Marketing Infrastructure, Distribution Channels and Trade Pattern of Inland Fisheries Resources in Cambodia: An Exploratory Study

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Note: In this book, unless otherwise stated, all $ refers to US$. The conversion rate applied was $1 = 4000 riels, as of May 2004.

1. Introduction

Cambodia has a vast freshwater ecosystem that includes rivers and lakes, flooded forests, ricefields, grasslands and swamps that have made it the world's fourth largest freshwater fish producing country (Degen et al. 2000). The Tonle Sap Lake (the biggest in South Asia) and the lower tributary of the Mekong River system are supported by monsoon rains, floods and wetland vegetation, and nutrient-rich soil. These conditions have created the ecosystem that allows fish and other aquatic animals' access to abundant nutrition and food resources. Traditionally, the Great Lake is the spawning ground for many fish habitats that migrate through the Tonle Sap River when the lake expands with floodwaters usually by four to six times its dry season size. In the dry season, the surface area of the lake shrinks to 2,500-3,000 km^2 from its wetland size of about 10,000-15,000 km^2 during monsoon months of June-October[1] (NEDECO 1998; McKenney and Tola 2002). The Great Lake, which is thought to be the most productive inland fisheries of the world, contributes about 60% of the country's commercial fisheries production (Ahmed et al. 1998).

Although inland fisheries provide foreign exchange to the government and nutrition, livelihoods and food security to the millions living in rural areas, the country lacks a precise estimate of the total fish production from this source. Many observers believe that the official estimates of the Department of Fisheries (DOF) are grossly underestimated because of its weak and improper data collection methods. The natural weakness of the data collection system is its incentive to the commercial fisheries to underreport catch. The DOF statistics[2] are mostly based on licensing and leasing systems that cover mostly commercial fisheries in 13 provinces (McKenney and Tola 2002) only, and there has been no effort to collect data from the remaining 11 provinces (Ahmed et al. 1998). Catches from ricefield fisheries and small-scale indigenous fisheries are almost ignored in the data collection efforts of the DOF. However, the official estimate of the DOF jumped by 300%, from 76,000 t in 1988 to 228,000 t in 1999, due to the inclusion of small-scale catch into the national annual production figure of inland fisheries. Nevertheless, there still remains a sharp contrast between the official inland fish production figure and the estimates based on catch assessment and related studies by van Zalinge et al. (2002).

van Zalinge et al. (2002) made a comprehensive effort to obtain a reliable estimate by combining data from different sources[3]. This estimate provides a range of total fish production/catch of 290-430,000 t. Currently, this figure is widely used by researchers and policymakers although the estimate still remains indicative only. Much effort is still needed to reach ~~to~~ a conclusive figure in order to assess sustainability of inland fisheries. If it is true that the current catch of fish is higher than that of the previous decades, this is likely to be due to an increase in the population dependent on fishing and increased fishing effort in the form of destructive and illegal fishing.

Like fish catch statistics, there is no reliable information on the quantity of inland fisheries products traded domestically and internationally, although the sector has a significant

[1] The depth of the lake rises from 1-2 m in the dry season to 8-10 m during monsoon (McKenney and Tola 2002).
[2] The DOF estimates of total inland fish production during 1981-1995 fell in the range of 50,000-75,000 t/year (McKenney and Tola 2002).
[3] The estimate combined data from a number of studies (Gregory et al. 1996, Ahmed et al. 1998, and Gregory and Guttman 2002) of fish consumption and production that covered commercial and small-scale indigenous fisheries including ricefield fisheries.

contribution to the country's foreign exchange earning. Information on export of fisheries products is available from two official sources – the Ministry of Commerce (MOC) and the DOF. According to the MOC, the country exported only 517 t of fish and fisheries products, valued at $4.34 million in 1998. In contrast, the DOF estimated 40.2 thousand t for the same year and 44.6 thousand t for the following year, which seemed closer to reality. However, many observers believe that the actual exports are much higher than the DOF estimates, as over the last decade, along with the state-owned Kampuchea Fisheries Export and Import (KAMFIMEX) Company, private exporting companies have been involved in international trade of fish and fisheries products. During the same period, the government of Cambodia has relaxed the monopoly status of the KAMFIMEX to encourage private initiative in fisheries exports. Recently, many private export houses, including four big companies[4] who have modern processing facilities, are actively involved in international trade of fish.

Given the private sector initiatives, export markets have been expanding from neighboring countries like Thailand and Vietnam to other countries in Asia[5], Australia and the USA over the last ten years. The export markets have been diversified to include freshwater fish, processed fish, other aquatic animals such as crocodiles and snakes along with marine fish. The demand for exports of both freshwater and marine fish products has also been significantly increased since 1993 in Thailand and Vietnam (Tana and Seang 2002). Therefore, one can reasonably be skeptical about the current official estimates of exports of fisheries products, given the expansion and intensification of fish exports over the past years. The official estimate of export data may not be reliable as it is principally based on statistics provided by the customs officials, which according to many observers are under-reported due to illegal practices[6] (Tana and Seang 2002). Despite these weaknesses in the data collection methods of the DOF, no independent attempt has been made to get a more reliable estimate until now.

In addition, there are many constraints to fish marketing and trade, some of which are sparsely mentioned elsewhere at a very rudimentary level. Available information on both domestic and international trades of fisheries products suggests that the entire supply chain from the fishing grounds to retail market and border points is traditional and subject to loss of value in terms of spoilage and weight loss due to improper handling and preservation techniques. A recent study by Chea and McKenney (2003) observed two exporters from the landing site to the border points that provided a grave story about the constraints and challenges faced by the exporters[7] in terms of fee payments at different checkpoints of the export route to Poipet. Nevertheless, traders and exporters face many other constraints that

[4] One of these processing plants located in Phnom Penh specializes in processing freshwater fish and the remaining three, located in the port city of Sihanoukville, specialize in processing and exporting shrimp, squid and marine finfish. One trading company manages two processing plants – one in Phnom Penh and another in Sihanoukville.

[5] Other Asian markets, such as Singapore, Malaysia, Taiwan, Japan, Hong Kong and mainland China, import high-value fish (live sand goby, crocodiles, snakes, shrimp, squid, etc.) as reported by Tana and Seang (2002).

[6] Illegal practices are in the form of under-reporting actual volume to evade taxes and customs duties and border crossing through illegal checkpoints to avoid customs officials, among others.

[7] The study observed that the exporters paid fees 28 times (including 3 payments in the Thai side) of which 8 times were to economic police, 3 times to provincial fisheries, 2 times to military police and other stakeholders with or without legal basis. Among these, payment to Thai customs (no legal basis) was the highest, which is more than double the official tax paid to the Cambodian customs. Other major fee payments went to KAMFIMEX, an investment company, as road fee and to authorities of the DOF and the provincial fisheries office at Poipet. All these fee payments took 33% of their gross margin while 52% was for expenses on transport, labor and other management aspects, and the remaining 15% was credited to their net profit.

need to be addressed. This will help develop a class of efficient and competitive entrepreneurs who will be able to overcome new challenges of globalization and health safety barriers in the form of sanitary and phyto-sanitatry (SPS) and hazard analysis critical control point (HACCP) processes.

Given the importance of fish trade to the developing countries in the world market, Cambodia has to revisit its fish import and export policy, constraints and prospects of fish exports, and existing infrastructure of fish handling, processing and distribution channels. The world has experienced a significant shift in fish trade since the early 1990s, as many of the traditional fish-exporting developed countries have become net importers (Delgado and Courbois 1997; Ahmed et al. 2003). Simultaneously, developing countries, especially those in Southeast Asia and South Asia, have become the main suppliers of exports of fish and fish products. Developing Asian countries have been competing with each other for the increasing export market, and the competition is likely to increase in the near future.

In the face of globalization and increasing pressure of implementing SPS and HACCP procedures from the developed, fish-importing countries, survival in the competition will increasingly depend on efficiency and quality in health safety measures of these countries. Cambodia is falling far behind its Asian competitors not only in terms of volume of export, but also in its ability to export quality products. Currently, most of its exports are fresh and semi-processed fish to Thailand, Laos and Vietnam, with little value additions from processing. It is believed that Thailand and Vietnam re-export products with added value through industrial processing. Therefore, comprehensive studies on the need to develop market infrastructure from fishing ground to export points and retail markets, constraints to fish marketing and trade, status of fish handling and quality processing, species important for export and domestic markets, price formation and trade margins, and the overall supply chain of freshwater fisheries, etc., are needed for the development of efficient and competitive markets for both domestic and external trade. This study will address these issues in an exploratory manner based on observation and field survey, which will generate interests for further in-depth studies on these topics.

2. Objectives

There exist numerous reports and seminar and symposia papers focusing on socioeconomics, livelihoods, and marketing and trade on inland fisheries sector, but few of them are based on primary information. Specifically, studies based on primary data collection are almost absent. The study by Chea and McKenney (2003), as mentioned above, is the only study that explored constraints of fish exports. The pioneering report by Ahmed et al. (1998) is the only available study that was based on household survey of fishing communities and covered fish production, consumption, livelihoods in the fishing communities, and fish marketing pattern at the producer and consumer levels. However, providing a broader picture of fish marketing and trade constraints was out of the scope of the study. Tana and Seang (2002) provided comprehensive information on the fishery sector as a whole, largely based on official and unofficial secondary information. The authors also provided some interesting information on fish marketing, trade and fish processing from their experiences and observations. However, the report lacked scientific basis to be generalized for policy purposes, although it generated many interesting questions regarding proper working of the system as a whole.

In the light of paucity of information and lack of in-depth analysis on marketing and trade of fish and fisheries products, the broad objectives of this study are to generate meaningful primary information on marketing infrastructure and distribution channels of fish and fish products in Cambodia and provide input for new policy development.

The specific objectives of the study are to:

1. identify major stakeholders and beneficiaries of fish processing, marketing and trade;
2. explore existing marketing and trade infrastructure and conditions of fish handling and means of transportation;
3. identify important species for export and domestic consumption;
4. identify constraints to marketing and trade of fish and fish products; and
5. provide recommendations based on the results and findings.

3. Research Methods

3.1. Study Area

Given the complexities of interactions across agents and stakeholders in market exchanges, research methods that measure market attributes from a single agent are unlikely to provide a clear picture about the inherent dynamics of fish marketing in the country. For instance, marketing of fish begins from fishing grounds up to middlepersons, landing sites, wholesalers, exporters, retailers and finally to consumers. Therefore, research methods in market analysis should take approaches that will vertically integrate all the agents and stakeholders where exchanges take place. The study used secondary information from government and other sources to complement primary data and observations.

The study design is detailed and comprehensive in that it takes into account stakeholders at different levels in the supply chain. Given its focus in the Great Lake-Tonle Sap and Mekong-Bassac areas, the study purposively selected the three provinces of Kandal (Mekong-Bassac), Kampong Chhnang, Siem Reap (Great Lake-Tonle Sap), and Phnom Penh in the first-round data collection to cover key fishing grounds and landing sites from where most of the fish are channeled to key cities and export points. Moreover, in the second-round data collection, the study included Pursat Province since it is one of important landing sites of fish from the Great Lake-Tonle Sap to markets.

3.2. Sample Selection and Data Collection

Market Observations

Out of the total 19 fish markets in Phnom Penh, the study selected 10 markets (2 big, 3 medium and 5 small) following proportionate random sampling procedure. In each province, the provincial town market and two rural village markets for fresh and processed fish were also surveyed. Sixty-one retailers of fresh and processed fish were interviewed during the first-round data collection in closed season.

Landing Site Observations

Important landing sites around the Phnom Penh and in the selected provinces were also observed and monitored. The observation and monitoring focused on fish handling and storage facilities, quantity, quality and prices of fish by species, and sources of fish. Overall, two landing sites in Phnom Penh, one in Kandal, two in Kampong Chhnang, two in Siem Reap and one in Pursat were surveyed.

Fish Exporters

The study also interviewed fish exporters in Phnom Penh, Kandal, Kampong Chhnang, Siem Reap, Kratie and Stung Treng Provinces, following snowball-sampling procedure[8]. Following this method, four fresh fish exporters in Phnom Penh, two in Kampong Chhnang and two in Siem Reap were identified and interviewed. In addition, case studies of two big exporters in Phnom Penh and Stung Treng were conducted. The big exporting company in Phnom Penh owns two fish processing plants/units in Phnom Penh and Sihanoukville and exports fresh and processed fish to mainland China, Hong Kong, USA, Japan and other neighboring countries. The big fish export company in Stung Treng mainly exports fish caught from the upstream Mekong River to Lao PDR and Thailand through the Lao-Thailand border.

Provincial Fisheries Officials

The study also interviewed provincial fisheries officials about fish catch, exports of fish and important fish species for exports.

All observations and interviews were conducted twice – in the open and closed seasons[9] - to capture seasonality in market dynamics. First-round data collection took place in September 2003 and second-round, in January 2004. The overall sample breakdown is shown in Table 3.1.

Table 3.1. Sample breakdown type of interview/observation and province.

Type of Interview/ Observation	**Province**					**Total**
	Kampong Chhnang	**Kandal**	**Siem Reap**	**Pursat**	**Phnom Penh**	
Landing site observations	2	1	2	1	2	8
Retail market observations	1 provincial, 2 rural	1 provincial, 1 rural	1 provincial, 2 rural	-	10 city markets	18
Interviews with fish processors	20	-	20	20	-	60
Interviews with fish exporters	2	-	4	-	-	6
Discussions among provincial fisheries officers	1	1	1	1	-	4

[8] Although nonprobability sampling, this method is useful when there is inadequate information about the population to be sampled. The DOF has lists of registered exporters by province most of which are either out of business or have not yet started one.

