

## **LOGISTICS FOR IMPROVEMENT OF FISH TRANSPORT EFFICIENCY TO CONSUMERS IN THAILAND**

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**Abstract:** Fish is one of the primary sources of animal protein in Thailand. The per capita consumption rose from 20.3 kg to 29.8 kg per year within 20 years. The marine fishing industry in Thailand grew from 1.8 million tons in 1981 to 2.7 million tons in 1991 and remains between 2.7 and 3.1 million tons since then. Inland fisheries contribute another twelve percent share, that make a total fisheries production of 3.4 million tons with a value of 108.6 billion baht in 1997.

Thailand at present has 15 fishing ports under the Fish Marketing Organization as well as other ports to serve local consumption. Cold stores are distributed at some major logistic locations in the country and provide long term storage. It is common that Thai fishing vessels prefer to unload the catches to affiliated ports. Then, fish is normally transported several hundred kilometers with special trucks from southern and eastern fishing ports to three major fish markets of Bangkok, Samutsakhon and Samutprakarn in Central region, where the catches are auctioned. The further inland distribution is similar to other perishable goods and done mainly by trucks and pick-ups with ice-packed containers.

This paper presents the process of handling, storing and carrying by modern road transports on the improvement of marine fisheries product distribution to consumers, even in the rural areas, all over Thailand and neighbouring landlocked countries.

**Key Words:** Thailand fisheries, fish logistics, fish marketing, fish transportation

### **1. THAI FISHERIES STATUS**

The period since 1960 has been a period of rapid development for the fisheries in Thailand. New techniques and new technologies were adapted to different fields of fishing. With the help of new methods fishing has moved into new fields – (deep-sea) trawling, new ways of aqua- and marine culture, fishing for industrial purposes (fishmeal, fishoil) etc. The adaptation of new techniques has, however, not been uniform or simultaneous at all levels or in all places. Large parts of the total fishing efforts are still made by coast-bound, small-scale fishermen using traditional methods.

Related to the development of modern fisheries is a necessary improvement of the post-harvest sector. To take care of the growing amounts of fish that are landed, a modernization of the post-harvest sector has to be made. Far from all fish caught in the region can possibly be consumed fresh, and large portions have to be processed in one way or another.

A large number of canneries, freezeries, fishmeal factories, fishoil factories and ice factories have been built, thus complementing old methods of conservation like drying and salting.

The improved methods have led to a large increase in the pressure on the available resources as the catches have grown and the number of vessels engaged has increased. The entry into the fishing sector for new participants has been rather easy. In the post-war era of quick expansion the flow of new entrants from groups formerly not directly engaged in fisheries has been noticeable.

Not only in the field of marine fisheries (deep-sea and coastal) are changes taking place but also in the field of aqua- and marine culture. With the rising pressure on the marine fisheries there are large interests directed towards the development of freshwater and salt-water fish farming.

### **1.1 Small scale, coastal fishing**

Traditional small-scale fisheries are still a dominating feature along the coasts of Thailand. In spite of the rapid development of modern fisheries in Thailand and partly in some of the other countries in the region, the largest part of people engaged in fishing are still engaged in small scale fisheries. Large parts of the production are coming from small-scale activities.

Small-scale fisheries are still the main supplier of fish for domestic markets and local consumption and also influence the development of industrial fisheries. A relation based on the small-scale fisheries and its relation to the production of fish for human consumption should have underlined the sector's importance for local markets.

The general importance of small-scale fisheries for the supply of consumption fish is important when the relations between different types of fisheries are discussed. The general situation and development constraints for small-scale fisheries can be summarized by the points below.

- The fish that is harvested must be kept in a way that keeps it consumable.
- Because of limited access to ice, fresh fish has to be consumed rather quickly.
- Transportation possibilities of fresh fish are limited.
- In areas with a growing usage of ice there are possibilities of increasing the markets.
- The introduction of new methods for the treatment of the catches as well as other new methods is evenly spread.
- Traditional ways of preserving fish, such as drying and salting, are important.
- Areas closer to urban (fishing) centers usually have better access to modern facilities, while fishermen in some other areas have to rely on old methods.
- Small-scale enterprises close to fishing centers have also opportunities to deliver excess catches to fish industries

### **1.2 Large scale fisheries**

Among the Southeast Asian nations, Thailand has so far been the most successful in adapting new techniques and new technology in fisheries. Thailand stands presently with the largest and most advanced deep-sea fishing fleet. This development has brought many new participants into the fisheries.

