An Analysis of the Requirements, Current Conditions and Opportunities for Traceability in the British Columbia Seafood Sector

Assessing the State of Readiness

Final Report

June 2005

ARCHIPELAGO
MARINE RESEARCH LTD.

AN ANALYSIS OF THE REQUIREMENTS, CURRENT CONDITIONS AND OPPORTUNITIES FOR TRACEABILITY IN THE BRITISH COLUMBIA SEAFOOD SECTOR

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1.0 PROJECT RATIONALE

1.1 PROJECT SCOPE AND OBJECTIVES

Information requirements over the seafood industry supply chain are growing and diversifying. These traceability requirements result from a number of regulatory and non-regulatory requirements such as:

1. **Food Safety** – Canadian Food Inspection Agencies Programs including HACCP requirements;
2. **Access to International Markets** – EU General Food Law Regulations, US Country of Origin Labelling (COOL), US Bioterrorism Regulations;
3. **Consumer Driven Seafood Choice Initiatives** – Marine Stewardship Certification, "BC Wild", Seafood Choices Alliance "Fish List".

A number of initiatives have been undertaken nationally and internationally to address traceability information requirements for the seafood industry. In the European Union, guidelines for an information management system (Tracefish) have been developed to assist the seafood industry in addressing upcoming EU General Food Law regulations. In Canada common standards to facilitate supply chain traceability for the food industry are being developed by Can-Trace, an industry-led initiative comprised mainly of commodity producing organizations and food industry wholesalers and retailers. Both these initiatives focus on use of a systematic data management system based on the EAN.UCC[1] standards (including bar codes) to trace food products through the supply chain.

Traceability regulations require information from the "water to buyer" component of the seafood supply chain. However, there is considerable uncertainty and lack of clarity about the specific information required from harvesters and how this information will be incorporated into proposed traceability protocols. This uncertainty exists, in part, because most existing and developing QMP and product tracing processes (with the exception of bivalves) address tracing product after it has entered the processing facility. In addition, with some notable exceptions, harvesters are often poorly connected to the seafood supply chain, with less priority being placed on product quality and communication (GSGislasson, 2004)

Can-Trace (2004) points out that the seafood industry faces three major questions:

1. What information to collect, keep and share?
2. How should this information be stored to meet demands (including timeliness) of customers and regulators?
3. How to collect and store information in a cost effective manner?

These three challenges apply to the seafood production sector (both capture and aquaculture). In British Columbia the amount and quality of data collected in different capture fisheries varies significantly. Fisheries operating under individual quota (IQ) management all have associated dockside monitoring programs, generally carried out by an independent, third party entity. The information collected varies but usually includes catch, landings, fishing area, beginning and end date of fishing operation, offload date and identification of primary processor. This information

[1] European Article Numbering and the Uniform Code Council

is collected to manage the individual quota system as well as to provide data for fisheries management and enforcement purposes. Non- IQ fisheries generally use less comprehensive and verifiable information systems such as fishing hails, catch logs and sales slips to collect fisheries-dependent data for fisheries management purposes. These programs contain many (and possibly all) of the essential data requirements for the traceability regulations outlined above but, to date, there has not been a systematic assessment for each fishery to determine if traceability requirements are being met. In addition the ability of current data management (storage and access) systems to meet regulatory and customer demands has not been assessed.

The aquaculture industry is likely better positioned to meet upcoming traceability regulations, primarily because shellfish aquaculture (oysters, mussels, clams and scallops) already has strict "water to fork" traceability requirements to manage contaminant risk (sanitary and PSP). Industry standards within the salmon aquaculture industry require tracing feed and medication regimes for each lot of fish harvested. However a systematic assessment of traceability data requirements and current data management practices has also not been carried out for the aquaculture sector in British Columbia.

The specific objectives of the current project were to:

1. **Document data requirements for traceability**
   Summarize the fundamental data requirements of the various traceability initiatives anticipated to impact BC commercial fisheries and aquaculture in the foreseeable future (5-10 years).
2. **Compare with current fisheries information programs in British Columbia**
   Compare traceability data requirements with current fisheries management, enforcement and fish inspection information requirements for the major commercial fisheries in British Columbia (both IQ and non-IQ managed fisheries).
3. **Identify and address data gaps**
   Identify gaps in the existing data collection programs with respect to information requirements for traceability. Assess and recommend ways to address these data gaps, with particular focus on fisheries lacking dockside monitoring programs (i.e. salmon).
4. **Assess and recommend approaches to data management**
   Assess and recommend approaches and technologies for cost effective traceability data management (collection, storage and access).
5. **Address data harmonization**
   Assess the feasibility of using existing or evolving dockside or at-sea monitoring programs to meet traceability requirements in order to benefit from the cost effectiveness, efficiency and verifiability of an integrated system.

1.2 APPROACH AND REPORT STRUCTURE

This report is divided into four subsequent sections.

Section 2 summarizes traceability systems in practice, including paper and electronic data capture and storage, as well as existing traceability software packages. This information is drawn primarily from existing literature, web-based sources as well as personal interviews.

Section 3 presents the business case for traceability, providing regulatory and non-regulatory rationale for implementing traceability systems in seafood businesses. The information was drawn from traceability literature, interviews with the seafood processing sector as well as the recent SWOT report on the BC seafood industry.[2]

Section 4 provides the current conditions in the BC capture fishery and aquaculture sectors with respect to traceability requirements and includes:

- a summary of current BC seafood exports and trends taken primarily from Statistics Canada and BC Ministry of Agriculture, Fish and Food (MAFF);
- the seafood supply chain pathways in BC;
- an assessment of current and upcoming data requirements for the "water to buyer" component (harvester, transporter and first point of sale) of traceability as defined by EU regulations, COOL, US Bioterrorism Legislation;
- a sector specific (e.g. the halibut fishery) listing of harvest data collected by dockside validation programs, catch logs and sales slips;
- current traceability practices and issues at the processor level, addressed primarily by a series of interviews with buyers and processors exporting seafood products to key global markets;
- summary themes resulting from an analysis of data gaps between traceability regulation requirements and fisheries data requirements and issues identified from processor interviews.

Section 5 provides the summary State of Readiness Report for "Water to Buyer" traceability in the BC seafood sector. This section summarizes harvester, transporter and buyer/processor issues for the seafood industry as a whole as well as opportunities and constraints for IQ and non-IQ fisheries. State of Readiness report cards for the major capture fisheries as well as shellfish and finfish aquaculture are also provided. The report cards are intended to summarize the issues each sector will face in addressing traceability requirements given current fishing or aquaculture practices, major markets, existing data collection and storage regimes as well as the status of industry organization.

[2] GSGislason and Assoc. 2004 BC Seafood Sector and Tidal Water Rcreational Fishing: SWOT Assessment. Prepared for BC Min. of Agriculture, Food and Fisheries

2.0 TRACEABILITY SYSTEMS IN PRACTICE

2.1 WHAT IS TRACEABILITY?

A simple, working definition of traceability is the ability to follow and identify a product unit or batch through all stages of production, processing and distribution, both forward and backward. This requires an independent "trail" that identifies:

- where a product or item is,
- where it has been, and
- what was done to it along the way.

Traceability can be envisioned as the ability to find a needle in a haystack by having records that tell you which needle, which haystack, who put it there, and exactly where they put it.[3]

2.2 WHAT MAKES A GOOD TRACEABILITY SYSTEM?

For the effective and efficient recording, maintenance and transfer of product information traceability systems must meet a number of criteria.

One-Up One-Down Traceability

One-up-one-down traceability is the minimum requirement of traceability regulations such as the US Bioterrorism Act and EU General Food Law. Under one-up-one-down traceability (Figure 2.1) each partner in the supply chain is responsible for linking input records to output records but is not responsible for information which may be several steps removed in the supply chain. For example, a retailer of groundfish in Los Angeles may not receive information from the processor in Vancouver as to harvest vessel(s), area of catch or date of catch. However, this information should be linked to the retailer through records maintained by the processor. One-up-one-down traceability is the simplest system to implement, provides the most flexibility for individual businesses, provides some privacy of confidential data but may be inefficient in the event of a traceback due to the number of contact points. The integrity of the system depends on all partners in the supply chain and is only as good as the weakest link.

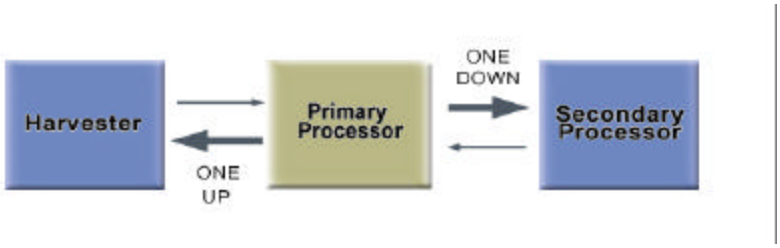


Figure. 2.1 One-up, One-down traceability model.

[3] Can-Trace Traceability of Seafood Guidelines (http://www.can-trace.org/)

Recording Appropriate Data

The system must record information that will allow it to meet the traceability definition provided above. A traceability system requires three basic information elements[4]: a means of identification for the product (***product identifier***), information about the product (***item information***) and a ***traceability linkage*** between the identifier and item information (Figure 2.2). The item information can be further described as follows:

Product Description - Information describing what the product is and how it was produced, stored and handled must be linked to the Product Identifier.

Business Identification. The identity of each business that handles the product unit must be recorded and linked to the Product Identifier.

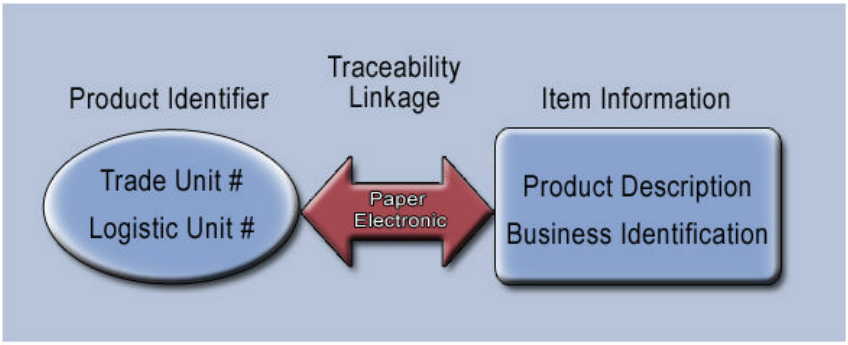


Figure 2.2 Essential elements of a traceability system.

The key to a successful traceability system is the assignment of product identifier codes to specific product (trade or logistic) units, and then maintaining the integrity of each unit (together with all relevant descriptive information) as it moves through the supply chain. The linkage between the product identifier and the item information can be as simple as a paper record (validation record or tally sheet) containing both pieces of information. Electronically compatible formats such as a bar code, spreadsheet or database records can also provide the required linkages.

Effective Data Transfer through the Supply Chain

The system must allow effective and efficient data transfer between stages in the chain. To facilitate data access and transfer at each step in the supply chain, records must be:

- Created and maintained in a timely manner
- Accessible in a timely manner
- Compatible with other stages in the chain – the scheme for recording, storing and transferring information must be seamlessly linked with preceding and following stages of the chain. This need for system compatibility extends to export markets.

[4] adapted from Federal/Provincial/Territorial Agri-Food Inspection Committee (FPTAFIC) document of Basic and Essential Criteria for Traceability systems, dated May 2004

Verifiable

The performance of the system must be verifiable. Independent verification of system performance should be part of system design. Currently, no country has a formal statement requiring an exporter's traceability system to be 'certified'. However, US Customs and Border Patrol are indicating that they intend to eventually require exporter's traceability systems to be audited and certified by a third party. In addition, the system and individual transactions will be subject to audit and verification by Customs. A similar informal system already exists in the EU. It is noteworthy that, when there have been food scares or border closures, products that have been ISO 65 / EN45011certified by an independent auditor have moved through Customs more readily than non-certified products.

Data Responsible Party

Traceability information for a partner (business) in the supply chain must be managed and stored in such a way that it can be easily accessed at a single point of contact. In the event of a trace back or trace forward, the authorities must have a single contact to obtain the one-up, one-down information relating to the supply chain partner. *The person who manages and is responsible for the traceability data for a partner in the supply chain is the data responsible party.* Each partner in the supply chain must have a data responsible party. The data responsible party can be the business for which the data is required; however, it may also be another business in the chain, or a third party outside the chain that has been appointed to manage the information. More than one supply chain partner may have the same data responsible party (see Section 2.5 on centralized traceability systems).

2.3 PRODUCT IDENTIFIERS

Batches, Trade Units and Logistic Units

Product identifiers are essential to traceability systems, without them, you cannot achieve traceability. Think about how difficult it would be to find a friend's house without a street name or house number if you have never been to the town they live in. There are three levels of product identification, batch, trade unit and logistic unit. A batch denotes product that is harvested or produced under virtually the same conditions. Batches generally refer to larger volumes of product and the point at which one batch becomes another may be decided by factors such as time, area, volume or interruption of production. At the harvester level, batches will likely be defined by entire offloads or, in some bivalve fisheries, they may be portions of offloads defined by the areas fished. Product from one batch may be placed or packaged in one or more containers or trade units. A trade unit ID is a unique number assigned to each trade unit, therefore no two trade units would have the same ID. Trade unit IDs allow the tracing of product on a unit by unit basis. Trade units could vary from entire vessel holds to totes of fish to individual fish. Trade units may be packaged together into larger units (e.g.. pallets) for the convenience of transport. These units are called logistic units. Logistic units allow the tracing of shipped packages. Trade units and logistic units may be the same units.

2.4 PRODUCT LABELLING

Product information is linked to an actual container of product through container labelling. Containers must be labelled or marked with a product identifier through which associated information contained on paper forms or in computer databases can be found. Without container labels, the verifiability of product identity is lost. Labels may also contain some or all of the product information to be passed to the next partner down the chain. At the harvester level, there may be circumstances where it may not be practical to affix a label to the product or container, such as when an entire boat load of fish is pumped directly into a processing plant. Fisheries where this might occur include herring, salmon and hake. In these cases, the hold of the vessel could be labeled.

An example of a label containing all the necessary product identifier information is given in Figure 2.3. This box label was obtained from Marine Harvest, a salmon aquaculture company.

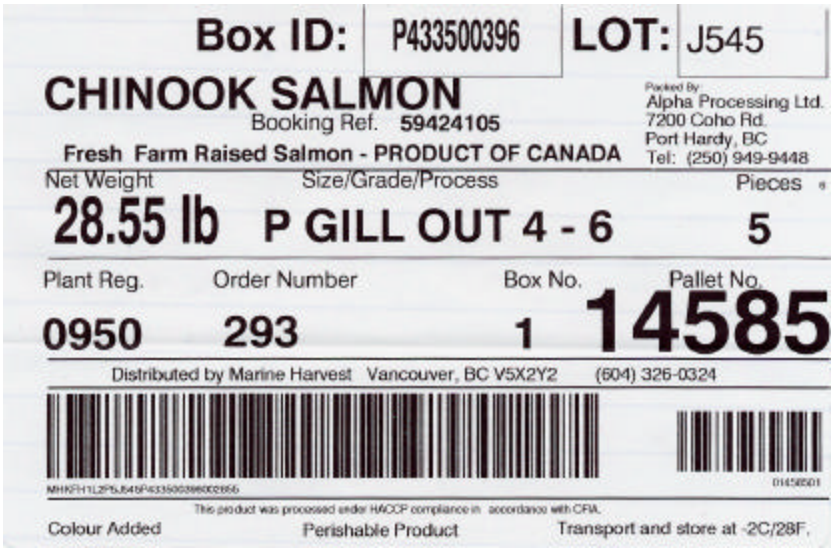
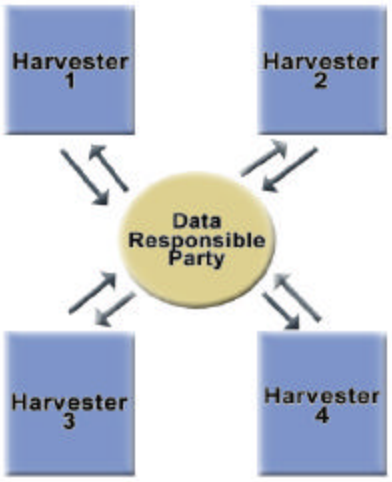


Figure 2.3 Product label for BC farmed salmon product

2.5 CENTRALIZED TRACEABILITY

In a centralized system, there is a single data storage and access point for several partners in the supply chain. Centralized systems often go beyond one-up-one-down traceability (Section 2.2) by providing traceability through several levels in the supply chain. These systems may be more cost effective and efficient for each partner in the supply chain compared to designing and maintaining their own system, but all partners must follow specified data standards and criteria for the privacy of information must be developed. Centralized data systems can be applied to sectors of industry (Figure 2.4a) and linked to other levels of the supply chain, or one system can be used to achieve full chain traceability (Figure 2.4b). Dockside monitoring programs are examples of sector based, centralized data systems for commercial harvesters.



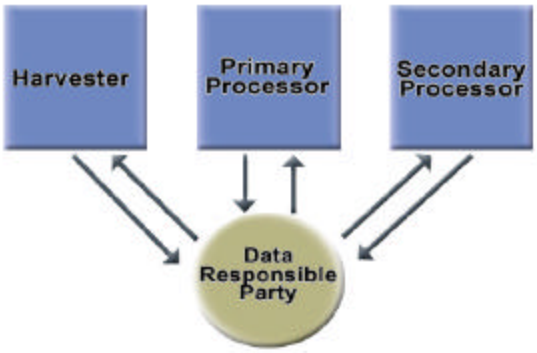


Figure 2.4a. Sector based centralized model. **Figure 2.4b. Supply chain based centralized model.**

It appears that, within the seafood sector, corporate-based one-up, one-down traceability systems are emerging rather than centralized systems. We were unable to find an example of a full chain, fishery specific traceability system after extensive web searching and contacts with the UK Seafish Authority, Tracefish, Seafood Plus and the European Seafood Safety and Traceability Organization (ESSTO).

> *"Seafish are unaware of a entire chain or sector of the fishing industry that has adopted the Tracefish/ EAN Seafood traceability standard."*
> *Dr. Jason Coombs, UK Seafish Authority*

There are significant barriers to implementing centralized traceability systems in the BC seafood sector, such as data confidentiality of fishing data and primary processor market information. The essential criteria for an effective traceability system can be met with a corporate based traceability system, however fishing organizations and/or government may wish to become involved in setting or implementing data standards. In BC, some of these barriers may have already been overcome with the evolution of dockside monitoring programs. These issues are addressed more fully in Section 5.0.

