

A MODEL OF TRACEABILITY OF FISH PRODUCTS FOR THE DOMESTIC MARKET IN CHINA BASED ON TRACEABILITY STUDIES IN ICELAND AND CHINA

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ABSTRACT

This paper suggests a model for traceability of fish products on the domestic market in China. The model is based on a review of available concepts and standards on traceability and the current situation of traceability. A field study was conducted in a fish market and a processing factory in Iceland to evaluate how traceability is secured at these locations. Results from the evaluations were compared to studies of the supply chain and traceability procedures in China in order to identify issues that threaten fish product safety and to suggest improvements of the supply chain. In addition, recommendations regarding the batch, the batch code, the recorded information and recalling are made for development of regulation for traceability in Chinese domestic market to regulate the fisheries industry. Furthermore, recommendations on how traceability can be implemented on the domestic wild fish market are suggested. The model of paper-based code system includes the product labelling, the record of information and the evidence for tracing the product, to implement traceability system in the different stages of the supply chain.

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TABLE OF CONTENTS

LIST OF FIGURES.....	4
LIST OF TABLES.....	5
1 INTRODUCTION.....	6
1.1 THE SAFETY AND QUALITY ISSUES OF FISH PRODUCTS IN CHINA.....	8
1.2 RATIONALE FOR THE PROJECT	9
1.3 OBJECTIVES AND METHODS	9
2 CONCEPTS, STANDARDS AND LAWS ON TRACEABILITY	10
2.1 TRACEABILITY	10
2.1.1 <i>T</i>	10
2.1.2 <i>Definition of traceability</i>	11
2.1.3 <i>Tracing and tracking</i>	11
2.1.4 <i>Types of traceability systems</i>	11
2.1.5 <i>Standards and laws of traceability</i>	12
2.2 TRACEABILITY SYSTEMS OF FISH PRODUCTS IN THE EUROPEAN UNION AND CHINA	14
2.2.1 <i>Standards of traceability systems of fish products in EU</i>	14
2.2.2 <i>Traceability of fish products in China</i>	15
3 TRACEABILITY SYSTEMS OF FISH PRODUCTS IN ICELAND BASED ON AUCTION AS CORE-COMPANY IN THE SUPPLY CHAIN.....	15
3.1 SUPPLY CHAIN AND LOGISTICS BASED ON AUCTION AS THE CORE COMPANY	15
3.1.1 <i>Introduction of the fish market</i>	15
3.1.2 <i>The model of the fish product supply chain</i>	16
3.2 TRACEABILITY SYSTEM OF THE FISH MARKET.....	16
3.3 TRACEABILITY SYSTEM OF THE PROCESSING COMPANY	19
3.3.1 <i>Introduction of processing company</i>	19
3.3.2 <i>The processing</i>	19
3.3.3 <i>The labels for traceability in Isfiskur</i>	21
3.3.4 <i>Links and methods of the traceability system in Isfiskur</i>	24
3.4 CONCLUSIONS AND SUGGESTIONS OF TRACEABILITY AND SUPPLY CHAIN IN ICELAND	25
3.4.1 <i>The advantages of the supply chain management for traceability</i>	25
3.4.2 <i>The characters of traceability</i>	25
3.4.3 <i>Issues and suggestion for traceability</i>	26
4 IMPROVING SUPPLY CHAIN MANAGEMENT TO ESTABLISH TRACEABILITY IN CHINA	26
4.1 THE SUPPLY CHAIN OF FISH PRODUCTS IN CHINA.....	27
4.1.1 <i>General characteristics of the fish products supply chain</i>	27
4.1.2 <i>The structure of the fish products supply chain based on the wholesale market as the core link</i>	27
4.2 FOOD SAFETY RISKS IN THE SUPPLY CHAIN THROUGH WHOLESAL MARKET	28
4.3 CONCLUSION AND SUGGESTION FOR FISH PRODUCTS SUPPLY CHAIN MANAGEMENT IN CHINA.....	29
4.3.1 <i>The suggestions for the government</i>	29
4.3.2 <i>The suggestions for the wholesale markets</i>	29
5 CONCLUSION AND SUGGESTION OF METHODS FOR TRACEABILITY IN CHINA.....	30
5.1 SUGGESTED ITEMS TO BE INCLUDED IN A GENERAL REGULATION FOR TRACEABILITY ON THE DOMESTIC MARKET.....	30
5.1.1 <i>The batch</i>	30

5.1.2	<i>Batch code</i>	31
5.1.3	<i>Recorded information</i>	32
5.1.4	<i>Recalling</i>	32
5.2	THE METHODS OF PAPER STORED INFORMATION FOR TRACEABILITY	33
5.2.1	<i>Fishing vessel</i>	33
5.2.2	<i>Fish dealer or agency</i>	35
5.2.3	<i>Primary processing</i>	36
5.2.4	<i>Wholesale market</i>	37
5.2.5	<i>Distribution</i>	39
5.2.6	<i>Street market</i>	40
ACKNOWLEDGEMENT		41
LIST OF REFERENCES		42

LIST OF FIGURES

Figure 1: Fish production in China, from capture fisheries and aquaculture (FAO 2009)	6
Figure 2: Volume and value for annual imports and exports of fishery commodities in China (FAO 2009)	7
Figure 3: Annual average seafood consumption in China 1990-2005 ((kg/person).....	7
Figure 4: The internal traceability and external traceability of a processing company	12
Figure 5 : The model of the fish product supply chain through fish market	16
Figure 6: Paper of storing information provided by vessel.....	17
Figure 7: Labelling of tubs provided by vessel.....	17
Figure 8: Information of the bid on the web site	18
Figure 9: Labelling of the tubs by the fish market.....	18
Figure 10: Monitor of weighing in Ísfiskur	20
Figure 11: Package of frozen haddock fillet of big size in Ísfiskur	20
Figure 12: Packing the master cartons on the pallet	20
Figure 13: Flow diagram for production of frozen haddock fillet in Isfiskur.....	21
Figure 14: The package and label for frozen haddock fillet of big size	21
Figure 15: The package and label for frozen haddock fillet of small size.....	22
Figure 16: The package and label of master case of frozen haddock fillet of big size	23
Figure 17: The label of master case of frozen haddock fillet of small size	23
Figure 18: The package and label of logistic units for pallet.....	23
Figure 19: The production date code of frozen haddock fillet in Isfiskur	24
Figure 20: Fish products supply chain in China (Li 2008)	28
Figure 21: Supply chain of wild fish in China.....	30
Figure 22 : The batch code of raw material produced in vessel or boat	31
Figure 23: The processing batch code of fish products	32
Figure 24: Container and label of caught fish from vessel or boat.....	34
Figure 25 : Frozen fish products in China	36

LIST OF TABLES

Table 1: Some recent trade bans imposed on Chinese fish products (Glitnir,2007).....	8
Table 2: Definition of tracing and tracking (EAN International 2002)	11
Table 3: Some common standards for traceability	14
Table 4: Information carried by label of frozen haddock fillet package in Isfiskur	22
Table 5: Information carried by label of master case of frozen haddock fillet of big size in Isfiskur	22
Table 6: Information carried by pallet label of frozen haddock fillet of big size in Isfiskur	23
Table7: The recorded information in traceability system of processing in Isfiskur	24
Table 8: The links and methods for batch identification for traceability in Isfiskur ...	25
Table 9: Recorded information in vessels and boats	33
Table 10: Bill from vessels or boats to the downstream in supply chain	34
Table 11: Recorded information for primary processing product codes in vessels and boats	34
Table 12: Bill of primary processing product from vessels or boats next step in supply chain.....	35
Table 13: Label of primary processing product	35
Table 14: Recorded information in agency or dealer.....	35
Table 15: Bill from agency or dealer to the downstream in supply chain	36
Table 16: Label for package or container of Dealer or agency.....	36
Table 17: Recorded information in primary company.....	37
Table 18 : Bill from primary company to the downstream in supply chain	37
Table 19: Recorded information in wholesaler for stock bill	38
Table 20: Recorded information in wholesaler for selling bill	38
Table 21: Bill from wholesale market to the downstream in supply chain	38
Table 22: Label of package or container in wholesale market	39
Table 23: Recorded information in distribution.....	39
Table 24: Bill of distribution providing to consignee	39
Table 25: Bill from street market to consumer	40

1 INTRODUCTION

China has been the largest fish producing nation in the world since 1989. In 1978 the country began to implement a policy of economic reform opening the doors to the outside world. This led to increasing investment in fisheries and application of more advanced technologies as new markets opened for Chinese fish products, stimulating fishers to increase their production (Zhong and Power 1997). From around 1980 fish production grew at an exponential rate, until 1995 when capture fisheries levelled off at around 15 million tons (Figure 1). In 2007, the total fish production reached about 56 million tons of which aquaculture accounted for around 73% (FAO 2009).

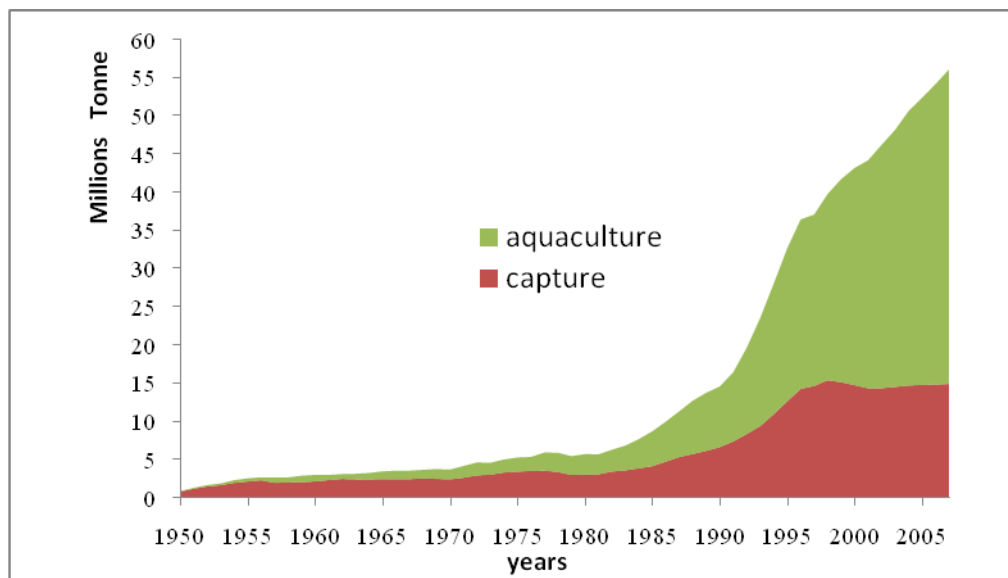


Figure 1: Fish production in China, from capture fisheries and aquaculture (FAO 2009).