In the 1960's otter board trawlers, pair trawlers, beam trawlers, purse seiners and in the 1970's luring purse seiners with lights were introduced. Motorized small vessels and the use of nylon nets have also to some extent spread to small-scale fisheries.



New types of vessels together with modern equipment for communication and navigation have made it possible for the Thai fishing fleet to venture into faraway water, away from local waters that tended to get overcapitalized.

This period of rapid development brought a tremendous increase of the total marine landing in Thailand. The increase was "at least ninefold between 1960 and 1980", or with 21% annually from 1960 to 1971.

The evolution of a large-scale commercial sector is to a large extent not based on a development of the traditional fishing sector. The modern fishing sector is instead generally located to urban centers and backed by people who were formerly not active in fisheries.

The rapid development of the Thai fisheries has demanded investments in the development of the post-harvest sector, and in many of the coastal cities fish industries are built. Ice factories, canneries, freezers, fishmeal and fishoil factories are found in the main fishing harbours.

The economic backbone of many Thai coastal cities is built on the fishing industry. In these areas the fishing industry also provides a large share of the existing working opportunities.

Thailand has, together with some of the other nations in the region, with the help of modern technologies been able to provide fish products of high quality and high value for growing export markets. In Thailand fish products are now one of the major foreign exchange earners.

The development towards a modern fishing sector has brought more and larger vessels, larger catches, a modernized post-harvest sector, better infrastructure for the fisheries and a lot of new participants.

## **2. THE FISH MARKETING ORGANIZATION**

As the consequence of the FAO study and recommendation to the Thai Government in 1946 for improving hygiene and eliminating the political influence on the activities of the fish market at that time, the Bangkok Fish Market was established in 1952 as a new central fish market to carry out the following:

1. Transportation service
2. Cold storage service
3. Systematization of fish auction procedure
4. Establish of credit institute for fishermen
5. Fisheries promotion, technical information service and sanitation service

Later on, the Act of Organizing the Activities of the Fish Market was then proclaimed in 1953, which resulted the establishment of the Fish Marketing Organization.

The Fish Marketing Organization (FMO) is an autonomous body under the supervision of the Ministry of Agriculture and Co-operative. It is juristic person and the duties of which include the operation of wholesale fish markets the control of the fish marketing system and the promotion of fishermen's welfare.

FMO is authorized by the Government to construct, purchase, procure, dispose, hire, own or poses various properties, to borrow or lend out money or things. It is also responsible for the establishment of a wholesale fish market in any locality deemed appropriate by the approval from the Minister. The main objectives are as follows:

1. To undertake various activities in the development and improvement of wholesale fish markets, local fish markets and fishing industry in general
2. To arrange, control, supervise and render services to fish agents including transportation and other activities connected with the business transactions of fish agents
3. To improve the living standard and to promote welfare and profession of fishermen and their communities
4. To encourage the establishment of fisherman cooperatives or fisheries associations on fisherman groups in the country and render support to these activities

#### *FMO Fish Markets and Fish Landings*

Name	Location (from Bangkok)	Port Size (meters)	Inauguration (Year)
1. Bangkok Fish Market	in Bangkok	246.00	1953
2. Samutprakarn Fish Market	29 km	177.00	1982
3. Samutsakorn Fish Market	36 km	150.00	1967
4. Trat Fishing Port	315 km	104.00	1968
5. Hua-Hin Fishing Port	173 km	40.00	1965
6. Pranburi Fishing Port	210 km	25.50	1967
7. Chumporn Fishing Port	463 km	102.00	1982
8. Surattani Fishing Port	644 km	97.50	1969
9. Songkla Fishing Port	950 km	200.00	1954
10. Ranong Fishing Port	568 km	98.00	1964
11. Phuket Fishing Port	862 km	181.50	1974
12. Satun Fishing Port	973 km	100.00	1975
13. Pattani Fishing Port	1055 km	n.a.	1972
14. Narathivas Fishing Port	1149 km	n.a.	1997
15. Nakhon Srithammarat Port	780 km	n.a.	1991
16. Langsuan Fishing Port	528 km	n.a.	1997

### **3. FISHERIES DEVELOPMENT PROJECT**

Since 1976, FMO has taken charge of the fisheries development projects for both economic and social development. The main objectives are to help fishermen and improve their economic condition, and to increase fish production for domestic consumption particularly in the areas where per capita consumption of fish is low. The project aims at exploitation of only the pelagic resources in the waters of Thailand through the replacement and modernization of existing smaller sized vessel mainly operating in the coastal waters, and provision of modern-purse seiners to introduce modern purse seiner technology to exploit off-shore pelagic resources. This is to be completed by onshore facilities in ice-making, refrigeration and transportation to ensure efficient preservation and distribution of the project catch.