[9] Closed season is from 30 June to 1 October, and open season is from November 01 to July 01. The government has categorized three different scales of fishing operations to reserve the rights to access to inland fisheries. These are large-scale, highly commercial operations in designated water area (lot fishing), medium-scale commercial operations in open waters, and family-scale subsistence fishing, which may or may not be commercial purposes. For the first type of fishing operation, the government collects revenue through leasing out fishing lots. For the second type, fishers are required to obtain licenses from the government. For the third type, fishing operations are waived from paying taxes. For the first and second types, fishing operations are allowed only during open season, while family-scale fishing gears are allowed all year round.

4. Market Infrastructure

Fishing communities in the Great Lake-Tonle Sap area are composed mostly of small-scale fishers using labor-intensive traditional gears for subsistence and whose level of income is low and supplemented by other nonfishing activities. The fishers' productivity per unit of time and effort is low, and their catch is sold at the fishing ground and scattered landing points at unfavorable prices to middlepersons or traders who often possess the market power. Small-scale fishers are unable to generate surplus income for reinvestment to acquire sophisticated gears and techniques that could provide them with income, employment, and social and political mobility. The Fisheries Reform of 2000 provided increased access to small-scale fisheries by reducing the operational area of industrial (lot) fisheries. Small-scale fisheries in the Tonle Sap area play an important role as they are the major source of income, employment and animal protein for millions who live in and around the lake.

Given the dominance of small-scale fishing communities in the lake area, it is not unexpected that the marketing system should be traditional with scattered and undeveloped landing sites. To understand the fish marketing system and its importance to the lives of small-scale fishing communities, the study observed and monitored landing sites and retail markets in selected provinces. This section provides information on fish market infrastructures and fish handling methods.

4.1. Description of Landing Sites

Eight landing sites of freshwater fisheries were observed; two around Phnom Penh, and six other big and small landing sites in Kandal, Kampong Chhnang, Pursat and Siem Reap Provinces.

Phnom Penh and Kandal Landing Sites

The locations of the Phnom Penh landing sites, Chrang Chamress (KM no. 9) and Prek Phneou (KM no. 11), and Pomung Kul in Kandal Province and the distribution chain for fish landed at them are shown in Figure 4.1.

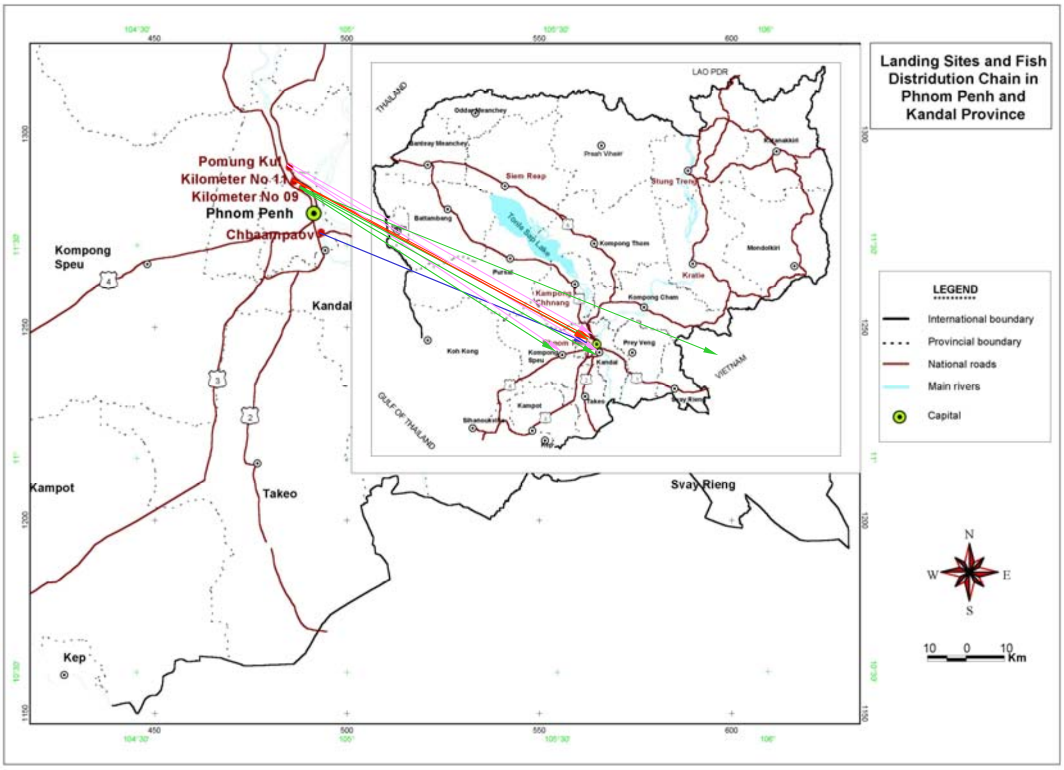

Figure 4.1. Map showing landing sites and fish distribution chain in Phnom Penh and Kandal Province.

The two landing sites around Phnom Penh are big and busy during both seasons, as fish from different fishing grounds in the lake area and the Mekong River are landed here. Most of the traders come with a large amount of fish, collected from fishing grounds, cage farmers, middle-scale fishers and lot owners. In some instances, agents/employees of the commercial operators, who have bulk of production, come to sell their excess products. Traders/wholesalers and exporters from the city markets and export houses buy fish from these landing sites. Significant shares of fish are also destined for distant provinces like Sihanoukville, Kandal, Kampong Speu and Kampot from these city-landing sites. The Prek Phneou (KM no. 11) landing site is specialized for live fish landing and has provision for stocking in cages in the Tonle Sap River on rental basis. The Chrang Chamress (KM no. 9) is used for landing fresh and chilled fish. The Pomung Kul landing site is small, basically for fish landing from small and middle-scale fishers in the Mekong River area. The dominant means of transportation to these landing sites are powerboats and engine boats with cage. In few instances, land transports such as mini trucks, cars and motors are also used.

Both landing sites in Phnom Penh are managed by private leaseholders. There are concrete floors and structures with space for 19 stores in Chrang Chamress landing site and 23 stores in Prek Phneou landing site. Both are located north of the Phnom Penh on the bank of Tonle Sap River and are accessible by national road no. 5. Although both landing sites are suitably located in terms of transportation and market access, they are very inconvenient for unloading from boats due to steeper and longer edge of the riverbank.

Usually, fish landing starts at around 2 a.m., and brokers who help to sell products on commission basis open the boxes for sorting, de-heading and repacking, so that they can charge higher prices for better quality products. Brokers do their business in the open space, although there is plenty of room inside. Wholesalers, exporters and retailers from the city markets and distant provinces such as Kampot, Kampong Speu and Sihanoukville arrive to buy fish from these landing sites. A significant share of the fish is destined for city markets either through retailers or wholesalers. A few varieties of fish such as white fish and snakeheads also go to fish processors from one of the landing sites.

Supplies of fish to Phnom Penh landing sites generally come from provinces such as Kampong Chhnang, Kampong Cham, Kampong Thom, Siem Reap, Pursat, Battambang and Kandal surrounding the Great Lake-Tonle Sap and Mekong-Bassac River, either from cage culture or fishing grounds during closed season, and both fishing grounds and lots during open season.

Kampong Chhnang Landing Sites

There are also two landing sites in Kampong Chhnang Province – one in the periphery of the provincial capital and another in Chnok Tru which is over 50 km away from the provincial capital. The locations of these landing sites are shown in Figure 4.2, together with distribution routes for fish within and out of the province.

The landing site located in the provincial capital has no permanent structure, although the government collects revenues by leasing it out to a private operator based on competitive bidding. The leaseholder of the site charges sellers 50 riel/kg. The site has a small jetty that can provide space for 10-12 boats at a time. During peak period, there is always a long queue of boats waiting for fish landing. Sorting and de-heading are done on the floor of the jetty and on the beach of the river. There are 10-15 brokers who facilitate selling of the products to retailers and wholesalers from local and distant markets. At this site, fish landing starts at 1 a.m. and lasts until 5 a.m. Most of the fish landed at this site are live and are transported in boats with 2-5 t capacity.

At the Kampong Chhnang landing site, almost 90% of the total supplies of fish come from Phat Sandai (Kampong Thom) and Chnok Tru (Kampong Chhnang) fishing grounds and cage culture, and the remaining 10% come from other communes of Kampong Chhnang Province. Most of the high-value fish such as snakeheads and pangasius go to Phnom Penh and other wholesale markets in Kampong Chhnang. Some of the high-value fish and most of the white fish go to the local retail markets and medium-scale fish processors. Women and children de-head and separate eggs of giant snakeheads at the landing site. By doing so, they add value to their products, and charge different prices for the head, body and eggs. The average prices per kilogram of the body, head and eggs of the snakehead are $1.2, 0.5 and 6.25, respectively; while the average price of the whole fish is $1 or less. The body of the giant snakehead goes to Phnom Penh for processing, the head goes to local markets for further processing as animal feed, and the eggs go to city markets; also some of the eggs are sold fresh and are preserved for future sale.

The Chnok Tru landing site is a prominent place due to its proximity to major fishing grounds of the lake, small and medium-scale fish processing zone and wet market and the presence of fish exporters. However, a casual visitor will hardly find any characteristics that can label it as a landing site. There is no fixed landing space or beach. Transactions involving exporters, fish processors and fish collectors are usually made in the wet markets or from boat to boat. Due to bad road transportation links to the provincial capital and other important provincial markets, and a toll charge for fresh and processed fish at the rate of 15 and 40 riel[10] per kg,

[10] Riel 4,000 = US$1.

respectively, fish producers and traders send their products by river transport to other important landing sites and wholesale markets. A few retailers use motor-taxi to carry fish to nearby retail markets. Most of such transactions occur at the river stream that connects the road with the main fishing grounds in the lake.

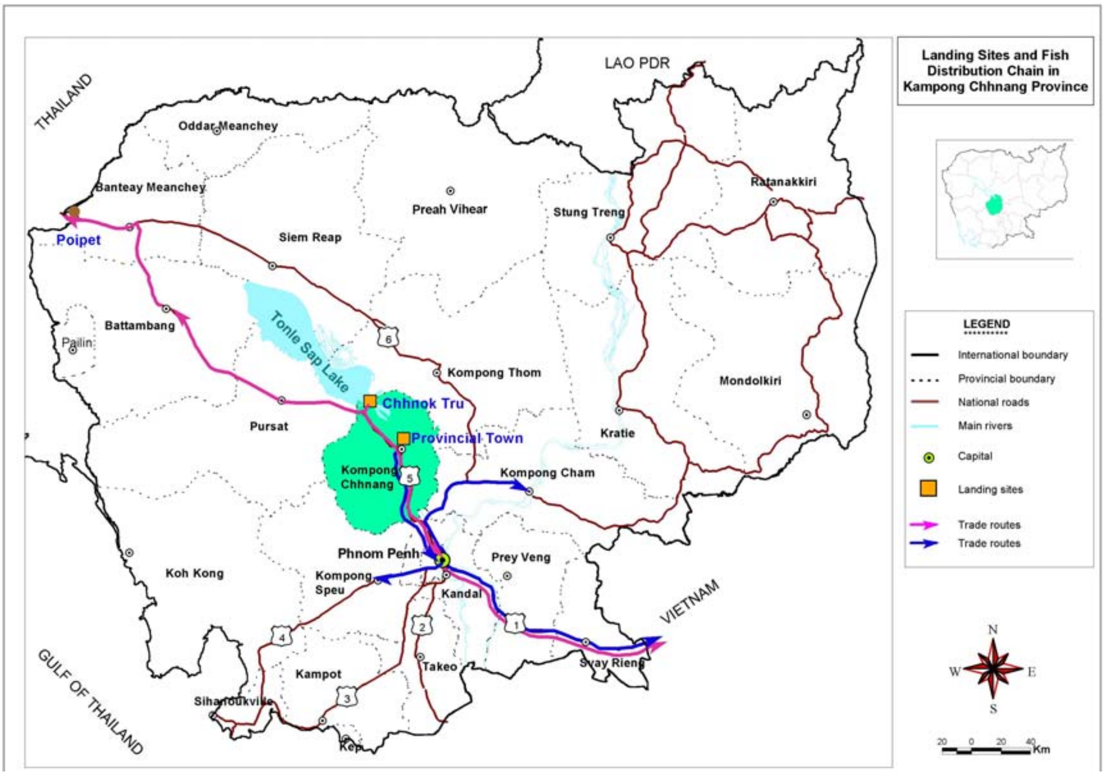

Figure 4.2. Map showing landing sites and fish distribution routes in Kampong Chhnang Province.

Siem Reap and Pursat Landing Sites

The locations of Kampong Khlang and Chnong Khneas landing sites in Siem Reap Province are shown in Figure 4.3, together with distribution routes. Kampong Khlang in Siem Reap is an important place for fish marketing although it lacks the features of a landing site. The place is more than 50 miles away from Siem Reap town, 20 miles west of the national road no. 8 through an unpaved feeder road, which is suitable only for motor driving. During flooded months, the place is under deep water. The place is not suitable for fish landing as the road communication is really bad. Most of the transactions occur among the fishers, collectors, exporters and traders who transport fish by boat to other landing sites and export points. There are two floating fish export houses at the site, which collect species from fishers and fish collectors for export to Thailand and Vietnam. In the marketing and distribution perspective, the place has enormous potential to be an important fish landing place and can be the hub of fish supply in provinces northeast of the lake such as Preah Vihear and the northern part of Kampong Thom. There is no landing place to cover these provinces within 20-30 miles radius. The river is the only transportation route through which there is access to distant landing sites and wholesale markets in Siem Reap, Kampong Chhnang, Pursat and Battambang.