Quantity and value of China's annual imports and exports of fish has increased steadily since 1986 (Figure 2), for after the economic reform in China, the market demand and the quantity of fish production have been increasing. In 2006 the quantity of fish commodities in international trade (export + import) was around 15 million tonnes worth US\$ 13 million (FAO 2009). Growth in fish production and the expansion of the fish-processing industry increased fish exports. This is partly due to increased imports of raw material for processing and re-exporting again. A large quantity of fishmeal required in aquaculture is also imported. China's main export markets of fish commodities are Japan, Republic of Korea, United States of America, EU countries, Hong Kong, and ASEAN countries.

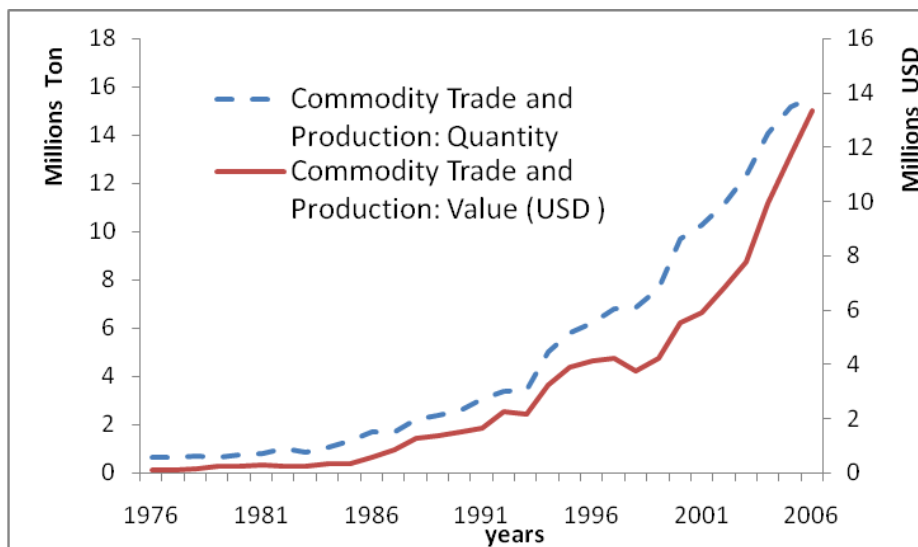


Figure 2: Volume and value for annual imports and exports of fishery commodities in China (FAO 2009).

Seafood consumption in China grew fast from 1990 to 1998 (Figure 3), due to great development in aquaculture and improved living standards. And Fish consumption in China has since then levelled off at around 25 kg per capita (Glitnir 2007).

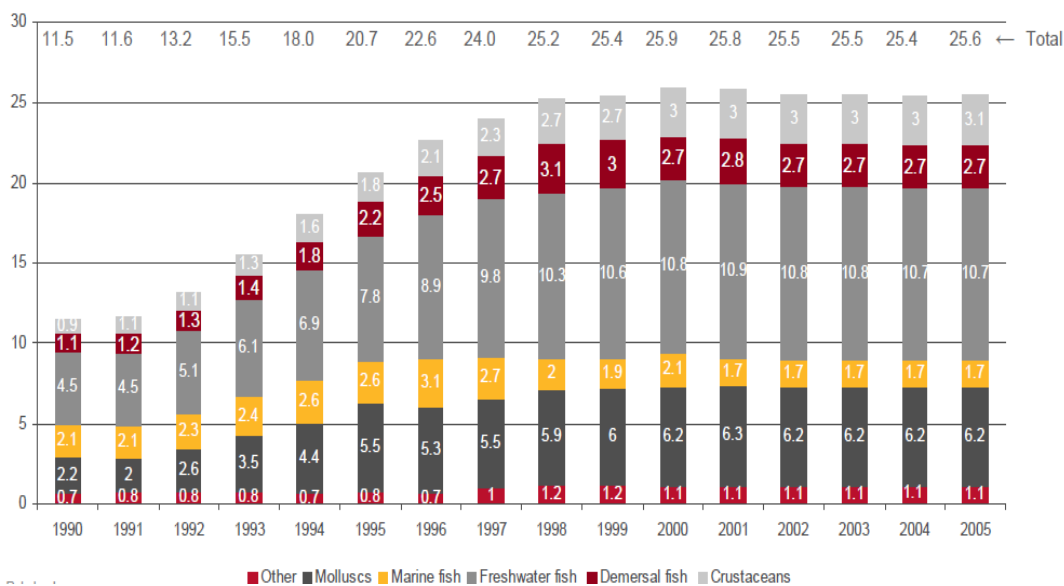


Figure 3: Annual average seafood consumption in China 1990-2005 ((kg/person).

Aquaculture is becoming an important part of the traditional agriculture. In 2008, gross value of aquaculture output from agricultural farms was about US\$ 78 billion (520 billion Yuan), accounting for 10% of agricultural GDP and 1.7% of total GDP in China (National Bureau Statistics of China 2009).

1.1 The safety and quality issues of fish products in China

The expansion in fish production and trade in China has not been accommodated by necessary food safety procedures by the processing companies and the local competent authorities. Several food safety problems have been encountered in fish products. Among them are the quantity of cadmium in oysters and scallops and drug remains in farmed fish that have repeatedly exceeded the maximum allowed limits of the national standard (Ministry of Agriculture Bureau of Fisheries 2005).

The safety of fish production in China is not only important for the local consumer but also for the export trade. A problem encountered in one processing company can affect the whole industry when bans from valuable markets are implemented. In recent years, some temporary bans from trading partners have been imposed on Chinese fish products due to illegal drug residues (Table 1). In USA, the large number of fish and shellfish was refused due to chronic problems that began in 2006 (Gale and Jean 2009). FDA found farm-raised seafood imported from China to be contaminated with antimicrobial agents (antibiotics) from October 2006 to May 2007. FDA issued an import alert ordering the “Detention without Physical Examination” of all aquaculture products from China: catfish, basa (related to catfish), shrimp, dace (related to carp), and eel on June 28, 2007 (Becker 2009). The trade issues caused by safety of Chinese fish products not only cause the industry losing money but also affect the image of Chinese products in international trade.

Table 1: Some recent trade bans imposed on Chinese fish products (Glitnir 2007).

Start year	Originator	Scope	End year
2002	EU, EU-wide ban after tests found traces of chloramphenicol	Shrimp and crayfish	2004
2006	Taiwan after tests found carcinogens	Hairy mitten crab	-
2007	Wal*Mart after tests found antibiotic contamination	Catfish	-
2007	US after tests found antibiotics contamination	Shrimp, basa, catfish	-

The safety of fish products is also a critical issue on the domestic market. In China feed producers and fish processors are mostly small-scale enterprises. They lack the technology and management for food safety. The main distribution of fish products is from wholesalers to street markets where control and food safety concerns are limited. In this trade the flow of information is lacking and hence the withdrawal of harmful products from the market is difficult in the timeframe needed. Aquaculture has furthermore significant implications in regards to the safety of fish products, where risks from parasites, viruses, chemical pollutants and veterinary drugs are high. Food borne illnesses represent serious and ignored problems (Li 2003).

The distribution of fish products in China can be complex as in some cases many parties are involved in the distribution to the end consumer. The longer the distribution chain is the higher the probability of fish spoilage and possible pathogenic growth (Zhou 2007). The supply chain furthermore lacks exchange of information and effective communication to secure the freshness of the fish being handled. China should therefore form a strategic plan to support the safety of fish products in the supply chain through traceability.

1.2 Rationale for the project

Traceability has been defined as “the ability to re-call defective/hazardous products and identify the source of the problem” (Bevilacqua and Ciarapica 2009). Traceability is considered important in the global market to secure food safety (Polymeros 2009), and has become a legal obligation within the EU, the United States, and Japan, which are the main export markets for fish products from China. Chinese fish processing and fish handling companies need to establish traceability to secure a quick withdrawal of products from the market in case serious defects are noticed in their products or handling. This will increase consumer confidence in Chinese fish products both on the domestic and export markets.

The principles and types of traceability systems should be considered to establish traceability for the domestic fisheries supply chains in China. Traceability is a systematic approach to trace back the origin of the product, its ingredients, packaging and processing. Traceability systems can be paper based, electronic (Bar code, RFID) or a combination of the two (Petersen and Green 2004). Traceability has to be adjusted to the current situation of the fish supply chain in China. It is important that the methods of traceability are practical and adaptive for fish products in the whole supply chain.

The main professional work on traceability in China is being conducted by research institutions working for individual export companies in setting up traceability systems for their production and distribution. These systems do not take into account the current situation in the domestic market, as it does not affect them directly. The emphasis is mainly on advanced technology that does not suit the current supply chain of fish products in the domestic market.

The main distribution of fish on the domestic market is through wholesalers and the chain of distribution lacks the condition for using advanced technology. Small food companies on the domestic market do not have the resources to implement traceability based on advanced technology, but will have to make use of paper based techniques. A practical approach to traceability needs to be established for the domestic market in China that is based on the actual whole fish supply chain.

1.3 Objectives and methods

The objective of the this project is to analyse supply chains and traceability systems of fish products in Iceland and China and use the knowledge gained in these studies to form a model for traceability of fish products on the domestic market in China.