Modernization of Existing Vessels: The number of fishing boats registered in 22 coastal provinces and Bangkok is in a total of 18,182 vessels. Typical modern fishing vessels are Gillnetter with 30-60 hp engine, size 12-14 meters, Anchovy purse seiner with 60-90 hp engine, size 14-15 meters and traditional purse seiner with 240 hp engine, size 16-18 meters or 23-25 meters with 80 ton capacity for longer trips of several weeks. A typical Thai fishing vessel can make a maximum catch up to 25 tons per trips of, say 7-10 days, but an average catch of 5 tons per vessel seems to be more common. The operating costs are in the order of 150,000 baht a month for a typical size and 270,000-380,000 baht a month for a larger size.

#### 4. THE BANGKOK FISH MARKET (BFM) AND THE FISH AGENTS

The establishment of Bangkok Fish Market was on March 30, 1953 but operated in April 15, of the same year. The main objectives are to serve as a central wholesale market for fresh marine fish and fresh water fish. It covers an area of 18 rai (approximately 7.28 acres) and, having a frontage along the Chao Phaya river of 246 meters in length. It is located on the river at 30 kilometers upstream from the Gulf of Thailand. The compound is comprised of FMO headquarters, BFM office, Fish Agent office, C.S.O.cold storage and private cold storage as well.

The Fish Agents are regarded as brokers and representatives of the fishermen. They proceed and conduct the auctioning. Every fish agent must be registered and conferred a license from the Department of Fishery. The fish agents are allowed to take not more than six percent of gross sale for commission.

There are approximately 1,400-1,500 fish buyers or retailers to participate in fish auctioning daily at BFM and the auction starts at 3:30 a.m. and ends around 10:00 a.m. daily. The auctioning is based on bidding price and the one who gives the higher price will win.

The Bangkok Fish Market is one of the three major fish markets in Thailand, locating at the center and functioning as main suppliers to inland central, northern and northeastern regions. The Fish Markets of Bangkok, Samutsakhon and Samutprakarn, as central markets, handle fisheries products in the amount of 520,000 tons annually, i.e. about 47 % of all the fisheries products that are landed at 15 fishing ports under the Fish Marketing Organization as listing in Table 1. Nowadays, the advent of modern road transports and cold stores some fisheries transactions are dealt directly between provincial fishing port agents and inland markets.

Table 1 also shows the figures on transportation per day (trips) of boats and trucks in and out of all related fish markets and fishing ports, as well as the numbers of fish buyers and fish agents per day. It is worth noting that Bangkok Fishing Port and Market no longer serves boat landing despite on the river. Each day it serves the mercantile transaction at the load of 350 tons of marine and fresh water fisheries products. The percentage of fresh marine and fresh water fish transported to the Bangkok Fish Market from related fishing ports during 1995-1999 are shown in Table 2 and 3 respectively. It indicates the contribution of various fishing grounds, such as the Andaman sea and the upper Gulf of Thailand, in supplying fishery products to Bangkok and other inland logistic centers.

Table 4 shows the number of inward and outward trips of fish trucks at the Bangkok Fish Market each year during 1990-1999. The daily traffic volume is at an average of 1,100 vehicles, comprising three wheeled 14.3 %, four wheeled 80.3 %, six wheeled 2.8 % and ten

wheeled 2.6 %. As land transportation totally replaces water transportation at Bangkok Fishing Port, the existing port and market area of 28,000 square meters needs to be redesigned for speedy handling to cope with in- and out- vehicles at unloading, loading and parking. The extension of another 6,400 square meters is under consideration despite the tendency of higher overhead on renting land.

Fresh marine fish channel of the Bangkok Fish Market and the Samutsakhon Fish Market can be diagrammatised as shown in Figure 1 and 2 respectively: presenting the percentage of retailers, processing plants and cold storage as well as export involvement. The latter involves more in the supply for processing and export rather than sale of fresh products. For the far fishing ports in the most south of Thailand, fish agents tend to do more transaction with Malaysia.