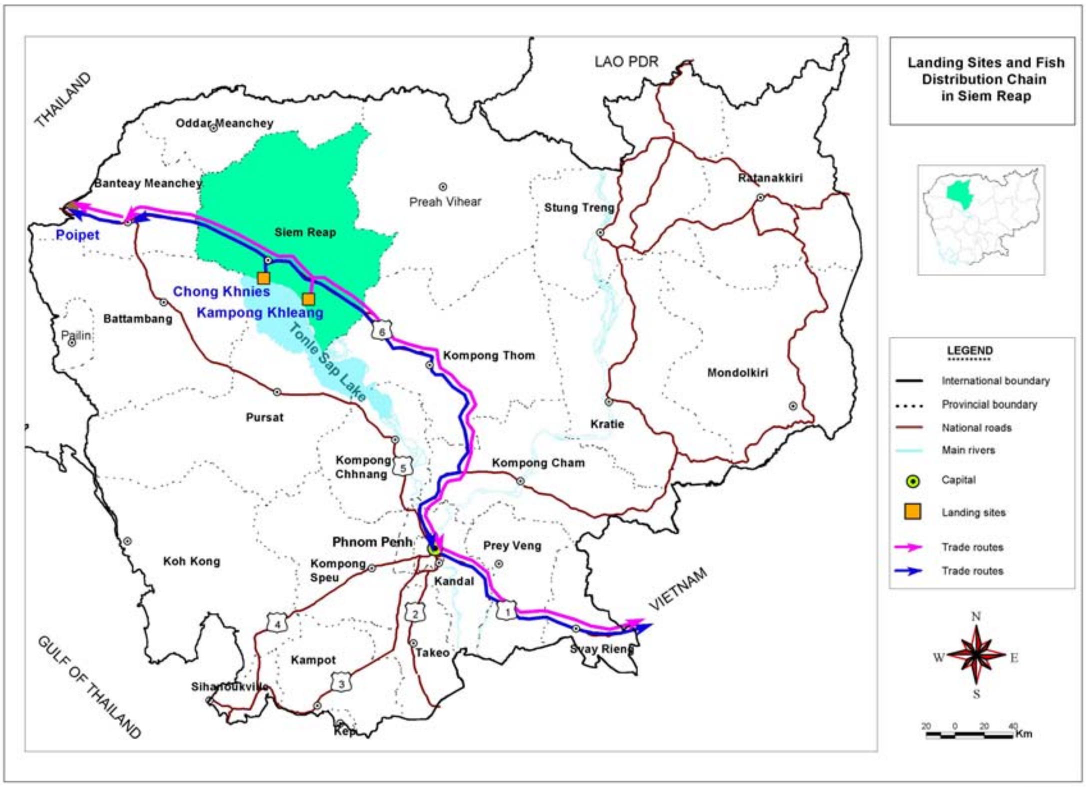

Figure 4.3. Map showing landing sites and fish distribution routes in Siem Reap Province.

Both landing sites in Kampong Loung in Pursat Province and in Chong Khneas in Siem Reap are important for exports and domestic fish supply to the northwest part of the country that covers Pursat, Battambang, Banteay Mean Chey, Otdor Mean Chey and Siem Reap. These places have also grown as important business centers for the people who live around in floating villages. Most business takes place in the floating shops and mobile boats around the landing sites. Unfortunately, although these places are renowned and important for fish landing, they lack facilities and support services for fish handling, processing and storing.

The major suppliers of fish at Kampong Loung and Chong Khneas landing sites are collectors and medium-scale and commercial fishers from nearby fishing grounds and distant places. Fish landing and transactions start early in the morning and continue until late afternoon. At Chong Khneas landing site, most fish buyers are exporters, retailers, and crocodile, cage and animal farmers. A few of them are fish processors. Substantial shares of the total fish, mostly low-value white fish, landed in this site are processed to fish and animal feed. There are five to six fish traders/exporters who buy desired species, chill and store them, and supply them to nearby provinces and to Thailand through Banteay Mean Chey and Otdor Mean Chey border points. In addition, the site has recently been gaining importance as a tourist destination; thus, providing income and livelihood opportunities for many people. There are some 15-20 big powerboats that are especially designed to take tourists on sightseeing rides in the lake. On average, each boat makes 4-5 trips per day, with 5-10 passengers per trip.

The observation of landing sites suggests that even though fish has become an important commodity due to its increased value both in the domestic and export markets over the past decade, physical facilities and support services at the landing sites still remain basic and traditional. In fact as per the modern definition of landing sites, these places can in no way be labeled as standard landing place. As per the Food and Agriculture Organization (FAO) manual for fish landing and marketing facilities, fish landing sites should provide basic infrastructure and services so that freshness and quality of fish can be maintained and cross-contamination can be avoided (Pizzali and Medina1988). The most important constraint to developing fixed structures and other landing facilities at these sites is that the ~~places~~ shift with the changing water level during wet and dry seasons, within the range of 5-10 miles.

4.2.Quantity and Price of Fish at Landing Sites

The quantity of fish landed at the sample landing sites in one day in the closed season is shown in Table 4.1. Fish were graded according to quality (e.g., size, species, condition) and priced accordingly. There were no data at the landing sites in Kandal Province during that time because it was closed season, and the province was not included in the first-round data collection.

Table 4.1. Daily quantity and average price of fish at sample landing sites by grade during closed season, August 2003.

Quantity sold/day (kg)	**Phnom Penh**	**Kampong Chhnang**	**Siem Reap**	**Grand Total**
Grade 1	7,352.30	4,262.00	4,778.70	16,393.00
Grade 2	8,794.30	4,806.00	485.40	14,085.70
Grade 3	3,685.00	2,826.00	1,059.80	7,570.80
Total	19,831.60	11,894.00	6,323.90	38,049.50
Average price ($/kg)				
Grade 1	3.48	5.83	0.74	3.29
Grade 2	2.50	3.20	0.51	2.47
Grade 3	1.92	1.81	0.48	1.55
All	2.46	2.77	0.54	2.16

The most important species landed, based on the average for all sample landing sites, are shown in Table 4.2. Overall, three species (*kanchak sla*, *chdaur* and *chhkok*) made up over 40% of fish sold at landing sites, by quantity. Table 4.3 shows the most important species sold by value. The most valuable species were *kbork* ($5.8/kg), *krormorm* ($5.0/kg), *kanchos thmor* ($4.84/kg) and *kchoeung* ($4.76/kg) although these species made up less than 0.5% of the total quantity sold by volume. These prices were particularly high, reflecting the rarity of the species compared to others. The high prices might have also reflected very high quality and large size, which probably qualified the fish for export market.

The results showed that there were different fish species in terms of quantity and price landed by the sample province (Appendix A, Tables 1-6).

Table 4.2. Important fish species in terms of volume in selected landing sites in Tonle Sap area, 2004.

Name of Species		Quantity	Average Price	Quantity
Local Name	**English Name**	**(kg)**	**($/kg)**	**(%)**
Trey kanchak sla	Small-scale archerfish	7,208	3.52	18.94
Trey chhdaur	Giant snakehead	4,375	2.91	11.50
Trey chhkok	Soldier river barb	4,042	3.11	10.62
Trey carp	N/A	2,085	0.80	5.48
Trey kaok	N/A	2,014	1.76	5.29
Trey po	Black ear	1,677	2.42	4.41
Trey kaok	Bigmouth sea catfish	1,437	2.26	3.78
Trey krum	Greater bony lipped barb	1,350	2.83	3.55
Trey chrakaing	N/A	1,199	2.29	3.15
Trey kantrang preng	Duskfin glassy perchlet	1,178	1.54	3.10
Trey pra	Iridescent shark-catfish	1,066	2.16	2.80
Trey chhpin	Goldfin tinfoil barb	930	2.22	2.45
Trey chhlaing thmor	N/A	703	2.68	1.85
Trey kaek	Black shark minnow	683	1.59	1.80
Trey slat	Bronze featherback	630	1.15	1.66
Trey kanchos chhnoht	N/A	512	1.20	1.35
Trey chhlonh chhnoht	Peacock eel	508	1.88	1.34
Trey chhlaing	N/A	495	2.58	1.30
Trey damrey	Marbled sleeper	454	3.24	1.19
Trey khmann	Hampala Barb	339	1.95	0.89
Others		5,165	1.84	13.57
Total		38,050	2.16	100.00

Table 4.3. Important species in terms of price in all the landing sites in Tonle Sap area.

Name of Species		Quantity (kg)	Average Price ($/kg)	Quantity (%)
Local Name	**English Name**			
Trey kbork	Laotian shad	11	5.80	0.03
Trey krormorm	N/A	72	5.00	0.19
Trey kanchos thmor	Asian bumblebee catfish	72	4.84	0.19
Trey kchoeung	Freckle fin eel	22	4.76	0.06
Trey klaing hay	Twisted jaw sheatfish	158	4.39	0.42
Trey kanh chorn chey	N/A	109	4.30	0.29
Trey kanchak sla	Small-scale archerfish	7,208	3.52	18.94
Trey sanday	Great white sheatfish	203	3.52	0.53
Trey tilapia chhnoht	Nile tilapia	33	3.33	0.09
Trey damrey	Marbled sleeper	454	3.24	1.19
Trey chhkok	Soldier river barb	4,042	3.11	10.62
Trey ka port	Malayan bony tongue	47	3.10	0.12
Trey promah	Small-scale croaker	51	3.00	0.13
Antung	Swamp eel or freshwater eel	20	3.00	0.05
Trey proul	Small-scale mud carp	273	2.94	0.72
Trey chhdaur	Giant snakehead	4,375	2.91	11.50
Trey kampliev	N/A	10	2.90	0.03
Trey krum	Greater bony lipped barb	1,350	2.83	3.55
Trey kahe	Redtail tinfoil barb	8	2.81	0.02
Trey kaok	Spotted sea catfish	6	2.70	0.02
Trey chhlaing thmor	N/A	703	2.68	1.85
Trey chhlaing	Yellow mystus	202	2.64	0.53
Trey chhlaing	N/A	495	2.58	1.30
Trey stuak	N/A	63	2.52	0.17
Trey prorlung	Mad barb	103	2.43	0.27
Trey po	Black ear	1,677	2.42	4.41
Trey chrakaing	N/A	1,199	2.29	3.15
Trey kaok	Bigmouth sea catfish	1,437	2.26	3.78
Trey dangkteng	N/A	86	2.23	0.23
Others		13,562	1.18	35.65
Total		38,050	2.16	100.00

4.3. Observations of Retail Markets

Fresh and processed fish were commonly sold in provincial and local markets. As Table 4.4 shows, a great many individual traders sold fish at city and rural markets, both at covered "indoor" shops and uncovered market stalls. On average, there were 25-107 fresh fish shops and 25-54 processed fish shops per retail market, based on the sample markets. Fish shops/stalls in city markets are generally covered, while provincial and particularly rural markets are more likely to have open stalls selling fish. Overall, processed fish shops/stalls are more commonly covered than fresh fish shops/stalls. This reflects the overall condition of provincial and rural markets (Table 4.5); city and provincial markets are generally covered or partially covered, while rural markets are more likely to be open.

Table 4.4. Average number of fish sellers in the sample markets by location of markets.

Location of Markets	Number of Fish Shops			
	Retail Fresh	Retail Processed	Covered Shops	Covered Processed
City markets	41.60	25.30	23.50	19.80
Provincial town markets	107.33	54.00	15.67	24.00
Rural markets	24.67	11.50	0.83	1.33
All markets	46.63	25.47	15.11	14.63

Source: Retail fish market observation, August 2003.

Table 4.5. Type and condition of market by location.

Market Location	Open	Covered	Partially Covered	Total
City markets	1	7	2	10
Provincial town markets	1	1	1	3
Rural markets	3	2	1	6
All markets	5	10	4	19

Source: Retail fish market observation, August 2003.

Fresh fish retail shops were typically run by one person in rural markets, and two in provincial and city markets (Table 4.6). Overall, fish sellers surveyed had been working in the business for 10-13 years, with city and provincial-based traders having longer service than rural fish sellers.

Table 4.6. Average number of years in business and number of persons involved in retail fish shops.

Market Location	Years in the Business	Number of Workers
Provincial/rural		
City markets	12.95	1.95
Provincial town markets	11.89	2.22
Rural markets	9.61	1.34
Provinces		
Kampong Chhnang	8.64	1.20
Siem Reap	10.53	1.87
Kandal	12.25	1.63
All	11.18	1.70

Source: Retail fish market survey, August 2003.

The main sources of fish sold in retail markets in Phnom Penh, Kandal, Kampong Chhnang and Siem Reap towns are shown in Table 4.7. Retail markets in Phnom Penh were sourced from all provinces around the Great Lake with the exception of Battambang, Pursat and Siem Reap. Fish landed in these provinces were more likely to be sold in Siem Reap or exported to the Thai border in the north. However, fish caught in Pursat and Battambang were landed in Kampong Chhnang and taken to Phnom Penh from here. Phnom Penh retail markets also sold fish from Takeo and Kampong Cham Provinces. Retail markets in provincial town markets were sourced from the more local area of one or two surrounding provinces.

Table 4.7. Main sources of fish sold in retail markets in study areas.
Sources are listed in order of importance for each market location.

Market Location (Town/City)	Source of Fish (Province)
Phnom Penh	Kampong Chhnang
	Kampong Cham
	Kandal
	Prey Veng
	Kampong Thom
	Takeo
Kandal	Kandal
	Phnom Penh
Kampong Chhnang	Kampong Chhnang
	Pursat
Siem Reap	Siem Reap
	Battambang

Table 4.8 shows the most important species sold in sample retail markets in terms of volume, detailing the quantity sold per week and average selling price for each species. The species sold in the greatest quantity were *raws* (25%) and *chdaur* (13%), for $1.11 and 1.22, respectively. The most important species in terms of price are shown in Table 4.9. The most expensive species sold was *bankang* ($7.81/kg), although this is a crustacean rather than finfish. The most expensive fish species were *khya* ($2.50/kg), *klainghay* ($2.21/kg) and *pra* ($2.00/kg). These species made up less than 1% of the total volume sold.