The concepts, standards and the legal framework of traceability will be studied through reviewing the literature. Additional information and understanding will be gathered

through visits to a fish market and a processing company in Iceland. The format and characteristics of the fish product supply chain in Iceland will be studied, and how traceability is implemented. The characteristics of the domestic fish product supply chain in China are studied. Based on the literature review and studies in Iceland and China, improvement of the domestic supply chain in China and suggested to secure traceability.

Recommendations are then made on how the regulatory framework on the traceability and the model regarding traceability of wild fish of capture fish in the domestic market can be implemented in the different stages in the supply chain base on using a unique paper based coding.

2 CONCEPTS, STANDARDS AND LAWS ON TRACEABILITY

In this chapter the concepts, standards and the legal framework of traceability are reviewed. Special emphasis is placed on the traceability of fish products in the European Union and China in order to gather information for establishing a traceability model for the domestic market in China.

2.1 Traceability

2.1.1 The background and purpose of traceability

Emphasis on traceability of food has been increasing in recent years, primarily because of various crises in the food sector such as the mad cow disease (BSE) in 1996 in the UK and the dioxin contamination in Belgium in 1999 (Huss 2004). Authorities have focused on traceability to be able to recall defective/hazardous products from the market and to identify the source of the problems (Bevilacqua and Ciarapica 2009).

Due to increased complexity of food distribution worldwide, greater demands are being placed on food processors and distributors to provide information on the origin and destination of their products. This applies to the whole food supply. Recent food safety incidents have highlighted the importance of being able to track forward and trace backwards product information throughout the supply chain with the purpose of decreasing product risk and enabling recalls. From this perspective, traceability forms a key principle adding up to food safety and consumer confidence (Polymeros 2009).

Traceability has become a legal obligation within the EU in January 2005 Regulation EC2002. Similar requirements for traceability systems are present both in the United States (FDA 2008) and Japan ((MAFF 2007).

Enterprise needs for traceability is not only to secure food safety, but also to enhance the image of the enterprise and consumer confidence in the product. Traceability can also be used to add value to food products by providing information about the food, which could differentiate a particular food product from others (Alessio *et al.* 2008).

Traceability provides information that can be used to aid in managing and controlling processes, stocks and quality in the food supply chain (Smith 2005). The development

of advanced internal traceability systems can improve the efficiency of data collection, plant control and quality assurance.

2.1.2 Definition of traceability

Although there is a general agreement on what is meant by traceability, different organisations emphasize different aspects in their definitions. Following are the main definitions.

The International Organization of Standardization (ISO): “Traceability can also be defined as the ability to trace the history, applications, or location of that which is under consideration” (ISO 2005).

EU: “traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution” (EC) No 178/2002).

The Codex Alimentarius Commission (CAC):

“Traceability/product tracing: the ability to follow the movement of a food through specified stage(s) of production, processing and distribution”(CAC 2006).

Though the definitions of traceability vary, the above definitions on traceability all cover the following aspects:

- The origin of materials
- The processing history
- The distribution and location of the product after delivery.

2.1.3 Tracing and tracking

Traceability consists of tracing and tracking (Table 2). Tracing is done upstream against the flow of the product and towards the source, while tracking is done downstream with the flow of the product. Tracing is used during product recalling in order to find the source of the product. Tracking is implemented to find the rest of the batch of products that has to be recalled.

Table 2: Definition of tracing and tracking (EAN International 2002).

Term	Definition
Tracing (back)	A flow of information has to be systematically associated with the physical flow of goods with the objective of being able to obtain pre-defined information concerning units using one or more key identifiers.
Tracking (forward)	The capability to follow the path of a specified unit and/or batch of a trade item downstream through the supply chain as it moves between trading partners

2.1.4 Types of traceability systems

Traceability can be divided into internal and external traceability (Figure 4). Internal traceability refers to the ability to keep track of what happens to a product, its ingredients and packaging within a company or production facility, e.g. within a fish plant (Petersen and Green 2004).

External traceability refers to the ability to keep track of what happens to a product, its ingredients and packaging in the entire or part of a supply chain, e.g. from boat/fish-farm to table (Petersen and Green 2004).

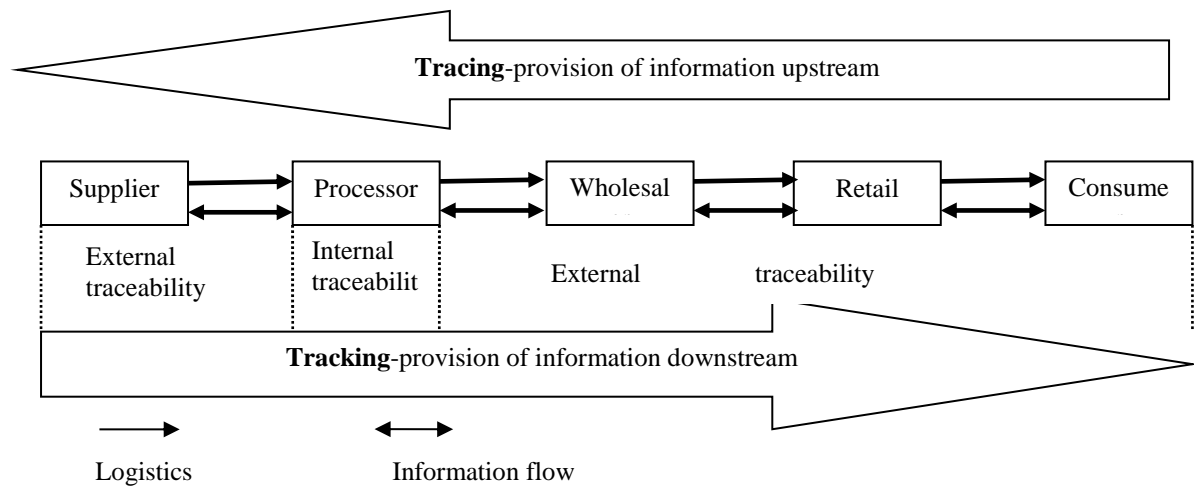


Figure 4: The internal traceability and external traceability of a processing company.

A traceability system can be classified as paper-based and/or electronic by data carrier. Most traceability systems are a mixture of paper and electronic systems. The size of the company is often a key factor in determining the type of traceability systems.

In a paper-based traceability system, information is manually recorded on forms that follow the raw material or product through processing to retail. Paper based traceability systems do not require high investment costs in equipment but the need for manual labour is high. A paper-based traceability system also needs a lot of storage space (Petersen and Green 2004).

Electronic traceability systems are divided into bar codes and RFID (radio frequency identification). Bar codes have been widely used in the food industry since the 1970s. Bar codes are small digital images of lines and spaces affixed to retail goods, identification cards and mail. Bar codes can store a limited amount of data and must be in the reader's line of sight and not more than a few centimetres away from the reader (Petersen and Green 2004).

RFID tags are placed on items and can be read even if the reader and the tag are not in line-of-sight by using radio frequencies. It is possible to use RFID tags in wet and harsh conditions, which are unsuitable for the reading of bar codes. RFID tags can store larger amounts of data than bar codes. However RFID technology can be expensive and it is a less widely used technology than bar code technology (Petersen and Green 2004).

2.1.5 Standards and laws of traceability

With the increase in international trade and higher awareness on food safety, the demand for traceability is increasing. This is reflected in current laws and standards intended to regulate or guide the companies and protect the consumer.

The European Union (EU) was the first to put traceability standards into law. Since the beginning of 2005, the regulation (EC) No178/2002 requires that all food and feed business operators have to conform to the traceability. The most relevant article regarding traceability is Article 18, where the principles and requirements of the traceability are introduced. Traceability of food shall be implemented at all stages of production, processing and distribution. Food businesses shall be able to identify suppliers of all incoming raw material and goods they also shall identify the outgoing production and the destination of their products. The legal text only stipulates what information the companies must provide but not how it should be achieved.

The Codex Alimentarius Commission elaborates the context, rationale, design and application of traceability/product tracing as a tool for use by a competent authority within a food inspection and certification system (CAC 2006). It mainly guides the company or organization to implement traceability of food in the international trade. This document has become a basic reference point for regulations to implement the traceability for exported and imported fish products.

The ISO (the International Standard Organization) 9000:2000 only gives a broad definition of traceability. It only consists of two aspects: identification of product status and serial numbers or batch numbers must be recorded. ISO 22000:2005 gives the basic requirements for a food safety management system to ensure safe food supply chains. The ISO 22000 standard enables organizations operating at any step of the food chain to (Lazarte 2009):

- ✓ Trace the flow of materials (feed, food, their ingredients and packaging),
- ✓ Identify necessary documentation and tracking for all stages of production,
- ✓ Ensure adequate coordination between the different links involved,
- ✓ Each party of at least his direct suppliers and clients are required above.

Some other standards for traceability are listed in Table 3. The standards direct the implementation of traceability for the food industry. The GS1 System originally referred to as EAN.UCC System with EAN being European Article Numbering and UCC being Uniform Code Council that was an internationally accepted method of identifying products, serializing shipping containers and clearly communicating other important business transaction data in a standard, machine readable (bar code) format. The GS1 standards document elaborates a common language of electronic identification and communication in the supply chain for the traceability system of food products. The guideline is mainly on how to label the identified products using an EAN/UCC system and what information should be exchanged in the whole supply chain to implement traceability. Traceability is regarded as one part to guarantee the safety of food for the consumer in the other standards, but they only require the implementation of traceability, but do not describe it.

Table 3: Some common standards for traceability.

Organization	Documents	Part for traceability	Published time	References
GS1 Standards Document	Global Traceability Standard Business Process and system requirements for full Chain Traceability	All	Sep 2007	GS1 2007
International food Standard(IFS)	Standard for audition retailer and wholesaler branded food products	Part 2 requirements 4.16 traceability	Aug 2007	IFS 2007
TESCO (Terence Wilde)	Food manufacturing standard	Section12 traceability	July 2008	TESCO 2009
British Retail Consortium (BRC)	Global standard for food safety	Food safety and Quality management system 3.9 traceability	Jan 2008	BRC 2008

2.2 Traceability systems of fish products in the European Union and China

2.2.1 Standards of traceability systems of fish products in EU

Tracefish (Traceability of Fish Products) is a voluntary and electronic system of chain traceability developed by the Norwegian Institute of Fisheries and Aquaculture and other organizations in the EU in 2000-2002 (EC 2002b). The aim of the project was to guide companies and research institutes to establish common views for what information should follow a fish through the entire supply chain.