## 5. GENERAL ASSESSMENT OF FISHERY MARKETS

In order to assess fishery market logistics in greater depth it is necessary to classify the varying types of fishery ports met with. This is a difficult task, but one solution would be to grade them according to the type of fishery customers they serve, as in the following:

- (i) *Simple landing place*, which would serve a group of subsistence, or even artisanal fishermen, generally operating on a daily trip basis a short distance from the landing place.
- (ii) *Coastal fishery port* providing a facility for small coastal fishery vessels, generally less than 20 m in length making trips of one or two day duration.
- (iii) *Near-distance fishery port* involving with vessels of 25 to 40 m class and fishery trips extending up to several days to two or more weeks.
- (iv) *International ocean fishery port* involving with the large modern factory-type fishing vessel roaming the ocean on long trips, stopping only at ports of call for provisions.

As regards the existing locations of fishing ports and already developed fish markets in Thailand, the following qualities are determined:

- (i) distance from the fishing grounds within a determined maximum – depending on a number of factors – e.g., vessel size, capacity, preservation method, type of product, etc;
- (ii) distance from the major consumer areas should be limited, especially if a fresh product is being distributed;
- (iii) the location should be near urban areas, where residential facilities, amenities, stores, supplies, etc., can be obtained for the crews and port workers and transport facilities provided;
- (iv) fishing operations should already exist in the area, for reasons of availability of vessel operators and shore workers;
- (v) existence of good road and /or rail communication facilities to the principal consumer centers;
- (vi) the presence of physical conditions generally suited to port and associated marketing and industrial development.

Certain other factors could influence the choice of fishing ports or fish markets though, in themselves, they may not necessarily be essential:



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- (i) availability of sufficient electrical power supplies to serve the full needs of the industry and the port;
- (ii) availability of adequate fresh water supplies for many, especially processing needs of the industry.

In addition, the technical assessment of actual sites available for market development includes:

- (i) projections of the type, size and number of fishing vessels likely to use the landing and inland transport facilities in the first and later stages from which would lead;
- (ii) the determination of various basic port dimensions, e.g., depth and extent of basins and approaches; lengths of quays, etc.;
- (iii) the projections of catches landed from vessels and transported by trucks, which would lead to estimates of the services required for catch handling, distribution, marketing and processing, etc.

### 6. SOME ASPECTS OF OPERATIONS RESEARCH IN FISH TRANSPORT IMPROVEMENT

The practice of unloading wet fish differs very little from port to port. The unloading gangs dig out the fish with hooks or shovels, filling baskets which are then swung ashore, and tipped into market containers ready for auction. In addition to the physical damage, the fish are removed from the protecting ice and lie exposed, in the market containers, to relatively high temperatures for several hours until after the auction and processing.

In Thailand, after having been unloaded from vessels at the ports majority of fish are always transported by container trucks to Central Fish Markets in Bangkok or the vicinity. The fish are correctly packed with ice in suitable boxes or fish containers made of high density polyethelene (HDPE). By doing this shows a significant improvement in quality over unpacked methods. This improvement has been subsequently measured as being up to three days extension of edible life over shelf stowed fish. However, it would be even better if fish could be correctly packed at sea in a suitable boxes and each box could be marked as to the day of catching and could be expected to contain fish of uniform quality.

Following are the basic patterns of fish distribution:

- (a) From vessel to distribution transport –
  - (i) fresh fish by volume in containers
  - (ii) frozen fish in cardboard boxes
- (b) From vessel to cold store – frozen fish and fish for freezing
- (c) From vessel to handling and processing hall to distribution transport – fresh fish
- (d) From vessel to processing hall to cold store - to distribution transport
- (e) From vessel to stores or tanks – fishmeal, fishoil.

The fish discharge from vessel is weighed either in whole lots, e.g. fresh fish in cases, or by weighing a standard sample, e.g. salt fish in barrels, and sorted. Nowadays there are three types of containers used in transportation of fish to markets in Thailand: first, plastic tall, round basket of 30–70 kg fish capacity or plastic rectangular basket of the same capacity;

second, HDPE box or barrel of 80-90 kg fish capacity with packed ice in cold container truck for long distance journey; and third, ice packed foam box for the distribution of processed fish to supermarkets, restaurants and small retailers all over the country.

The issue of fish transport efficiency is concerning the brisk supply of fresh fisheries products to inland markets with reasonable cost. Sufficient land transports are the major contribution to this aspect. In the past 25 years the fisheries logistic management in Thailand has been developed a great deal due to a good highway network, the establishment of cold stores in every provincial cities and towns and the advent of recent telecommunication systems. The intercity highway network consists of 51,477 km of national highways and 81,164 km of rural roads, out of which 3,165 km are the trunks of 4-6 lane dual carriageways, i.e. road distribution at 0.26 km/sq.km. or 2.17 km/1,000 population.