Table 4.8. Important species in terms of volume sold in the sample retail markets during open season, 2004.

Name of Species		Quantity Sold (kg/week)	Average Price ($/kg)	Quantity (%)
Local Name	Local Name			
Trey raws	Chevron snakehead	7,733.0	1.11	24.92
Trey chhdaur	Giant snakehead	4,074.2	1.22	13.13
Trey kranh srai	Climbing perch	1,299.5	0.78	4.19
Trey chrakaing	N/A	1,282.5	1.01	4.13
Trey chhpin	Goldfin tinfoil barb	1,281.1	1.01	4.13
Trey riel	N/A	1,114.3	0.53	3.59
Trey chhlaing	N/A	975.7	0.96	3.14
Trey chhkok	Soldier river barb	889.5	1.51	2.87
Trey pra	Iridescent shark catfish	790.0	0.87	2.55
Trey andaing toun	Blackskin catfish	781.5	1.10	2.52
Trey krum	Greater bony lipped barb	769.2	1.78	2.48
Trey kantrang preng	Duskyfin glassy perchlet	624.5	0.85	2.01
Trey po	Black ear	612.0	0.94	1.97
Trey proul	Small-scale mud carp	535.5	1.14	1.73
Kampeus	Lanchester's freshwater prawn	511.0	0.68	1.65
Trey chhlonh chhnoht	Peacock eel	421.9	1.63	1.36
Trey slat	Bronze featherback	398.7	0.84	1.28
Leas	Ridged Venus clam	395.0	0.25	1.27
Trey bandol ampeou	River sprat	306.0	0.50	0.99
Trey damrey	Marbled sleeper	305.4	1.01	0.98
Trey kanchos chhnoht	Iridescent mystus	270.5	0.74	0.87
Trey kanchos kdaung	Bocourt's river catfish	236.0	0.79	0.76
Others		5,430.2	0.96	17.50
Total		31,037.2	0.97	100.00

Table 4.9. Important species in terms of price in the sample retail markets during open season, 2004.

Name of Species		Quantity Sold (kg/week)	Average Price ($/kg)	Quantity (%)
Local Name	**English Name**			
Bankang	Giant freshwater shrimp	98.0	7.81	0.32
Trey khya	N/A	1.5	2.50	0.01
Trey klaing hay	Twisted jaw sheatfish	96.5	2.21	0.31
Trey pra, Trey bong lao	N/A	6.5	2.00	0.02
Trey krum	Greater bony lipped barb	769.2	1.78	2.48
Trey sanday	Great white sheatfish	128.0	1.76	0.41
Trey pawa muk py	N/A	1.5	1.75	0.01
Trey kray	Royal featherback	26.5	1.71	0.09
Trey kbork	Loatian shad	2.0	1.69	0.01
Trey chhlonh chhnoht	Peacock eel	421.9	1.63	1.36
Trey chhkok	Soldier river barb	889.5	1.51	2.87
Trey kanchos thmor	Asian bumblebee catfish	46.5	1.50	0.15
Trey kaok	Soldier catfish	6.0	1.50	0.02
Trey kes	Common sheatfish	215.0	1.46	0.69
Trey ka port	Malayan bony tongue	38.0	1.36	0.12
Trey kchoeung	Spiny Eel	39.8	1.36	0.13
Antung	Swamp eel or freshwater eel	53.5	1.27	0.17
Trey pream, Trey kam pream	Fringed threadfin	7.5	1.25	0.02
Trey pra kandor	N/A	2.7	1.23	0.01
Trey krormorm	N/A	121.0	1.23	0.39
Trey chhdaur	Giant snakehead	4,074.2	1.22	13.13
Others		23,991.9	0.75	77.30
Total		31,037.2	1.84	100.00

The overall average amounts and prices of fresh fish sold in retail markets, together with average travel costs and market fees and taxes are shown in Table 4.10. On average, fresh fish sellers in city and provincial markets sold more fish for a higher price than rural fish sellers (79-83 kg/day at $1.14-1.60/kg compared to 42 kg/day at $0.66/kg). However, fish sellers in provincial and city markets paid much higher taxes and fees than rural market sellers ($106-130/month compared to $31/month). The average transport costs were highest for fish sellers in city markets ($23.33/day) and lowest for provincial markets ($0.83/day). Fish sellers at rural markets paid an average of $5.05/day for transport costs. Fish sellers at provincial and city markets were able to recoup the higher transport costs and taxes by charging higher prices for fish. Fish sellers in rural and city markets expended 22% of the daily takings on transport costs and taxes. In contrast, fish sellers at provincial markets paid only 5% of the daily takings on fees and taxes. Moreover, the amount and price of fish sold in the selected retail markets were for different fish species by province (Appendix A, Tables 7-11).

Table 4.10. Average quantity, price, cost of transport, and taxes and fees in retail fresh fish shops.

Market Location	Average Quantity Sold (kg/day)	Average Price ($/kg)	Average Transport Cost ($/day)	Average Taxes and Fees ($/month)
Provincial/rural				
City markets	79.00	1.60	23.33	129.75
Rural markets	42.12	0.66	5.03	31.39
Provincial town markets	83.08	1.14	0.83	105.84
Province				
Kampong Chhnang	44.58	0.76	0.77	38.81
Siem Reap	61.59	0.68	8.64	48.86
Kendal	47.10	0.99	1.52	68.49
All	61.79	1.08	11.11	78.62

Source: Retail market survey, August 2003.

In keeping with fresh fish retail shops, processed fish shops were typically run by two people in city and provincial markets, and one person in rural markets (Table 4.11). Similarly, processed fish sellers had been in the business for an average of 12 years in city markets, 15 years in provincial markets and 10 years in rural markets.

Table 4.11. Average number of years in business and number of workers in each retail processed fish shop.

Market Location	Years in Business	Number of Workers
Rural/provincial		
City markets	11.89	1.79
Rural markets	10.26	1.26
Provincial markets	14.75	1.50
Provinces		
Kampong Chhnang	10.93	1.13
Siem Reap	11.67	1.58
Kendal	12.50	1.25
All	11.6	1.50

Source: Retail fish market survey, August 2003.

The average amounts and prices for processed fish sold in retail markets, together with average travel costs and market fees and taxes are shown in Tables 4.12 and 4.13. Taxes and fees and transport costs were highest for processed fish sellers in city markets. There was significant variation in these costs as paid by fresh and processed fish sellers in all types of markets. At city markets, fresh fish sellers paid high taxes and fees ($130/month) and transport costs ($23/day) compared to processed fish sellers ($17/month and $6/day, respectively). Likewise, at rural markets, fresh fish sellers paid an average of $31/month for fees and taxes and $5/day for travel costs while processed fish sellers paid only $2/month and $1/day for the respective costs. At provincial markets, fresh fish sellers paid much higher fees and taxes than processed fish sellers ($106/month compared to $3/month), but slightly lower transport costs ($1/day compared to $2/day).

Table 4.12. Average transport costs, taxes and fees by market location for each retail processed fish shop.

Market Location	Transport Cost ($/day)	Taxes and Fees ($/month)
City markets	5.877	17.207
Rural markets	0.900	2.285
Provincial markets	2.450	2.727
All	2.949	7.739

Source: Retail fish market survey, August 2003.

As Table 4.13 shows, generally, the largest quantities of processed fish were sold at provincial markets, followed by rural markets. This was with the exception of dried fish, which were sold in biggest quantities at city markets. Prices for processed fish were highest in city markets (which contrast with fresh fish prices which were highest in provincial markets), followed by provincial and rural markets.

Table 4.13. Average quantity and price by product type and market location of processed fish products.

Product Type/ Market Location	Average Quantity Sold (kg/day)	Average Price ($/kg)
City markets		
Dried	38.13	3.874
Smoked	9.13	6.278
Fermented	8.90	3.185
Fish paste	9.48	1.524
Egg	2.67	4.183
Rural markets		
Dried	17.15	1.973
Smoked	11.67	3.274
Fermented	17.57	1.068
Fish paste	29.24	0.953
Fish sauce	7.67	0.339
Egg	8.83	1.042
Provincial markets		
Dried	22.83	2.400
Smoked	17.27	3.297
Fermented	17.07	1.491
Fish paste	39.00	0.849
Fish sauce	12.58	0.171
Egg	6.33	2.725
All markets		
Dried	27.25	2.881
Smoked	10.65	5.423
Fermented	14.23	1.962
Fish paste	25.50	1.106
Fish sauce	10.94	0.227
Egg	5.13	3.033

Source: Retail fish market survey, August 2003.

5. Supply Chain of Inland Fisheries Products

5.1. Stakeholders in the Supply Chain

The most complicated component of the fish marketing system in Cambodia is the supply chain and distribution channels in which numerous transactions take place before fish and fish products reach the consumer or export markets. There are many middlepersons (often women) who, in all their guises, are essential for the fisheries trade. The trading system would not function without these entrepreneurial individuals and their enterprises.

The fish distribution networks are relatively well-managed in inland fisheries. There are two types of fish trader in inland fisheries, i.e., small and medium-scale. In general, the small traders collect fish directly from fishers at the fishing ground and sell these to wholesalers or fish traders who distribute them to different markets (i.e., local and outside of the province). There is high domestic demand for fish and fish products, ranging from live to processed forms, such as fish paste, fermented fish, dry salted fish, steamed fish, smoked fish, fish-sauce, etc. High-value species are usually sold to traders for marketing in Phnom Penh or for exporting.

The main players of the supply chain of fisheries products system are the fishing lot owner, fisher, fish collector, wholesaler/trader/middleperson and retailer. Following is a description of each of these stakeholders in the supply chain.

Fishing Lot Owners
Lot owners control the fish product and ~~play~~ as fish suppliers to wholesalers/traders, fish processors, fish collectors and exporters at fishing lot or landing site. Lot owners never export fish to Thailand directly by themselves, but generally stock fish in pen cage for selling to Phnom Penh market during closed season. Fishing lot owners market their fish in fresh and processed forms. Some of them bring their fish by cage to Phnom Penh's central or regional markets. Some lot owners are reportedly financed by larger exporters, traders or government officials, and are subsequently required to sell their catch to these financiers.

Fishers
Fishers are classified as small, medium and large-scale, depending on the size of catch potential and type of fishing gear. Small-scale (family-scale) fishers consist of 1-3 persons who fish primarily for family subsistence and income. The number of small-scale fishers is increasing annually as the population grows and as alternative livelihoods become scarce. Medium-scale fishers are extended families and village level partnerships (3-6 persons) who catch fish for family income and processing. These kinds of fishers sell to fish collectors and sometimes directly to consumers.

Fish Collectors
Fish collectors collect fish directly from fishers at the fishing ground. Generally, they have one or several boats which contain several ice boxes for fish storage during the fish collection period. Fish collectors are specialized operators who proceed with fish buying throughout the year, buying fish from fishers and bringing these to the landing site. They set prices with fishers, depending on fish quality, supply situation and daily fish market demand. Most fish collectors have capital for immediate cash payment to fishers, although they also often

provide credit in cash and in kind (e.g., fishing gear). In practice, some collectors also get loans from wholesalers, middlepersons and exporters to whom they sell fish at landing site.

Wholesalers/Traders

Wholesalers/traders represent an important part of the fish marketing chain in that often, major quantities of fish are channeled through them. In Cambodia, they are best compared to fish distributors who have a permanent fish stall at a fish landing site, floating village or distribution center. They usually buy fish from fishers, lot owners, collectors or middlepersons and sell these to exporters, retailers and restaurants. This business is very much location-specific, and the scale may depend on whether a wholesaler is based in a provincial town or in the Phnom Penh area.

Semi-wholesalers

Defined as semi-wholesalers are those fish traders who have a permanent stall inside/outside a market, whereby fish are brought by middlepersons or wholesalers and sold to them at the market. Semi-wholesalers act sometimes as retailers but they usually have an additional function in distributing fish to small retailers who sell fish at local markets directly to consumers and processors. Most semi-wholesalers are fish traders at the provincial level but some of them also operate in Phnom Penh, or may transport fish from the capital to sell to retailers in fish-deficit provinces.

Retailers

Defined as fish retailers are those who sell fish in markets directly to consumers or restaurants. In many cases, they have a permanent stall inside or outside the market. Generally, in each market (from provincial to local levels) there are many fish retailers selling fish every day. Fish retailers who sell fish in the market are mostly women but they often have their spouses or relatives who help them buy fish from the landing site or the distribution center. Some fish retailers who work alone (i.e., those who are widow/ers) buy fish from semi-wholesalers in the same market or place where they sell fish directly to consumers.

In addition, there are also retailers who are itinerant traders in that they do not have a permanent stall but sell from a basket or another container by moving from place to place.

Fish Processors

Fish processors are generally fishers or fish raisers (but not all of them) or businesspersons. The processors, who mainly buy fish from fish lot owners or traders/middlepersons/fish collectors, produce fish paste, salted dried fish, fermented fish, smoked fish, etc. Processed products are usually sold to domestic markets; some are also sold to international markets with specific products and species.

Exporters

Exporters export fisheries products to neighbors and other countries. They generally purchase fish directly from fishing lot owners or traders/middlepersons, store the~~se~~ with ice in containers and export the~~se~~ by land or air as live fish.

Transporters

Fish transporters provide only transportation service to fish traders/wholesalers and do not buy or sell fish. They are important in the fish trade channel. The transportation means differ from one area to another. Fish are usually transported by boat, motorbike, mini truck or pick-up car from fishing ground to landing site, local market and fish distribution center.