According to the TraceFish standard, it lists what information shall, should and may be description in the different stages of fish product supply chain. And it regulates the identities of trade units and logistic units of the goods in the different stages of the supply chain based on the EAN.UCC. The EAN.UCC used in standard for the identified code that mainly include: Global Location Number (GLN) for identifying the facilities of the companies, Global Trade Item Number (GTIN) for identifying the kind of product, Serial Shipping Container Code number (SSCC) for identifying the logistic units and the batch code for identifying the same kind product of the same company (CWA 14559 and CWA 14660 2003).

EANUCC Standards (Traceability of fish guidelines) were developed together with the EAN Member Organisation, the TraceFish project, and national working groups. It provides for the unique identification and physical labelling of fish products using the UCC/EAN-128 at every step of the fish product chain and it is used for physical labelling with bar codes (EAN International 2002). These guidelines do not apply either to shellfish or to fish used as a raw material in the processing of fishmeal.

2.2.2 *Traceability of fish products in China*

The Chinese government has adopted the U.S.A. and the European Union regulatory standards (Bay 2007) for exported products. The traceability regulation of exported fish products is administered by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, which has been implemented since 17 June 2004. This regulation is applied to the exported-imported companies implement traceability (AQSIQ 2004).

TraceTracker is a supplier of global information exchange for the food industry. Shandong Institute of Standardization is a national leader in developing, testing, and implementing food traceability solutions in China. They signed an agreement with TraceTracker to establish a joint venture company named China Trace on September 20th, 2008. China Trace enables trading partners to exchange information across whole supply chains and effectively create "food passports" that trace every stage of production, processing and distribution from source to supermarket shelf.

It is not an easy task to establish a tractability system of fish products in China, and it will face many problems. Europe, the United States and some other countries have issued related rules and regulations of traceability and give an explicit and clearly direction for the enterprise. Governments have invested heavily to support companies and research institutions in establishing and study traceability systems. In China, there are no laws or regulations associated with traceability for the domestic market. China also lacks the standards for operating a traceability system of fish products in the domestic market. These standards should be established including information code standards, labelling standards and specifications of unified information exchanged.

3 TRACEABILITY SYSTEMS OF FISH PRODUCTS IN ICELAND BASED ON AUCTION AS CORE-COMPANY IN THE SUPPLY CHAIN

In learning how traceability is conducted in the fish supply chain in Iceland two companies were visited. Information was collected at fish market in Reykjavik and a processing company named Isfiskur, which were visited on separately occasion on at 16 Dec 2009 and 18 Jan 2010.

3.1 Supply chain and logistics based on auction as the core company

3.1.1 Introduction of the fish market

The quantity of fish landed is influenced by the weather, leading to fluctuations in supply and price volatility. The bidding in fish market is done on the Internet by the use of an electronic clock. The clock starts at a high price and descends until one of the buyers presses his button, thereby stopping the clock and securing the batch. This system speeds up the sale and reduces the cost of auction administration. Buyers can attend the bid on the website. The quantity of fresh fish that is sold through auction in Iceland is about 25-30% of the total quantity of ground fish landed.

The fish market visited in Reykjavik is linked to a computerised network through where the fish auction is conducted. A separate company that runs the network and collects

and distributes payments owns this computer network. Everyone interested in participating in the auction must supply the computer network company a bank guaranty that secures all payments to the fish market and the fishermen. The computer network company is connected to 15 fish markets in 30 locations in Iceland.

3.1.2 *The model of the fish product supply chain*

Fishing vessels can stay at sea for 1-14 days, the onboard catch handling consists of washing, gutting, bleeding and packing in tubs with layers of ice. The tubs are labelled with the day of catch. The fish may be sorted by size and species.

The fish markets are located at the harbour area and therefore the fish is taken directly into the fish market after landing. Fish sold through the fish market is mainly coming from small boats that land every day. The bigger vessels usually belong to big fish processing companies that deliver the catch directly for processing at their companies, but species that are not processed at their location are sold on the market.

At the fish market the fish is weighed and counted giving an average size in each tub. Then information is stored electronically and available during the auction. After the auction the name and number of the buyer is printed out on a sticker that is placed on the tubs. The logistic and trade is sorted by the computer network company and the sale finalized through the Internet. The goods are then delivered within one day to the buyer. An independent distribution company usually does distribution of fish from the fish market. The distribution company collects the fish from different fish markets and sort it according to the buyers, then distribute to the fish shop or processing company (Figure 5). The buyer then checks if the quantity and quality is in accordance to information from the auction and if he does not form a complaint the business is finished.

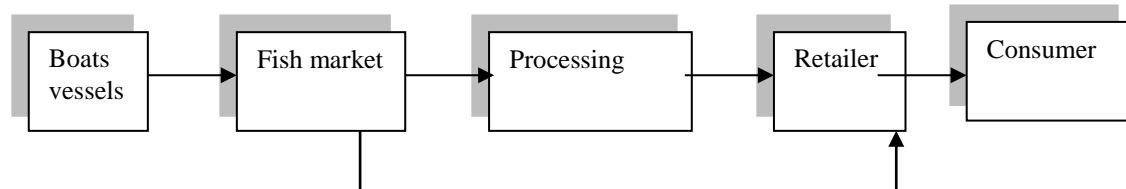


Figure 5: The model of the fish product supply chain through fish market.

Fish can be processed into fresh fish (whole fish, fish fillet in different cuts, fish mince), frozen fillet and dry products in the processing company. The main products of the processing company in this case are frozen fish that are exported to USA. The fish is transported in refrigerated trucks from fish market and arrives at company between 7:00-9:00 hours. After processing, the final products packed on pallets and stored in the frozen warehouse of the processing company. Trucks to the harbour transport them. Then they are assembled into a container and transported to USA by ship. Every four weeks the products leave the processing company. The products arrive at retailer and are sold to consumer in USA.

3.2 **Traceability system of the fish market**

Fish vessels in Iceland must be licensed and have the name. Fish vessels record information on catching area, catching time, landing day and time, fishing gear, processing method, storing temperature records, weight and species. A batch of fish is

St. n.	Fiskteg	Stærð	S/O	Ein	Kg	Verð
509	LANGA	Mp Bland	S	6	1919	143
508	LANGA	Mp Bland	S	9	3132	144
507	LANGA	Mp Bl-sm	S	1	74	112
506	LANGA	Mp Stör	O	1	56	162
505	LANGA	Mp Stör	O	1	77	142

Figure 8: Information of the bid on the web site.

The fish market enters the information into the computer before he bid from 13:00 to 16:00 hours every day. After bidding the tubs are labelled, the information consists of number and name of buyer, auction date, auction bid number, section number, tubs number, seller name and number, species and size, total weight, gutting or not, fish market name, the total number of tubs and the number of one tub (Figure 9)

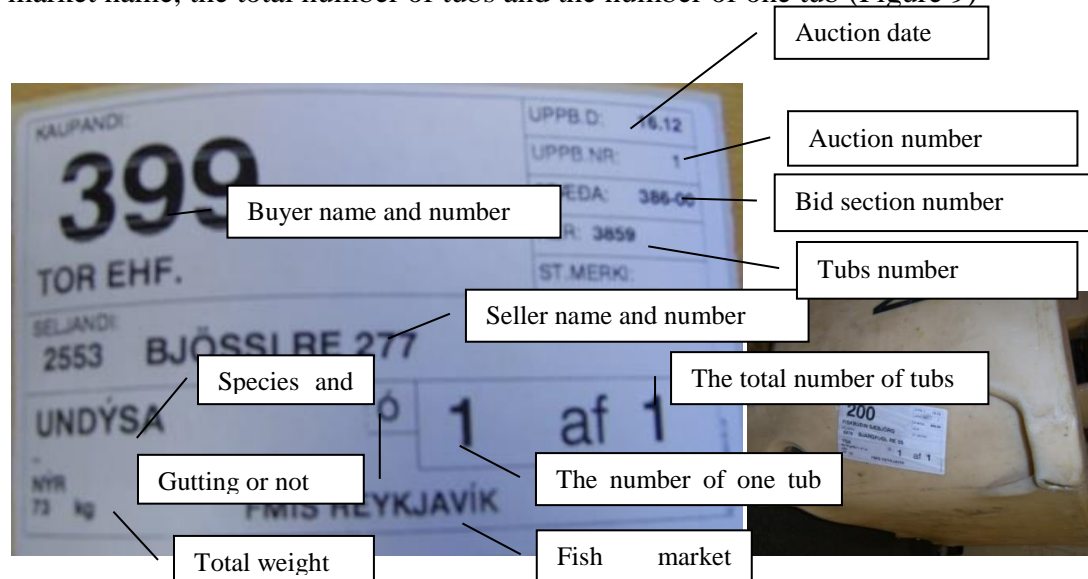


Figure 9: Labelling of the tubs by the fish market.

Distribution of the fish within next morning, the information given to downstream consist: species, gear, capture days, weight, price. Buyer and seller can also get all information from the website using a password protected access (<http://rsf.is/>).

The label of the tub becomes a link between the upstream supply chain (vessel) and the downstream supply chain (processing company), the label can identify the fish from one batch of the same species of fish caught by the same vessel on the same date and selling in the same fish market. The same batch has a same identified tubs number. It

can trace the information about the upstream using the recorded information in fish market. In fish market some fish products of the same grade from different boats are mixed, which causes some information to be lost. The assessments of quality are based in auction only depend on the information provided by seller.