Long distance transportation of fisheries products is carried out in three manners : by knocking at freezing temperature, or by keeping alive with oxygen supply, or by ice packed fresh in container. Land transportation by container truck normally carries a fish load of 11.5 tons (maximum) or 9 tons (for a refrigerated truck) at the transport cost of 15,000 baht per trip of 1,000 km distance delivery. Each month there are about 4,400 trips of fish trucks from southern ports to Bangkok and some of them return empty. This aspect needs a further investigation for better utilization of land transportation. It is worth noting that every where in Thailand marine fresh fish can reach inland markets within 10 hours after Central markets.

From the economic point of view the fishing port is the complex of installations on land, organized to service the fishing fleet and its products, and is the main link in the production chain of all components of the fishing industry, which should efficiently perform their tasks, with the aim of achieving the planned targets with the minimum costs.

The problem of existing servicing relations between the port/market/land transport and the fishing vessel is required operations research. The service of the fishing vessel in the port is a non-continuous process, in general cyclic, in which the exact time of the ship's arrival in the port, as well as the exact time of the end of the service can not be predicted. The principles of the probability analysis, may be used to predict the probability frequency of these occurrences. The received results of calculations according to queuing theory conform with reality in such a way that they can be used in the practice of market planning.

Methods of defining the needed number of berths and truck parking lots in the fishing port and the market may be used the conventional method of planning. By conventional methods the number of needed boat-truck trips in and out of the fishing ports and in this way the length of the quay, or the expected traffic result when the number of berths is given, are obtained assuming a deterministic pattern of fishing cycle, and in this, a determined service time in the port. Sometimes, without respect to the real service time, a normative time of the stay of the fishing vessel in the port is assumed with different motivations, as for instance the recreation of the crew.

## 7. CONCLUSION

Major market segments for fish consumption in total there are over 100,000 restaurants and eating establishments in Thailand not including the tens of thousands of food stalls on the streets. According to the information of Tourism Authority of Thailand, the breakdown of the



food service market is as follows: 2,350 hotels, 364 resort hotels, 748 bungalow resorts, 639 international food restaurants, 733 fast food restaurants, 328 high-end Thai restaurants, 15,000 mid-level Thai restaurants, 80,000 lower level Thai restaurants, and 200 institutions (private hospitals, airline catering)

To be fully aware of this problem, the transport scheme of fish markets or logistic terminals is to be considered. Big autonomous fishing vessels perform all the functions of fishing industry and transport, covering catching on the fishing grounds, transport to, and discharge in the port. It was soon found while analyzing the autonomous fishing vessels cycle, that better results would be obtained, if the vessels, instead of being general purpose, were specialized, that is special vessels for catching, for processing, and for storing and transport to the nearest port then transferring to land transport would be introduced into service.

This led to the following schemes while planning distance fishing: Expeditionary catches- the mother ship is the permanent base and fish is transported to the port by specialized transport boats, then inland container trucks and pick-ups as the final distributor integrating with telematics.

For the most developed scheme, i.e. most specialized, and therefore where the best results are to be expected, the working scheme is the integration of Catcher- Fishing port- Fish market – Cold container truck – Processing plants – Pick-up distributor - Consumers.

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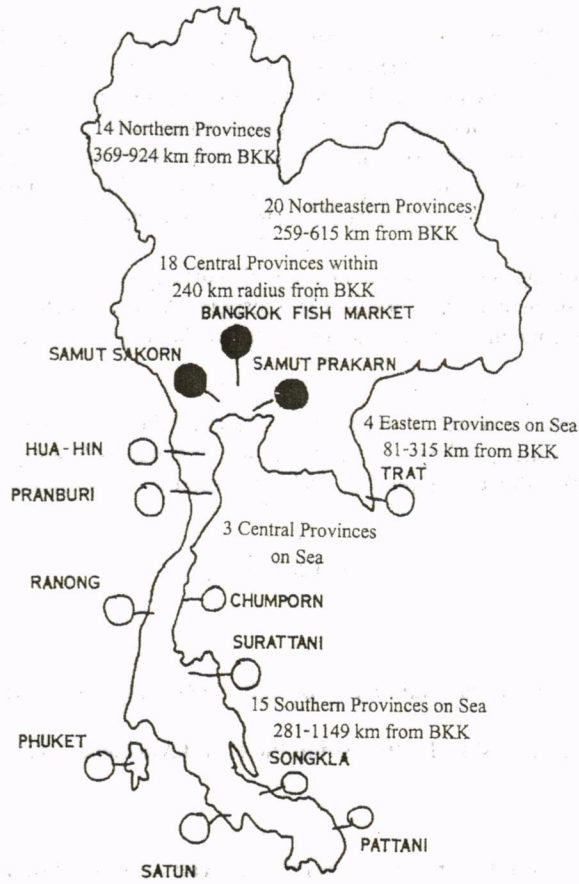
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- FISH WHOLESALE MARKETS
  - FISHING PORTS
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**Table 1. Statistics of Fish Markets and Fishing Ports of the Fish Marketing Organization (FMO), 1999**