Our interviews with processors have concluded that so far, their response to traceability initiatives has been cost, product, market or regulatory driven (Section 4). Currently regulations differ for different product sectors (i.e. requirements for bivalves versus finfish). Buyers in Japan demand more traceability information than buyers in Hong Kong. These market differences may also present a barrier to the implementation of sector wide traceability systems in some fisheries.

2.6 USE OF DATA SYSTEM STANDARDS

The use of data standards in traceability systems provides a set of "business rules" to follow that facilitates the collection, storage and exchange of data. Traceability regulations define the data attributes (e.g. vessel ID, date of harvest) but do not define standard data formats for these attributes (e.g. YYYY.MM.DD for harvest date). The use of standard data formats facilitates effective and efficient data exchange, particularly in a non-integrated supply chain. Internationally recognized standard formats will be important in global markets.

The most widely used data format standard in the food industry is the internationally recognized EAN.UCC numbering system. Under this system, products, shipments, locations, production lines, boats, trucks, and other physical assets can be identified with a unique number, generally in the form of a machine readable bar code. Further information on bar codes and the EAN.UCC system is provided in Appendix A.

Bar codes and RFID technology are some examples of electronic methods through which coded information can be communicated in a standard way. Another example of a data exchange standard is XML. XML is a universally recognized standard that defines the information requirements and structure of a file in order to facilitate the exchange of electronic data from one computer application to another.

Section 2.9.2 summarizes commercially available seafood traceability software solutions. Most of these commercial databases packages use data format and exchange standards such as XML. It is important to recognize that these commercial packages are not the only means of addressing data format standards for exchanging information. What is essential is the understanding and use of recognized standard formats which can be used by a wide variety of software applications.

2.7 THE SEAFOOD SUPPLY CHAIN

To help understand the flow of information for one-up-one-down traceability (Section 2.2) one should be aware of the structure of seafood supply chains. Figure 2.5 provides a simplified model of the seafood supply chain in BC from water-to-consumer. The upstream stages of the chain (water-to-buyer) for wild harvest and aquaculture are quite different, but the downstream stages (post primary processor) are similar. Businesses such as transporters and cold storers that have custody of the product without purchasing or producing the product may be involved between chain partners. A more detailed view of the various supply chain pathways within the water-to buyer supply chain for wild fisheries is shown in Figure 2.6. The supply chain pathway within a specific fishery can be varied and complex, increasing the difficulty of tracing products. The various elements of the water to buyer pathways for wild harvest as well as finfish and shellfish aquaculture are defined in the accompanying inset boxes.

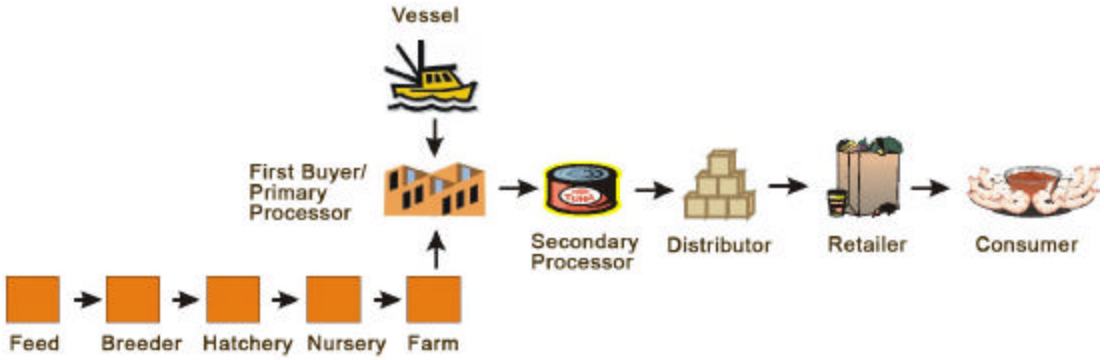


Figure 2.5 Seafood (aquaculture and wild harvest) supply chain

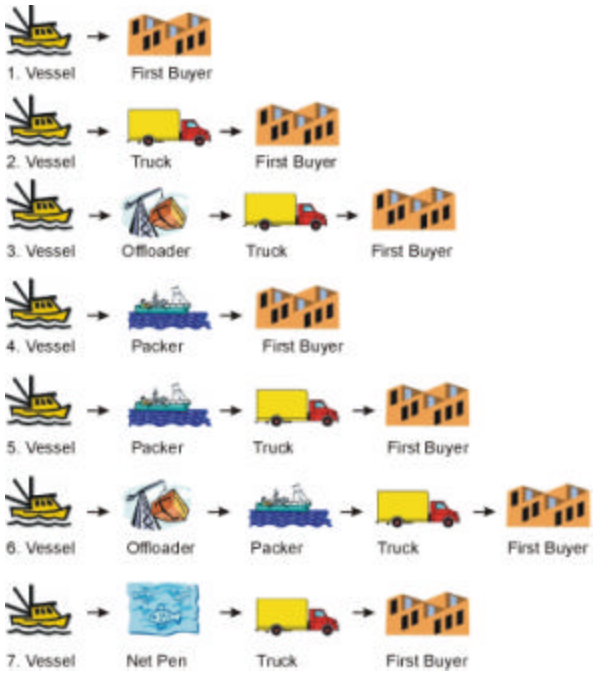


Figure 2.6 Wild harvest water-to-buyer supply chain pathways

Elements of Water to Buyer Pathway – Wild Harvest

Vessel	The vessel harvests seafood product. Basic processing operations may be carried out on board such as heading, bleeding, gutting, grading and freezing. Catch may be discharged by the vessel or by offloading companies. Harvesters are responsible for meeting a number of fisheries management data requirements (Section 4.3), some of which are also required for traceability.
Packer	A packer is a transport vessel that collects fish from one or more vessels and delivers it to a land based facility or transporter. Pooling of product is typical on packers, except in most shellfish fisheries where product is labelled and physically kept separate.
Offloader	The offloader is a business that discharges catch from a vessel. The offloader may carry out unit transformations (e.g. repacking), grading and sorting.
Net Pen	Live catch from vessels may be placed into net pens for storage until sale. Net pens are typically maintained by the vessel.
Truck	The truck is the land based transporter of seafood products. The truck may include other forms of transportation such as air transport. Documentation of shipments are made on a Bill of Lading.

Elements of Hatchery to Processor Pathway - Finfish Aquaculture

Feed manufacturer	The fish feed manufacturer manufactures feed for broodstocks, hatcheries and fish farms.
Breeder	Breeders are establishments that maintain broodstocks, often based on selection for specific characteristics, from which they collect eggs for hatcheries. Prior to dispatch, breeders may carry out operations such as quality grading.
Hatchery	Hatcheries are establishments that receive eggs from breeders and rear them through the hatching & juvenile phases until dispatch to a grow-out facility.
Farm (Grow-out)	Farms receive fish from hatcheries and rear them during the grow-out stage until dispatch to the slaughtering/processing link.
Live fish transporter	Live fish transporters may operate at two stages in the finfish aquaculture supply chain: 1) transport between hatcheries and fish farms; 2) transport between fish farms and processors.
Transporter	In the upstream portion of the supply chain covered by this project, transporters transport fish slaughtered on-farm to the processing plant.

Elements of Hatchery to Processor Pathway - Shellfish Aquaculture

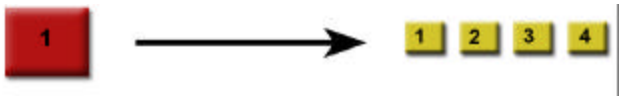
Hatchery	Hatcheries are establishments that maintain broodstocks from which they collect larvae and seed for nurseries. Prior to dispatch, hatcheries may carry out operations such as quality grading. While some hatcheries are located in BC, the major hatcheries supplying larvae and seed to the BC industry are located in the US.
Nurseries	Nurseries are establishments that receive shellfish seed from the hatchery and subsequently 'boost' its size through the use of rearing systems such as Floating Upwelling Systems (FLUPSY's).
Farm	Depending upon the shellfish species and the culture methods employed by the farm, farms will receive seed from hatcheries and/or nurseries – and rear them during the grow-out stage until dispatch to the processing plant.
Live shellfish transporter	Live shellfish transporters operate at three stages in the shellfish aquaculture supply chain: 1) transport between hatcheries and nurseries; 2) transport between nursery and farm; 3) transport between shellfish farms and processors

2.8 UNIT TRANSFERS AND TRANSFORMATIONS

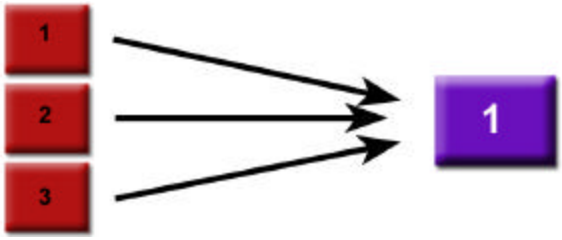
At each step in the supply chain, trade and/or logistic units may be transferred to another party or transformed by pooling or splitting. The more transfers and transformations that take place along the chain, the more complex traceability becomes. In a traceability system each unit transfer or transformation requires record keeping. The following diagrams provide typical trade unit transformations that occur from water-to-buyer.

1. **Unit Unchanged** – e.g. Fish stored in totes on a vessel delivered to a buyer in the same totes

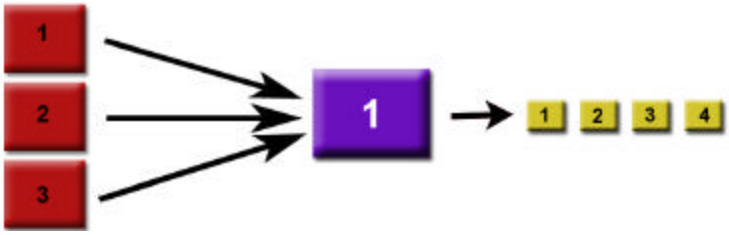
2. **Unit Splitting** –e.g. Fish stored in the hold of a vessel placed in totes by an offloader for shipping to a buyer



3. **Unit pooling** – e.g. Fish stored in the holds of three vessels emptied into the hold of a packer for shipping to a buyer.



4. **Unit Pooling and Splitting** – e.g. Fish from three vessels emptied into the hold of a packer then placed in totes by an offloader for shipping to a buyer.



2.9 OVERVIEW OF TRACEABILITY SYSTEMS[5]

2.9.1 Traceability Tools

Paper-based Systems

Fishing boats, transporters and fish processors, irrespective of size, will have some form of purchasing, order processing, sales and invoicing systems. In smaller companies these systems usually rely on the completion, storage and review of paper-based records by employees. Traceability of the product can be achieved by linking these individual systems and implementing additional procedures during the processing and storage of the product in the plant (Table 2.1).

Table 2.1. Advantages and disadvantages of paper-base traceability.

Advantages	Disadvantages
Based on existing quality assurance and stock control documentation systems. Inexpensive to implement. Flexible in terms of the processing systems to which it can be applied.	Processing and maintenance of data records is time consuming compared with other traceability methods such as bar coding and integrated IT systems. Manually intensive, with respect to writing and collating of records. Reliant on correct procedural operations being carried out, e.g. may be unreliable due to operator error. Trace-back of information is time consuming and difficult for paper based records. This is especially true where the process operations involve more than one raw material/ingredient. Records not easily summarized or reviewed; therefore only limited strategic use of information can be made.

Barcode Systems

Bar codes can not only be used to label and identify raw materials and products through the supply chain, but can also be used to label locations (e.g.. docks, processing stations) or individual pieces of equipment (e.g. weigh scales, processing equipment). Bar code systems rely on the use of hand held scanners for reading bar codes and inputting additional data, printers for re-labelling and a coordinated computer system to manage the information (Table 2.2).

[5] Adapted from A Guide to Traceability Within the Fish Industry. 2004. Eurofish and the Swiss Import Promotion Programme (SIPPO)

The system can be implemented at various levels, from reading information on incoming raw materials and labelling of final product (with all other records being paper based), to a fully integrated traceability system for all operations.

Table 2.2 Advantages and disadvantages of using bar codes and scanners for traceability.

Advantages	Disadvantages
Data input is easy and often menu led, minimizing potential errors. Additional information can be entered into the hand held device so that product quality records such as temperatures etc. are also included in the data-sets. Each scanner can be used to collect data from various process steps therefore minimizing capital expenditure and maximizing use of equipment. Real time availability of records results in improved stock and process control. This information is down-loaded to a data-base which can collate and process the information to provide the necessary reports and records.	Requires capital expenditure for equipment in order to successfully implement. This is especially true where processing information is to be automatically logged and integrated with the scanned data. Paper bar codes are easily damaged, losing all information. Technology can be unreliable, so an additional paper based system is recommended as a back-up system

Radio Frequency Identification (RFID) Tags

RFID systems use radio waves of specific frequencies to read, and/or modify data stored in electronic circuits or a micro-chip that is usually encased in durable plastic to form a "tag". The RFID system consists of 3 components, the RF tag, the transceiver or scanner, and a computer. The transceiver transmits energy in the form of radio waves via an antenna. When a tag is near the transceiver, the tag emits a radio signal that can be picked up by the transceiver and decoded to reveal the information contained in the tag. The transceivers can be incorporated into various types of equipment such as portals (doorways); handheld scanners; specific pieces of equipment (e.g. weighing scales) and have even been built into the glove of the person who handles fish boxes.

RFID tags can be attached to fish boxes, freezing racks etc. and are used to carry the traceability information in a format that can be read automatically and at a distance. The advantage of this method is that the box needs only to be placed on a scale or passed through a detector for the identification information to be automatically determined and only additional information added (e.g. quality grades, weight etc.). This can be achieved by inputting the data via drop down menus on a touch screen interface. RFID tags are well suited to harsh environments where barcodes fail. For example, RFID tags are embedded into crab floats and read by an on-board scanner during trap recovery to monitor fishing activity in the northern BC Area A crab fishery.

How technologically advanced a traceability system should be depends on a number of factors including regulatory requirements, market demands, and the operation and goals of a particular business. Considerations for implementing technology based approaches to traceability are summarized in Table 2.3.

Globally, traceability requirements are growing and the increased volume of data that will be collected in the future and the increased speed with which it will have to be accessed should be a major consideration in designing traceability systems. Traceability is already "*just part of doing business*" in the BC aquaculture industry. These trends suggest traceability information systems in the BC seafood industry should utilize and take advantage of technology-based solutions to remain competitive with other seafood industries around the world.

Table 2.3 Advantages and disadvantages of technology-based approaches.

Advantages	Disadvantages
Flexibility- the system can be customized to user's specific needs. The types of equipment, scanning systems, data-base software etc. can be adapted to meet individual companies requirements.	Requires capital cost at start up for hardware and software. But this should be evaluated against potential cost savings in material, labour and other resources.
Increased efficiency in data storage and access with increased volume and complexity of data. As volume increases in a semi-automated system you do not have to exponentially add staff to shuffle paper.	Relies on either ID tags/labels throughout process or Bar code scanning an additional capital cost.
Easier data compilation and production of statistics summaries for business management. Storing data in a database makes it easier to query and summarize information. For example, regulatory reporting can be done faster.	Requires training for staff in new equipment and new processes.
Less labour required for data entry and maintenance (i.e. lower labour costs).	May require higher level of computer expertise for some staff managing the systems.
Promotes structured processes which leads to increased efficiency.	Generally there is a higher comfort level with low-tech paper solutions and higher discomfort with change to electronic solutions.
Faster data communication with other partners in the supply chain or with internal divisions of a business.	Complexity of integrating the technology and systems. The technology should be suited/customized for the system, which requires understanding of the systems.
Less errors in communicating data.	
Less consumption of paper (environmental benefits).	
Less storage space required for archiving paper records.	
Increased information accessibility- the paper copy can only be physically accessed where it is stored/located, information stored electronically can be accessed from anywhere in the world with compatible infrastructure. For example webmail or internet based access.	
Increased security and auditing- paper copy can be physically seen by anyone with no record of who saw/accessed it, while electronic copy can have auditing for who created, edited, viewed the data with date/time stamps.	
Ability to translate information into multiple languages.	

2.9.2 Traceability Software Solutions

A number of traceability software solutions have been brought on to the market in recent years, largely in response to the EU regulations. As a result most of the solution providers are based in Europe. Table 2.4 summarises information on the major traceability software solutions currently available.

Most of the packages are aimed to facilitate compliance with the European Tracefish standard and hence store and share data in XML format. Current users in North America are largely from the aquaculture industry.

Most of these software solutions do, or can be adapted to, accommodate water to buyer stages of the supply chain. The Trace 2000 software package developed by C-Trace in the UK is designed specifically for this stage and is essentially an onboard electronic logbook that is being marketed as a traceability tool. Electronic logbook software packages are in use and/or in development throughout the world. For example, Archipelago recently completed an electronic logbook pilot project for the salmon industry in BC. This system uses satellite communications to report catch from a computer on board the vessel to a database on a land based computer system.

Table 2.4. Summary of selected traceability software solutions.

Software Brand Name:	Tracetracker	Wisefish	Traceway	NuTrace	Trace 2000
Developed by	Tracetracker, Norway.	Maritech, Norway.	UK-based Rontech and Nesco Weighing.	Marine Harvest, Norway.	C-Trace, UK
Canadian support	Have just opened a Canadian office	Maritech Canada (NS)	Not advertised	None advertised	None advertised
Designed application	Generic to food industry	Designed specifically for the seafood industry.	Generic	Specific for *Marine Harvest* supply chains.	Specific to fishing vessel operations. System is essentially an electronic logbook solution.
TraceFish compatible (data in XML format)?	Yes	Yes	Yes	Not known	Yes
Major seafood clients	• *Fjord Seafood* (aquaculture) • *Skretting* (fish food producers)	• *SIF Canada* (NS processing plant) • *Clearwater Seafoods* (large N. American seafood company) • *Pan Fish* (2nd largest global producer of farmed fish).	Not advertised	*Marine Harvest* – world's largest aquaculture company, and the largest global producer and supplier of farmed salmon.	Not known
Can it accommodate boat to buyer stage/s?	Yes	Yes. By using *Wisefishing* and *Wisetrawler* modules	Does not appear to.	Not known	Yes, designed specifically for this stage of the supply chain.
Notes:			Includes both software and hardware (data logger attached to weighing device etc.) solution.		
URL	www.tracetracker.com	www.wisefish.com	www.rontec.co.uk	www.marineharvest.com	http://fish.jrc.cec.eu.int/shee l/partnership/c-trace.htm

3.0 THE BUSINESS CASE FOR TRACEABILITY

3.1 INTRODUCTION

Globally, the implementation of traceability systems within seafood industries is being driven both by *compliance-driven factors* – as regulatory authorities respond to societies growing desire to know where food comes from and whether it is safe to consume; as well as *value-driven factors* – as industry partners work to remove inefficiencies in supply chains and build quality and safety as brand values. There is mounting evidence that tangible business value can be created through implementing effective traceability programmes, regardless of the primary driving force.