Transporters own trucks and boats that transport fish from the fishing ground to the landing site, fish processors and markets in Cambodia and export markets at Thailand and Vietnam. Transporters pay a registration fee to the DOF and also a series of unofficial road taxes from the landing site to the final destination.

Others Stakeholders

Many other stakeholders and beneficiaries who are involved to a lesser degree in fish marketing and trade include the following:

- fish handlers/workers at landing sites and markets;
- fishing equipment producers and sellers;
- boatmakers;
- money lenders;
- ice suppliers;
- salt suppliers;
- boat and motor-taxi drivers;
- fisheries officers;
- police and local authorities;
- basket producers and sellers;
- landing place owners; and
- market managers.

5.2. Overview of the Supply Chain

An overview of the supply chain for inland fisheries products is shown in Figure 5.1.

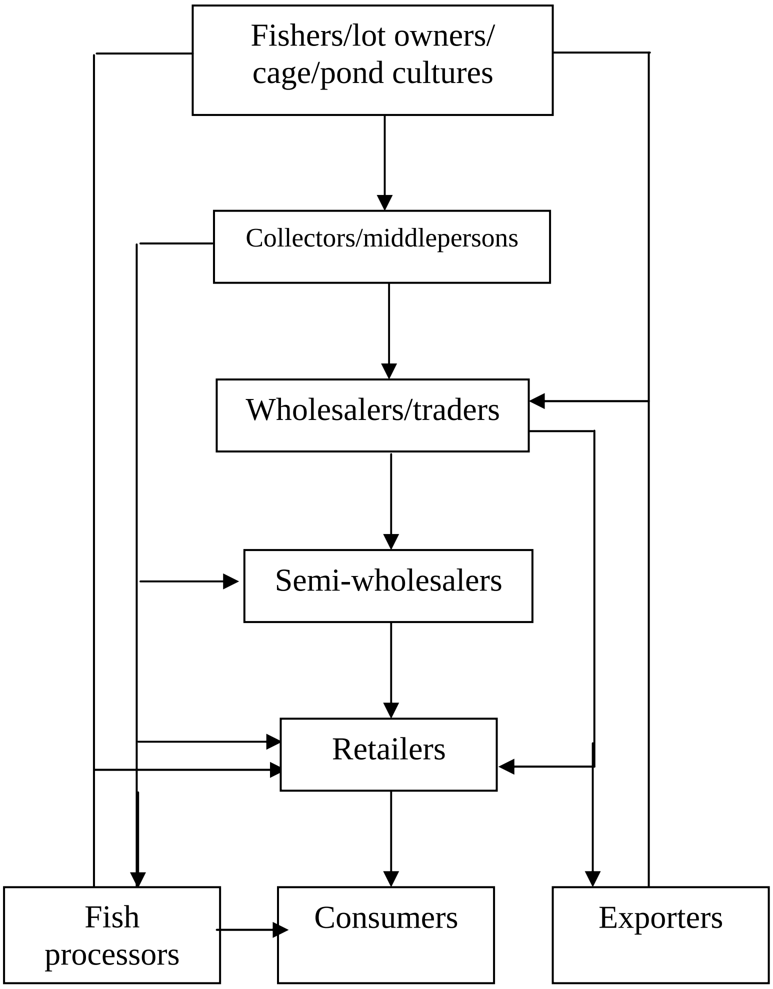

Figure 5.1. The supply chain of inland fisheries products in fish marketing system in Cambodia.

6. Fish Processing

Fish from freshwater capture fisheries are processed using both traditional and modern technologies. The traditional processing of fish can be classified as small, middle and large-scale (commercial). Normally, traditionally processed fish products are for domestic consumption, whereas modern processing industries supply both domestic and export markets.

6.1. Traditional Fish Processing

Small-scale (family-scale) processing is common practice for Cambodian ~~people~~, who are very fond of processed fisheries products like fish paste, fish sauce, dried salted fish, smoked fish, etc. These traditional ways of processing fish are well adapted to the irregularity of the seasonal fish catch. In the very short peak period for inland fish catches, it is necessary to process fish quickly and in a basic way, i.e., by hand within the household. For example, in the production of fish paste and fish sauce, salt is added immediately to conserve fish, which can be kept in this form for the whole year. The salted fish is further processed by the addition of water and other ingredients and left to ferment to make fish sauce. Though the final product is of low value, it is a way of handling the amount of fish during peak period. In general, small-scale fish processing is an activity of households who process for family consumption and to sell in the village and local market. They generally live near the river, fishing lots and lakes and in upland areas.

Middle-scale fish processing operations are usually family-run, relying on the members' labor, with the help of relatives and some hired labor during peak periods. An average of 5-10 workers is hired, depending on the fishing season. These operations are usually located near fishing lots, fishing villages or landing sites. Generally, they involve processing fish to produce dried salted fish, smoked fish, fermented fish *(pha-ork)*, and fish paste *(pha-ork)*, etc. The market for sun-dried fish for animal feed has expanded markedly in the last few years, particularly for export to Vietnam.

Large-scale processing is generally operated by fisheries enterprises and fish sauce factories. They usually employ about 40-60 workers, 80% of whom are females who are involved in the activities of transforming fish into dried salted fish products, ordinary fish pastes, boneless fish pastes (with high value), fermented fish *(pha-ork)* and smoked fish (Tana, 1993). Large-scale operations are normally run by private individuals, often fishers or their relatives, and are usually located in fishing villages near fishing lots, especially in the Great Lake and the Tonle Sap River.

6.2. Modern or Industrial Fish Processing

In general, the fisheries products obtained from industrial fish processing are mainly destined for export to international market. These enterprises are owned by private companies and foreigners, and are located in Phnom Penh and Sihanoukville. They are operated under supervision of the government, and are represented by the fisheries company KAMFIMEX. There are four freezing processing plants in Cambodia, all of which hold export permits. One plant is in Phnom Penh and three are in Sihanoukville. Two of the facilities are owned by a Cambodian firm, Liang Heng Trading Company. There are also some small freezing facilities which undertake contract processing mainly for traders, including KAMFIMEX, the state-owned trading company. The other one is owned by a foreign firm, SUN WAH enterprise, which has headquarters in Hong Kong.

Liang Heng Trading Company in Phnom Penh operates two processing plants: one has 100% Cambodian investment whereas the other has foreign investment from Hong Kong. This company produces freshwater products, such as frozen fish and shrimp, smoked fish and fish fillet, which are exported to the USA, Australia, Singapore and Hong Kong. The second processing plant located in Sihanoukville has been leased out by the government to foreign investors from Hong Kong and Taiwan. All products from this enterprise are exported to two buyers in Hong Kong and Taiwan.

Sun Wah Factory in Sihanoukville was established in August 1996 with 100% foreign investment by the large Hong Kong-based conglomerate Sun Wah. It is a medium-scale operation with a daily capacity to process 10 t of raw materials. All fisheries products are mainly exported to the headquarters in Hong Kong and some of these are then re-exported to other international markets. The headquarters in Hong Kong is responsible for marketing the products. The main goods for export are shrimps and squids and some finfish.

6.3. Survey of Fish Processors

Fish processing activity is one of the sources of additional income ~~of~~ households who live with or near fisheries resources around the Tonle Sap-Great Lake and Bassac-Mekong River. Moreover, fish processing benefits a huge amount of the labor force, especially women and children, and is therefore of great importance to the local economy. However, the processors, as well as stakeholders involved in fish processing and labor activities, often still live in poverty and generally receive little of the end product value.

Primary data on processing activities were collected in three provinces, namely, Siem Reap, Kampong Chhnang and Pursat Provinces. Sixty households were interviewed. The results showed that majority of the fisher households were involved in fish processing. The main processed fish products were fish paste *(prahok)*, semi-fish paste *(semi-prahok)*, salted dried fish, fermented fish, dried fish, smoked fish, dried small shrimp and trash fish for animal feed. All small-scale and some medium-scale fish processors owned their processing plant and relied on both family and some hired labor, especially during peak season. Overall, 58% of the sample households used hired labor – 77% employed 1-4 hired laborers and only 6%, 7-8 hired laborers (Figure 6.1). In general, processors used their own capital to start their business.

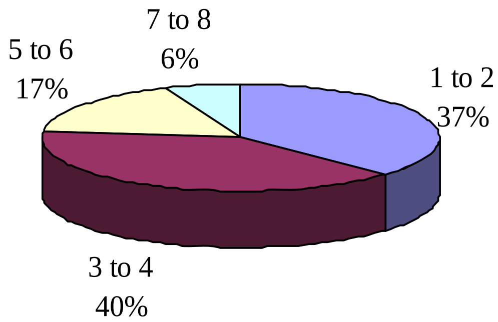

Figure 6.1. Number of hired labor used for processing activities per plant.

The salaries of hired laborers ranged from 65,000 to 160,000 riels/month. However, the majority received about 100,000 riels/month. The wage rate varied according to processing type and activities involved. The highest wage rate was given to laborers with most experience in making fish paste without bone and smoked fish, whereas the lowest rate was given to those working in trash fish, dried small shrimp and salted dried fish.

The most important marketing routes for fish processors in the study areas were wholesalers, both within the local province (69% of sampled processors) and other provinces (49%). A minority of processors (10%) exported processed fish products to buyers at the Thai border. Table 6.1 shows the directions of the products.

Table 6.1. Marketing of processed fish produced in 2003.

Type of Marketing	Number of Processors (n=61)	% of Processors
Sell directly to customers in local markets	3	4.92
Sell to middlepersons/traders who collect from processors	3	4.92
Sell to wholesalers within province	42	68.85
Sell to wholesalers in different cities outside the province	30	49.18
Sell to exporters	2	3.28
Export directly to Thailand	6	9.84

7. Export Markets

As fisheries products are the most valuable source of animal protein for daily food in Cambodia as well as in the world, the domestic and international demand for fish commodity and fish products is high compared to other animal meat. In Cambodia, the most important fisheries products are derived from inland fisheries. Marketing and distribution networks are well developed for inland fisheries products. There are small and middle-scale fish traders in the fisheries sector. High-value species are usually sold in the international market.

In general, a lack of complete and accurate data at the national level makes it difficult to quantify the fishery exports from Cambodia. Table 7.1 shows the official statistics of inland and marine fish exports from 1992 to 2002 from Cambodia (DoF 2002). The data indicated that the volume of fish exports increased in year 2002 compared to many years ago.

However, the actual exports are much higher than these figures as exporters commonly do not report all exports at land border points, and the main export destinations are Thailand and Vietnam. Live freshwater fish are exported to other Asian markets, namely, Singapore, Malaysia, Hong Kong, and China. Taiwan, Japan, Australia and the USA are markets for frozen fish, fish fillet and ball, and salted dried fish. Until now, Cambodia does not have the European Union (EU) Commission's approval to export fisheries products to the EU markets due mainly to lack of quality control certification. Fish sauce has been exported to Thailand from Battambang, Siem Reap and Kampong Chhnang Provinces, and to Vietnam from Kampong Cham, Kandal, Takeo, Phnom Penh and Prey Veng.

Table 7.1. Exports of inland and marine fisheries products by each province in Cambodia, 1992-2002.

Name of City or Province	**Year**										
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Phnom Penh	-	2,343	1,540	1,631	2,000	2,905	3,660	1,655	3,990	2,550	4,080
Kandal	1,138	835	1,397		570	1,065	1,350	1,000	800	1,000	5,890
Prey Veng	1,020	1,000	920	50	50	40	500	450	500	800	770
Takeo	120	60	90	108	120	110	78	35	272	1080	720
Kompong Cham	70	78	336	223	120	96	53	30	87	55	670
Kratie	-	-	85	27	40	40	45	40	50	50	60
Stung Treng	-	-	-	-	-	-	12	15	10	60	65
Rattanakiri	-	-	-	-	-	-	-	-	-	45	100
Kompong Thom	1,245	430	365	19	20	72	63	50	52	110	290
Kompong Chhnang	1,332	705	853	675	1,420	4,510	4,430	12,000	11,210	4,800	6,590
Pursat	1,050	170	560	498	570	475	510	430	430	2350	5650
Battambang	1,000	1,417	595	675	650	700	495	500	403	160	330
Banteay Meanchey	69	-	43	14	110	5,516	3,925	4,130	3,444	780	1,285
Siem Reap	1,810	2,885	2,296	5,523	3,310	3,066	3,670	2,930	2,124	2,630	5,600
Kep	-	-	-	-	-	-	-	15	22	30	30
Kampot	1,620	762	983	2,343	2,000	1,580	1,500	1,000	1,200	1,120	630
Sihanoukville	6,100	4,093	4,528	3,845	3,610	3,250	6,582	7,140	7,006	6,500	7,430
Koh Kong	13,600	14,200	9,585	2,000	6,000	8,400	7,000	8,820	8,400	12,180	12,310
KAMFIMEX Company	4,197	3,354	3,497	6,185	4,110	5,045	6,367	4,360	3,600	1,800	-
Total	34,371	32,332	27,673	23,816	24,700	36,870	40,240	44,600	43,600	38,100	52,500

Source: DOF (2002).

Table 7.2 shows some trade statistics collected from importing countries. As mentioned earlier, the actual exports of marine and freshwater fisheries products to Thailand are much higher than the figures reported by Thai official sources. Besides the reported imports, a substantial quantity of marine fisheries products, mainly high-value finfish, shrimp and cephalopods, leaves the border unreported. According to the DOF office in Sihanoukville (pers. comm.), only 20% of the exports of marine fishery products take place officially, the remaining 80% are smuggled by sea to Thai traders who supply fuel and ice to Cambodian fishers.

Table 7.2. Imports of fisheries products from Cambodia to selected markets, 1998-1999.