Fish markets and Fishing ports	Transportation per Day (Trips)			Number of fish Buyers per Day	Number of fish Agents per Day
	IN		OUT		
	Boats	Trucks	Trucks		
Ranong	7	-	25	28	17
Hua Hin	35	-	6	45	5
Surat Thani	1	6	6	12	-
Pattani	33	2	54	150	16
Satun	9	-	34	18	19
Phuket	16	12	35	20	10
Chumphon	5	-	5	20	11
Nakorn Srithammarat	7	-	9	40	8
Songkhla 2 (Ta Sa-ant)	34	363	225	86	12
Narativas	2	-	3	1	-
Langsuan	4	-	4	6	2
<b>Total (Fishing ports)</b>	<b>153</b>	<b>383</b>	<b>406</b>	<b>426</b>	<b>100</b>
<b>Samutprakarn Fish Market</b>	<b>6</b>	<b>7</b>	<b>551</b>	<b>300</b>	<b>8</b>
<b>Samutsakhon Fish Market</b>	<b>8</b>	<b>57</b>	<b>268</b>	<b>309</b>	<b>34</b>
<b>Total Regional</b>	<b>167</b>	<b>447</b>	<b>1,225</b>	<b>1,035</b>	<b>142</b>
<b>Bangkok Fish Market</b>	<b>-</b>	<b>345</b>	<b>636</b>	<b>1,798</b>	<b>16</b>
<b>Total</b>	<b>167</b>	<b>792</b>	<b>1,861</b>	<b>2,833</b>	<b>158</b>

**Table 2. Percentage of Fresh Marine Fish transported to the Bangkok Fish Market by the Outstanding Provinces 1995-1999**

Provinces		1995	1996	1997	1998	1999
<b>By Truck (distance from Bangkok)</b>						
Trad	315 km	12.37	10.45	12.68	9.29	9.08
Chanthaburi	245 km	4.90	3.77	3.04	2.14	1.40
Chonburi	81 km	2.17	1.96	2.16	3.00	2.68
Rayong	179 km	1.04	0.88	0.53	0.56	0.71
Samutprakan	29 km	5.13	5.00	5.81	6.45	9.52
Samutsakhon	36 km	9.21	9.05	9.79	9.97	15.24
Samutsongkram	72 km	12.53	15.00	15.22	7.64	2.60
Phetchaburi	123 km	1.78	2.83	2.72	3.24	4.32
Prachuabkhirikhan	281 km	9.41	13.60	12.50	9.92	8.30
Chumphon	463 km	11.08	11.65	10.92	8.72	7.43
Surat Thani	644 km	3.12	1.88	2.22	3.17	3.74
Nakhon Srithammarat	780 km	1.59	1.25	0.99	1.53	1.71
Songkhla	950 km	2.13	1.81	1.03	1.05	1.34
Pattani	1055 km	0.29	0.17	0.08	0.16	0.26
Satun	973 km	2.69	2.23	1.21	0.81	1.99
Krabi	814 km	0.07	0.14	0.17	0.32	0.15
Phuket	862 km	1.68	1.20	1.21	1.21	0.60
Trang	828 km	5.69	2.95	2.32	3.04	3.58
Ranong	568 km	11.48	12.43	13.56	25.44	21.46
Other Provinces		1.64	1.75	1.84	2.34	3.89
<b>Total</b>		<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