The business case for the implementation of traceability systems within BC fisheries and aquaculture industries are varied and inter-linked. These are discussed in more detail below.

3.2 IMPROVED SUPPLY CHAIN MANAGEMENT

Traceability is assisting supply chain partners to work together to eliminate inefficient practices that are not value-added to the consumer.

The benefits of better supply chain management include improved real-time inventory management, which in turn reduces product waste as well as ensures a more consistent quality delivery to supply chain end users – the seafood consumer.

New and more affordable technology is at the forefront of this change. New technologies, that are making it easier to record and pass on information about seafood products in digital format, are more cost-effective and more reliable over time. This technology-driven change is making it easier to develop seamless "fisher to fork" information supply chains and supply chain partners are experiencing the benefits of such systems. The finfish aquaculture sector is a leader in implementing these new information technologies in the seafood supply chain.

Supply chain partners are also looking at innovative monitoring solutions that add value to the end product. For example, relatively inexpensive micro-chips containing sensitive and accurate temperature probes are now being inserted into individual high value fish destined for the Japanese market, allowing historical temperature graphs to be generated at any stage in the supply chain, in turn informing quality and pricing decisions [6].

Improved supply chain management is now extending back to seafood harvesters and growers in recognition that there is data that can only be supplied by these first link partners such as date, area of harvest and feed sources. In particular many individual quota fisheries are now managing fishing effort on a market demand rather than fishing opportunity basis. For example, in the geoduck fishery, processors keep track of every landing that each vessel delivers to them, knowing exactly how much quota each vessel still has to fish and planning accordingly for the market.

[6] Hashimoto, T., K. Tanaka, H. Niwa. Trial of farmed fish traceability in Japan, 2004 http://www.ean-int.org/Doc/040318_Hashimoto.pdf

3.3 IMPROVING AQUACULTURE PRODUCTION/MANAGEMENT PRACTICES

In addition of assisting in supply chain management, traceability systems are being used increasingly in the aquaculture sectors to improve production and management operations.

Most BC finfish aquaculture businesses exhibit a high level of vertical integration. Their involvement in many stages of the aquaculture supply chain allows them to implement effective identity traceability systems covering the entire upstream chain – from feed manufacturer to breeder to processor. These traceability systems are used as a supply chain production/management tool. In addition, data on feed, medication, and other inputs used in rearing are readily recorded by these systems. By recording quality-related data elements in a traceability system, a downstream link (e.g. processing) can efficiently provide upstream links (e.g. farm) with valuable feedback for management decisions. For example, gaping of fillets recorded by processors would inform the farm managers that excess stress may have occurred during harvest – while observations of 'pale' fillets would alert the farm managers to feed-related issues.

Traceability systems also serve as valuable fish health tools for finfish aquaculture. By linking the incidence of bacterial and viral diseases at the hatchery/farm level with specific broodstock, parental lines with a greater resistance to these diseases may be identified, thereby allowing for improvements in breeding programs at broodstock facilities.

Using Traceability to Improve Shellfish Growout Management

Unlike finfish aquaculture, few shellfish growers utilize traceability as a production/management tool. However, to assess its potential in this area, an interview was conducted with Keith Reid of Odyssey Shellfish - one of BC's most innovative and technologically advanced grower/processors. For this grower/processor, the driving force for a higher level of traceability (e.g. beyond that required by food safety regulations) has been the desire for improved internal management control. Mr. Reid believes that only through improved traceability will businesses be able to determine the actual cost of growing shellfish product and, consequently, determine the actual profitability of the business enterprise. Mr. Reid further believes that automation and standardization (with its associated requirement for improved identity traceability) are the keys to competitiveness within the shellfish industry.

3.4 PREREQUISITE FOR MARKET ACCESS

Compliance with data requirements to supply seafood to key international markets is arguably the single biggest driving force behind the implementation of formalized traceability systems.

The traceability requirements for seafood being imported into the EU are comprehensive and strict. Regulation (EC) No. 178/2002 states that "The traceability of food, feed, food-producing animals, and any other substance intended to be, or expected to be, incorporated into a food or feed shall be established at all stages of production, processing and distribution." This and other EU tracing regulations are outlined in detail in Section 4.2 of this report.

Similarly, seafood suppliers to the US market will have to comply with the US Bioterrorism and Country of Origin legislation, necessitating a reliable and efficient traceability system. The requirements of this legislation are also outlined in detail in Section 4.2 of this report.

While the EU and the US have made the greatest progress in the implementation of seafood traceability requirements, many other large markets are actively developing food traceability data requirements and/or are evaluating traceability pilot projects.

In Japan, the Ministry of Agriculture, Forestry and Fisheries published guidelines for the introduction of food traceability systems, including all seafood, in 2003. A beef traceability system that will require retailers to include additional information on labelling, such as country of origin and distribution channels became compulsory in Japan as of December 2004. Japan plans to implement a similar certification system in 2005 for all farm products. There is strong evidence that a traceability requirement for seafood will follow, as evidenced by the number of seafood traceability pilot projects being conducted. The first of these pilot studies is evaluating the Tracefish data requirements and the EAN Numbering System (which are explained in more detail in subsequent sections of this report).

In addition to Japan's ongoing evaluation of traceability models, Japanese fish consumers may soon be able to access product information – including where and when the fish was caught – through a new cell phone information system. The fishery information system may be available in retail stores as early as 2005 (http://www.smh.com.au/articles/2004/09/24/1095961862675.html?oneclick=true).

In the United States fines for failing to meet Country of Origin labelling requirements (COOL) can be up to $10,000 per product item. With large seafood distributors carrying thousands of product items, these penalties are a significant liability, and distributors are working with their suppliers to develop appropriate labelling (T. Dewer, S&S Seafoods, Oregon, pers. comm.).

Seafood producers also face increasing demands for information from their wholesale and retaile clients. For example, BC aquaculture companies are already being asked by prospective customers to answer detailed questions about their operations and product. Some high volume buyers of farmed salmon apply rigorous traceability standards to their enterprises – and demand the same standards of their suppliers. In fact, some of these buyers (e.g. Costco) audit the traceability systems of their farmed salmon suppliers.

The information required by buyers can extend far upstream in the supply chain to include information such as:

- origin of the raw materials used in the feed fed to the fish they purchase,
- genetic information concerning broodstock of the fish that they purchase,
- antibiotic use in the fish that they purchase.

Moreover, buyers require timely responses to their queries. As a result, the salmon aquaculture companies have developed traceability solutions that allow almost immediate answers to production and processing questions.

The reality that BC seafood suppliers wanting to trade in world markets are facing is that without an appropriate traceability system in place, they will not have access to certain markets where traceability systems are a prerequisite.

3.5 IMPROVED HEALTH AND SAFETY ASSURANCE AND IMPROVED RECALL EFFECTIVENESS

Improved traceability of foods makes it easier to provide customer assurance around food safety and improves the efficiency of recall events.

Traceability is also being driven by the need to assure the customer and/or end consumers of specific ingredients or other product attributes. There is evidence that many foreign buyers, even in the absence of specific market access traceability regulations, are requiring basic elements of a traceability system in order to ensure and document product quality standards (Y. Hamakawa, Areo Trading, pers. comm.).

From a regulatory perspective, product traceability can increase the effectiveness of a recall. From a commercial perspective, a comprehensive traceability system can substantially reduce the cost and liability associated with a recall by enabling only impacted product to be withdrawn from the market in contrast to the default option of a 'shot gun approach' where all product would be withdrawn.

It is important to recognize that most fish product recalls in North America have, so far, been related to either bacterial contamination as a result of processing (e.g. Ghio Seafood Products of San Diego, California recalled hot smoked salmon distributed by Pacific Shellfish in San Diego during July and August 2001 because it was suspected that the product was contaminated with listeria monocytogenes[7]) or because of unlabelled food additives/ingredients (e.g. in April 2003, Pacific Seafood of Portland Oregon recalled its Pacific Fresh Seafood Mix because the imitation crab meat, one of the ingredients in the seafood mix, contained egg whites and wheat flour).

Traceability systems that connect sold product to the seafood processors are probably adequate to effectively addressing the above health and safety issues. However, other seafood health risks are associated directly with the environment from which the product came from. Global awareness and concerns related to the presence of neurotoxicants (e.g. polychlorinated biphenyls or PCBs and mercury) in seafood is present and growing. Although Canada has strict guidelines for chemical contaminants and toxins in fish and fish products with specific limits for a wide range of industrial contaminants, and even though Canadian, including BC, fish products have been tested to be contaminant "free"[8] what marketers of seafood are acutely aware of is that consumer perceptions are as much fact as scientific evidence. If consumers perceive there is a problem and are thinking and acting negatively about seafood, then there is a problem.

[7] A micro-organism that can cause serious and sometimes fatal infections in small children, frail or elderly people and others with weakened immune systems.

[8] Health Canada undertook a specific survey of PCBs, dioxins, furans, polybrominated diphenyl ethers (PBDEs) and veterinary drugs in Canadian fish and seafood in 2002 and found that levels of all contaminants tested for were far below accepted risk levels for all wild and farmed fish sampled.

Food scares in other industries (e.g. BSE in beef) has also focused consumer attention on food safety in general. Negative press (e.g. September 30, 2004 headline in the Vancouver Sun that read *"Fish diet blamed for high mercury levels in 2 BC kids"*) damages the whole seafood industry. In addition, if there is a perception that farmed salmon contains too much PCB (regardless of whether this is scientifically true or not) then the marketing of all salmon, wild or farmed and from all sources, has been shown to be affected negatively.

Importantly, the pressure from consumers to have assurance around health and safety of seafood is growing and is not likely to go away. There is therefore a growing realization that in order for retailers to make content identity and quality claims, they need the support of a traceability system that extends to the harvester level.

3.6 IMPROVED PRODUCT QUALITY AND QUALITY ASSURANCE

Traceability systems can be used to add value to seafood products, both by providing consumers with verification of product quality claims, as well as by providing a mechanism to financially reward harvesters that meet quality standards.

Over the past decade a number of BC fisheries have made significant value gains by pursuing quality advantages. Prices for halibut increased significantly when the fishery moved to an IQ management regime with an extended opening serving a fresh rather than frozen market. Similarly prices for geoduck increased significantly with growth of the live market in Hong Kong and mainland China (although more recent market conditions have resulted in price declines). In contrast the BC salmon fishery has not benefited by pursuing a quality advantage, in part because global production of farmed salmon has resulted in significant price declines, but also because the current fisheries regime (short openings based on harvest opportunity and lack of traceability from processor to harvester) provides no incentive to harvesters to take the extra steps (bleeding fish, adequate icing) to ensure higher quality product. Smaller, niche market processors have demonstrated that the "quality advantage" can be used to add value both at the harvester and processor level (see inset box). Traceability measures have been used quite effectively in other sectors (frozen at sea prawns) to provide the quality assurance to buyers who pay premium prices for this product.

The BC farmed salmon industry faces severe price competition in the US market from producers in countries like Chile, particularly when selling to big box wholesalers. The industry also faces significant human health and environmental sustainability accusations from NGO's. In the face of these challenges, one BC finfish aquaculture company (Marine Harvest) is adopting a third party audited quality management program (that includes a traceability component) to gain a competitive edge. By adopting the ISO 9001 Quality Management System, Marine Harvest believes that they will be viewed as an industry leader – and will be better equipped to withstand the intense scrutiny of NGO's.

The finfish aquaculture sector also uses traceability to verify and support environmental and sustainability initiatives (antibiotic use, disease control measures, waste management initiatives). Once organic standards for finfish aquaculture are approved by the Certified Organics Association of BC, companies adhering to the standards (e.g. Creative Salmon) will be able to

utilize their traceability programs to verify that their fish were reared according to the organic standards, and may thereby gain a competitive edge.

USING TRACEABILITY TO MARKET HIGH QUALITY, HIGH VALUED SEAFOOD PRODUCTS
FAS SEAFOODS,
Victoria, BC

Bob Fraumeni founded Finest at Sea (FAS) Seafoods in Victoria in 1977 to market seafood products (primarily sablefish, tuna, halibut, salmon and longline rockfish) landed by his own fishing vessels. The focus of FAS is to provide top quality, wild seafood products of known origin. Initially all seafood products were sold into the Asian market, but Bob was anxious to make his high quality product available locally. 'Finest At Sea' was established as a 'boutique-style' seafood company, combined with state of the art freezing, processing, storage facilities, transportation and delivery.

Traceability is a key component of the business strategy at FAS, in that customers need to know which vessel caught which fish, where, and at what time (full harvester to fork traceability). This involves:

- **Setting quality standards for harvesters -** although most deliveries are by boats owned and operated by FAS the company also buys salmon from several other vessels. Harvesters are provided with quality standards (i.e. delicately handled, properly cleaned, bled, flash frozen, straight, with a minimum core temperature of -20^0F) and harvesters are paid a premium price if quality standards are met.
- **Tracing product to individual harvesters** - all vessels provide detailed hail of catches and product is segregated at the dock, plant and cold storage facility by vessel and offload batch numbers.
- **Working with supply chain partners -** the company works with state of the art trucking and cold storage facilities which are able to guarantee required temperature regimes and provide data records to verify that required conditions have been met.
- **Providing documentation** - information on product origin and quality standards is communicated to customers on every invoice to support the "Finest at Sea" brand name. High end customers (particularly restaurants) desire this information in order to market the FAS quality and local supply to their clientele.

This business strategy has built a growing and committed clientele for FAS, who are willing to pay premium prices for high quality product. The end result is a value added product, with increased returns to both harvester and processor as well as an educated and satisfied customer base.

3.7 VERIFYING ECO-LABELLING CLAIMS

Traceability systems developed as post-processing traceability tools can be extended to the harvester stage to support eco-labelling initiatives.

Given growing consumer concerns about the ecological impacts associated with seafood harvesting and culture, seafood eco-labelling is on the increase. Eco-labelling (such as dolphin-friendly) is now standard practice around the world and the number of fisheries certified by the Marine Stewardship Council (MSC) is growing every year. British Columbia is no different – currently both the BC salmon and halibut fisheries are undergoing certification. In addition, future salmon certification may be stock specific (as opposed to species specific). These initiatives (bycatch friendly gear types, stock or area specific eco-certification) require traceability to the harvester level in order to verify where and how the product is harvested.

Information from both the harvesters and the processors is needed to support eco-labelling claims, and data management systems need to be put in place to supply ongoing verification of claims. In addition, BC's world leading catch monitoring programs provide the traceability criteria (accurate and verifiable) to support marketing sustainable fishing practices as a BC advantage.[9]

3.8 SUPPORTING FISHERIES MONITORING EFFORTS

Traceability data collection can be integrated with fisheries management data collection to add value to both requirements.

Without exception, more information is being collected about where, when, how and how much fish are being caught and landed in BC. Whilst this is being driven by fisheries resources management and conservation efforts by government regulators and, increasingly, the seafood industry, fisheries monitoring data can also facilitate the process of developing traceability systems for these products in seafood supply chains.

In Japan, a pilot traceability project for farmed fish is integrating data collection elements used by the industry association, the Japan Seawater Fishery Cultivation Association, in the primary production stages of the supply chain, with data elements collected by the Tracefish traceability management system for the post-landing supply chain stages.[10] The overlap between fisheries management data collection and traceability system requirements is an important consideration in BC and is explored in more detail in Section 4.5.

[9] . GSGislason and Assoc. 2004 BC Seafood Sector and Tidal Water Rcreational Fishing: SWOT Assessment. Prepared for BC Min. of Agriculture Food and Fisheries

[10] Hashimoto, T., K. Tanaka, H. Niwa. Trial of farmed fish traceability in Japan, 2004 http://www.ean-int.org/Doc/040318_Hashimoto.pdf

3.9 SUPPORTING ENFORCEMENT EFFORTS

Ensuring that all product moving through the seafood supply chain has been legally harvested is essential for both quality assurance and marketing purposes.

By their very nature, information on product source (harvester, location and time of harvest) is usually lacking for illegally harvested product. This is clearly a health and safety issue for certain seafood products (i.e. bivalves) but also a marketing concern in a sector where quality assurance and sustainable fisheries issues are increasing public concerns.

The implementation of full traceability will benefit enforcement officers by allowing them to use business and product identifiers to determine the origin of products being inspected at a processing plant, cold storage facility, fish store, restaurant, border crossing, airport cargo bay, transport truck and deep sea terminal. Failure of product to have a legitimate business or product identification number (or no number) would allow officers to seize the product being inspected pending further verification and authenticity of the product.

Currently there is no system of traceability with which an enforcement officer can trace back the origin of the product other than through extensive interviews of all individuals who have handled and or come into possession of the seafood product. Further the requirement of fishers, processing plants, cold storage facilities, sellers and buyers and transport companies to keep records of product bought, sold and shipped utilizing product identifiers will allow officers to conduct audits of any of these facilities and or transport companies to verify that product in equals product out (see Appendix B for further detail).

3.10 DIFFERENTIATING BC SEAFOOD AS A GLOBALLY COMPETITIVE BRAND

Integrated, reliable and verifiable traceability systems are a key requirement for branding BC seafood as superior products that are safe to consume, managed sustainably and of superior quality.

BC seafood harvesters and producers are increasingly aware that they are vital partners in supply chains that extend beyond the province's borders. BC seafood is in competition with seafood from South America, New Zealand and China (to name a few) and buying patterns for seafood products are increasingly affected by global factors and trends often out of the control of harvesters and processors.

The BC seafood industry has focused considerable recent effort on identifying key opportunities and reducing industry-wide threats through a provincially led SWOT assessment.[11] Key processing and marketing opportunities identified by this assessment focused on obtaining higher value for seafood products by meeting consumer needs through the entire seafood value chain and pursuing quality as the BC advantage. Realising these opportunities will assist in

[11] GSGislason and Assoc. 2004 BC Seafood Sector and Tidal Water Recreational Fishing: SWOT Assessment. Prepared for BC Min. of Agriculture Food and Fisheries

differentiating BC seafood in an ever competitive, risk averse and discerning global market. Traceability systems will be required to support these branding initiatives.

OPPORTUNITIES FOR TRACEABILITY TO MEET STRATEGIC OBJECTIVES FOR THE BC SEAFOOD SECTOR

In 2003 the Province of British Columbia commissioned a major review of the BC seafood sector, to assess strengths, weaknesses, opportunities and threats (a so-called SWOT analysis). This study was conducted by GSGislason and Associates Ltd. and is available on the Ministry of Agriculture, Food and Fisheries website (http://www.agf.gov.bc.ca/fisheries/studies_rpts.htm).