3.3 Traceability system of the processing company

3.3.1 Introduction of processing company

A typical Icelandic fish processing company was visited in order to examine its traceability. A company that gets on raw material from fish market was surveyed. The company visited, Ísfiskur in Kópavogur was founded in 1980 and in the last 5 years, their yearly production has been around 1500 tons. Their main production is frozen products for the USA market that contributes to about 70% of their total production. Fresh fish, about 30% of their production is sold to a secondary processing company for the domestic market. The raw material is all from auction, haddock is 90% and cod is 10%. Following are observations from that visit.

3.3.2 The processing

All the raw material is bought through the national electronic auction system and delivered by a private delivery company between 5:00 to 7:00 hours. After reception the quality of the raw material is evaluated by sensory evaluation and the temperature is confirmed. If it is above 4°C the raw material is rejected.

The received raw material is stored on ice in isolated tubs in a refrigerated area where the temperature is kept at 0-3°C. All tubs are identified with labels from the fish market. The age of the raw material is indicated on a label from the fish market. The raw material is processed according to the age of the fish and oldest is first processed. The fish is graded in the cooler into three sizes in accordance to the company grading system. This time the tubs from the auction are mixed and changed to new tubs labelled with the describing size, the tubs are transported to processing place by fork lifter and processed the same day.

The fish in the tubs are poured into iced water. Some tubs are stored near the processing line 10-15 minutes before processing. After washing and cooling, the fish is transported by conveyor for processing: cutting off dorsal and ventral fins, gutting, getting rid of viscera, heading. After washing the fish are filleted and skinned. The fillets cooled in iced water and then transported by plastic conveyor to the trimming line. The trimmers check each fillet for bones and nematodes on table. Other quality defects like blood spots, bruises and gaping are removed during trimming according to the factory quality standards. After trimming the fillets or fillet portions are weighed. The weight of each fillet and/or fillet portion is recorded as well as the total weight (Figure 10).



Figure 10: Monitor of weighing in Ísfishur.

Conveyor takes the fillets in the same weight category to the operator for packing. For the big size fillet, the two pieces of fillet are put in plastic envelopes and five pound packed in one package (Figure 11). For the 12 pound small size fillet are wrapped by plastic in one package. The package is labelled.



Figure 11: Package of frozen haddock fillet of big size in Ísfishur.

The cartons are put on freezing pans and taken into the plate freezers. The time of freezing is about 2.5 hours and temperature is -34°C . Ten 5 lbs packages are packed in each master case for 50 Lbs and four 12 lbs package are packed in each master case for 48 lbs. The master case are stacked on a pallet and strapped with plastics and labelled. One pallet consists of 60 master cases of 50 lbs or 54 master cases of 48 lbs (Figure 12).



Figure 12: Packing the master cartons on the pallet.

The pallets are placed immediately in frozen storage at -22°C . Palletised product is straight transport by freezer truck from frozen storage to freezer containers every four weeks and exported to USA. The entire processing is showed (Figure 13).

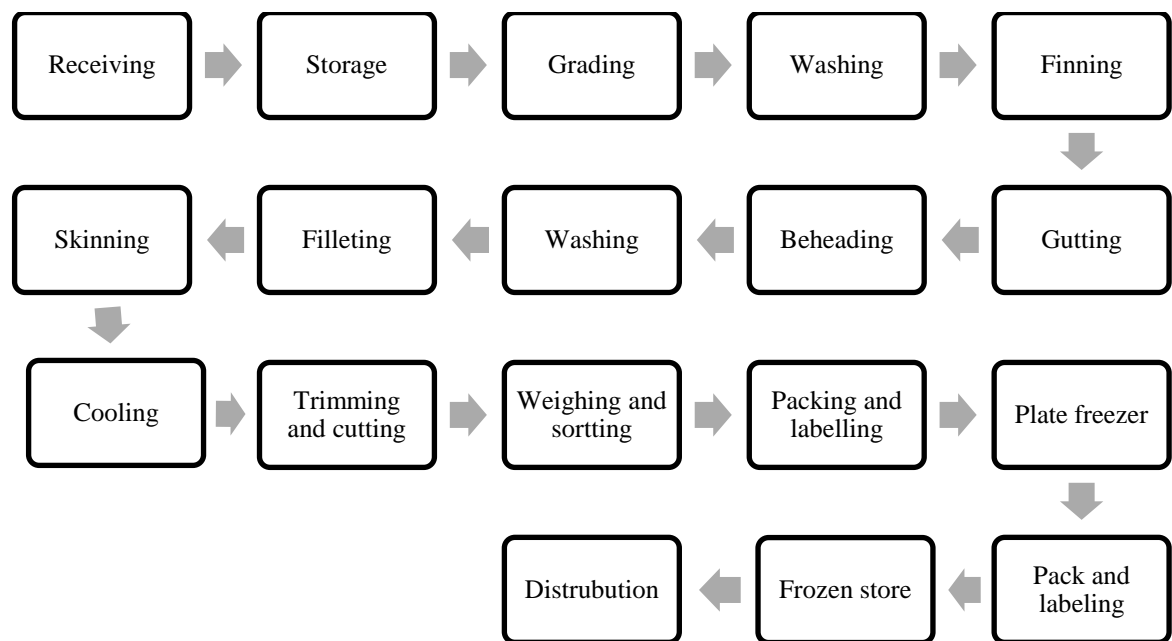


Figure 13: Flow diagram for production of frozen haddock fillet in Isfiskur.

3.3.3 The labels for traceability in Isfiskur

Labelling is important to establish the traceability. It doesn't only provide the information to consumer but also identifies the product. The traceability at Isfiskur is through three kinds of label, one for primary package, one for master case and finally one for the pallet. The main final products are haddock fillets sorted in two size categories, small and big. A label is placed on each 5 lbs carton (Figure 14) with information about the plant number, production date and the product code.



Figure 14: The package and label for frozen haddock fillet of big size.

The label of 12 lbs carton put on the face of the package including the information: product name and code, size, net weight, plant code, production date, authorization number, the simple description of origin, distribution company and export company (Figure 15 and Table 4).



Figure 15: The package and label for frozen haddock fillet of small size.

Table 4: Information carried by label of frozen haddock fillet package in Isfiskur.

Product	Product name	Haddock fillet skinless, boneless
	Code	52039
	Size	3-5oz 85-141 g
	Net weight	12 lbs 5.44 kg
	Production date	0019
	Description of origin	Frozen at sea, from wild fish product of Iceland
Producer	Plant code	034
	Authorization number	Is-01107
Distributor	Name	Icelandic USA Inc,
	Description	190 Enterprise Drive, Newport News, VA 23603
Exporter	Name	Icelandic group plc
	Address	Reykjavik, Iceland

Ten 5 lbs packages are packed in each master case for 50 lbs or four 12 lbs packages are packed in each master case for 48 lbs. The label of master case of different products consist the same information about products code, name and origin, producing date, one package weight and quantity, authorization number, weight, barcode, distributed company and exported company (Table 5). The label of big size haddock fillet has the buyer's code (Figure 16). The label of small size haddock fillet has the size of products (Figure 17).

Table 5: Information carried by label of master case of frozen haddock fillet of big size in Isfiskur.

Product	Product name	Haddock fillet skinless, bonless
	Code	52039
	Size	3-5oz 85-141 g
	Package	4×12 lbs
	Net weight	48 lbs 21,77 kg
	Producing date	0019
	Description of origin	Frozen at sea, from wild fish
Producer	Plant code	034
	Authorization number	Is-01107
Distributor	Name	Icelandic USA Inc,
	Description	190 Enterprise Drive, Newport News, VA 23603
Exporter	Name	Icelandic group plc
	Address	Reykjavik, Iceland
		With EAN barcode



Figure 16: The package and label of master case of frozen haddock fillet of big size.



Figure 17: The label of master case of frozen haddock fillet of small size.

The pallet label gives the information about product and plant code, date of package, the total of retail trade units and pallet code (Table 6 and Figure 18).

Table 6: Information carried by pallet label of frozen haddock fillet of big size in Isfiskur.

Product	Code	052-039
	Size	3-5oz BI RI
	Package	4x12 lbs
	Net weight	48 lbs 21,77 kg
	Producing date	13.01.10
Producer	Name	Isfiskur ehf
	Code	034
Pallet	Total package	54
	Pallet number	007571
With EAN barcode		

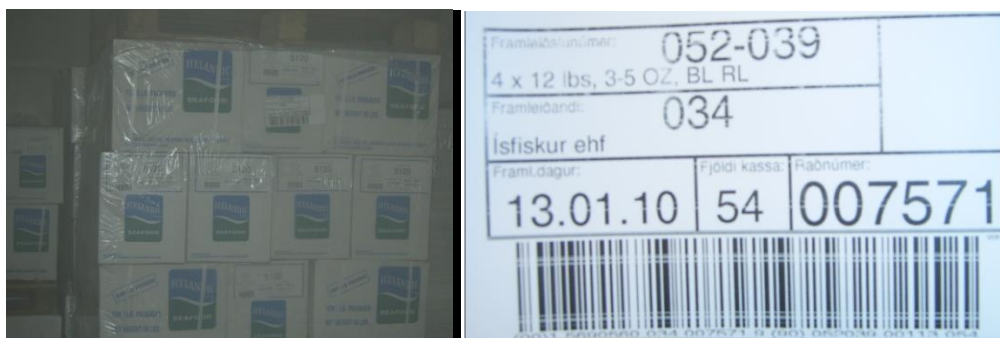


Figure 18: The package and label of logistic units for pallet.

The labels are in accordance with EU regulations. They can provide the scientific name and method of production-whether it is a farmed or a caught fish. The Icelandic Group exports the frozen fillet product of Isfiskur to USA. The Product Code System of the Icelandic Group is used to provide the identified information of products. The product code and the plant code or authorization number are fixed for the same kind product of the produced in the same plant. Different production date code identifies code of batch. The production date shown in Figure19 means it produced on 10 Jan 2010. The pallet number identifies pallet and follow the pallet in the supply chain.