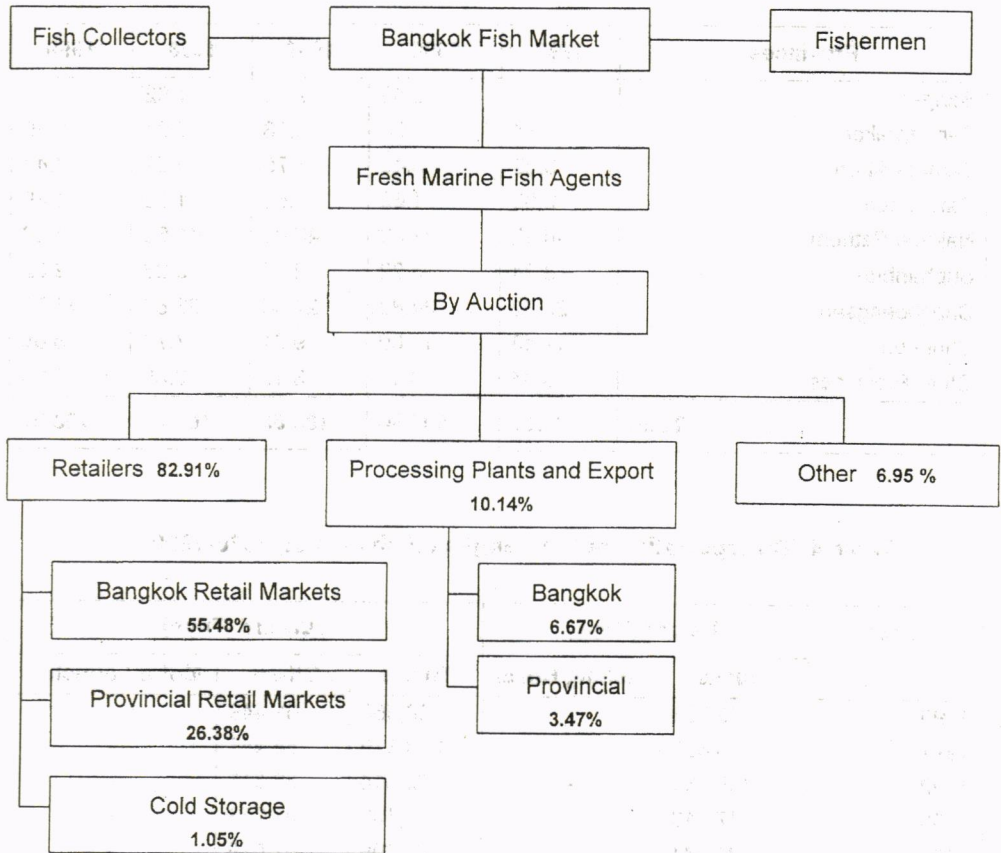


**Table 3. Percentage of Fresh Water Fish transported to the Bangkok Fish Market by the outstanding provinces 1995-1999**

Provinces	1995	1996	1997	1998	1999
Bangkok	3.60	2.40	2.02	1.62	1.40
Samutprakan	8.74	7.88	4.38	5.01	6.85
Samutsakhon	3.39	3.48	3.75	3.52	3.47
Ratchaburi	2.09	1.63	1.63	1.53	1.89
Nakhon Pathom	40.45	41.59	46.05	41.63	31.28
Suphanburi	3.24	3.22	2.45	2.26	2.32
Chachoengsao	22.72	24.89	27.56	33.67	41.79
Chonburi	12.43	11.80	9.01	7.70	8.05
Other Provinces	3.34	3.11	3.15	3.06	2.95
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

**Table 4. Transportation of the Bangkok Fish Market, 1990-1999**

Year	Inward (Trips)		Outward (Trips)		
	Trucks	Fishing Boats	Trucks	Others	Motor Launches
1990	103,533	-	268,565	61,449	-
1991	105,655	-	273,819	54,447	-
1992	109,581	-	272,514	52,515	-
1993	117,213	-	267,133	47,253	-
1994	130,541	-	263,208	67,078	-
1995	121,878	-	255,580	55,419	-
1996	121,889	-	252,440	46,870	-
1997	126,453	-	253,393	48,163	-
1998	119,233	-	253,030	51,276	-
1999	125,793	-	232,189	55,656	-



**Figure 1. Fresh Marine Fish Channel of the Bangkok Fish Market, 1999**

**Note:**

In the vicinity of Bangkok there are 180 agents of fish processing and packing to supply hotels, restaurants, supermarkets, etc., out of which 24 agents processing for export.