The report makes five key recommendations with respect to seafood harvesting opportunities

1. Reform the Capture Salmon Fishery
2. Improve Security of Tenure
3. Improve Fish Quality
4. Enhance Fish Quality with Better Traceability
5. Market Sustainable Fishing Practices

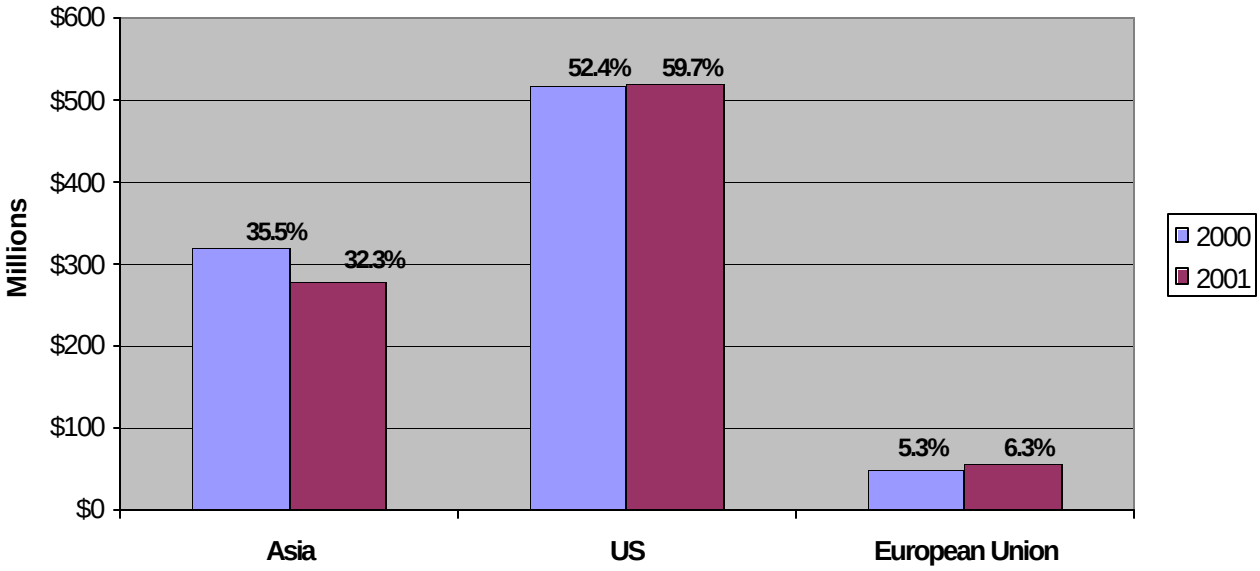
Improved water to buyer traceability will assist in meeting four of these recommendations, improving security of tenure being the exception. Improving quality and value in the salmon fishery requires slowing of the harvest rate, improved on-board handling of fish and the ability to traceback product from processor to harvester in order to meet quality standards. Traceability permits tracking of quality standards through the supply chain, supporting price initiatives to meet high end market needs. In addition, traceability provides the verification and transparency necessary to market sustainable fishing practices to an increasingly vigilant and informed consumer base.

4.0 CURRENT CONDITIONS IN THE BC SEAFOOD INDUSTRY

4.1 BRITISH COLUMBIA SEAFOOD EXPORT MARKETS[12]

British Columbia exports over 90% (by value) of wild and farmed seafood production. Although the volume of seafood exported from British Columbia declined by about 10% during the 1990s (primarily due to the decline in wild salmon production), total export value increased by over 25% due to increased prices for shellfish and groundfish (including halibut). Almost 60% of BC's seafood export value is to the United States (Figure 4.1), an increase from 27% in 1990. About 35% of export value is to the Asian market (primarily Japan, Hong Kong and mainland China). Asian market share has declined from 45% in 1990, again due to the declines in wild salmon export volume and price. Exports to the European Union (EU) are approximately 6% of total export value, down from 21% in 1990.

Figure 4.1 Value of BC fish exports.



[12] **Sources**:
1. Price Waterhouse Coopers 2001. State of the BC Seafood Industry Report. Prepared for the BC Seafood Alliance.
2. GSGislason and Assoc. 2004 BC Seafood Sector and Tidal Water recreational Fishing: SWOT Assessment. Prepared for BC Min. of Agriculture and Fisheries Food
3. BC MAFF Trade Statistics, 2001
4. Carman Mathews, BC MAFF, pers. comm.

Figure 4.2 summarizes export value to the United States, Asia and the EU by product sector for 2001. The following points are noteworthy with respect to exports to these regions:

United States

- British Columbia's dominant export market, with both export volume and value growing substantially over the past decade,
- Dominant export market for groundfish, halibut, farmed salmon and some shellfish species (i.e. Dungeness crab and shrimp),
- Salmon is the largest product sector in terms of value (approximately 50% of total export value to the US). Over 80% of the salmon exported to the US is farmed product.

Asia

- Figure 4.2 includes exports to all Asian counties but values are dominated by exports to Japan, with growing markets in Hong Kong and mainland China,
- Herring (roe and spawn on kelp) is the largest valued product exported to Asia, 35 to 40% of total export value. In contrast exports of herring products to the US and EU are insignificant (<1% of total export value),
- Value of shellfish exports to Asia is dominated by highly valued products such as live geoduck and frozen at sea prawns,
- Value of wild salmon exports to Japan has declined over the past decade; currently 25 to 30% of salmon export value is farmed product.

European Union

- There is a significant downward trend in export value to Europe, which currently represents only about 6% of BC's seafood export value,
- Over 85% of export value to the EU is salmon, primarily canned and smoked, but also frozen product,
- Farmed salmon exports to the EU are insignificant with none are reported on recent BC Ministry of Agriculture, Fisheries and Food summaries,
- A small amount of halibut and groundfish are exported to the EU, but the value of shellfish exports is insignificant.

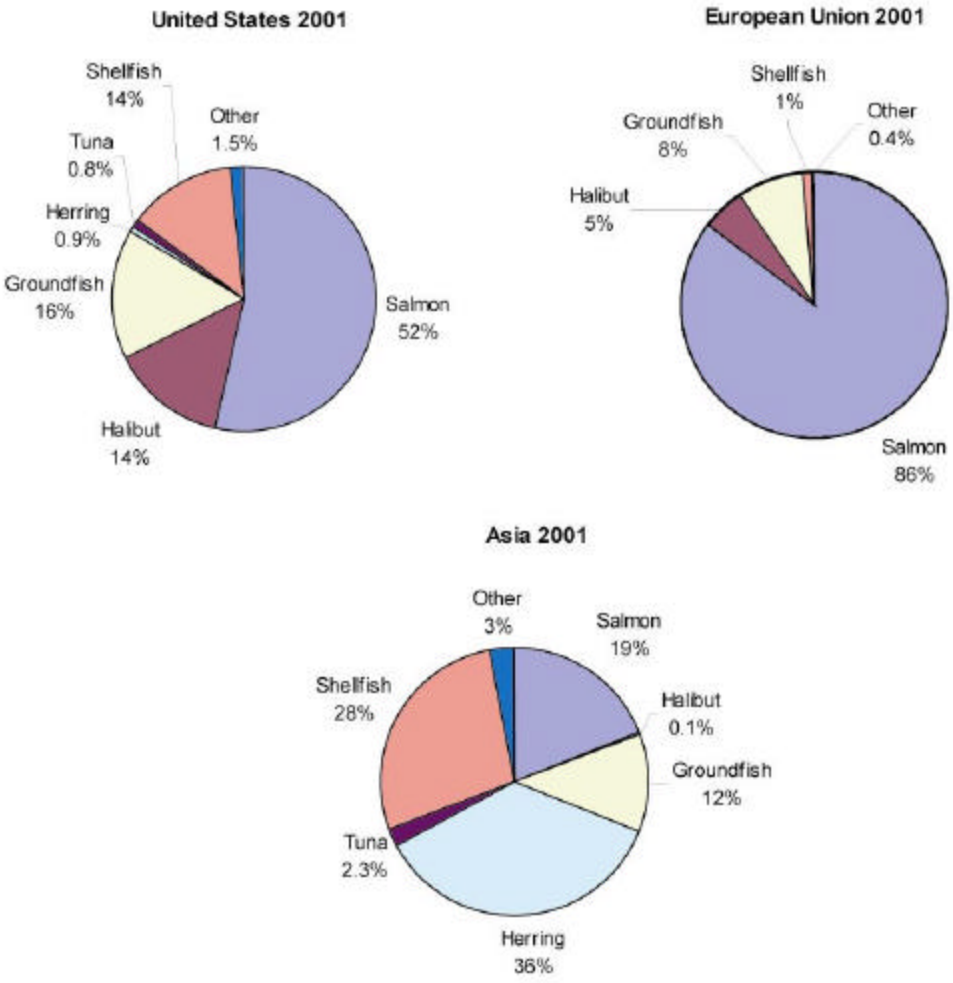


Figure 4.2 Relative value of BC seafood exports by product sector in 2001.

The status and trends in BC's seafood export market have important implications for traceability: The most relevant points are:

1. The EU is a small export market for BC ($55 million in 2001) and is dominated by processed (canned and smoked) salmon products. The introduction of the EU Food Law in 2005 will directly impact only a small and selective portion of the BC seafood export market, including traditional canned salmon exports. However addressing EU traceability regulations will be important in order to open new markets for BC seafood exports to Europe. The addition of eastern European countries to the EU may have some implication on traceability requirements for processed fillets such as hake.

2. The US is British Columbia's highest valued export market as well as the region where market growth (both volume and value) has been greatest over the past decade. The US is

also BC's most diverse export market, taking significant quantities of all seafood product sectors except herring. Although the EU appears to be the main "driver" for traceability initiatives in Canada (i.e. Can-Trace) it should be recognized that, for British Columbia, compliance with US export and traceability requirements (COOL and US Bioterrorism) will be more immediately significant for the seafood industry.

3. Although exports to Japan have declined over the last decade, exports to China and Hong Kong have increased. Traceability regulations for seafood in Asian countries have yet to be defined, but it is important to consider upcoming initiatives in these important export markets. Interviews with BC processors suggest that the Japanese market is demanding traceability information, whereas the Hong Kong/China market is quality driven but currently does not emphasize traceability.

4.2 DETERMINATION OF TRACEABILITY DATA REQUIREMENTS FOR BC FISHERIES AND AQUACULTURE INDUSTRIES

A key component of this project was to determine the data elements required to establish full product traceability within BC fisheries and aquaculture industries. This was a difficult task because there is no one document which lays out these traceability requirements for all markets. Our approach was a three-step process involving:

1. examination of an existing seafood traceability guideline,
2. analysis of relevant traceability regulations, and
3. consultations with industry members.

Each of these steps is described in detail in the following sections.

4.2.1 Tracefish Project Data Set

As food buyers, consumers and regulators demand increasing volumes of information about seafood products, seafood industries around the world have recognized that there are an infinite number of data elements that *could* be recorded. The struggle that each industry faces is to determine what data elements *should* be recorded. The most significant initiative yet undertaken to define the data elements appropriate for the wild harvest fisheries and aquaculture industries is the *Tracefish* initiative funded by the European Commission. As part of the Tracefish project[13], over 100 major European fish exporters, processors, importers and research institutes participated in establishing a European consensus on what data should be recorded and transmitted in European seafood supply chain. The data elements deemed by Tracefish to be appropriate for full traceability of the wild harvest and aquaculture supply chains are presented in the following two documents:

[13] http://www.tracefish.org/

- *Traceability of fishery products – Specification of the information to be recorded in captured fish distribution chains*[14]
- *Traceability of fishery products – Specification on the information to be recorded in farmed fish distribution chains.* (November 2002)

The full traceability data elements presented in these documents were primarily intended for companies operating in EU Member States and Non-EU countries exporting to EU Member States. However, the traceability standards established by the Tracefish data set have now formed the global benchmark for full traceability within seafood supply chains. These standards now form the basis for numerous traceability implementations in the seafood industry as well as in publicly funded pilot R&D projects.

As a result of its global endorsement, the Tracefish traceability data sets were adopted by this project as the *basic level of traceability* that BC fisheries and aquaculture industries should aim for when developing/evaluating their traceability systems. The Tracefish traceability data sets, therefore, form the basis of three important tables contained within this report:

- Table 4.1 entitled *Wild Harvest Fisheries: Traceability Requirements and Definitions* is based upon the tabular information presented in the Tracefish 'Captured Fish' document.
- Table 4.2 entitled *Finfish Aquaculture: Traceability Requirements and Definitions* is based upon the tabular information presented in the Tracefish 'Farmed Fish' document.
- Table 4.3 entitled *Shellfish Aquaculture: Traceability Requirements and Definitions* contains only the identity-related traceability elements presented in the Tracefish 'Farmed Fish' document. The Tracefish farmed fish document was designed specifically for the finfish aquaculture supply chain. Therefore, the production history/quality/safety data elements defined in this document are not applicable to shellfish aquaculture. Tracefish has not undertaken a similar identification of shellfish-specific data requirements.

These tables are located at the end of Section 4.0.

Data elements identified within these tables as **mandatory** are required to track/trace the identity of a trade unit along the supply chain from producer to processor. Data elements more associated with food safety and quality assurance are identified as either **recommended** or **optional**.

Tables 4.1-4.3 do not indicate how or where information is to be stored. Instead, the specific product identity information requirements (e.g. name, address, phone) are detailed for each step in the chain. How information is stored will depend upon the traceability system implemented.

4.2.2 Data Elements Required By Relevant Regulations

For industry to supply BC seafood to key international markets, traceability requirements stipulated in the regulations of some of BC's major seafood trading customers will have to be met. Globally and domestically there are many other regulations and initiatives aiming at

[14] Source http://193.156.107.66/ff/po/EUTrace/WGCaptured/WGC_StandardFinal.doc.

developing traceability systems for seafood. Indications are this list will continue to grow in the future.

Recognizing that the Tracefish traceability data set may not satisfy all of the traceability regulatory requirements placed upon BC fisheries and aquaculture industries, an additional twelve regulations that have important traceability-related implications were investigated including:

- US Bioterrorism Act (USBTA)
- US Country of Origin Legislation (COOL)
- Canadian Food Inspection Agency *Quality Management Program (QMP)*
- Canadian Food Inspection Agency *Canadian Shellfish Sanitation Program (CSSP)*
- Canadian Food Inspection Agency *Vibrio Parahaemolyticus Program (Vp)*
- EU General Food Law (EC 178/2002)
- European Council Regulations 2001/2065, 2003/804, 2004/319, 2004/852, 2004/853, 2004/854

The following subsections summarize the traceability-related implications of these regulations. The dates when these regulations come into effect vary (Table 4.4) and there will likely be a grace period during which time industry will be expected to adjust their operations and comply with the regulations.

Table 4.4. Effective dates for traceability regulations, see Section 4.2.2 for details of specific regulations

Name of Regulation	Effective Date
US Bioterroism Act	December 2003
US Country of Origin Legislation	March 30, 2005
CFIA Quality Management Program	1992
CFIA Canadian Shellfish Sanitation Program	April 1997
CFIA Vibrio Parahaemolyticus Program	Summer 2000
EC 2002/178 – EU General Food Law:	January 1, 2005
EC 2001/2065:	October 2001
EC 2003/804:	May 1, 2004
EC 2004/319:	May 1, 2004
EC2004/852:	No earlier than January 1, 2006
EC 2004/853:	No earlier than January 1, 2006
EC 2004/854:	No earlier than January 1, 2006

4.2.2.1 US Bioterrorism Act (USBTA)[15]

Section 306 of the US Bioterrorism Act requires the establishment and maintenance of records for one-up, one-down traceability and specifies a 4 hour (during business hours) and 8 hour (during non-business hours) time limit to respond to a Food and Drug Administration (USFDA) demand for information.

[15] Source: http://www.cfsan.fda.gov/~acrobat/fr03059a.pdf

Non-Transporter Sources – a processor shipping to the US must be able to provide specific information on all *"immediate non-transporter previous sources"*. In other words, the USBTA requirements apply specifically to the processor – who must be able to provide information on all sources 'one-step' upstream. To meet the one-up traceability requirement where product moves directly from harvester to processor, the harvester would be considered the 'one-up' non-transporter previous source. It would, therefore, be the responsibility of the harvester to record and share certain information to allow the processor to comply with the USBTA requirements. The harvester-related USBTA information required by the processor is shown in Tables 4.1- 4.3.

Where product moves from harvester to buyer to processor, the buyer would be the 'one-up' non-transporter previous source; the buyer would, therefore, assume the responsibility of providing the processor with USBTA-related information. The buyer-related USBTA information required by the processor is shown in Tables 4.1- 4.3.

Transporter Sources – a processor shipping to the US must also be able to provide specific information on all *"immediate transporter previous sources."* The one-up transporter-related USBTA information required by the processor is shown in Tables 4.1- 4.3.

The USBTA has been implemented, and so far, little attention has been directed toward the record keeping component of this legislation in contrast to the prior notice provisions, which are considered onerous by many exporters and transporters.

4.2.2.2 US Country of Origin Legislation

The US Country of Origin Legislation (COOL) requires fish products to bear labels identifying their country of origin and method of production (wild/farmed). However, in addition to this labelling requirement, the USFDA also requires country of origin and production method to be verifiable through additional supporting documentation. COOL requires that all suppliers possess, or have legal access to, records that substantiate origin claims – and that they maintain records unique to each transaction for 2 years. The records must identify the previous source and subsequent recipient of all products.

With regard to finfish aquaculture, the hatchery must provide enough information for an auditor to verify the origin and ownership of all shipments of fry/fingerlings and must properly record all hatchery production according to origin designation. Finfish grow-out facilities must identify and segregate fingerlings according to the origin designation. They must properly label and identify all marketable size fish sold as well as maintain all ownership transfer records.

With regard to shellfish aquaculture, the hatchery must provide adequate information for an auditor to verify the origin of all seed, eyed larvae and set cultch. The shellfish grow-out facility must be able to identify and segregate seed according to the origin designation and manner of production. The grow-out facility must also maintain and identify origin designation information as well as maintain ownership and transfer records.

Examples of the type of documents that the USDA considers would be "useful" to verify country of origin and method of production for wild harvest, finfish aquaculture and shellfish aquaculture are shown in Table 4.5. As indicated by the lists of "useful" verification documents shown in

Table 4.5, the basic labelling requirements under COOL would not satisfy the COOL verification requirements. However, on the basis of the suggested verification documents, it is considered that a basic traceability system would readily provide adequate verification.