Importing Country	**Quantity (t)**	**Value ($)**
Hong Kong (1999)	648	6,137,820
Malaysia (1998)	173	2,632,849
Thailand (1999)	3,342	1,224,989
USA (1999)	280	1,063,464
Singapore (1999)	108	1,000
China (1998)	15	24,761

Source: Ferdouse (2000).

There are three types of exports in freshwater fisheries products in Cambodia: (1) export of chilled fish by land using big trucks and cars (to Thailand); (2) export of live freshwater species and catfish fingerlings by waterway using cages with big boats (to Vietnam); and (3) export of high-value live fish and some fish products by air (to Asian countries).

According to the fisheries export company KAMFIMEX, the most lucrative markets for Cambodia's fisheries exports are: first, USA and Australia; second, China, Hong Kong, Singapore and Malaysia; and third, Thailand and Vietnam.

Tables 7.3 and 7.4 show the top 20 important species for export in terms of volume and price from sample traders in Phnom Penh, Kampong Chhnang and Siem Reap Provinces in the closed season. In terms of volume, the highest fish species were *chhpin* (39%), *kanchos thmor* (9%), *slat* (7%) and *chhlang* (6%). In terms of average export price, the most important species were live *damrey* ($42/kg, 2.4% of export volume), fresh *damrey* ($23/kg, 1.4% of export volume), *promah* and *khya* ($11/kg) and *kanchos thmor* ($7/kg). For the rest, the average export price ranged from $1 to 4/kg.

Table 7.3. Important species for export in terms of volume by all the sample traders in Phnom Penh, Kampong Chhnang and Siem Reap Provinces in closed season, 2003.

Name of Species		**Quantity (kg)**	**Average Price ($/kg)**		**% of Quantity**
Local Name	**English Name**		**Buying**	**Export**	
Chhpin	Goldfin tinfoil barb	999.00	0.80	1.20	38.56
Kanchos thmor	Asian bumblebee catfish	222.00	5.83	7.13	8.57
Slat	Bronze featherback	194.00	2.78	3.35	7.49
Chhlaing	N/A	158.00	2.05	2.55	6.10
Chhdaur	Giant snakehead	144.00	2.65	2.92	5.56
Kanchak sla	Small-scale archerfish	123.00	2.35	2.87	4.75
Chhlaing	Yellow mystus	82.00	2.00	2.48	3.16
Sanday	Great white sheatfish	81.00	3.72	4.57	3.13
Kray	Royal featherback	63.00	3.18	3.89	2.43
Damrey (live)	Marbled sleeper	63.00	19.81	42.44	2.43
Kchoeung	Frecklefin eel	55.00	3.70	4.52	2.12
Chhkok	Soldier river barb	48.00	1.33	1.60	1.85
Krormorm	N/A	43.00	2.35	2.97	1.66
Kantrob	Kissing gourami	38.00	1.08	1.28	1.47
Damrey (fresh)	Marbled sleeper	37.00	7.00	23.20	1.43
Kanchrouk	Chameleon botia	35.00	2.52	3.14	1.35
Khya	N/A	35.00	10.25	11.32	1.35
Chhlonh chhnoht	Peacock eel	35.00	2.61	3.28	1.35
Kaok	Arius Catfish	30.00	4.20	4.66	1.16
Khmann	Hampala Barb	16.00	1.48	1.96	4.09
Others		90.00	2.19	2.63	0.58
Grand total		2,591.00	3.44	4.49	100.00

Table 7.4. Important species for export in terms of price in Phnom Penh, Kampong Chhnang and Siem Reap Provinces in closed season, 2003.

Grand total 2,591.00 3.44 4.49 100.00

Name of Species		**Quantity (kg)**	**Average Price ($/kg)**		**% of Quantity**
Local Name	**English Name**		**Buying**	**Export**	
Damrey (live)	Marbled sleeper	63.00	19.81	42.44	2.43
Damrey (fresh)	Marbled sleeper	37.00	7.00	23.20	1.43
Promah	Small-scale croaker	13.00	10.50	11.37	0.50
Khya	N/A	35.00	10.25	11.32	1.35
Kanchos thmor	Asian bumblebee catfish	222.00	5.83	7.13	8.57
Kaok	Arius Catfish	30.00	4.20	4.66	1.16
Sanday	Great white sheatfish	81.00	3.72	4.57	3.13
Kchoeung	Frecklefin eel	55.00	3.70	4.52	2.12
Ruschek	Speckled horseface loach	10.00	3.40	4.50	0.39
Klaing hay	Twisted jaw sheatfish	2.00	4.00	4.50	0.08
Kray	Clown featherback	5.00	3.72	4.34	0.19
Kray	Royal featherback	63.00	3.18	3.89	2.43
Kaok	Sona sea catfish	2.00	3.25	3.85	0.08
Kaok	Spotted sea catfish	5.00	3.00	3.80	0.19
Slat	Bronze featherback	194.00	2.78	3.35	7.49
Chhlonh chhnoht	Peacock eel	35.00	2.61	3.28	1.35
Kanchrouk	Chameleon botia	35.00	2.52	3.14	1.35
Krormorm	N/A	43.00	2.35	2.97	1.66
Chhdaur	Giant snakehead	144.00	2.65	2.92	5.56
Kanchak Sla	Small-scale archerfish	123.00	2.35	2.87	4.75
Others		1,394.00	1.06	1.37	53.80

During the open season, the top 20 important species for export in terms of volume and price from sample traders in Phnom Penh, Kampong Chhnang and Siem Reap Provinces are reported in Tables 7.5 and 7.6. The fish species in highest volume was *changwa poht* (27%), followed by *kray* (20%), *raws* (18%) and *chhdaur* (8%). In terms of the average export price, the most important were live *damrey* ($35/kg), fresh *damrey* ($23/kg), *promah* ($13/kg), *khya* ($10/kg) and *kes* ($7/kg). For the remaining species, the average export price ranged from $1 to 6/kg.

Table 7.5. Importance of species by quantity export by all sample traders in open season, 2004.

Name of Species		Quantity (kg)	Average Price ($/kg)		% of Quantity
Local Name	**English Name**		**Buying**	**Export**	
Changwa poht	Scissortail rasbora	40,000	0.70	1.00	26.72
Kray	Royal featherback	30,450	3.50	3.83	20.34
Raws	Chevron snakehead	26,475	2.85	3.34	17.68
Chhdaur	Giant snakehead	11,225	3.30	3.53	7.50
Chhlonh chhnoht	Peacock eel	5,712	2.66	3.17	3.82
Chhlaing	Yellow mystus	5,090	2.08	2.65	3.40
Kes	Common sheatfish	4,570	7.04	7.92	3.05
Slat	Bronze featherback	4,106	3.49	4.08	2.74
Sanday	Great white sheatfish	4,080	4.97	5.72	2.73
Kanchrouk chhnoht	Tiger botia	3,000	1.50	2.50	2.00
Taaun	N/A	3,000	4.20	4.66	2.00
Ruschek	Speckled horseface loach	2,600	4.25	5.25	1.74
Bandol ampeou	Borneo river sprat	2,500	0.45	1.00	1.67
Others		6,910	4.72	6.77	4.62
Total		149,718	4.26	5.28	100.00

Table 7.6. Importance of species by prices of export by all the sample traders in open season, 2004.

Name of Species		Quantity (kg)	Average Price ($/kg)		% of Quantity
Local Name	**English Name**		**Buying**	**Export**	
Damrey (live)	Marbled sleeper	1,140	22.34	34.95	0.76
Damrey (fresh)	Marbled sleeper	210	8.00	23.20	0.14
Promah	Small-scale croaker	450	11.33	12.72	0.30
Khya	N/A	270	9.41	10.26	0.18
Kes	Common sheatfish	4,570	7.04	7.92	3.05
Kchoeung	Frecklefin eel	640	5.69	6.55	0.43
Sanday	Great white sheatfish	4,080	4.97	5.72	2.73
Ta aun	Whisker sheatfish	50	4.50	5.30	0.03
Ruschek	Speckled horseface loach	2,600	4.25	5.25	1.74
Tanel	Truncated estuarine catfish	200	4.00	5.00	0.13
Ta aun	N/A	3,000	4.20	4.66	2.00
Kray	Clown featherback	60	3.63	4.33	0.04
Slat	Bronze featherback	4,106	3.49	4.08	2.74
Krormorm	N/A	70	3.18	3.83	0.05
Kray	Royal featherback	30,450	3.50	3.83	20.34
Chhdaur	Giant snakehead	11,225	3.30	3.53	7.50
Raws	Chevron snakehead	26,475	2.85	3.34	17.68
Chhlonh chhnoht	Peacock eel	5,712	2.66	3.17	3.82
Chhlaing	Yellow mystus	5,090	2.08	2.65	3.40
Kanchrouk chhnoht	Tiger botia	3,000	1.50	2.50	2.00
Others		46,320	1.28	1.63	30.94
Total		149,718	4.26	5.28	100.00

As these results show, the most important species varied in the open and closed seasons in terms of quantity, but not in terms of export price. However, the overall average export price was higher in the closed season.

Figure 7.1 shows the export routes of freshwater fisheries by land and boat to neighboring countries from Cambodia. As the map indicates, the most important landing sites for freshwater fish exports are Chong Khneas and Kampong Khleang in Siem Reap Province and Kampong Chhnang for export to Thailand via Poipet and Vietnam via Phnom Penh, and Kratie for export to Lao PDR (and then to Thailand) via Stung Treng.

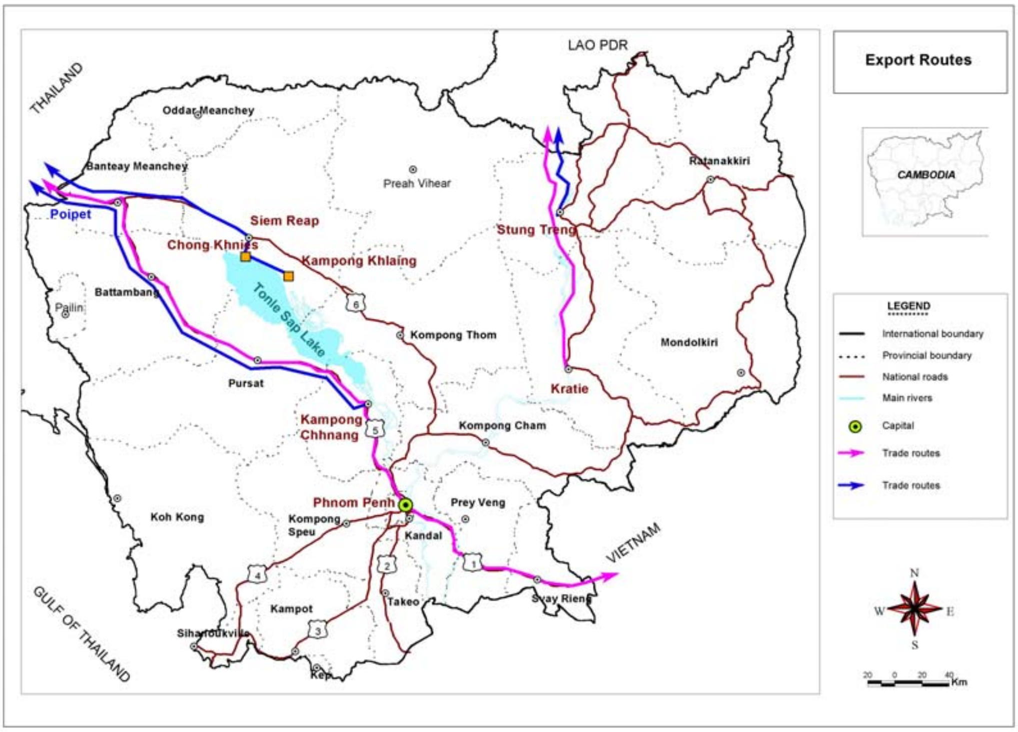

Figure 7.1. Map showing export routes for inland fisheries products in Cambodia.

8. Summary of Results

8.1. Landing Sites

Phnom Penh Landing Sites

Phnom Penh landing sites consist of permanent structures on the bank of the Tonle Sap River with concrete floors, covered spaces and storage facilities. One site is specialized for the sale of live fish and has cages in river. The sites are both managed by private leaseholders. Fish are brought to landing sites by powerboat and occasionally by truck. There are good road and river links for onward transportation and market access.

The landing sites are used mainly by fish collectors and traders who have collected fish from small and medium-scale fishers, cage farmers and lot owners, from most of the provinces surrounding the lake (Kampong Chhnang, Kampong Thom, Siem Reap, Pursat, Battambang and Kandal). The landing sites are also used by commercial operators to sell surplus catches. Sales are managed by "brokers" who sort and re-package fish (to increase sale price) and sell on commission basis. Fish are sold to market traders, wholesalers and export houses, for export, sale at city and provincial markets, and processing.

Kampong Chhnang Landing Sites (Kampong Chhnang and Chnok Tru)

Kampong Chhnang landing sites consist of a small jetty (10-12 boat spaces) and river beach, but no fixed structure exists. The site is operated by a private leaseholder, who charges fish sellers 50 riels/kg. Fish are transported to and from the landing site by boat. Landed fish are brought by middlepersons, having been collected from fishing grounds, and cage farmers within the province. Sales at the site are facilitated by brokers. Fish are sold to retailers and wholesalers for sale at local and wholesale markets (for snakehead and pangasius), medium-scale fish processing and animal feed processing. Some processing of giant snakeheads (separating fish eggs and heads), which allows for price differentiation and increases the overall sale price, is conducted at the site by women and children.

At Chnok Tru, there is no fixed space or beach to form a "landing site", but boat to boat transactions take place in a "wet market" located close to major fishing grounds and fish processing zone. There are poor land transport links and a toll is charged for fresh and processed fish transported on the local road. Fish sold at the site are supplied from fishing grounds and cage farmers within the province. Fish are sold to exporters and processors, and also sent by collectors and traders to other landing sites and wholesale markets.