Bangkok retail markets of 55.48% share can be divided into four groups:

- Daily markets having sale exceeding 3 tons a day, 12.33% share
- Daily markets having sale exceeding 2 tons a day, 15.66% share
- Daily markets having sale exceeding 1 tons a day, 8.75% share
- Daily markets having sale less than 1 ton a day, 18.74% share



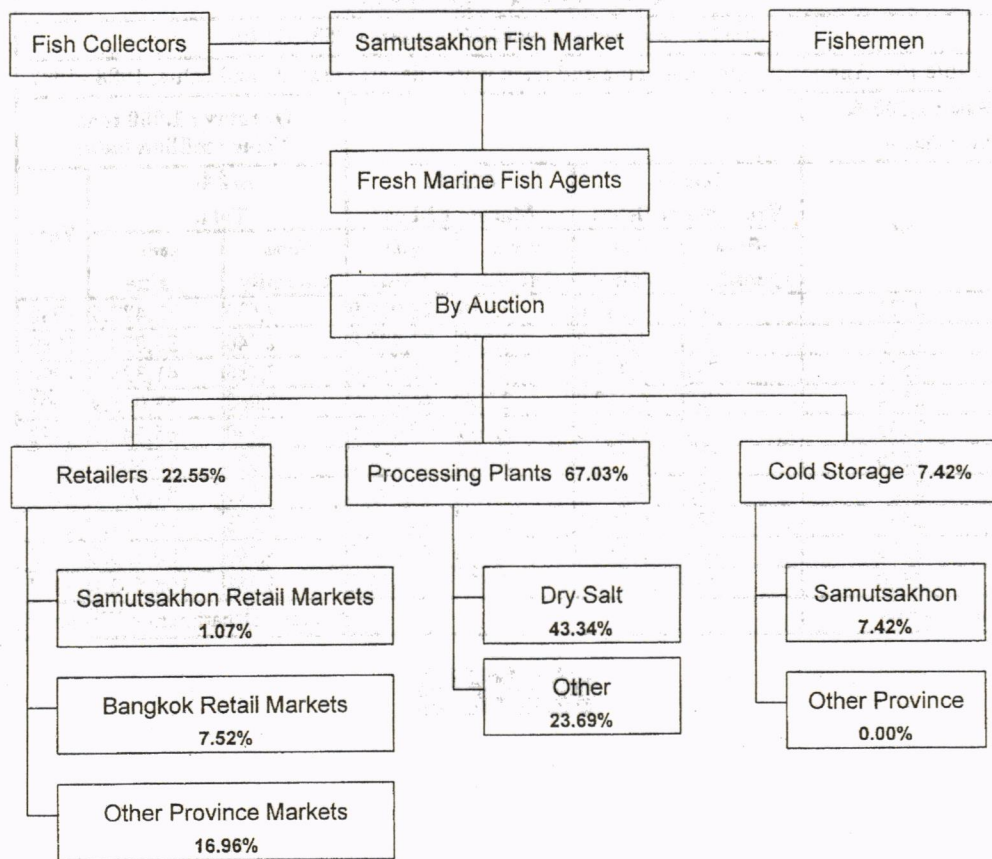


Figure 2. Fresh Marine Fish Channel of the Samutsakhon Fish Market, 1999

APPENDIX							
SECTION IX. FISHERIES							
ตารางที่ 104. ปริมาณและมูลค่าสัตว์น้ำที่จับได้ทั้งประเทศ พ.ศ. 2531 - 2540							
Table 104. Annual catches of marine and fresh water fishes: Quantity and value, 1988 - 1997							
ปริมาณ : 1,000 ตัน มูลค่า : ล้านบาท		Quantity : 1,000 tons Value : million bahts					
พ.ศ.	สัตว์น้ำจืด Fresh water fishes		สัตว์น้ำเค็ม Marine Fishes		รวมทั้งสิ้น Total		Year
	ปริมาณ Quantity	มูลค่า Value	ปริมาณ Quantity	มูลค่า Value	ปริมาณ Quantity	มูลค่า Value	
2531	184	4,382.6	2,446	28,039.9	2,630	32,422.5	1988
2532	201	4,441.2	2,539	31,428.8	2,740	35,870.0	1989
2533	231	5,903.7	2,555	35,492.0	2,786	41,395.7	1990
2534	259	6,260.0	2,709	46,765.9	2,968	53,025.9	1991
2535	274	6,477.0	2,966	59,067.5	3,240	65,544.5	1992
2536	337	8,579.1	3,048	69,827.6	3,385	78,406.7	1993
2537	373	9,702.2	3,150	77,299.0	3,523	87,001.2	1994
2538	388	9,889.6	3,185	86,222.0	3,573	96,111.6	1995
2539	437	11,781.0	3,112	88,844.8	3,549	100,625.8	1996
2540	404	11,079.2	2,979	97,533.2	3,383	108,612.4	1997
ที่มา : กรมประมง					Source : Department of Fisheries.		