The USDA issued an interim final rule for the mandatory country of origin labelling program for fish and shellfish on September 30, 2004. This rule became effective on March 30, 2005. All cooked and canned fish and shellfish products, including such items as canned tuna and canned sardines and restructured fish products (e.g. fish sticks and surimi), are excluded[16]. Similarly, processed products where the fish or shellfish is an ingredient (e.g. sushi, crab salad, and clam chowder) are excluded from COOL legislation.

Table 4.5. Documentation useful to verify country of origin and method of production under COOL legislation.

Supply Chain Stage	Wild Harvest[17]	Finfish Aquaculture[18]	Shellfish Aquaculture[19]
Hatchery		Hatching records Broodstock records Purchase records Sales receipts Feed bills Feeding records Site maps Production estimates Health records Ownership records	Spawning records Broodstock records Seed/eyed larvae purchase records Feeding records Ploidy records Cultch purchase records Growth records Spat collection records Site maps Production records Import permits Health records Crop records and reports
Grow-out/ harvest	Catch area Vessel ID Harvest records Transportation records Dispatch/Reception records	Transportation records Receiving records Purchase records Sales records Feed bills Feeding records Stocking records Replacement activities Segregation plan Feed per acre rate Cage yield rate Location Site map Harvesting records	Seed/eyed larvae records Cultch purchase records Seed transfer records Inspection monitoring records Dive records Transfer permits Transplant records Site maps Harvest records Landings reports Crop records and reports Sales records Sampling records Bulk tagging transaction records

[16] Source: http://www.ams.usda.gov/COOL/ls0213.pdf
[17] Source: http://www.ams.usda.gov/COOL/coolwfish.pdf
[18] Source: http://www.ams.usda.gov/COOL/coolfish.pdf
[19] Source: http://www.ams.usda.gov/COOL/coolshellfish.pdf

4.2.2.3 EU General Food Law (Decision 2002/178/EC)

The EU General Food Law lays down the general principles and requirements of food law, establishing the European Food Safety Authority and establishing procedures in matters of food safety. According to Article 18 of Decision 2002/178/EC, the traceability of food shall be established at all stages of production, processing and distribution. According to Article 2(5), transport businesses are considered to be 'food businesses' and must therefore comply with the traceability requirements of Article 18. The article requires that a food business be able to identify any *person* from whom they have been supplied with a food product. This person can be an individual (e.g. fisher or shellfish grower) or a legal entity (e.g. business). The food business must also be able to identify legal entities that it subsequently supplied with this product[20].

Article 18 does not detail the specific data elements that the EU would demand to meet its traceability requirement. However, the document entitled *"Guidance On The Implementation Of Articles 11, 12, 16, 17, 18, 19 And 20 Of Regulation (Ec) N° 178/2002 On General Food Law"* (see footnote 16) more clearly stipulates the data requirements. These data requirements appear in Tables 4.1-4.3. For highly perishable products destined directly to the final consumer, this document states that records should be kept for the period of 6 months after date of manufacturing or delivery. For products with a specified shelf life, records should be retained for six months beyond the specified shelf life. Records for products without a specified shelf life must be retained for 5 years.

The 'guidance document' cited above states clearly that the traceability provisions of Article 18 do not have an extra-territorial effect outside the EU. In other words, exporters in non-EU trading partner countries are not legally required to fulfill the traceability requirement imposed within the EU. According to this document, the objective of Article 18 is sufficiently fulfilled because the requirement extends to the importer. Since the EU importer shall be able to identify the exporter in the third country, the requirement of Article 18 and its objective is deemed to be satisfied.

While BC fishery and aquaculture supply chains may not be legally required to fulfill the traceability requirements of the EU General Food Law, the data requirements of this regulation have been included in this report for the following reasons:

- Exporters must be prepared to provide the traceability-related information that may be needed by the importer for compliance with the regulation. Some of the product-related information required by the importer may extend back to the harvester.
- The traceability requirements of the General Food Law will likely become the template for other countries seeking to implement traceability legislation. In other words, a level of traceability – similar to that required by this law – may soon become necessary for access to many other important markets.

[20] http://europa.eu.int/comm/food/food/foodlaw/guidance/guidance_rev_7_en.pdf

4.2.2.4 Decision 2002/2065/EC

Decision 2002/2065/EC lays down *"detailed rules for the application of European Council Regulation (EC) No 104/2000 in regards to informing consumers about fishery and aquaculture products"*. This regulation requires the recording of the following information:

- Commercial name of the species
- Method of production (i.e. wild or farmed)
- Catch Area. Products caught at sea have to show the area of capture (taken from the FAO list, in annex of the above EU regulation). However, only the general area has to be mentioned (e.g. "Pacific Ocean") and not the "Area codes". Operators may provide additional information on the area.

These required data elements are noted in Tables 4.1- 4.3.

4.2.2.5 Decisions 2003/804/EC & 2004/319/EC

Decision 2003/804/EC lay down *"the animal health conditions and certification requirements for imports of molluscs, their eggs and gametes for further growth, fattening, relaying or human consumption."*

Decision 2003/804/EC applies only to

- live molluscs, their eggs and gametes, for further growth, fattening or relaying
- live molluscs and non-viable molluscs for immediate human consumption or further processing before human consumption.

According to this regulation, EC member states shall authorize the importation into their territory of live molluscs intended for immediate human consumption, or for further processing before human consumption, only if:

- the molluscs originate and have been harvested in a territory listed in Annex I of the regulation.
- the consignment complies with the guarantees, including those for packaging and labelling and the appropriate specific additional requirements, as laid down in the animal health certificate in Annex II of the regulation.

At the time of adoption of Decision 2003/804/EC, no non-EU countries could be listed in Annex I to the Decision. In order to avoid interrupting trade with third country exporters, the EC adopted Decision 2004/319/EC which amended Annex I of 2003/804/EC to include a list of countries temporarily approved as exporters to the EU. Countries – such as Canada – that appear on this list must allow EC regulators to conduct inspections regarding their compliance with 2003/804/EC. These inspections were to have been completed by January 2005.

Through this regulation, the EU requires that the exporter can attest to the disease status of the animals being exported. According to the 2004 report by the Centre for Coastal Health entitled *"Capacity of the British Columbia shellfish industry to meet European Union health requirements for exports: Preliminary situation assessment"*, Decision 2003/804/EC (implemented May 2004) had an immediate impact on BC's shellfish aquaculture exports by blocking the import of products into the EU – thereby causing economic losses for Canadian shellfish producers. This report emphasized that there continues to be limited scientific data or systematic surveillance upon which to base assurances that specific diseases are absent in BC wild or farmed shellfish stocks. The lack of a systematic coordinated shellfish health program to

verify compliance with Decision 2003/804/EC will therefore continue to present challenges to BC companies seeking to export shellfish to the EU.

The key traceability-related requirements of this regulation include:

A. Farms must maintain up-to-date records that are open to scrutiny on:
- Observed mortalities of molluscs, eggs or gametes entering or leaving the farm
- All information on the delivery and dispatch of molluscs, eggs or gametes
- The number or weight, size, origin, suppliers and destination of molluscs, eggs or gametes

B. In order to meet EU requirements, reliable evidence of freedom from particular diseases is needed. Farm shellstocks must have been free of unexplained or abnormal mortalities for two years prior to shipment; as well, the regulation requires that the farm be capable of providing evidence that it is free from specific diseases (one of these diseases, Denman Island Disease, does occur in BC).

The data elements associated with Decision 2003/804/EC appear in Table 4.3.

4.2.2.6 Decisions 2004/852/EC, 2004/853/EC & 2004/854/EC

Decisions 2004/852/EC, 2004/853/EC and 2004/854/EC represent a trio of related regulations that deal with food hygiene "*laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption*". While these regulations focus on animal health certification, they do contain a limited number of requirements that would demand the existence of a traceability system for verification of compliance. These requirements appear in Tables 4.1- 4.3.

4.2.2.7 Canadian Food Inspection Agency *Quality Management Program*

QMP plans are quality control plans required for federally registered seafood processing plants. The QMP uses the internationally recognized HACCP (Hazard Analysis and Critical Control Point) principles for ensuring safe food production. The shellfish harvester and/or buyer must provide the processor with certain information for the QMP requirements to be met. In the case where the buyer does not transform the original trade units, it is assumed that the only additional information requirements (over that provided by harvester) would be 'buyer name'. However, where the buyer transforms the original trade units into new units, the complete QMP information requirements must be re-stated (re-recorded).

The data requirements associated with the QMP are listed in Tables 4.1 and 4.3.

4.2.2.8 Canadian Food Inspection Agency *Canadian Shellfish Sanitation Program*

Harvesters are legally obligated to identify and label shellstock in accordance with CFIA CSSP requirements. In the event of contaminated product entering the market, proper CSSP tagging and recording currently provide the only way of tracking product back to the source harvester and lease area.

Shellfish growers must attach harvest tags to each shipping unit (e.g. sack, crate, bin, cargo net) of their product. When smaller sacks are placed inside a larger sack or cargo net, only the larger unit requires a tag if the larger unit will not be broken down until it reaches the processor.

However, for purposes of liability and tracking, some industry members interviewed for this project recommended that all containers be tagged.

The data elements that the CSSP requires to be recorded on the harvest tag are included in Tables 4.1 and 4.3.This tag is to remain attached to the product unit until the unit is empty – and thereafter kept on file for 90 days.

4.2.2.9 Canadian Food Inspection Agency Vibrio parahaemolyticus (Vp) Control Program

During the summer months (generally June to September, depending on water temperature) half shell oyster growers and transporters must record information as required by the Vp Control Program. The information required by the Vp Control Program appears in Table 4.3.

4.2.2.10 Data Elements Added Through Industry Consultation

Additional data elements were added to Tables 4.3 and 4.4 as a result of industry consultation. These data elements were:

- Table 4.2: while the Tracefish 'farmed fish' document specifies data elements associated with the manufacture of aquaculture feed, it does not specifically indicate the data elements to be recorded by feed users in order to provide a link between specific units of fish and the units of food that they consumed. Therefore, Table 4.2 has been 'enhanced' with data elements essential to provide this feed manufacturer-feed user link.
- Table 4.3: since the Tracefish 'farmed fish' document did not contain production history/quality/safety data elements appropriate for shellfish aquaculture, Table 4.3 has been 'enhanced' with additional data elements derived through discussions with leaders in the BC shellfish aquaculture industry.

4.2.3 Cumulative Traceability Data Set for BC Fisheries and Aquaculture Industries

A cumulative data set appropriate for BC fisheries and aquaculture industries was determined as follows:

- Tracefish data set was used to establish a baseline level for full traceability
- Baseline level of traceability was enhanced with traceability data requirements from regulations relevant to BC fisheries and aquaculture industries
- Baseline level traceability was further enhanced through industry consultation

The resulting cumulative traceability data requirements, appropriate for BC fisheries and aquaculture industries, are presented in the final columns of Tables 4.1, 4.2 and 4.3. The 'cumulative requirements' column of each table specifies the information that must be recorded at each step in the supply chain, by each data responsible party each time a trade unit is transformed, transferred, sold or transported, in order to achieve full traceability between stages.

In addition to Tracefish, two other organizations (CanTrace[21] and EAN[22]) have produced seafood traceability guidelines. The cumulative traceability data set determined by this project for the

[2121] A discussion of the CanTrace initiative is given in Appendix C

[22] A description of the EAN numbering system appears in Appendix A including a demonstration of how the EAN system could be used to record the traceability data elements for BC fisheries is presented in Table W.

wild harvest fisheries was compared with the CanTrace and EAN guidelines. This comparison showed that the wild harvest cumulative data set determined by this project provides for a more comprehensive level of traceability than either the CanTrace or the EAN guidelines.

4.3 OVERVIEW OF HARVEST FISHERIES TRACEABILITY PRACTICES

4.3.1 Data Sources

A number of data programs are in place in the BC fishing industry to collect catch, landing and sales data. Most of the information is collected for fisheries management, enforcement and stock assessment purposes and mandated by Fisheries and Oceans Canada (DFO). Additional programs collect information for food health and safety, business transaction, invoicing and traceability purposes. These programs have been implemented over time in a cumulative fashion, with new systems added to old systems to address issues or management initiatives within specific fisheries. The initial information systems were harvest logs and sales slips. More recent additions have been validation records and transit slips as part of dockside monitoring programs for individual quota fisheries. A brief explanation of these programs is provided in the accompanying inset box.

DFO Fisheries Data Programs

Hail - Hail reporting may be required prior to fishing and/or after fishing. "Start fishing" hails are used to keep track of which vessels are fishing where, when and for what species. "End fishing" hails may be used for notification that the vessel has left the fishing grounds, for reporting catch totals and/or notifying when and where catches will be offloaded. The harvester is responsible for hail reporting and, with the exception of roe herring packers (where certified scales are required on board), catch amounts are estimates.

Harvest Log - Harvest logs are a record of fishing events that document what was caught, where and when. Species and amounts reported are estimates made by the harvester. The location of catch is usually documented as latitude and longitude coordinates.

Validation Record - Validation records are completed by dockside observers, who independently record and report how much of each species (or species aggregate) was offloaded from each vessel and from each area fished. Weights are obtained from certified weigh scales at the offload site and are used for business transactions. Validations are used to maintain an official accounting of vessel and area quotas. Validation information is regarded as the most accurate and reliable fish landing information.

Transit Slip - A transit slip is completed by a dockside observer for halibut and sablefish offloads and may sometimes be used for rockfish hook and line, Schedule II species, and groundfish trawl offloads. The transit slip is similar to a bill of lading, documenting the transport company, when and where product was picked up, what the product is, the number of containers, the total weight, and where and when the product was delivered.

Sales Slip (Fish Slip) - A sales slip is a record of sale between the fisher and the buyer of his product. Typically, sales slips are completed and submitted to DFO by commercial buyers. Weights reported in fisheries with dockside validation are usually validated weights. Amounts reported on sales slips in fisheries without dockside validation are taken either before or after the product is processed (e.g. shrimp harvesters are generally paid on processed or peeled weight). Sales slips may also document fishing area and harvest date, but this information is generally considered to be unreliable. Sales slips are used for estimating the economic value of the fisheries.

At-Sea Observer Catch Estimation - An at-sea observer independently records the catch (species kept as well as discarded), time and area of fishing. Other information such as gear specifications, weather and biological sampling information may also be recorded. Catch weights are usually estimated based on standard catch estimation methodologies. At sea observer catch estimates are not carried out in all fishing sectors and, with the exception of groundfish trawl where observer coverage occurs on 100% of the fishing trips, observer catch estimates are only carried out on a portion of fishing trips.

Other data programs, such as delivery records, processing records, storage records and sales records may also be used by buyers or processors depending on the type of operation and product(s) produced. Examples of some of these non-DFO programs are given in the accompanying inset box.

Other Data Programs

Offload Tally

Offload tally sheets are used by custom offloading companies to record the catch landed by a vessel. If a dockside monitoring program is in place, observers will have a separate tally sheet for the validation record, and the weights on the offloader's tally sheets will be verified by the dockside validation observer. The information on the offloader's tally sheet may be organized differently from a validation record because the tally sheet functions as a business transaction record possibly based on grade or quality categories rather than species and area categories used for fisheries management purposes. Typical information recorded on an offload tally includes offload company, vessel and buyer, product description, container weights, number of containers, and transport company.

Bill of Lading

A bill of lading is a business record kept by transporters documenting what packages they picked up, who they picked them up from and to whom, where and when the packages were delivered. The information contained on the bill of lading is used for invoicing purposes by the transport company.

4.3.2 Date Review

Fisheries and Oceans Canada currently requires large amounts of information to be collected and reported through one or more of the data systems outlined in the previous section. The responsibility for this information is placed at the harvester level, as other agencies have jurisdiction over other business partners in the supply chain. DFO data requirements for each commercial fishery in BC were reviewed and an inventory of these requirements is provided in Table 4.6 (see end of Section 4.0). Sources examined for these requirements included commercial fishing management plans and conditions of licence, third party validation records and data forms, harvest logs, sales slips, and personal communications with fishery managers and harvest association representatives.

The emphasis of the review was placed on fisheries with the significant volume or value relative to total seafood production in BC. Table 4.7 provides a summary of the number of active licences, volume landed and value for each fishery included in the review. Intertidal clam wild harvest is also of significant volume and value but has not been included in the review because the reporting data requirements were essentially the same as shellfish aquaculture under the Canadian Shellfish Sanitation Program.

Table 4.6 provides the comprehensive data requirements applying to all participants, all the time. Partial requirements were not documented because such programs do not provide the comprehensive data set required for traceability purposes. The party (skipper, observer, buyer) that collects the information is also indicated in Table 4.6.

It should be recognized that some fisheries have more than one level of licensing category (e.g. Option A and Option B designations in the rockfish hook and line and groundfish trawl fisheries) Each licence level is accompanied by a specific set of requirements. The data provided in Table 4.6 represents what is collected consistently across the entire fishery, regardless of licence level.

Table 4.7. Summary of landed weight and value of BC fisheries included in the traceability data review[23]

Fisheries Sector	No. Licences	Landed Wt. (tonnes)	Landed Value ($ millions)
Halibut	435	5,450	48
Sablefish	48	1,900	15
Rockfish	262	790	5
Schedule II	541	5,280	3
Groundfish Trawl	142	98,100	66
Herring Roe	1523	24,600	37
Herring SOK	46	390	9
Tuna	209	5,140	18
Salmon (Gillnet, Seine, Troll)	2221	33,100	57
Geoduck	55	1,820	39
Prawn Trap	252	1,700	18
Red Sea Urchin	110	4,770	8
Green Sea Urchin	49	120	1
Sea Cucumber	85	1,150	2
Crab	222	4,090	28
Shrimp Trawl	245	2,000	5
Total		**190,400**	**358**

4.3.3 Traceability Issues – Harvest Level

A gap analysis between the traceability requirements (Table 4.1) and the fisheries data requirements (Table 4.6) was used to identify whether the required traceability information is being collected for specific fisheries. Identified data gaps for specific fisheries are provided in Table 4.8 (end of Section 4.0) and in the State of Readiness report cards (Section 5.1). This analysis, and subsequent interviews with processors (Section 4.3.4) identified a number of general data issues at the harvest level of the supply chain which are summarized below.

A. Most of the required data at the harvest level is collected but product identifiers are lacking

Product description information – Generally this information is complete and well documented. Usually this is the same information used for fisheries management purposes.

Business identification information – Harvester and buyer identity information is documented but transportation details such as who the transporter is, when and where products were picked up, by which vehicle, and when and where they were delivered is not well documented within existing fisheries data programs. Better transportation documentation exists in validated fisheries than non-validated fisheries. Bill of ladings and buyer delivery records are not included in Table 4.6, and are likely a better source of transportation information than fisheries management sources, therefore the integration of this information is required.