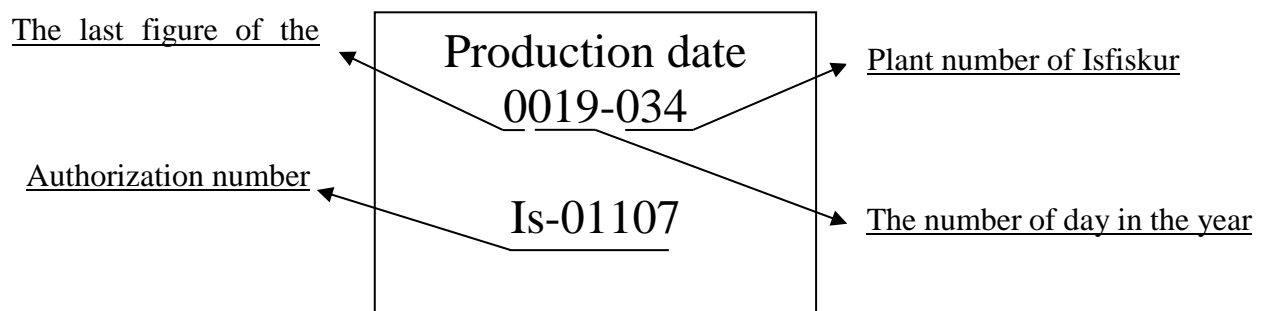


Figure 19: The production date code of frozen haddock fillet in Isfiskur.

3.3.4 Links and methods of the traceability system in Isfiskur

Once tubs have been received from the auction, the information about the raw material is recorded and identified the raw materials by the tubs` number. They record the raw materials information from fish market and assure processing dates of the tubs, this information of traceability are recorded and stored in computer (Table 7).

Table7: The recorded information in traceability system of processing in Isfiskur.

Date	Temperature	Landed date	Auction number	Ship number	Gear	Species	Age	Gut	Size	Tub	Weight
19 Jan, 2010	-1	19 Jan, 2010	1	1111	line	haddock	1	no	small	5203	24 kg

The different batches of raw material are mixed in the grading processing. New batches are formed and identified by the processing date. The information (Table 7) kept in a computer links the new batch and original batches. The same kind of final products processed at the same plant are identified by the production date. The production date identifies the batch of same product and links the final product and the raw material. If safety problem arises, they can be traced to the batch of the product.

The links and methods of batch identification for traceability is summarised in Table 8. After reception of the raw material, the batch of raw material is identified by the tubs code. The company record information about the batch of raw material. In the processing phase, the company ascertain the production date of the raw material and generate a new batch of raw material for each processing date. The label can identify the batch of final product. The production date on the label identified the same kind of

product produced in the same plant as one batch. Pallet number and plant code on the label of logistic units follow and identify the pallet.

Table 8: The links and methods for batch identification for traceability in Isfiskur.

Phase	Methods of Batch Identification	Identification code	Example	Links of Batch Identification
Raw material received	Tubs label	Tubs code	3859	No
Processing	Production date	Production date	19 Jan 2010	information recorded in company
Final products	Master carton label	Production code and Production date code	010-400 and 0019-034	Production date code on master carton label
Distribution	Logistic units label	Pallet number And plant code	007580 and 034	Pallet number On master carton label

3.4 Conclusions and suggestions of traceability and supply chain in Iceland

3.4.1 *The advantages of the supply chain management for traceability*

The supply chain observed was mainly landings from vessel, auctioning at fish markets, processing, retail and consumer. The fish market plays an important role in the supply chain. The fish market records necessary information and identifies all batches by the labeling. The fish market gives necessary information downstream for traceability.

The types of tubs used for fish distribution are standardized and therefore save time for distribution between the links in supply chain. The tubs also improve the fish quality by reducing handling. The distribution is the responsibility of special distribution companies that are equipped with refrigerated vehicles to secure the cold supply chain during transport.

The quantity of fish landed is influenced by the weather, leading to price volatility and price variations. The transactions in auctions are through electronic transfer allowing everyone to participate in the auction giving maximum profits to the fishermen. The trade and the logistics are separate. The trade is between the fishermen and the buyer through a centralized Internet auction but the logistic is between a distribution company and the buyer. When the product has arrived to the buyer, the entire trade has finished. The information on the trade can be visualized through the fish market website. This kind of trade saves time for trading and improves the freshness of the fish.

3.4.2 *The characters of traceability*

The company studied abide by the One-up-one-down traceability required by EU General Food Law. Each partner in the supply chain is accountable for linking input records to output records. They don't need to record the information several steps removed in the supply chain. The information on origin, destination and batch identification is recorded and stored in each link in the supply chain.

Labels and records are important for a company to implement traceability. The labels identify the product of one batch or a lot and follow the product in the supply chain. Records show the necessary information acquired from upstream and provided to downstream. Records link original batches and new batches in processing. Records of critical information for assuring the safety and quality of product in internal processing are also kept in the companies, such as the temperatures of received raw materials.

3.4.3 Issues and suggestion for traceability

The traceability system studied had problems regarding effective implementation.

Vessels: Information recorded is lacking descriptive information of product. The types of records are different format and record different information in the vessel. The information transferred upstream is ineffective.

Fish market: Fish market should be restricted by principles of quality assessment on the products. The mixing of products from multiple sources leads to information loss. Each unit contributing to mixed entity should be recorded.

Processor: The identity of the batch is separated by one day. If recalls become frequently it would be sensitive to reduce the size of identification batches. A batch could be identified by the different period of processing in order to decreasing the quantity of the products in one batch. The quality control of product and traceability is separate and operator checks and records the temperature of raw material for quality control only in the phase of received raw materials. The other quality control methods such as bone in fillet, gaping of fillets, grading the fillet are checked by quality team every day and recorded in quality books. Traceability system should be combined with the quality control; the information about the temperature and store time should be recorded in the processing, which mainly affect the quality of the fish. The management of processing should join with traceability. Traceability is not only an implement on “as required” basis, but should integrate quality control and processing management.

The code on the label should unite to use EAN for labelling the retail trade and logistic trade. The processor concerned of cost of implementing traceability but a traceability system of using barcode might be effective.

4 IMPROVING SUPPLY CHAIN MANAGEMENT TO ESTABLISH TRACEABILITY IN CHINA

The profits of the companies are determined by the actions of others within the chain as much as their own individual actions. The advantages of the companies depend on good management of the whole supply chain (Kordic 20008). An effective traceability system needs favorable supply chain management in the aspects of information and logistics.

Most fish products in the domestic market of China go throughout the wholesale market. In this chapter the main characteristics of the supply chain are studied to highlight the main safety issues. Based on this and the study of the supply chain in Iceland, the improvements of the supply chain management to establish traceability are suggested.

4.1 The supply chain of fish products in China

4.1.1 General characteristics of the fish products supply chain

The characteristics of a supply chain affect what methods can be used to establish traceability. In China the supply chain is characterised by the following:

The length of the supply chain varies and the relationship of operations is complex (Zhu and Chen 2006). The fish products can go through many wholesalers before arriving to retailers. The origin of product is difficult to trace.

The management of fish products is extensive for the standards and codes are faultiness. Many policies have not been implemented well to regulate fishery industry (Shao 2007). The wholesale markets play an important role in the supply chain of fish products, but many of them are poorly managed and have no recorded information connecting upstream and downstream kept in the supply chain.

Many companies are restricted by technology, finance and education of employees (Zhou 2008). Different companies in the supply chain are on various level such as technology, scale, financing. So the tractability system needs to base on the current and practical level of supply chain. But some processing enterprises have become dominant with well-known brands, which become core enterprises in the supply chain of fish products. They support fisherman technology and finance, which reduce market risk for fisherman (Li 2008). The food safety issues of the raw material can be reduced in this kind of supply chain. The costs of production and transaction within the supply chain are also decreased. This kind of supply chain has a good information management system, which could use automatic and advanced methods for traceability combined with the supply chain and logistics management.

4.1.2 The structure of the fish products supply chain based on the wholesale market as the core link

The wild or farmed fish products are primary processed and then sold to the wholesale markets or dealers or agents sell the fish products directly to the wholesalers. The wholesale markets mainly consist of fresh, live or frozen fish. The fish can be sold in the wholesale markets of in the city where it was landed or transported to wholesale market of different cities. Retailers can receive the fish from several agents or wholesalers. The retail terminals at this stage are mainly street markets, supermarket or restaurants (Figure 20). The length of supply chain is long and internal links vary.

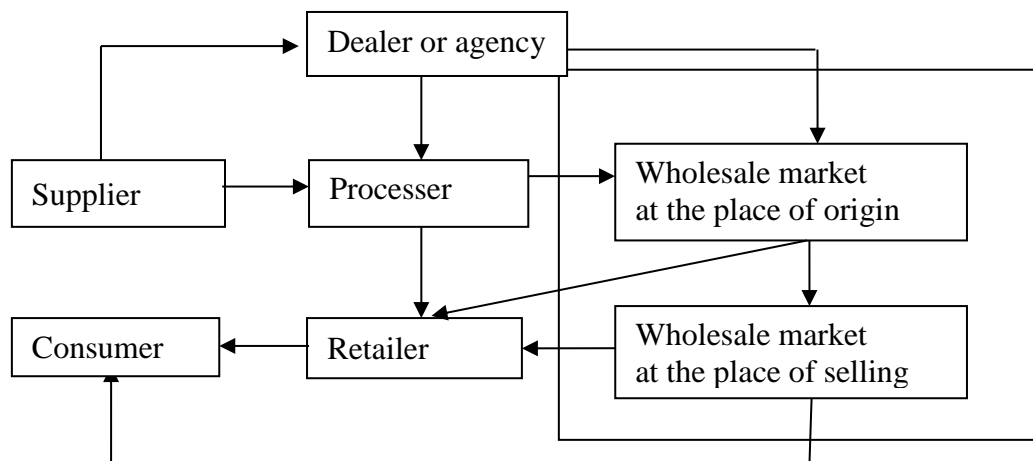


Figure 20: Fish products supply chain in China (Li 2008).