Siem Reap and Pursat Landing Sites
(Kampong Khlang, Chnong Khneas and Kampong Loung)

Kampong Khlang landing site is the only landing site within 20-30 mile radius, and has no fixed structure. Two floating export houses at the site buy species from fishers and collectors for export to Thailand and Vietnam. The site has very poor land transport links (it can be reached by motorbike during the dry season only, and is flooded during the rainy season), but has good links to other landing sites and wholesale markets via boat across the lake. Fish are supplied from provinces northeast of the lake, brought to the landing site by fishers and collectors. Fish are sold to traders and exporters who transport them to other landing sites and export points by boat.

Chong Khneas and Kampong Leung landing sites represent important business centers for the surrounding floating villages on the lake. They have no fixed structures or facilities for fish processing or storage, and most transactions take place in floating boats or shops around the landing sites. Fish are supplied from surrounding fishing grounds and brought to the site by collectors. At Kampong Leung landing site, fish are sold to traders and exporters for northwest domestic markets and export to Thailand. At Chong Khneas landing site, fish are sold to exporters, traders and retailers for export to Thailand and sale in surrounding provinces, and also to crocodile/fish cage farmers and fish processors (particularly low-value white fish for processing to fish and animal feed). The site is also becoming important for tourism, as boat trips on the lake depart from here.

Overall, the most important species in terms of volume are *kanchak sla, chdaur* and *chhkok,* which make up 40% of the quantity sold at landing sites. The most valuable species *(kbork, kromorn, kanchos thmor* and *kchoeung),* which are destined for export market, make up less than 0.5% of the total quantity landed.

8.2. Observations of Retail Markets

Fresh and processed fish are sold through separate retail outlets at city (Phnom Penh), provincial and rural markets. Facilities are generally best in city markets, where majority of fresh and processed fish shops are fully or partially covered. Around half of the fish shops in provincial markets are covered, particularly those selling processed fish. In contrast, rural markets are smaller and generally uncovered.

Fish shops tend to be run by 1-2 people (with fewer people in rural markets), who have typically been in the business for 10-15 years (with longer years of service in city and provincial markets). Overall, fish sellers in city and provincial markets pay higher taxes, fees and transport costs than those operating in rural markets. Additionally, fresh fish sellers pay higher taxes, fees and transport costs than processed fish sellers. City markets sell fish landed in most of the provinces around the lake. In contrast, provincial markets sell fish from one or two surrounding provinces, and rural markets are generally sourced from a very local area.

The largest quantities of fresh fish are sold per day in provincial markets, followed by city markets. On average, fresh fish are sold for the highest prices at provincial markets, while processed fish cost most in city markets. Overall, the species sold in greatest volume at sample markets are *raws* (25%) and *chdaur* (13%), which are sold for $1.11/kg and $1.22/kg, respectively. The most expensive species sold at domestic markets are *khya* ($5/kg), *klainghay* ($2.21/kg) and *pra* ($2/kg).

8.3. Stakeholders in the Supply Chain

The most important stakeholders in the fisheries supply chain in Cambodia are as follows:

- fishers (small/medium-scale) and cage farmers;
- lot owners;
- fish collectors/middlepersons (who supply fish to landing site);
- wholesalers/traders at landing sites;
- semi-wholesalers at city/provincial markets;

- retailers;
- fish processors (small/medium/large-scale);
- exporters; and
- transporters.

8.4. Fish Processing

Fish processing is conducted at small and middle scales within villages or close to fishing lots and landing sites. The products are for household consumption and sale at local rural/provincial markets. Large-scale fish processing is generally done in factories, and the products are sold in domestic and international markets.

Most households involved in fish processing also catch fish and conduct processing as an additional occupation. Around half of the sampled operations relied only on household labor while 58% hired laborers for some or all of the year (especially during peak season). The majority (77%) of operations hired 1-4 laborers.

The most important marketing route is sale to wholesalers within the local province or in surrounding provinces. A minority of processors (10%) sell products directly for export at the Thai border.

8.5. Fish Export

Exports of fish products from Cambodia increased from year to year, from 32,000 t in 1993 to 52,500 t in 2002. However, these figures did not include the additional high numbers of unreported exports at land borders. Fresh and processed fish products were exported to Asia, Australia and the USA.

The most important species for export vary in open and closed seasons in terms of quantity, but not in terms of export price. In the surveys conducted, the most important species during closed season, were *chpin* (39%), *kanchos thmor* (9%), *slat* (7%) and *chhlang* (6%). In open season, the most important species were *changwa poht* (27%), *kray* (20%), *raws* (8%) and *chdaur* (8%). The most important species in terms of price in both seasons were live and fresh chilled *damrey* ($42/kg and 23/kg, respectively), *promah* and *khya* (both $11/kg) and *kanchos thmor* ($7/kg). However, the overall average export price was higher in closed season.

The most important landing sites for freshwater fish exports are Chong Khneas and Kampong Khleang in Siem Reap Province and Kampong Chhnang for export to Thailand via Poipet and Vietnam via Phnom Penh, and Kratie for export to Lao PDR (and then to Thailand) via Stung Treng.

9. Conclusion and Recommendations

As these results indicate, the marketing of fresh and processed fish in Cambodia relies on a complex network of stakeholders and beneficiaries which include middlepersons, traders, wholesalers and transporters as well as fishers, processors, retailers and exporters. Fish marketing therefore supports a very wide range of different livelihoods for a great number of rural and urban households, who are consequently very dependent on fisheries resources.

The existing infrastructure for marketing and trade of inland fisheries products is still very poorly developed in terms of landing, storage, preserving, transport and retail facilities. This limits market opportunities and also prevents those selling fish to schedule selling decisions to their competitive advantage.

Specifically, constraints to marketing and trade of fish products include the following:

- rudimentary or no permanent structure at landing sites;
- inadequate facilities for hygienically handling, sorting, weighing and packing fish, and lack of storage facilities and preservation equipment or materials (e.g., ice, ice-crushing machines, ice boxes, freezers, salt) at landing sites;
- minimal quality control measures or hygiene standards and lack of modern equipment or production methods in small and medium-scale fish processing operations;
- poor land transport links and means of transportation between landing sites and sale and export points, resulting in poorly coordinated distribution of fish products;
- inadequate market facilities in terms of product conservation and hygiene standards; and
- poor access to market information such as prices and supply/demand for fishers.

While the domestic market for freshwater fish in Cambodia is relatively well established, despite constraints to distribution and infrastructure, the export market is still developing. Currently, fish exports consist mainly of processed fish products from industrial-scale processing plants and high-value species as fresh fish to neighboring countries such as Vietnam and Thailand. Two low-value fish ($1.1-1.2/kg) species, *raws* and *chdaur,* make up 38% of fish sold in domestic markets by volume while high-value fish species such as *damrey* ($7-19/kg), *khya* ($10.25/kg) and *kanchos thmor* ($7/kg) are most important for export.

A number of opportunities for development of fish marketing and trade already exist. Landing sites are generally at commercially important centers for business exchange and generally have good water transport links. Additionally, sorting and repackaging by brokers and basic processing at landing sites give some price differentiation in products.

The fish export market is relatively small but there seems to be good potential for continued growth, for both fresh and processed forms. However, international food safety and quality standards are becoming increasingly stringent and meeting them will require modernization and improvement at all points of the fish marketing chain.

Fish processing and trade are often conducted in addition to fishing and/or farming, and therefore provide an additional source of income for many households. Fish marketing and trade provide one of the few opportunities for women and poor households who live in and near the Tonle Sap Lake areas to increase household income, and their involvement should therefore be encouraged.

Recommendations

In order to improve, develop and strengthen the fish marketing and trade chain in freshwater fisheries, it is necessary for government and all related agencies and institutions to do the following:

- Improve and develop landing sites for inland fisheries, land transport links and means of transportation between landing sites and sale and export points, and market and processing facilities within fisheries sector.
- Strengthen capacity of beneficiaries and all related stakeholders with regard to awareness of market economy function, their role in the economy, market network and information access.
- Provide reliable and transparent fish market information and prices of fisheries products, which are accessible to all stakeholders (fishers, fish processors, collectors, wholesalers/traders and retailers).
- Improve processing technology, hygiene, food safety and quality control in order to meet national and international standards, and thereby increase opportunity for domestic and export trade.
- Provide credit system with low interest rate in the fish marketing and trade chain, which would allow greater uptake of trade and processing activities for income generation, particularly for women and poor households.
- Improve validity and collection of export and catch statistics for fisheries products.

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APPENDIX TABLES

Table 1. Important fish species in terms of quantity landed around Phnom Penh.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey chhkok	3,137.00	5.10	15.82
Trey carp	2,029.00	0.60	10.23
Trey kanchak sla	1,838.00	4.33	9.27
Trey kaok	1,736.00	1.58	8.75
Trey kaok	1,434.90	2.29	7.24
Trey po	1,107.00	2.36	5.58
Trey kantrang preng	1,066.00	2.02	5.38
Trey chhlaing thmor	703.00	2.68	3.54
Trey chhdaur	679.00	3.18	3.42
Trey krum	595.30	3.40	3.00
Trey kaek	515.00	1.64	2.60
Trey kanchos chhnoht	512.00	1.20	2.58
Trey chhlonh chhnoht	498.00	2.99	2.51
Trey pra	360.00	2.04	1.82
Trey krorlang	315.00	0.70	1.59
Trey kanchanh chras thom	277.00	1.20	1.40
Trey chrakaing	241.00	1.86	1.22
Trey chrakaing	211.00	1.84	1.06
Trey chhlaing	202.00	2.64	1.02
Trey sanday	197.00	2.02	0.99
Others	2,178.40	1.91	10.98
All species	19,831.60	2.46	100.00

Table 2. Important fish species in terms of price landed in Phnom Penh.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey kbork	11.00	5.80	0.06
Trey chhkok	3,137.00	5.10	15.82
Trey chhlaing	2.00	4.50	0.01
Trey kanchak sla	1,838.00	4.33	9.27
Trey kanh chorn chey	109.00	4.30	0.55
Trey krum	595.30	3.40	3.00
Trey promah	37.00	3.35	0.19
Trey tilapia chhnoht	33.00	3.33	0.17
Trey ka port	4.00	3.20	0.02
Trey chhdaur	679.00	3.18	3.42
Trey proul	135.00	3.04	0.68
Trey chhlonh chhnoht	498.00	2.99	2.51
Trey kranh srai	17.40	2.92	0.09
Trey chhpin	84.00	2.86	0.42
Trey klaing hay	152.00	2.79	0.77
Trey kaok	6.00	2.70	0.03
Trey chhlaing thmor	703.00	2.68	3.54
Trey chhlaing	202.00	2.64	1.02
Trey kray	89.00	2.63	0.45
Trey kaok	82.00	2.57	0.41
Others	11,417.90	1.73	57.57
All species	19,831.60	2.46	100.00

Table 3. Important fish species in terms of quantity landed in Kampong Chhnang Province.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey chhdaur	3,208.00	3.71	26.97
Trey kanchak sla	1,629.00	3.32	13.70
Trey chrakaing	958.00	2.50	8.05
Trey chhkok	889.00	2.47	7.47
Trey krum	747.00	3.56	6.28
Trey pra	706.00	2.35	5.94
Trey chhpin	642.00	2.55	5.40
Trey po	570.00	2.45	4.79
Trey chhlaing	443.00	2.61	3.72
Trey damrey	288.00	6.51	2.42
Trey kaok	214.00	2.75	1.80
Trey kaok	173.00	1.32	1.45
Trey khmann	172.00	2.00	1.45
Trey kaek	168.00	1.53	1.41
Trey proul	138.00	2.85	1.16
Trey kanchos	117.00	1.50	0.98
Trey bandol ampeou	99.00	0.70	0.83
Trey kantrang preng	89.00	1.74	0.75
Trey kampoul bay	88.00	2.40	0.74
Trey krormorm	72.00	5.00	0.61
Others	484.00	2.86	4.07
All species	11,894.00	2.77	100.00

Table 4. Important fish species in terms of quantity landed in Kampong Chhnang Province.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey damrey	288.00	6.51	2.42
Trey sanday	6.00	6.50	0.05
Trey kanchos thmor	48.00	6.47	0.40
Trey klaing hay	6.00	6.00	0.05
Trey krormorm	72.00	5.00	0.61
Antung	15.00	5.00	0.13
Trey chhdaur	3,208.00	3.71	26.98
Trey krum	747.00	3.56	6.28
Trey kanchak sla	1,629.00	3.32	13.70
Trey kanchrouk	44.00	3.07	0.37
Trey ka port	43.00	3.00	0.36
Trey kampliev	10.00	2.90	0.08
Trey proul	138.00	2.85	1.16
Trey kahe	8.00	2.81	0.07
Trey kaok	214.00	2.75	1.80
Trey chhlaing	443.00	2.61	3.73
Trey chhpin	642.00	2.55	5.40
Trey prorlung	49.00	2.54	0.41
Trey chrakaing	958.00	2.50	8.06
Trey kray	2.00	2.50	0.02
Others	3,322.00	1.83	27.92
All species	11,892.00	2.65	100.00

Table 5. Important fish species in terms of quantity landed in Siem Reap Province.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey kanchak sla	3,740.90	1.51	59.15
Trey slat	630.00	1.15	9.96
Trey chhdaur	488.30	0.78	7.72
Trey nuy	294.00	0.75	4.65
Trey chhpin	204.40	0.27	3.23
Trey kanchos	194.00	0.29	3.07
Trey changwa poht	99.00	0.22	1.57
Trey khmann	95.00	0.47	1.50
Trey kranh srai	82.00	0.41	1.30
Trey kros	73.00	0.16	1.15
Trey kaok	64.00	0.14	1.01
Trey chhlaing	49.50	0.58	0.78
Trey srorka kdam	43.00	0.15	0.68
Trey kamphleanh phluk	27.00	0.19	0.43
Trey kanchos thmor	23.50	1.60	0.37
Trey kantrang preng	23.00	0.64	0.36
Kam poeus	17.00	0.75	0.27
Trey chhkok	15.50	0.44	0.25
Trey chonluanh moan	15.00	0.10	0.24
Trey angkat prak	15.00	0.15	0.24
Others	130.80	0.55	2.07
All species	6,323.90	0.54	100.00

Table 6. Important fish species in terms of price landed in Siem Reap Province.