Product identification – The identification of products by batch numbers, trade unit ID's and logistic unit ID's are virtually non-existent in most fisheries except for spawn-on-kelp where there are shipment numbers and tote numbers to identify products. Validation numbers used in dockside monitoring programs could serve as batch numbers. Product identification is one of the

[23] Source: GSGislason and Assoc. Ltd. 2004. BC seafood sector and tidal water recreational fishing: a strengths, weaknesses, opportunities and threats assessment

most important elements for traceability and the lack of product identification from harvester to processor is a major constraint to meeting traceability for this level of the supply chain.

B. Data systems vary greatly and data transfer is often ineffective

The required traceability data elements are recorded by a variety of data systems and data parties. If this information is not stored and readily accessible with a data responsible party at a single location for each step in the supply chain, the traceback of a product will be slow and inefficient.

Creation and maintenance of records – All the data systems investigated were paper based with most information subsequently entered into either spreadsheets or databases. Using paper based systems requires data to be recorded in a timely manner; however, the timeliness of subsequent data entry into electronic data systems can be quite variable. For example, some harvest logs may not be entered into an electronic system for over a month after the fishing event. Although there is no *requirement* to have data in an electronic format, it is more efficient to search for data electronically in the event of a trace back.

Accessibility of records – The accessibility of fisheries data is variable. Some harvest information is sent directly from the fisher to DFO. This information would not be considered accessible, nor would likely be accessible in a timely manner. The accessibility of information is dependant to some degree on the nature of third party catch monitoring contracts. Some contracts are through DFO while others are through industry associations. The information collected under fisheries monitoring programs is protected under the Privacy Act. Information from these programs can be used publicly provided it is not specific to an individual. For traceability purposes, it is important to know the identity of the business (or harvester) as well as the product information, suggesting a problem may exist in using fisheries information for traceability purposes. However, personal identity information is already being provided by harvesters to transporters and buyers for business transaction and invoicing purposes, which suggests harvesters should be able to give consent to allow their information to be used for purposes other than fisheries management.

Compatibility and redundancy of data systems – The level of data system compatibility that exists through the supply chain is limited to paper records passed from one business to the next. There is virtually no communication of data electronically from water to buyer and there are duplicate systems in place recording similar information for different purposes. Processors do not generally use validation records as part of their internal data records (dive fisheries may be an exception). Two tally sheets are often created for an offload, one completed by an observer for fisheries management purposes and one created by the offloading company for business and invoicing purposes. Offload tallies and validation records are reconciled at the offload but the validation record is generally not used by the processor, leading to duplicate entry of offload information into separate data systems. The integration of these data systems would generate efficiencies for both processors and catch monitors.

Although the scope of this project does not cover the entire supply chain, it should be noted that traceability must extend throughout the supply chain (i.e. record keeping must be seamlessly linked throughout the chain to allow for effective and efficient communication). The traceability system eventually implemented at the harvester/buyer level should be compatible with the systems of all downstream players in the chain (all the way to the retail level). Since this need for compatibility extends to players in export markets, the use of globally recognized standards (e.g. the EAN numbering system) would improve compatibility with global partners.

C. Data systems are only partially verifiable.
At certain points in the supply chain, some data systems are verifiable. Dockside monitoring programs would be considered verifiable as they are carried out by a third party, but these programs are currently focussed on collecting data for fisheries management purposes. QMP systems are audited by federally authorities to ensure food is processed in a safe manner. Hails or fish slips are not be considered verifiable since there is no way to prove the information is accurate.

D. Data responsible parties are not clearly defined.
Much of the required information for traceability is collected through a variety of systems and parties in the supply chain including harvesters, monitoring service providers, transporters and buyers/processors. Although the traceability data required for any one party may be collected, that data is typically being collected, and held by two or three different parties. This situation is clearly not efficient in the event of a trace back nor is it acceptable according to verification requirements of the US Bioterrorism Act and COOL. It is important that a data responsible party be specified for each partner in the supply chain.

4.3.4 TRACEABILITY ISSUES - PROCESSING LEVEL

Since much of the response to changing export regulations lies with the processing sector, a series of interviews were conducted with processors to determine current traceability practices at the processing level in order to identify issues of concern to the BC seafood industry in meeting new traceability requirements. Processors were selected for an interview based on the species, product and export markets focus of their business. A total of seven processors were interviewed (Table 4.9).

Issues and themes related to opportunities and barriers to implementing traceability in the BC seafood industry identified as a result of the interviews are summarized below.

Table 4.7. List of processing companies interviewed about traceability practices.

Processing Company	Interview Contact	Products Sold	Primary Export Markets
Seaworld Fisheries	Tony Wong	Geoduck, crab, prawns	China, US, Asia
Aero Trading	Yuki Hamakawa	Roe herring, spawn on kelp, sablefish, tuna, prawns, halibut, salmon, crab	Japan, US, EU
Canadian Fishing Company	Ralph Drew and Kate Abraham	Salmon, herring	US, Canada, EU, Japan
Ocean's Fisheries	Doug Safarik	Salmon, herring, groundfish	US, Canada, EU, Japan
Finest At Sea Ocean Products	Paul Chaddock	Salmon, sablefish, groundfish, tuna	Canada, US
Lions Gate Fisheries and S&S Seafoods	Carl Caunce, Ty Dewar,	Groundfish, halibut, shrimp, salmon	Canada, US
North Sea Products	Thomas Okuma	Roe herring, sablefish, tuna, prawns, halibut, salmon	Japan, US

A. Product pooling may occur at various stages of the supply chain

The moment that product is pooled, traceability to a specific boat is lost. In some fisheries such as salmon and roe herring, pooling of product is common as a result of the way those fisheries are managed. None of the regulations reviewed *require* traceability to a single vessel/harvester (except CSSP/QMP for bivalves). For example, the EU General Law requires the traceability of food at all stages (you must be able to say where it came from) however, this does not preclude mixing or pooling of product from multiple sources.

> *"The Tracefish scheme does not demand perfect traceability, i.e. that a particular retail product should be traceable back to a single vessel or farm and batch of origin, or vice versa from origin to destination. Pragmatically it is recognized that mixing of units is likely to occur at a number of stages in the distribution chains, e.g. in grading at auction markets prior to sale and in the processing of raw materials into products. Where such mixing occurs, the food business is transforming the trade units. The requirement for traceability is that the business records the IDs of the received trade units that may be input to each created trade unit, and vice versa. The particular product is then traceable back to a finite number of vessels or farms and batches of origin, and vice versa."*[24]

The notable exception is the requirement to segregate product by country of origin under COOL legislation. Currently, some Canadian packers and processors mix product caught in US and Canadian waters. According to representatives of the Agri-Food Trade Service, this mixing would not be acceptable under COOL; rather, all product will be required to remain segregated by country.

If the mixing of product units occurs, it is essential that the ID of each unit contributing to the mixed consignment be recorded. This would ensure that even if the physical traceability of the *individual* product units were lost, their presence within the mixed consignment would be known (in case a trace back was initiated). Interviews with salmon processors indicate that this form of pooled trace back could be achieved in the salmon fishery, however the trace back process would be time consuming, requiring queries from an number of different data sources.

Although traceability systems do not preclude pooling, risk is increased each time product is pooled. For example, if a food safety problem arises in pooled product sourced from a number of vessels, all of the vessels and all areas fished within the pool would be implicated in the problem. If product had not been pooled, the problem could be traced to a specific vessel or area, and the vessels fishing other areas would be unaffected.

B. Traceability can facilitate improvements to product quality

For fisheries where harvesters are paid a differential price based on quality, "water to buyer" traceability systems have to be established. This is generally the case for groundfish trawl, but not the salmon fishery. In general, processors do not pay harvesters based on product quality for salmon because much of the product is pooled on packers and traceability to individual vessels is lost. Under this system there is no incentive for a harvester to deliver a product of higher quality. A good traceability system can help buyers with quality control, as it provides a tool to

[24] Source: http://www.tracefish.org/

determine which harvesters are meeting quality standards and which harvesters need to improve the quality of landed product.

Several smaller processors (Section 3.4) are using traceability information from harvesters (vessel, date of catch, method of harvest) to access higher valued niche markets (i.e. the restaurant trade). Some processors are appealing to the consumers' appetite for knowledge by marketing information such as where and when the fish were caught and how they were stored on board the vessel. In addition, sector wide initiatives (product labelling on frozen-at-sea prawns) are seen as a definite advantage in markets like Japan.

C. Traceability is often implemented on an "as required" basis

Many processors react to regulatory changes or consumer demand. Concern about costs means that only minimum requirements are met. Proactive, non-regulatory business case advantages are often not recognized.

D. Most processors do trace product through the plant

In general, processors have traceability systems in place within the processing facility by use of batch numbers, lot numbers or sales order numbers. Current data systems in processing plants consist of paper and spreadsheets. Bar code systems were not used by any of the processors interviewed. Most of the required traceability information from water to buyer is being collected, but effective one-up, one-down traceability is lacking.

E. Market driven fisheries have a traceability advantage over opportunity driven fisheries

The fisheries management regime can be a barrier to addressing quality and traceability issues due to the "rush" to move large amounts of product to the processor in a short period of time. In general, IQ managed fisheries are slower paced with fishing activity more closely linked with market demand. Some IQ fisheries focus on product quality through better product handling. One of the best examples of market based fishing is the geoduck fishing. Each day, an order is placed by buyers to harvesters for how many geoducks to harvest. Fisheries such as salmon are not as fortunate. The current salmon management regime forces fast paced fishing and product pooling in order to transport the high volumes of fish caught in short periods of time. The latter scenario is clearly more challenging for implementing an effective traceability system.

F. Consumer driven demand for product information/history is not a major driver in many BC fisheries

Globally, there is an increasing demand from consumers to know more about food products and their production history. At present, consumer demand for BC seafood seems to be driven more by quality issues rather than by product knowledge or history. This may change with increased recognition of MSC certification and the development of product information systems such as cell phone links to product data in Japan (Sections 3.1 and 3.5).

G. Cold storage facilities are a "weak link" in the traceability chain

Processors remarked that inventory information systems vary considerably among cold storage facilities, and that frozen product (especially salmon) is often stored by processor, species, grade and year, with no further identification to facilitate trace back to processor batch numbers or the harvester. Although this step is beyond "water to buyer" level in the supply chain, addressing

this weak link will be a major challenge to meeting full supply chain traceability for frozen product. Cold storage facilities were also identified as one of the biggest problems for Fisheries Officers attempting to determine origin or ownership and legitimacy of stored seafood products, as it is very easy to mix legal and illegal product with current record keeping practices (S. Roxburgh, Speyside Environmental Consultant, pers. comm.).

H. There is a cost associated with transporting and storing partial containers

Due to space constraints and the associated costs of transporting and storing seafood products, totes may be topped up (product pooled) to gain cost efficiencies. With the implementation of traceability, this practice may be more difficult or undesirable. For fisheries where production volumes are low and catch is commonly separated into species or grades, consideration should be given to using smaller containers for transportation and storage rather than the standard large sized, insulated fish totes.

I. Live product is often not segregated by harvester or fishing area and batching may be poorly documented

It is more difficult to segregate live product during transportation (live rockfish) and at the processing plant (Dungeness crab). In many facilities it is not routine practice to document batching for live holding tanks (except possibly by harvest area). Although this "gap" can be addressed at the transportation/processing level by improved batching records, the pooling of live product through distribution chains will prove to be a major obstacle to full traceability (R. Bulmer, Ron Bulmer Consulting Inc., pers. comm.)

J. The health and safety rationale for increased traceability requirements is considered questionable by many seafood processors.

Processors commented that existing QMP programs based on HCCAP adequately deal with the health and safety risks associated with seafood processing and distribution (i.e. existing batch traceability for canned products, QMP programs for bivalves and cooked shellfish). Several processors commented on the ability of the BC salmon canning industry to track every can of salmon back to a specific plant, date and retort batch from the can label. From a health risk management perspective many processors do not consider it necessary to incorporate full "water to buyer" traceability into QMP programs. This adds a "resistance factor" for implementing these traceability measures.

K. There is a need to integrate information technology with fish processing operations.

The cost of implementing traceability is a concern to processors. Processors are cautious to adopt new technologies (i.e. bar codes) due to concerns over how they integrate with the existing processing line operations (including the dynamics of supplying fresh market demand). Those processors who had investigated technological solutions (e.g.. bar codes) were not confident that they were presented with a workable system. This is in part due to poor understanding of technology on the part of processors and poor understanding of fish processing operations by technology suppliers.

It is clear from the issues outlined above that challenges exist for BC fisheries to transform their current data recording systems into an effective traceability system.

4.4 OVERVIEW OF FINFISH AQUACULTURE TRACEABILITY PRACTICES

4.4.1 Data Sources

Each link in the upstream finfish aquaculture supply chain (feed manufacturer to breeder to fish processor door) is responsible for collecting traceability-related information. The following inset box provides overview of the type of information collected by each supply chain link to facilitate traceability.

Feed manufacturer **-** To provide "one up" traceability for each ingredient incorporated into the feed, the fish feed manufacturer is responsible for recording the source, transporter, and receipt of each ingredient. "One down" traceability is achieved by recording the destination, transporter and delivery of each unit of feed dispatched.

Breeder **-** The breeder provides "one up" traceability by maintaining the ability to identify each fish or animal in its breeding stock and by maintaining accurate records of the collection, fertilization, and storage of eggs linked to individual from the breeding stock. "One down" traceability is achieved by recording the destination, transporter and delivery of each unit of eggs dispatched.

Hatchery **-** The hatchery provides "one up" traceability by maintaining the identity of the source of its eggs and the genetic identity of each unit of fish in the hatchery. In addition, a hatchery maintains detailed traceability records of all feed, medication and other inputs (e.g. water conditions) for each unit of fish as they grow and are transferred into progressively larger rearing tanks. "One down" traceability is achieved by recording the destination, transporter and delivery of each unit of juvenile fish dispatched.

Farm (Grow-out facility) **-** Maintaining the identity of the units of fish transferred from the hatchery provides "one up" traceability for the farm. In addition, the farm maintains detailed traceability records of all feed, medication, and other inputs for each unit of fish as they grow. "One down" traceability is achieved by recording the destination, transporter and delivery of each unit of fish dispatched.

Live fish transporter **-** Live fish transporters maintain traceability by recording the source, destination, reception and delivery of each unit of fish transported. Any pooling of pens of fish to accommodate transport is also recorded.

4.4.2 Traceability Systems and Practices

The following review of current traceability systems and practices were identified primarily from interviews with the following BC aquaculture companies:

1. Marine Harvest – provided information covering upstream finfish aquaculture supply chain from breeder to processor.

2. Target Marine – provided information covering upstream finfish aquaculture supply chain from breeder to processor.

3. Aquatec Seafoods Ltd. – provided information covering farm to processor link of finfish aquaculture supply chain.

4.4.2.1 Type of Information Collected

The types of information recorded by BC finfish aquaculture companies can be characterized into three categories (A) fundamental traceability information, (B) specifically required information and (C) commercially desirable information.

A. Fundamental traceability information

Fundamental traceability information is that information required to identify the product and trace its physical movement through the supply chain. For each stage in the supply chain, the fundamental information recorded includes:

- Unit (e.g. hatchery, farm site etc.) ID and location
- Quantity, nature and unit IDs of product received by the business
- ID's of the previous food businesses from whom those units were received
- Dates/times and places of reception
- Quantities, nature and unit IDs of product dispatched by the business
- ID's of the next food businesses (to whom those units are dispatched)
- Dates/times and places of dispatch
- 'Mapping' relationships between the units received and the units dispatched (when units are transformed by the business).

B. Specifically Required Information

Information required by legislation to be recorded at appropriate stages of the finfish aquaculture supply chain includes:

- Species, method of production and area of origin – required by US Country of Origin legislation. Therefore, it must be passed along the supply chain from production onward.
- Product description as required by US Bioterrorism legislation
- Animal health and disease control information including therapeutant usage

C. Commercially Desirable Information

Commercially desirable information about the nature of the product and the circumstances of its production is recorded by finfish aquaculture companies for a variety of reasons. These reasons include maximizing the efficiency of operations; limiting liabilities under product liability and safety legislation; assuring the safety and quality of products; enabling accurate labelling; and substantiating marketing claims. Examples of commercially desirable information include much of that listed above as well as:

- Details of raw materials, products, processes and controls
- Ethical information on the nature of the fish farming, on their sustainability and on their environmental impact
- Date of harvest of the fish
- Data on temperature control through the chain
- Information on quality/safety programs

4.4.2.2 Evaluation of Traceability Practices

Product identification - Depending upon the specific stage in the supply chain, the identification of products within the finfish aquaculture supply chain is based upon batch numbers, tray numbers, tank numbers, pen numbers and lot numbers. Identity based upon these designations provides an excellent level of identity traceability from broodstock to processing (and beyond) and is readily equated to the EAN trade unit/logistic unit system.

While identification begins at the breeding unit, with broodstock being individually identified, pooling and grading during the hatchery and grow-out phases generally prevents traceability back to an individual brood fish. Nonetheless, documentation of all pooling and grading does allow trace-back to a limited number of brood fish. Some of the finfish aquaculture managers interviewed acknowledged that pooling of penstock as a result of grading activities increased the potential for record keeping errors as well as increased the potential impact of a food safety issue

occurring further downstream. However, they indicated that the existing extent of pooling was dictated by essential hatchery and farm management practices.

The level of pooling in the BC finfish aquaculture industry is completely compatible with the benchmark traceability requirements that were reviewed during this project (see Table 4.2 for complete list). As stated previously, Tracefish does not preclude pooling of product - it only requires that the ID of the pooled product be linked to the ID's of all inputs. Traceability requires only that the mapping relationship is known.

Business identification - The identity of each business unit (e.g. hatchery, farm site, processing plant) is well identified and linked to product identities by all finfish aquaculture companies interviewed. Transportation business identity information is also well documented.

Product description and production information - There is a huge range of information of potential interest to downstream players in the finfish aquaculture supply chain and regulatory agencies. Given this fact, as well as country-specific production and market requirements, Tracefish states that its information specifications (presented in Table 4.2) cannot itemize the specific information that may possibly be required in every situation. As a result, Tracefish 'recommended' and 'optional' product description/production data elements shown in Table 4.2 should be viewed as the general 'type' of information that should be recorded rather than the specific data elements to be recorded by the BC finfish aquaculture industry.

By relying upon the Tracefish data elements as a guide, this study considers that the BC finfish aquaculture industry is currently recording an appropriate set of product description/production information.