The distribution of fish products through wholesale markets is traditional supply chain in China. More than 80% of the fish products distributed (Li 2008). However, the main function of the wholesale markets is trade and the markets lack management and additional service to consumer such as distribution and information of origin. Because of decentralized management, the transactions in markets are disordered and unregulated (Li 2006; Zhu and Chen 2006). The information of the supply chain is broken in the wholesale markets. The wholesalers don't record the information of original raw material and where the products go.

4.2 Food safety risks in the supply chain through wholesale market

Distributed through the wholesale markets it can cause risk to food safety the technology and equipment are at a low level. The wholesale and the street markets are the primary venue for consumer shopping. But they have the following problems; Wholesale markets generally have poor storage refrigeration, testing facilities of the product quality does not meet consumers' demands for safety requirements, products are on display in the market for a long time affecting the freshness of products, and lack of effective measures and regulations to supervise and manage the safety of products.

There is a lack of cooperation between enterprises in the supply chain. The companies in the supply chain are deficient in the credit among enterprises. The associates in the supply chain do not trust each other. The companies of the supply chain often hide their information on stock and demand. They don't share to upstream and downstream in order to acquire maximum profit, which causes increased fish products in storage and decreased fresh fish. The supply chain has not relatively comprehensive and rapid information flowing and exchanged. The supply chain has not a core-company to integrate management of the whole supply chain. The whole supply chain has not a core-company to plan and cooperate with the other companies for the information and material flowing. Logistics play an important role in supply chain, consisting of transport, storage, and packaging, but the technology and equipment of logistics is at a low level, including: The equipment of logistics are poor and loading and unloading are still manual. Because of lack of equipment is difficult to secure the cold supply chain (Zhou 2008).

4.3 Conclusion and suggestion for fish products supply chain management in China

In securing the traceability the management of the supply chain must be sound. By combining the characteristic of the supply chain in China and learning from the merits in Iceland, suggest the methods for improvement of the supply chain management to establish traceability.

4.3.1 The suggestions for the government

The government should implement regulations for the fish industry in regards to information management and food labelling, which are the foundation to establishing traceability. The regulations and standards should request what information should be kept and provided downstream by the fish industry. The requirements of label should contain what information should be shown on package for identified batch of fish products.

The Government should establish regulation for the wholesale markets in regard to food safety and quality that would be supervised by the relevant departments and local governments. The government should increase the investment of facilities for the wholesale markets and help to transform the wholesale market's foundation from simple trade to trade combined with distribution function, price formation function, information function and value-added service functions.

4.3.2 The suggestions for the wholesale markets

It is urgent to improve the supply chain and the management of wholesale markets.

The labelling of the products should describe the necessary information and identified batch for downstream supply. It is difficult to label the unpackaged fish, therefore the container should be labelled appropriately. The basic information of the fish products should be stored in the wholesale market, where the information of origin and destination will be known.

The fish containers should be standardized, which not only would harmonize for the distribution of the fish and save time for distribution between the links in supply chain. It also would improve the fish quality decreasing the times of handing when changing the containers. It could also help to keep and protect the information of the product from the origin

The model of trade is not meeting consumers' demands and should change. The logistics should be separated from the trade; the transactions should use the electronic transaction system to decrease the storing time of the product.

5 CONCLUSION AND SUGGESTION OF METHODS FOR TRACEABILITY IN CHINA

It is necessary to trace fish products all the way through the supply chain from the vessel that landed the fish to the point of sale to the consumer (EAN 2002). The Chinese domestic fish market mainly consists of frozen, fresh and live fish. Fresh and frozen are wild or farmed and live fish comes from aquaculture. This chapter focuses on methods of traceability for the wild fish supply chain. The links of the supply chain comprises of vessels, through dealer or agency, transport to wholesaler or processing company and retail market to the consumer (Figure 21).

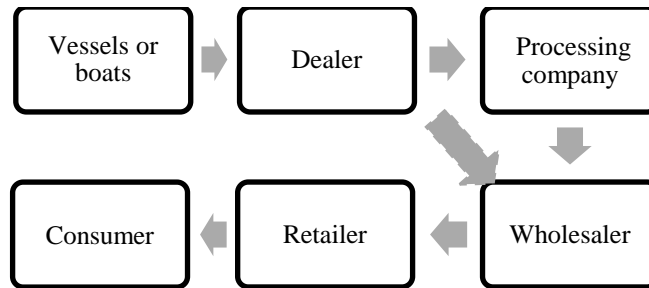


Figure 21: Supply chain of wild fish in China.

The basic requirements of traceability are based on one-up-one-down traceability. Each partner in the supply chain is accountable for linking input records to output records. One-up-one-down traceability is the simplest system to implement and provide flexibility for individual businesses. The general regulation for traceability methods in the domestic market in China will be suggested. Furthermore this chapter will give suggestion for the implementation of traceability in the different stages in the supply chain.

5.1 Suggested items to be included in a general regulation for traceability on the domestic market

Traceability in domestic market requires the regulation to regulate the fish industry, which can be divided into four parts.

5.1.1 The batch

A batch of raw material is defined as the same species of fish, caught each day in the same fishing area by a single boat or vessel.

A batch of fish product from a dealer, agency, or wholesaler is defined as a product of one batch from a supplier, supplied by a dealer; agency or wholesale each time.

A batch of the transport fish products is defined as one batch from a supplier; transported by a transport company with the same transport equipment each time.

A batch of processed fish products is defined as a batch of fish product from a supplier; processed in the same plant or the same processing line each day.

5.1.2 Batch code

Every batch of raw material should be given a batch code. The batch code identifies the fishing area, vessel code, name of species, catch date and time. A suggestion of a batch code could be as follows (Figure 22):

- ✓ The fishing area could have two letters, first letter identifies the fishing area: pelagic capture used Y, inshore capture used J and inland capture used D, the second letter signifies the first letter of the river or sea name in Chinese, yellow sea is used H.
- ✓ The vessel code could use four last digits of the vessel name code.
- ✓ The fishing date could use the Julian date system using four digits to identify the date. The first digits means the last figure of the year, the left three digits means the number of day in the year (YDDD)
- ✓ The species code could use two digits for main kind species code and “00” for other unusual species
- ✓ Time of catch could use two digits for the hour of the day of capture (24 hour clock).

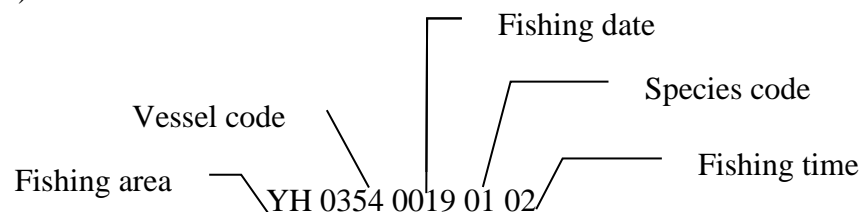


Figure 22: The batch code of raw material produced in vessel or boat.

The above batch code of raw material means the vessel number 0354 caught the hairtail at within 2:00-2:59 hours on 19 Jan 2010 for pelagic capture in Yellow sea.

The dealer or agency, wholesaler or retailer batch code: The dealer or agency, wholesaler or retailer code could use a four digit identification code to be placed in front of the batch code for raw materials for upstream. If the dealer or agency batch used mixed raw materials, he should add own code in front of the batch code with the biggest quantity of raw materials, the remaining batch of raw materials are recorded in the operation information.

The transport batch code: If the transport of fish products is done by a distribution company, the code of the distribution company is added in front of the original code. If buyer or seller does the transport of fished product, the original code remains and the information should be kept in the company. If the transport batch used mixed fish products, the batch code of the largest quantities of fish products should be regarded, as the original code and the remaining batch of raw materials should be recorded in operation information. The criterion code of a company should coincide with the retail industry code and be assigned by the government.

Identification code of a processing batch: The processing company should record the links between the raw material and the final product. The batch code of a processing company uses thirteen digits and consists of company code, product code and production date. The Company code should use four digits and product code should use

five digits. The criterion code of company and product code coincide with the retail industry code. Production date should use the Julian date system (Figure 23).

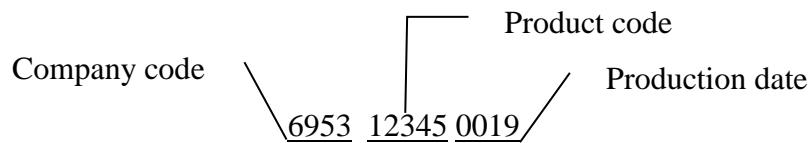


Figure 23: The processing batch code of fish products.

The above batch code of fish product means the processing company code 6953 produced the product code 12345 on 19 Jan 2010.

5.1.3 Recorded information

The information about traceability should be stored and kept in the links of the supply chain and should be checked by the supervised department.

The recorded information of vessels should confirm the identified batch of the raw material and consist of: the code of raw material, species, quantity, fishing area, name, and code of the vessels.

Fish dealer or agency wholesaler should be required to record the information of the identified batch from the supplier and link the original batch with the new identified batch. The recorded information consists: new batch codes, container and number, store and handling, supplier name, date of received, batch codes from seller, species and weight.

The company taking in hand the distribution should record the identified batch from consigner and link the original batch with the new identified batch. The recorded information consists of the name of consigner and consignee, time of departure and arrival, the truck code and temperature.

All production should be marked with the appropriate product identification code in primary processing company. The recorded information should identify batch from the supplier and link the original batch with product identification code. The recorded information should consist of batch identification code, supplier name, received time container and number, species and weight, processing line, operator, processing time and temperature, original batch code, store place and time, units and pallets code, and retailed code.

5.1.4 Recalling

Identification code from raw materials to the finished product should be used for recalling if hazards are identified in f products.

The defective products should be traced from wholesaler records - production and processing records - dealer records - the supplier of raw materials.

Recalling of the defective product is according to the identified batch code of fish. The companies should analyse of the reasons for failure and recall the defective products. The companies should trace back products according raw materials flow and to recall defective products in a timely fraction.