Fish Species	Quantity (kg)	Average Price (US$/kg)	% of Important Species
Trey promah	12.50	1.65	0.20
Trey kanchos thmor	23.50	1.60	0.37
Trey kanchak sla	3,740.90	1.51	59.15
Trey kaok	2.80	1.18	0.04
Trey slat	630.00	1.15	9.96
Antung	5.00	1.00	0.08
Trey kray	3.50	0.95	0.06
Trey chhdaur	488.30	0.78	7.72
Trey chhlonh chhnoht	10.00	0.76	0.16
Trey nuy	294.00	0.75	4.65
Kam poeus	17.00	0.75	0.27
Trey krorlang	6.00	0.75	0.09
Trey kantrang preng	23.00	0.64	0.36
Trey kanthor	12.00	0.64	0.19
Trey chhlaing	49.50	0.58	0.78
Trey andaing tonle	9.00	0.50	0.14
Trey kchoeung	7.00	0.50	0.11
Trey damrey	5.00	0.50	0.08
Trey khmann	95.00	0.47	1.50
Trey chhkok	15.50	0.44	0.25
Others	874.40	0.20	13.83
All species	6,323.90	0.54	100.00

Table 7. Top 20 important fish species in terms of quantity and price of the retail markets in Phnom Penh.

In Terms of Quantity				**In Terms of Price**			
Fish Species	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**	**Fish Species**	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**
Trey raws	5,090.5	1.24	35.41	*Bankang*	98.0	7.81	5.41
Trey chhdaur	1,674.0	1.32	11.64	*Trey krum*	392.5	2.49	21.67
Trey chrakaing	1,089.5	1.18	7.58	*Trey klaing hay*	95.5	2.45	5.27
Trey kranh srai	1,069.5	1.06	7.44	*Trey sanday*	114.0	2.06	6.29
Trey andaing toun	572.5	1.31	3.98	*Trey pawa muk py*	6.5	2.00	0.36
Trey chhpin	516.6	1.14	3.59	*Trey chhlonh chhnoht*	361.6	1.89	19.96
Trey chhlaing	500.7	1.14	3.48	*Trey kray*	17.5	1.81	0.97
Trey proul	444.5	1.36	3.09	*Trey chhkok*	333.5	1.81	18.41
Trey krum	392.5	2.49	2.73	*Ka port*	13.0	1.78	0.72
Trey riel	367.3	0.65	2.55	*Trey trasok*	6.0	1.75	0.33
Trey chhlonh chhnoht	361.6	1.89	2.52	*Trey pawa muk py*	1.5	1.75	0.08
Trey pra	349.0	0.95	2.43	*Trey kahe*	58.0	1.70	3.20
Trey slat	347.2	0.94	2.42	*Trey kbork*	2.0	1.69	0.11
Kampeus	338.0	0.82	2.35	*Trey kes*	186.0	1.67	10.27
Trey chhkok	333.5	1.81	2.32	*Trey pra kandor*	1.7	1.63	0.09
Trey kantrang preng	226.5	1.00	1.58	*Trey promah*	35.0	1.55	1.93
Trey damrey	215.0	1.12	1.50	*Trey kchoeung*	34.8	1.55	1.92
Trey kes	186.0	1.67	1.29	Unidentified	46.5	1.50	2.57
Trey bandola ampeou	164.0	0.62	1.14	*Kaok*	6.0	1.50	0.33
Trey phtoung	137.5	1.18	0.96	*Andat chhke*	2.0	1.50	0.11
	14,375.9	1.24	100.00		1,811.6	2.09	100.00

Table 8. Top 20 important fish species in terms of quantity and price of the retail markets in Kampong Chhnang Province.

In Terms of Quantity				In Terms of Price			
Fish Species	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**	**Fish Species**	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total)**
Trey chhdaur	840.0	1.2	18.98	*Antung*	1.0	1.8	0.04
Trey chhkok	440.0	0.8	9.94	*Trey chhdaur*	840.0	1.2	35.38
Trey po	399.0	0.7	9.01	*Trey krum*	269.0	0.9	11.33
Trey chhpin	395.0	0.8	8.92	*Trey raws*	305.0	0.9	12.85
Trey pra	373.0	0.7	8.43	*Trey sanday*	11.0	0.9	0.46
Trey raws	305.0	0.9	6.89	*Trey carp kbal thom*	4.0	0.9	0.17
Leas	295.0	0.1	6.67	*Trey krormorm*	3.0	0.9	0.13
Krum	269.0	0.9	6.08	*Trey kchoeung*	3.0	0.9	0.13
Trey chhlaing	148.0	0.7	3.34	*Trey tanel*	1.0	0.9	0.04
Trey kanchos kdaung	140.0	0.6	3.16	*Trey chhkok*	440.0	0.8	18.53
Trey khmann	133.0	0.6	3.00	*Trey chhpin*	395.0	0.8	16.64
Trey bandol ampeou	122.0	0.2	2.76	*Ka port*	23.0	0.8	0.97
Trey chrakaing	104.0	0.6	2.35	*Trey damrey*	46.0	0.8	1.94
Trey kantrang preng	99.0	0.6	2.24	*Trey promah*	13.0	0.8	0.55
Kampot	94.0	0.5	2.12	*Trey carp prak*	8.0	0.8	0.34
Trey riel	91.0	0.4	2.06	*Trey andaing toun*	5.0	0.8	0.21
Trey phtoung	47.0	0.5	1.06	*Trey dangkteng*	3.0	0.8	0.13
Trey damrey	46.0	0.8	1.04	*Trey carp chi smao*	2.0	0.8	0.08
Trey kanchos	45.0	0.5	1.02	*Trey ke, Pra ke*	1.0	0.8	0.04
Trey kaek	41.0	0.6	0.93	*Trey klaing hay*	1.0	0.8	0.04
Total	4,426.0	0.7	100.00	Total	2,374.0	0.9	100.00

Table 9. Top 20 important fish species in terms of quantity and price of the retail markets in Siem Reap Province.

In Terms of Quantity				In Terms of Price			
Fish Species	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**	**Fish Species**	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**
Trey raws	1,173.5	0.9	26.1	*Trey kray*	9.0	1.5	0.3
Trey chhdaur	1,014.2	0.9	22.6	*Trey ta aun*	65.5	1.2	1.9
Trey chhpin	265.0	0.7	5.9	*Kampot*	68.0	1.0	1.9
Trey kantrang preng	265.0	0.6	5.9	*Trey andaing roueng*	130.0	1.0	3.7
Trey kanchos chhnoht	216.5	0.3	4.8	*Trey carp samahn*	15.0	1.0	0.4
Trey kranh srai	210.0	0.4	4.7	*Trey tanel*	5.0	1.0	0.1
Trey kamphleanh phluk	158.5	0.2	3.5	*Trey bandol ampeou*	13.0	0.9	0.4
Kampeus	140.0	0.6	3.1	*Trey chhdaur*	1,014.2	0.9	28.9
Trey andaing roueng	130.0	1.0	2.9	*Trey raws*	1,173.5	0.9	33.4
Trey andaing toun	123.5	0.8	2.7	*Trey andaing toun*	123.5	0.8	3.5
Trey khnang veng	117.0	0.3	2.6	*Trey antung*	7.0	0.8	0.2
Trey riel	92.0	0.3	2.0	*Trey damrey*	32.9	0.8	0.9
Trey kanchos kdaung	89.0	0.6	2.0	*Trey chhlonh chhnoht*	14.0	0.7	0.4
Trey kros	76.0	0.6	1.7	*Trey chhkok*	74.0	0.7	2.1
Trey chhkok	74.0	0.7	1.6	*Trey chhpin*	265.0	0.7	7.6
Trey linh	74.0	0.3	1.6	*Trey pra*	68.0	0.6	1.9
Trey kanchrouk	71.0	0.6	1.6	*Trey kanchos kdaung*	89.0	0.6	2.5
Trey kaok	70.0	0.1	1.6	*Trey kros*	76.0	0.6	2.2
Trey pra	68.0	0.6	1.5	*Trey kchoeung*	2.0	0.6	0.1
Kampot	68.0	1.0	1.5	*Trey kantrang preng*	265.0	0.6	7.6
Total	4,495.2	0.6	100.0	Total	3,509.6	0.8	100.0

Table 10. Top 20 important fish species in terms of quantity and price of the retail markets in Kandal Province.

In Terms of Quantity				In Terms of Price			
Fish Species	Total Quantity (kg)	Average Price (US$/kg)	% of Total	Fish Species	Total Quantity (kg)	Average Price (US$/kg)	% of Total
Trey raws	1,164.0	1.1	33.9	*Trey khya*	1.5	2.5	0.1
Trey riel	564.0	0.3	16.4	*Trey sanday*	3.0	2.0	0.1
Trey chhdaur	546.0	1.2	15.9	*Trey chhkok*	42.0	1.8	1.8
Trey chhlaing	285.0	0.9	8.3	*Trey kes*	12.0	1.8	0.5
Trey kantrob	115.0	0.5	3.3	*Trey kchoeung*	1.0	1.8	0.0
Trey chhpin	104.5	1.1	3.0	*Trey damrey*	11.5	1.7	0.5
Trey andaing toun	80.5	1.1	2.3	*Antung*	6.5	1.6	0.3
Trey po	75.0	1.2	2.2	*Trey krormorm*	7.0	1.5	0.3
Trey promah	62.5	0.8	1.8	*Trey krum*	58.7	1.3	2.6
Trey krum	58.7	1.3	1.7	*Ka port*	2.0	1.3	0.1
Trey proul	58.0	1.2	1.7	*Trey chhdaur*	546.0	1.2	23.9
Trey chhlonh chhnoht	46.3	0.8	1.3	*Trey proul*	58.0	1.2	2.5
Trey chhkok	42.0	1.8	1.2	*Trey po*	75.0	1.2	3.3
Trey chrakaing	42.0	1.0	1.2	*Trey slat*	31.0	1.2	1.4
Trey khnang veng	39.0	0.4	1.1	*Trey raws*	1,164.0	1.1	51.0
Trey kantrang preng	34.0	0.9	1.0	*Trey andaing toun*	80.5	1.1	3.5
Trey slat	31.0	1.2	0.9	*Trey chhpin*	104.5	1.1	4.6
Trey kanchos	31.0	0.6	0.9	*Trey tilapia chhnoht*	30.0	1.0	1.3
Trey tilapia chhnoht	30.0	1.0	0.9	*Trey chrakaing*	42.0	1.0	1.8
Trey kros	27.0	0.4	0.8	*Trey phtoung*	4.5	1.0	0.2
Total	3,435.5	0.9	100.0	Total	2,280.7	1.4	100.0

Table 11. Top 20 important fish species in terms of quantity and price of the retail markets in all sample provinces.

In Terms of Quantity				In Terms of Price			
Fish Species	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**	**Fish Species**	**Total Quantity (kg)**	**Average Price (US$/kg)**	**% of Total**
Trey raws	7,733.0	1.1	30.8	*Trey bankang*	98.0	7.8	3.3
Trey chhdaur	4,074.2	1.2	16.2	*Trey khya*	1.5	2.5	0.1
Trey kranh srai	1,299.5	0.8	5.2	*Trey klaing hay*	96.5	2.2	3.2
Trey chrakaing	1,282.5	1.0	5.1	*Trey pra, Bong lao*	6.5	2.0	0.2
Trey chhpin	1,281.1	1.0	5.1	*Trey krum*	769.2	1.8	25.9
Trey riel	1,114.3	0.5	4.4	*Trey sanday*	128.0	1.8	4.3
Trey chhlaing	975.7	1.0	3.9	*Trey pawa muk py*	1.5	1.8	0.1
Trey chhkok	889.5	1.5	3.5	*Trey kray*	26.5	1.7	0.9
Trey pra	790.0	0.9	3.1	*Trey kbork*	2.0	1.7	0.1
Trey andaing toun	781.5	1.1	3.1	*Trey chhlonh chhnoht*	421.9	1.6	14.2
Trey krum	769.2	1.8	3.1	*Trey chhkok*	889.5	1.5	29.9
Trey kantrang preng	624.5	0.9	2.5	*N/A*	46.5	1.5	1.6
Trey po	612.0	0.9	2.4	*Trey kaok*	6.0	1.5	0.2
Trey proul	535.5	1.1	2.1	*Trey kes*	215.0	1.5	7.2
Trey kampeus	511.0	0.7	2.0	*Ka port*	38.0	1.4	1.3
Trey chhlonh chhnoht	421.9	1.6	1.7	*Trey kchoeung*	39.8	1.4	1.3
Trey slat	398.7	0.8	1.6	*Antung*	53.5	1.3	1.8
Leas	395.0	0.3	1.6	*Trey pream*	7.5	1.3	0.3
Trey bandol ampeou	306.0	0.5	1.2	*Trey pra kandor*	2.7	1.2	0.1
Trey damrey	305.4	1.0	1.2	*Trey krormorm*	121.0	1.2	4.1
Total	25,100.5	1.0	100.0	Total	2,971.1	1.9	100.0