Transportation related information - In addition to documenting the identity information of transporters, finfish aquaculture businesses and transport businesses link product identity information to data elements related to source and destination; time/date of reception and dispatch; and quality control checks.

4.4.2.3 Evaluation of Data Systems

The BC finfish aquaculture industry records its traceability data elements in computer-based data recording systems. In some cases, paper-based records are also maintained. The rationale for the duplicate paper records is that, while computer based systems are more efficient, system failure could result in the loss of essential information.

A. Traceability Software Solutions

Examples of the computer-based traceability systems used in finfish aquaculture include NuTrace, FarmControl (now know as WiseFarming) and Superior Control (also see Section 2.9.2).

As part of Nutreco, Marine Harvest represents a vertically integrated company with business units at all production stages of the finfish aquaculture supply chain. Through the implementation of their ***NuTrace*** system, Marine Harvest has a traceability system that provides fully transparent traceability from feed-to-fork. The underlying concept for NuTrace is that of a

data warehouse: data from each stage of the value chain is submitted on a continuous basis to a central server. The NuTrace software is designed to identify, link and cross link data to create a chain of knowledge from feeding and breeding to delivered product.

FarmControl (WiseFarming) is a Windows-based fish farm management system designed to meet the EU traceability requirements. This system imports data from other fish farm equipment, imports/exports data to follow fish transfers to other sites, and exports data to other systems and programs. The FarmControl *History Report* demonstrates (in text and graphic form) the movements of fish while on the farm. By identifying fish movements associated with grading and harvesting etc., the integrity of the fish in any unit is ensured. In addition, each unit of fish sold or transferred to another facility can be given a *Product Certificate* which summaries all the key indicators for that group in the period required. In addition, the FarmControl *Production Report* gives a detailed account of all activities in a summarized front page as well as detailed backup documentation.

In addition to providing product identity traceability, FarmControl also provides important animal health and husbandry functions. Both the *History Report* and the *Product Certificate* detail medication and vaccine usage. In addition, the system warns the user if fish units with incompatible health/treatment histories are about to be mixed. Feed types and volumes of feed and pigment are shown on the *Feed Report* and *Production Report*.

FarmControl instantly updates after each registration. As a result, the user has the assurance that information in reports is as up to date as possible. The FarmControl reports can be used to follow a unit or group of units for set periods of time – thereby enabling performance comparisons between both unit and period. The period can be further broken down by day, week or month.

FarmControl can be integrated with other systems and sophisticated modes of operation. For example, it can be used on-site or linked to terminal server applications in larger multi-site operations. This capability enables centrally based managers to access current data on-site, thereby providing information on single units, sites or the whole operation for management decisions.

B. Accessibility of records

As indicated by the previous examples, the implementation of a single traceability system by all units of a vertically integrated business provides managers with easy access to unit-specific information. Moreover, while not all finfish aquaculture companies have full vertical integration, the degree of integration greatly reduces the confidentiality concerns that can arise through easy accessibility.

C. Compatibility of data systems

The implementation of a single traceability system by all units of a vertically integrated business also eliminates issues related to the incompatibility of data systems. As a result, data system incompatibility was not an issue for the finfish aquaculture businesses interviewed.

D. Verification of data systems

As indicated previously, Marine Harvest has recently been certified by the ISO 9001 Quality Management Program. As part of this program, its traceability system will be verified by a third party auditor. Due to the competitive nature of the finfish aquaculture industry, it is likely that other BC companies will undertake similar certification in the future. In addition, as indicated previously, several large volume retailers currently conduct audits of the traceability systems of their finfish aquaculture suppliers.

4.4.3 Summary Analysis

Most BC finfish aquaculture businesses exhibit a high level of vertical integration. Their involvement in many stages of the aquaculture supply chain allows them to implement effective traceability systems covering the entire upstream chain, from breeding to processor. In addition, data on feed, medication, and other inputs used in the rearing process are readily recorded by these systems. These traceability systems readily allow them to meet all of the traceability requirements presented in Table 4.2.

While the downstream finfish aquaculture supply chain was not encompassed by this project, representatives of both finfish aquaculture businesses interviewed indicated that post-processing cold storage may represent a 'weak link' in their product traceability. The representatives expressed concern that cold storage companies do not keep an accurate record of inventory. In addition, these cold storage companies may transform logistic units without recording the appropriate transformation information. Since a finfish aquaculture traceability system is only as strong as its weakest link, it would seem imperative that cold storage traceability be elevated to a level equivalent with that of the upstream portion of the chain.

Since finfish aquaculture companies throughout the world have implemented similar sophisticated traceability systems, BC companies do not necessarily derive a competitive advantage from the use of such systems. Instead, BC finfish aquaculture companies have implemented traceability systems for the following reasons:

1. Regulatory requirements. Traceability systems allow finfish aquaculture companies to meet both general production and export regulatory requirements, as well as species-specific regulatory requirements[25].

2. Market requirements. Some high volume buyers of farmed salmon apply rigorous traceability standards to their enterprises and demand the same standards of their suppliers (see Section 3.4).

3. Production/Management Tool. As 0utlined in Section 3.3 the finfish aquaculture industry relies on traceability to improve production and management practices.

[25] To protect wild sturgeon from over-exploitation through commercial trade, the species has been placed on the International Trade in Endangered Species List. To allow Target Marine to market farmed sturgeon, each fish must be tagged with a serial code. Moreover, families of Target Marine sturgeon have been DNA profiled. As a result, each sturgeon can be tested against the wild sturgeon DNA profiles to ensure that poaching has not occurred.

Although meeting traceability requirements does not impart a general competitive advantage to the BC finfish farming sector, several related initiatives such as third party audits and organic certification may do so.

4.5 OVERVIEW OF SHELLFISH AQUACULTURE TRACEABILITY PRACTICES

4.5.1 Data Sources

Elements of traceability are present in the records of the upstream shellfish aquaculture supply chain partners (hatchery to processor). The following inset box provides an overview of the type of traceability information that may be held by specific supply chain partners.

Hatchery - A minimal level of "one down" traceability may be achieved through invoices identifying the destination and the transporter. The invoice number would also serve as a unique identification number for the 'batch' of product shipped. All shellfish seed businesses are identified by a unique certification number.

Nurseries - "One up" traceability may be achieved through invoices identifying the source, transporter and date of reception of hatchery seed. The invoice number should also serve as a unique identification number for the 'batch' of product received. "One down" traceability may be achieved through invoices or nursery records of the destination and date of dispatch of each unit of boosted seed dispatched.

Farm - "One up" traceability may be achieved through invoices identifying the source and date of reception of nursery seed. The invoice number should also serve as a unique identification number for the 'batch' of product received. Where the nursery and the farm are vertically integrated, "one up" traceability may be achieved through records linking the grow-out raft number and date of reception to the FLUPSY bin number of the boosted seed. "One down" traceability is achieved through the information recorded on harvest tags and bills of lading in compliance with the requirements of the CSSP and the Vp Control Program.

Live shellfish transporter - Invoices and packing slips should provide live shellfish transporters with a degree of traceability by recording the source, destination, and date of reception. As a requirement of the Vp Control Program (see Section 4.4.2 below), the traceability-related information recorded by the transporter is substantially increased for half shell oysters during the summer months.

4.5.2 Traceability Systems and Practices

The following review of current traceability systems and practices were identified primarily from interviews with the following BC aquaculture companies:

1. Aquatec Seafoods Ltd. – provided information covering farm to processor link of finfish aquaculture supply chain
2. Odyssey Shellfish Ltd./Stellar Bay Shellfish Ltd. – provided information covering the upstream shellfish supply chain from hatchery to processor.

4.5.2.1 Type of Information Collected

The types of information recorded by BC shellfish aquaculture companies can be characterized in a manner similar to finfish aquaculture: fundamental traceability information; specifically required information and commercially desirable information.

A. Fundamental traceability information

The type of fundamental traceability-related information that may be recorded in the shellfish aquaculture supply chain includes:

- Name and location of business enterprise (e.g. hatchery, farm site etc)
- Quantities, nature and "lot numbers" (e.g. invoice numbers) of product received by the business
- Name and location of previous food businesses from whom those units were received
- Dates of reception
- Quantities, nature and "lot numbers" (e.g. invoice numbers) of product dispatched by the business
- Dates of dispatch

B. Specifically Required Information

- Shellfish farms, transporters and processors record specific information as required by the QMP, CSSP and Vp Control Program. This information appears in Table 4.3.

C. Commercially Desirable Information

Some of the information recorded to meet regulatory requirements could also be considered as 'commercially desirable information' in other words, this information would limit liabilities under product liability and safety legislation, assure the safety and quality of products and enable accurate labelling. However, little information is recorded to gain a competitive advantage in the marketplace.

4.5.2.2 Evaluation of Traceability Practices

A. Product identification information

The identification of products using the specific designations of lot/batch numbers, trade unit ID's and logistic unit ID's is not used extensively in the upstream shellfish aquaculture supply chain (hatchery to processor). Currently, batches of shellfish lots are identifiable via invoice numbers, delivery slips and bills of lading, and harvest tags. The information recorded on harvest tags accommodates the traceability of batches of shellfish lots between the farm and the processing plant. The Vp Control Program implements a further degree of formality to the farm-to-processor traceability through the designation of unique lot numbers. Since the information on the tag and bill of lading is retained by the processing plant, traceability of shellfish lots between farm and plant is accomplished.

The current level of identity traceability within the upstream supply chain does not uniquely identify individual units of shellfish. Therefore, this level of traceability does not meet the requirements of the sophisticated level of traceability envisioned by Tracefish-related schemes. However, the current industry product handling practices could theoretically accommodate enhanced levels of traceability. For example, product is transferred between supply chain participants in smaller 'units' (e.g. bags/sacks, boxes, totes etc.). Multiple smaller units are shipped in a larger 'unit' (e.g. seed shipments from hatchery to nursery) or are transported as part of a larger shipment (e.g. shell stock shipments from farm to processor). This method of shipping product could readily accommodate an EAN numbering system where the smaller units would be designated as 'trade units' while the larger shipping units would be designated as 'logistic units'.

Nursery rearing systems and raft culture systems depend upon extensive grading and sorting to achieve consistent rates of growth and development. This grading/sorting necessitates a

considerable amount of product pooling. Current record keeping at the nursery and farm do not meet Tracefish requirements for documentation that maps transformations that occur between inputs and created units. For example, neither the transformations of specific units (lots) of seed within the nursery nor the transformations of units/lots of brood stock on the farm are fully documented. Many growers may currently view this level of traceability as unnecessary. Moreover, even the most progressive growers may encounter difficulty in approaching this level of traceability mapping until greater automation and technological innovation are achieved.

Beach culture of shellstocks also presents a formidable challenge to mapping and verifying the relationships between inputs and created outputs. For example, a significant portion of harvested beach cultured shellfish may originate from wild seed.

B. Business identification

The farm is well identified – and linked to product 'lots' – by the harvest tag and the Vp Control Program bill of lading. Since the information on the tag and bill of lading is retained by the processing plant, "one-up" traceability to the farm is readily accomplished. "One-up" traceability linking the hatchery identity to product received at the farm is much less formal and depends largely upon invoices and bills of lading. Transportation business identity information also lacks the formal documentation envisioned by Tracefish. With the exception of half shell oyster shipments during summer months, the identification of transport businesses relies on shipping records.

C. Product description and production information

There is a range of information of potential interest to downstream players in the shellfish aquaculture supply chain. Given this, as well as country-specific production and market requirements, the information requirement presented in Table 4.3 cannot itemize the specific information that may possibly be required in every situation. As a result, the 'recommended' and 'optional' product description/production data elements shown in Table 4.3 should be viewed as the general 'type' of information that should be recorded – rather than being regarded as the specific data elements that should be recorded by the BC shellfish aquaculture industry.

Overall, the BC shellfish aquaculture industry is currently recording most of product description and production information needed for safety and quality concerns. One food safety data element requirement identified by industry members interviewed was the regular recording of fecal coliform levels within shellfish meats. Currently, one aspect of the CSSP is based upon Environment Canada monitoring fecal coliform levels within growing waters, with CFIA conducting random tests of meat levels at the processing plant. Industry members cited instances where fecal coliform levels measured in growing waters permit harvesting, yet coliform levels measured in shellfish harvested from those waters exceeded permissible levels. As some important export markets rely upon testing coliform levels in shellfish meats, the documentation of meat testing data may be valuable for shellfish growers and processors.

D. Transportation related information

In addition to documenting the identity information of transporters via shipping records etc., shellfish aquaculture businesses and transport businesses link 'lot' identity information to date of reception and dispatch. Temperature and quality control information is recorded as required by the QMP and Vp Programs.

4.5.2.3 Evaluation of Data Recording/Storage Systems

A. Creation and maintenance of records

Data recording systems within the upstream supply chain are paper-based. There is no requirement to have data in an electronic format, although electronic systems may be more efficient than paper systems in the event of a trace back.

B. Compatibility of data systems

The level of data system compatibility that exists through the upstream supply chain is limited to paper records (invoices, bills of lading etc.) passed from one business to the next. There is virtually no communication of data electronically through the upstream supply chain.

Progressive grower/processors expressed interest in the implementation of computer-based traceability systems. However, the opinion expressed was, given the nature of the nursery/farm management practices, custom-built systems may be required. If custom systems were in fact necessary, it would be prudent to ensure that these systems are compatible with the data systems used by the downstream portion of the supply chain.

C. Accessibility of records

Information related to the farm-processor link of the chain is readily accessible. Harvest tag information is retained by the processor and this information provides a direct link to the farm. The accessibility of information upstream from the farm-processor link may be much more difficult to efficiently access. As indicated previously, most information recorded is paper-based and does not necessarily pass between supply chain participants.

D. Data responsible parties

The CSSP, processor QMP plan and the Vp Control Program clearly stipulate the data responsible parties for their specific data requirements within the farm-processor link of the supply chain.

E. Verification of data systems

As indicated in the finfish aquaculture section (Sect. 4.4) of this report, the BC finfish industry is beginning to seek certification by third party audited quality management programs. As an integral component of these programs, the program's traceability system will be verified by a third party auditor. Shellfish aquaculture industries in other regions of Canada (e.g. the Newfoundland mussel industry) are also seeking certification of their quality management programs. If BC shellfish aquaculture follows the lead of these other industries in the implementation of quality management regimes, their traceability systems would be verifiable.

4.5.3 Summary Analysis

The following issues have been identified with respect to meeting traceability requirements for shellfish aquaculture. Some of these issues (growout to processor) are also applicable to the wild harvest of intertidal clams.

A. US Bioterrorism Act Requirements

The USBTA "one up" traceability requirements for the processor are likely met through the CSSP/QMP/Vp requirements, depending upon how specifically the requirements are applied.

B. US Country of Origin Legislation

With regard to the US COOL, the upstream shellfish aquaculture supply chain may not currently be meeting the labelling or verification requirements of this legislation. For example, shellfish grown in BC from US-origin seed are considered a "mixed origin" product under COOL. Mixed origin products are defined as:

> *Products with an origin that includes processing steps (e.g. hatched, raised, harvested and processed) that occurred in more than one country, including the United States*

On the basis of the sample 'mixed origin labels' provided by the Canadian Agri-Food Trade Service, shellfish grown in BC from US-origin seed should be labelled as:

> *"Farm-raised [shellfish species] hatched in the USA and raised, harvested and processed in Canada."*

Moreover, if BC shellfish nurseries/farms are pooling seed from both US and Canadian sources, the shellfish would be considered "blended products" under COOL on the basis of their multiple countries of origin. According to the legislation, blended products must be labelled as follows:

> *Each specific origin included in the blend must be included on the label in alphabetical order.*

Given the importance of the US as a market for BC shellfish, it would also seem prudent for upstream supply chain participants to ensure that they are in compliance with the labelling and record keeping requirements of the US COOL. In addition, the current inability to track the pooling-related transformations in the nursery and farm (see below) may make the verification of origin very difficult.

C. Input/Output Linkages

'Mapping' relationships between the units received and the units dispatched (when units are transformed as a result of sorting and pooling activities) are poorly documented. One reason for this poor level of relationship mapping is that few shellfish growers recognize the value of mapping as a production tool. However, even the most progressive growers find the mapping of relationships challenging due to current methods of production and management.

D. Hatchery-to-Farm Traceability.

Traceability between these links in the shellfish aquaculture supply chain may only be possible through invoices. With regard to invoice based traceability, the EU General Food Law Guidance document[26] stated the following:

> *Food crises in the past have shown that tracing the commercial flow of a product (by invoices at the level of a company) was not sufficient to follow the physical flow of the products…it is essential that traceability system of each food/feed business operator is designed to follow the physical flow of the products…*

[26]Source: http://europa.eu.int/comm/food/food/foodlaw/guidance/guidance_rev_7_en.pdf

For these reasons the current level of traceability within the BC shellfish aquaculture industry differs significantly from the integrated traceability systems employed in the BC finfish aquaculture industry. Factors contributing to this difference include:

- Vertical integration within the shellfish aquaculture industry is very limited as the BC industry is made up primarily of independent growers.
- Many BC shellfish farms have traditionally operated as family or 'lifestyle' businesses. They have often employed a ranching approach to farming whereby the traceability of identities is difficult.
- As the industry has moved from a ranching approach to more intensive farming practices, with production moving from beaches to deep water systems, new challenges to product traceability have arisen. For example: raft cultured shellfish require considerable grading and sorting to ensure a consistent rate of growth and development. The amount of product pooling associated with grading/sorting makes the mapping of identity relationships extremely difficult.

The existing level of traceability within the upstream portion (hatchery to processor) of the BC shellfish aquaculture supply chain is largely a function of the need to meet food safety regulatory requirements. The value of traceability as a production/management tool and/or a means to meet market requirements plays a far smaller role within the industry.

1. **Regulatory requirements.** The traceability practices of shellfish aquaculture have primarily been implemented to allow growers to meet the food safety requirements of the Canadian Shellfish Sanitation Program (CSSP), the Quality Management Program (QMP) and the *Vibrio parahaemolyticus* (Vp) Control Program. Some members of the industry interviewed for this project could see little need for the implementation of a more sophisticated form of traceability. However, other members could clearly appreciate the value of a higher degree of product traceability – particularly as a production/management tool.
2. **Production/Management Tool.** As indicated, very few shellfish growers utilize traceability as a production/management tool. However, to assess its potential in this area, an interview was conducted with one of BC's more innovative and technologically advanced grower/processors. For this grower/processor, the driving force for a higher level of traceability (i.e. beyond that required by food safety regulations) has been the desire for improved internal management control. This grower/processor believes that only through improved traceability will businesses be able to determine the actual cost of growing product, and that automation and standardization (with its associated requirement for improved identity traceability) are the keys to competitiveness within the shellfish industry.
3. **Market requirements**. Even the more progressive grower/processors interviewed viewed market requirements and issues of competitive advantage as only indirect drivers for improved traceability within the upstream shellfish aquaculture supply chain.

