62	1.31	1.70	1.40	1.52	1.61	9.63%
<i>Labeo chrysophekadion</i>	1.37	0.90	1.35	1.27	1.51	2.04	1.58	1.43	8.55%
<i>Pangasianodon hypophthalmus</i>	1.17	0.71	1.02	1.00	1.38	1.51	1.06	1.12	6.71%
<i>Cirrhinus microlepis</i>	0.94	0.71	1.33	1.33	0.85	1.28	1.04	1.07	6.38%
Others	2.52	2.62	3.69	3.17	3.70	3.38	2.40	3.07	18.35%
Grand Total	16.23	15.00	18.87	15.83	16.25	18.60	16.37	16.74	100.00%
No. of days	52	52	52	52	53	53	52	366	

DISCUSSIONS AND CONCLUSIONS

Fish are one of the main sources of protein, not only for rural consumption, but also for urban consumption. The fish sold in the city markets come from different sources. Some sources are close to the city but others are considerably distant. In markets, fresh fish products are the most important. The main source of these fish is from rural areas close to the cities, fish from Mekong and its tributaries, and cultured fish imported from Thailand.

During this survey, it was found that fresh fish from aquaculture were considerably more important in the urban markets than wild captured fish from rural areas and the Mekong River. However, wild captured fish are still preferred to cultured fish, as is shown by the higher price of these fish in urban markets. Wild captured fish also generate significant income for rural people, many of them poor, who have less opportunity to invest in aquaculture.

P. hypophthalmus, *W. leerii*, *C. micropeltes*, *B. bagarius*, *P. conchophilus*, and *W. attu* are the most common Mekong fish found in fish markets in Vientiane.

O. niloticus, *C. mrigala*, *M. nemurus*, *H. molitrix*, and *Pangasius* spp., are the most common cultured species in the markets. Selling prices of wild capture fish from the Mekong, its tributaries and other natural ponds appear to be double the prices of cultured species. High prices of capture

fish may result from greater demand for fish in the urban areas. One interesting point is that the prices of Mekong fish species seem to be constant over a year at the urban markets while the prices of Mekong fish at the landing sites fluctuated with regard to the quantity of the fish supply (Phonvisay and Bush, 2001). In contrast, the prices of the wild capture fish from the Mekong and its tributaries in the markets in Luangprabang Province are cheaper than those in Vientiane Capital. The proximity to the fisheries resources and low demand for fish may be the explanation of this.

The survey of the whole market provides general information of fish sales. It presents types and prices of fish products and geographical sources of fish. In addition, total quantity of fish sold in the interviewed days can be estimated. This provides a view the level of fish consumption of that particular location.

In contrast, logbook analysis of specific vendors provides insightful details of the trend of fish sales within months and a year. We also obtain species composition of fish sold in the markets, prices information and sources of fish. In this study, it is found that a presence of wild capture fish in the urban markets may be related to seasonality and water levels of the rivers where they influence a migration and spawning of particular fish species. This specially occurs with wild capture fish from the Mekong.

Measurement of fisheries resources

Measurement of resource scarcity is the main concern in the point of view of the fisheries management. One of the market signals of scarcity of the natural resource is market information, especially market price (Simon, 1996). The price of fish in the final market, for example, the markets in Vientiane Capital, may be one of the most important factors in determining the demand for (or value of) the fisheries resource in Mekong River in the Siphandone area which is hundred miles away from the city. It maybe argued that the demand for fish at the fish landing sites in this area is significantly influenced by the demand for fish in the final markets. The final markets are either in the country itself or outside the country. Phonvisay and Bush (2001) found that there have been illegal trades of wild Mekong fish from the Siphandone area to Ubon Ratchathani, Thailand. These fish are mainly big fish with high value prices. In addition, some amounts of wild Mekong fish from Cambodia are also traded legally through Champasack Province to the final markets in Ubon Ratchathani, and possibly also Vientiane. This highlights the influence of demand for fish in the final markets to the level of exploitation of fisheries resources. Access to transportation and improvement of roads are also important factors facilitating high mobilization of fish trade from the resource base to the final market.

Market study may also involve systematic identification of the key variables influencing the supply for the resource. The factors that affect the supply of a natural resource can be divided into two broad categories i.e. one pertaining to nature, and the other pertaining to technology including infrastructure. In economic perspective, although nature plays a role in determining the availability

of natural resources, technology may be a key factor in determining the supply of natural resources. Technology of harvesting such as fishing gears and improvement of roads, for example, need particular attention because technology change can affect the supply of the resources.

onstant monitoring of the fish market, in a form of time-series data can provide valuable data for future research. It is argued that under ideal market settings and where resources have clearly defined ownership rights, the long-run equilibrium price of a natural resource measures the marginal social opportunity cost of bringing that resource onto the market. Under this condition, a positive price trend for the resource over a long period of time signals emerging resource scarcity (Hussen, 2000). This concept may be well applied to reservoir fisheries or aquaculture where ownership rights are clearly defined. Nevertheless, time-series data of price of fish from other inland fisheries, especially Mekong fisheries are very important for the future market research. In addition, monitoring of the fish market may involve in the activities of other government institutions like the National Statistic Center. Such data of fish sales would be definitely valuable for future research and management planning of fisheries resources.

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