5.2 The methods of paper stored information for traceability

The supply chain on the domestic market in China lacks equipment for electronic tagging. Therefore, manual recording of data on paper for traceability is required. The method of traceability based on paper mainly has three aspects: Product labelling, the record of information in companies and the evidence for tracing the product. Labels should include the identified batch and be added onto containers or packages of the fish products in the companies of the supply chain. The records kept in the companies should include the identified batch code from the supplier and the link to the original batch with new identified batch code. It should also contain the critical information that affects the product safety and quality in processing. The corresponding supervisory department should check the recorded information. As the evidence linking the upstream and downstream for the batch flow in the supply chain, the bills should have running numbers and be dispatched by the supervisory department. It has four copies, for buyer, supplier, food department and hygiene department as the evidence for recalling the defective fish products.

5.2.1 Fishing vessel

The organization of captured fisheries in China is divided to small scale fisheries and commercial fisheries. The commercial fisheries enterprises are financially strong, using advanced technology and equipment for pelagic fishing, while the small scale fishermen mainly fish in coastal work. For traceability purposes the vessels should be able to identify the catch by a unique batch number and record the information of origin and destination. The same batch of raw material should be classified as vessels or boats catch the same species at the same day in the same fishing area. Fish is graded by size in on board vessels and landed in container. One batch can comprise saved fish containers with different sizes. Such a batch should be labelled with identification code. Table 9 shows a possible format that can be used to record the necessary information for traceability of vessels.

Table 9: Recorded information in vessels and boats.

Vessels or boats name :		No :		Registered owner and number:				
License number:		Departure and return date:			Number of crew:			
Batch codes	Species	Weig ht	Containers number and stype	Fishing time	Gear used	Fishing area	Fish dealer number	Storage and handling

The vessels should give the bill (Table 10) downstream. The bill will be regarded as the evidence for the recalling and tracing back.

Table 10: Bill from vessels or boats to the downstream in supply chain.

Bill no:	
Vessels or boats name :	No : Registered owner and number:
License number:	Departure and return date: Number of crew:
Batch codes:	
Species:	
Weigh and container consist:	
Time of caught:	
Buyer name and Date:	
Signature and seal of seller:	Signature and seal of buyer:

The fish from vessels is packed in containers, the type and size of containers differ, and regardless of type the container should follow the product and be labelled accordingly. The label of the container should consist of batch code and series of container (Figure 24).



Batch code:
Date:
Total containers:
Container number:

Figure 24: Container and label of caught fish from vessel or boat.

If vessels are the primary processors of frozen fish, they should add the recorded information of product name, batch code, package, handling steps, production date, and batch code of raw material (Table 11). The form for primary processing of product from vessels or boats next step in the supply chain should use table 12. The label of primary processing product should use the Table 13.

Table 11: Recorded information for primary processing product codes in vessels and boats.

Vessels name :		No :		Registered owner and number:	
License number:		Departure and return date:		Number of crew:	
Product name	Batch codes	Package	Handling steps	Production date	Batch code of Raw material

Table 12: Bill of primary processing product from vessels or boats next step in supply chain.

Bill no:		
Vessels name :	No :	Registered owner and number:
License number:	Departure and return date:	Number of crew:
Product name:		
Batch codes:		
Total package:		
Buyer name and date:		
Signature and seal of seller:		Signature and seal of buyer:

Table 13: Label of primary processing product.

Product name:		
Batch code:		
Weight:	Size:	Producing date:
Processor name:	Address:	Tel:
Bar code:		

5.2.2 Fish dealer or agency

The catch from small boats is collected at landing by fish dealers or an agent and they trade the fish to the wholesale market. During this transaction basic information regarding the trade are not recorded. To secure traceability the fish dealer or agent should add their code in front of the batch code from the vessels and boats. If the batch traded by the dealer/agent consists of fish from many boats the dealer/agent code should be added in front of the fish batch code from the boat that has the biggest quantity and the remaining batches of raw materials are record by the dealer/agent. Table 14 shows a possible format that can be used to record the necessary information for traceability:

Table 14: Recorded information in agency or dealer.

Dealer or agency name :		City :	Tel:				
Registered owner and number:							
License number:							
Batch code	species or product name	Weigh	Container and number	Original code	batch received Date	Supplier' name	Storing and handing

Dealer/agent should give a bill to the wholesaler or restaurant comprising of enough information to secure traceability (Table15).

Table 15: Bill from agency or dealer to the downstream in supply chain.

Bill no:		
Dealer or agency name :	City :	Tel:
Registered owner and number:		
License number:		
Batch codes:		
product name:		
Weigh and Box consist:		
Buyer name and Date:		
Signature and seal of seller:		Signature and seal of buyer:

The batch code of the dealer/agent comprises of the code of own company and the original batch number. The label (Table16) can be adhered on the container from the dealer/agent and should consist of the product name, batch codes, weight, supplier name and date of receiving, dealer/agent name, address and telephone.

Table 16: Label for package or container of Dealer or agency.

Product name:	
Batch codes:	
Weight:	
Supplier name:	Received date:
Dealer or agency name:	
Address:	Tel:

5.2.3 Primary processing

Primary processing is only discussed for freezing. This kind of product can be processed on board vessels or in a processing company. The product is often whole frozen fish (Figure 25). The main processing of frozen product consist of washing, grading, weighing, freezing and packaging. The primary processing on board vessel has been discussed before.



Figure 25 : Frozen fish products in China.

In the processing company, the new batch code could use thirteen digits were four digits indicate company code, five digits the product code and four digits are for the production date. Table 17 shows a possible format that can be used to record the necessary information for traceability in processing company.

Table 17: Recorded information in primary company.

Processing company name :			City :			Tel:			
Registered owner and number:									
License number:									
Batch codes	Product name	Species and weight	Processing time	Processing line	Store place and time	Batch code of raw material	Supplier name	Received time	Pallets code

Processors should give a bill (Table 18) consisting of enough information to the wholesaler/restaurant. It is the basis for tracing back the information.

Table 18 : Bill from primary company to the downstream in supply chain.

Bill no:									
Processor name :		Address :		Tel:					
Registered owner and number:									
License number:									
Product name:									
Batch codes:									
Total package:									
Buyer name and Date:									
Signature and seal of seller:					Signature and seal of buyer:				

The same label as can be used for the primary processing (Table 13) and should be adhered to the package of the fish products. The label of the package should have information of processor name, address, Tel, product name, weight, size, date, and batch codes.

5.2.4 Wholesale market

The main product form of caught fish is in a fresh or frozen state. The upstream chain of fresh product is mainly from dealer or an agent and frozen fish comes from a processor or agent. The wholesale market code should be added in front of the original batch code. If the wholesale market receives a mixed batch of fish product the original batch code from the largest quantity should be used. The batch code of the remaining products should be recorded as operation information. Information recorded is divided into a stock bill and a selling bill. Information recorded for the stock are listed in Table 19.

Table 19: Recorded information in wholesaler for stock bill.

Stock bill										
Wholesaler name:		No :	Registered owner and number:			License number:				
Wholesale market name :			Address:							
Batch code	Product name	Received date	Original Batch code	Container	Weight	Production date	Producer name(Tel)	Address	Temperature	Store

After sale, the wholesaler should record the information of the transaction including: name of products sold, batch codes, selling dates, quantity, fish container number and type and buyers name (Table20).

Table 20: Recorded information in wholesaler for selling bill.

Selling bill						
Wholesaler name:		No :	Date:			
Batch code	Selling date	Products name	Quantity	No. fish container and types		Buyer Name

The wholesaler should issue a bill containing of enough information for the retailer or the restaurant to secure traceability (Table21).

Table 21: Bill from wholesale market to the downstream in supply chain.

Bill no	
Wholesaler name:	No :
Registered owner and number:	
License number:	
Wholesale market name:	
Address:	
Batch codes:	
Product name:	
Container:	
Signature and seal of seller:	
Signature and seal of buyer:	

The frozen product in wholesale market should keep the label from upstream. The fresh fish should be labelled on the container or package (Table 22), the information should consist of product name processor name, address, Tel, product name, weight, size, date, and batch codes.

Table 22: Label of package or container in wholesale market.

Product name:		
Batch code:		
Weight:	Size:	Received date:
Supplier name:		
Wholesale market name:		
Address:	Tel:	

5.2.5 Distribution

The responsibility for the distribution of fish products in China lies with the distribution companies, sellers and buyers. The batch code depends on the distributor. If a distribution company operates the transport, the code of the distribution company should be added in front of the original code. If a buyer or seller operates the transport, the original code should remain and the information of transport should be kept in the company. If the transported batch is of mixed origin, the batch code of the largest quantities should be regarded as the original code and the remaining batch of raw materials are recorded in the operation information. The format for the necessary records is suggested in Table 23.

Table 23: Recorded information in distribution.

Company name :		City :	Tel:							
Registered owner and number:										
License number:										
Batch code	Species	Weight	Container and number	Container sign	Consignor	Departed place and time	Arrived place and time	Vehicle and temperature	cod	Original batch code

The distribution company should issue a bill comprising of enough information to the consigner and consignee (Table 24). In the distribution phase the original batch labels should be used.

Table 24: Bill of distribution providing to consignee.

Bill no:	
Company name :	City : Tel:
Registered owner and number:	
License number:	
Batch codes:	
Product name:	
Weigh and container consist:	
Consigner name and departed place and time:	
Consignee, name and arrived place and time:	
Signature and seal of consigner:	Signature and seal of consignee:
Distribution company:	

5.2.6 Street market

The street market in China consists of individuals. Here there is no need for any new labelling of the products and recording of information are difficult. But issuing of bills is important and should be requested to give the consumer a warrant for tracing back (Table25).

Table 25: Bill from street market to consumer.

Bill no			
Retailer name:	No :	Registered owner and number:	License number:
Market name :	Address:		
Batch codes:			
Product name:			
Weight :			
Date:			
Signature and seal of seller:			
Signature and seal of the market:			

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