The current level of traceability (including the farm-processor link) does not meet the level of sophistication envisioned by Tracefish-related systems. Globally, Tracefish-related standards are becoming the benchmark for evaluating traceability practices and many countries may eventually implement traceability requirements based upon Tracefish standards and it would be

prudent for the BC shellfish industry to become more cognizant of the basic standards for identity traceability as defined by Tracefish.

Table 4.1 Wild Harvest Fisheries: Traceability Requirements for the Harvester

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	US Bioterrorism - Effective December 2003	US Country of Origin Labelling Effective September 30, 2004	CFIA - CSSP Shellfish Specific	CFIA - QMP Shellfish Specific	EU General Food Law - Effective January 1, 2005	EC 2065/2001- effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC - Effective no earlier than January 1, 2006	2003/804/EC 2004/319/EC Effective May, 2004	Cumulative Requirements
Vessel ID	M					M				M
Name of vessel owner/harvester	M	M		M	M	M			M	M
License Number				M	M					M
Name of Responsible Individual		M				M				M
Address	M	M				M			M	M
Telephone Number		M			M					M
Cell Phone Number		O								O
Fax Number		O								O
Email Address		O								O
Food Safety Certification ID	O									O
For each trade unit created by Vessel										
Identity Information										
Batch/lot #		M				R				M
Trade Unit ID	M	R								M
Descriptive Information										
Type of package	M	M				R				M
Net weight/quantity	M	M		M	M	R			M	M
Species (commercial and scientific names)	M	M		M	M	R	M		M	M
Age									M	M
Life cycle stage									M	M
Country of origin - Harvested	O		M						M	M
Country of origin - Processed			M							M
Product description (eg. Form, grade, storage condition etc)	M	M							M	M
Production history information										
Date of harvest	M				M					M
Catch Area	M			M	M		M		M	M
Method of production	R		M				M		M	M
CFIA Canadian Shellfish Sanitation Program Area designation (approved, conditionally approved etc)				M				R		M
Wild stocks free from unexplained/abnormal mortalities in 2 previous years (Y/N)									M	M
Wild stocks free from bonamiosis, marteiliosis, microcitiosis, perkinsosis, haplosporidiosis, witheirng syndrome in 2 previous years (Y/N)									M	M
Disease Record								M		M
Fishing method	R									R
Trawl or soak time	O									O
Ethical aspects of fishery	O									O
Size grading method	O									O
Weighing method	O									O
Stowage method	R				M					M
Storage temperature control method	R				M					M
Storage temperature record	R				R					R
For each logistic unit created										
Identity Information										
Logistic unit ID	M	R								M
Trade unit ID's that make up the logistic unit	M	R								M
Number of trade units in logistic unit		M								M
Number of logistic units in shipment		M								M
For each unit dispatched (either as a logistic unit or as a separate trade unit)										
Unit ID (either logistic or trade unit ID)	M	R								M
Destination Information										
Name of next food business	M					M			M	M
Name of Responsible Individual	M									M
Address	M					M			M	M
Transportation Information										
Date/time of dispatch	M					M				M
Place of dispatch	M									M
Name of transport firm						M				M

Table 4.1 (con't) Wild Harvest Fisheries: Traceability Requirements for the Buyer

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	US Bioterrorism - Effective December 2003	US Country of Origin Labelling Effective September 30, 2004	CFIA - CSSP Shellfish Specific	CFIA - QMP Shellfish Specific	EU General Food Law - Effective January 1, 2005	EC 2065/2001- effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC - Effective no earlier than January 1, 2006	2003/804/EC 2004/319/EC Effective May, 2004	Cumulative Requirements
Name of buyer business owner	M	M		M	M	M				M
DFO registration #				M						M
Name of Responsible Individual		M				M				M
Address	M	M		M		M				M
Telephone Number		M								M
Cell Phone Number		O								O
Fax Number		O								O
Email Address		O								O
Food Safety Certification ID	O									O
For each unit received by buyer (either a logistic unit or a trade unit)										
Identity Information										
Unit ID (either logistic or trade unit ID)	M									M
Trade unit ID's that make up the logistic unit	M									M
Lot/batch #						R				R
Source Information										
Name of previous food business	M					M				M
Name of Responsible Individual						M				M
Address	M					M				M
Transportation Information										
Date/time received	M									M
Control checks										
Temperature of unit when received	R				R					R
Unit temperature record	R				R					R
For each new trade unit created by buyer										
Source Information										
Name, address & telephone of harvester					M					M
Identity Information										
Trade unit ID	M	R								M
Lot/batch #		M				M				M
ID's of received trade units contributing to created trade unit	M									M
Descriptive Information										
Type of packaging	M	M								M
Net weight/quantity	M	M			M					M
Species (commercial and scientific names)	M	M			M		M		M	M
Method of production	R		M				M		M	M
Country of origin - Harvested	R		M						M	M
Country of origin - Processed (if processed on vessel)			M							M
Product description (eg. Form, grade, storage condition etc)	M	M								M
Product History Information										
Date of harvest					M					M
Catch Area	M				M		M		M	M
Size grading method	O									O
For each logistic unit created by buyer										
Identity Information										
Logistic unit ID	M	R								M
Trade unit ID's in logistic unit	M	R								M
Number of trade units in logistic unit		M								M
Number of logistic units in shipment		M								M
For each unit dispatched (either as a logistic unit or as a separate trade unit)										
Identity Information										
Unit ID (either logistic or trade unit ID)	M	R								M
Lot/batch #						R				R
Production history information										
Buyer temperature control method	R				M					M
Buyer temperature record	R				R					R
Destination Information										
Name of Processor	M					M				M
Address	M					M				M
Transportation Information										
Date/time of dispatch	M					M				M
Place of dispatch	M									
Name of transport firm						M		M		M
Vehicle Identification						M		M		M
Name of Responsible Individual						M				M
Address						M		M		M

Table 4.1 (con't) Wild Harvest Fisheries: Traceability Requirements for the Transporter

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	US Bioterrorism - Effective December 2003	US Country of Origin Labelling Effective September 30, 2004	CFIA - CSSP Shellfish Specific	CFIA - QMP Shellfish Specific	EU General Food Law - Effective January 1, 2005	EC 2065/2001- effective October 2001	2004/852/EC, 2004/853/IEC, 2004/854/EC - Effective no earlier than January 1, 200	2003/804/EC 2004/319/EC Effective May, 2004	Cumulative Requirements
Name of transport business	M	M				M				M
Name of Responsible Individual		M				M				M
Vehicle Identification	M	M				M				M
Address	M	M				M				M
Telephone Number		M								M
Cell Phone Number		O								O
Fax Number		O								O
Email Address		O								O
Food Safety Certification ID	O									O
For each unit received (either a logistic unit or a trade unit)										
Shipper information										
Name of Shipping Food Business (vessel or buyer)	M	M				M				M
Name of Responsible Individual		M				M				M
Address	M	M				M				M
Telephone Number		M								M
Cell Phone Number		O								O
Fax Number		O								O
Email Address		O								O
Collection information										
Time/Date collected	M	M				M				M
Location of collection	M									M
Temperature of unit when received	R				R					R
Identity Information										
Unit ID (either logistic or trade unit ID)	M	R								M
Lot/batch #						R				R
Trade units ID's within logistic unit	M	R				M				M
Number of logistic units in shipment		M								M
For each new logistic unit created by the transporter										
Logistic unit ID	M	R								M
Trade unit ID's within logistic unit	M	R								M
Lot/batch #						R				R
For each trade unit (within all logistic units)										
Trade unit ID		R								R
Lot/Batch #		M								M
Descriptive information for trade units within logistic unit										
Type of packaging		M								M
Net weight/quantity		M								M
Species		M								M
Product description (eg. Form, grade, storage condition etc)		M								M
For each unit dispatched (either as a logistic unit or as a separate trade unit)										
Unit ID (either logistic or trade unit ID)	M	R								M
Tranportation history										
Mode of transport					M					M
Transporter temperature control method	R				M					M
Transporter temperature record	R				R					R
Destination Information										
Date of delivery	M	M				M				M
Location of delivery	M									M
Name of next food business	M	M				M				M
Name of responsible individual		M				M				M
Address	M	M				M				M
Telephone Number		M								M
Cell Phone Number		O								O
Fax Number		O								O
Email Address		O								O

Table 4.2 Finfish Aquaculture: Traceability Requirements for the Fish Feed Manufacturer

Data Requirement M=mandatory; R=recommended O=Optional	**Tracefish**	**Additional data elemetns to allow traceability between feed and fish**	**US Bioterrorism Effective: December 2003**	**US Country of Origin Labelling Effective: September 30, 2004**	**EU General Food Law Effective January 1, 2005**	**EC 2065/2001 Effective October 2001**	**2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006**	**Cumulative Requirements**
Feed manufacturing business ID	M				M			M
Feed manufacturing establishment ID	M				M			M
Responsible Individual					M			M
Address	M				M			M
Feed manufacturing food safety certification	O							O
For each trade unit created								
Identity Information								
Lot or batch number	M				M			M
Trade unit ID	M							M
Source Information								
Previous Food Business ID	M				M			M
Responsible Individual					M			M
Address	M				M			M
Date and time of reception	M				M			M
Control Checks								
Quality control checks	O							O
Production history								
Temperature Record	R							R
Transformation Information								
Related created trade unit ID's	M							M
Fractions	R							R
For each new trade unit created								
Lot #					R			R
Unit ID	M							M
Descriptive information								
Net weight	M				R			M
Type of unit	O							O
Name/type of product	O				R			R
Production date	M							M
Product form	M				R			M
Compostion	M				R			M
GMO	M							M
Date of durability	R				R			R
Product specification	O				R			R
Species	R				M			R
Primary production method	R							R
Area/Country of origin	R							R
Production history								
Process specification	O							O
Production lines ID	O							O
HACCP	O							O
Hygiene checks	O							O
Temperature records	O							O
Product quality control checks	O							O
Transformation Information								
Related received trade unit ID's	M				M			M
Fractions	R				M			R
For each logistic unit created								
Identity Information								
Unit ID	M							M
Trade unit ID's	M							M
For each unit dispatched (either as logistic unit or separate trade unit)								
Identity Information								
Unit ID	M				M			M
Production history								
Temperature record	R							R
Destination Information								
Next food business ID	M				M			M
Address	M				M			M
Date and time of dispatch	M				M			M

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Breeder

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Breeder business	M				M			M
Breeding establishment	M				M			M
Responsible Individual					M			M
License Number	M				M			M
Address	M				M			M
Breeder food safety certification	O							O
For each unit of feed received from feed manufacturer (either logistic unit or trade unit)								
Identity Information								
Lot #					R			R
Unit ID		M						M
Trade unit ID's		M						M
Source Information								
Previous food business ID		M			M			M
Responsible Individual					M			M
Address		M			M			M
Date and time of reception		M			M			M
Control checks								
Temperature check		R						O
Temperature record		O						O
Quality control checks		O						O
Transformation Information								
Related created trade unit ID's		M						M
Fractions		R						R
For each trade unit created								
Identity Information								
Lot#					R			R
Unit ID	M							M
Descriptive Information								
Species	M				M			M
Day degrees	R							R
Viability	O							O
Spawning date	R							R
Genetic characteristics	O							O
Genetic ID	O							O
Genetically Modified Organisms (GMO)	O							O
Production History								
Country of origin				M				M
Method of production				M				M
Farm unit ID	R							R
Temperature Record	R							R
Salinity Record	O							O
Water flow record	O							O
Disease record	R							R
Weight of parental fish	O							O
Age of parental fish	O							O
Treatment record	O							O
For each logistic unit created								
Identity Information								
Lot#					M			M
Unit ID	M							M
Trade unit ID's	M							M
For each unit dispatched (either as logistic unit or separate trade unit)								
Lot#					R			R
Unit ID	M							M
Destination Information								
Next food business ID	M				M			M
Address	M				M			M
Date and time of dispatch	M				M			M

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Hatchery

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Food Business ID	M				M			M
Hatchery establishment ID	M				M			M
Responsible Individual					M			M
License Number	M				M			M
Address	M				M			M
Hatchery food safety certification	O							O
For each unit of feed received from feed manufacturer (either logistic unit or trade unit)								
Identity Information								
Lot#					R			R
Unit ID		M						M
Trade unit ID's		M						M
Source Information								
Previous food business ID		M			M			M
Responsible Individual					M			M
Address		M			M			M
Date and time of reception		M			M			M
Control checks								
Temperature check		R						R
Temperature record		O						O
Quality control checks		O						O
Transformation Information								
Related created trade unit ID's		M						M
Fractions		R						R
For each unit received from breeder (either logistic unit or trade unit)								
Identity Information								
Lot#					R			R
Unit ID	M							M
Trade unit ID's	M							M
Source Information								
Previous food business ID	M				M			M
Responsible Individual					M			M
Address	M				M			M
Date and time of reception	M				M			M
Control checks								
Temperature check	R							R
Temperature record	O							O
Quality control checks	O							O
Transformation Information								
Related created trade unit ID's	M							M
Fractions	R							R
For each new trade unit created								
Identity Information								
Lot#					R			R
Unit ID	M							M
Descriptive Information								
Average weight	R				R			R
Malformation	O							O
Production Information								
Country of origin				M				M
Primary production method				M				M
Farm unit ID	R							R
Disease record	R							R
Starving period	R							R
Temperature record	R							R
Oxygen record	R							R
Fish density record	O							O
Treatment record	O							O
Transformation Information								
Related received trade unit ID's	M							M
Fractions	R							R

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Hatchery

Data Requirement **M=mandatory; R=recommended** **O=Optional**	**Tracefish**	**Additional data elemetns to allow traceability between feed and fish**	**US Bioterrorism Effective: December 2003**	**US Country of Origin Labelling Effective: September 30, 2004**	**EU General Food Law Effective January 1, 2005**	**EC 2065/2001 Effective October 2001**	**2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006**	**Cumulative Requirements**
For each logistic unit created								
Identity Information								
Lot#					**R**			**R**
Unit ID	**M**							**M**
Trade unit ID's	**M**							**M**
For each unit dispatched (either as logistic unit or								
Lot#					**R**			**R**
Unit ID	**M**				**M**			**M**
Destination Information								
Next food business ID	**M**				**M**			**M**
Address	**M**				**M**			**M**
Date and time of dispatch	**M**				**M**			**M**

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Farm

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Farm ID	M				M			M
Name of farm owner	M		M		M			M
License Number	M				M			M
Name of Responsible Individual			M		M			
Address	M		M		M			M
Telephone Number			M					O
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Food Safety Certification ID	O							O
For each unit of feed received from feed manufacturer (either logistic unit or trade unit)								
Identity Information								
Lot#					R			R
Unit ID		M						M
Trade unit ID's		M						M
Source Information								
Previous food business ID		M			M			M
Responsible Individual					M			M
Address		M			M			M
Date and time of reception		M			M			M
Control checks								
Temperature check		R						R
Temperature record		O						O
Quality control checks		O						O
Transformation Information								
Related created trade unit ID's		M						M
Fractions		R						R
For each unit received from hatchery								
Identity Information								
Lot#					R			R
Unit ID (logistic unit or individual trade unit)	M							M
Trade unit ID's (contained within logistic unit)	M							M
Source								
Previous Food Business (hatchery/transporter etc)	M				M			M
Address	M				M			M
Date and time of reception	M				M			M
Control Checks (either on logistic unit or separate trade units								
Temperature Check in received unit	R							R
Temperature record	O							O
Quality control checks	O							O
Transformation Information								
Related created trade unit ID's	M					M		M
Fractions	R							R
For each new trade unit created by fish farm								
Identity Information								
Lot#					R			R
Unit ID	M		R			M		M
Descriptive Information								
Location of fish farm	R			R		M		M
CFIA Canadian Shellfish Sanitation Program Area							R	R
Wet storage location								M
Species (commercial and scientific names)			M		M	M		M
Type of package			M		R			M
Size (grade) distribution	R		M					R
Condition factor	O							O
Fat content	O							O
Color	O							O
Flesh texture	O							O
Net weight/quantity	O		M		R			O
Average weight	O							O
Total weight per quality grade	O							O
Date of harvest	M							M

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Farm

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Production History								
Country of origin				M				M
Primary production method				M		M		M
Farm unit ID	R				R	M		M
Nature and origin of feed fed to fish							M	M
Starving period	R							R
Temperature record	R							R
Fish density record	O							O
Disease record	R						M	M
Treatment record	R						M	M
Transformation Information								
Related received trade unit ID's	M							M
Fractions	R							R
For each logistic unit created								
Identity Information								
Lot#					R			R
Unit ID	M							M
Trade unit ID's	M							M
For each unit dispatched (either as logistic unit or separate trade unit)								
Lot#					R			R
Unit ID	M		M					M
Destination Information								
Next food business ID	M		M		M			M
Name of Responsible Individual			M		M			M
Address	M		M		M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Date and time of dispatch	M				M			M

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Live Fish Transporter

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Food Business ID	M		M		M			M
Transport vehicle/vessel establishment ID	M		M		M			M
Vessel/vehicle ID	M		M		M			M
Name of Responsible Individual			M		M			M
Address	M		M		M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Food Safety Certification ID	O							O
For each unit received								
Identity Information								
Lot#					R			R
Unit ID	M		R					M
Trade unit ID's (contained within logistic unit)	M		R					M
Source Information								
Previous food business ID	M		M	M	M			M
Name of Responsible Individual			M	M	M			M
Address	M		M	M	M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Date and time of reception	M		M	M				M
Control Checks (either on logistic unit or separate trade units								
Temperature check	R							R
Temperature record	O							O
For each new logistic unit created by transporter								
Identity Information								
Lot#					R			R
Unit ID	M		R		M			M
Trade unit ID's	M		R		M			M
For each trade unit within all logistic units								
Trade unit ID			R					R
Descriptive Information for trade units within logistic unit								
Net weight/quantity			M					M
Species			M					M
Production description			M					M
For each unit dispatched (either as logistic unit or separate trade unit)								
Identity Information								
Lot#					R			R
Unit ID	M		R		M			M
Production History								
Temperature control method	R							R
Temperature record	R							R
Disinfecting date	R							R
Water parameter record	R							R
Loading/unloading technology	O							O
Fish density	O							O
Destination Information								
Next food business ID	M		M		M			M
Name of Responsible Individual			M					M
Address	M		M		M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Place of delivery	M		M					M
Date and time of dispatch	M		M		M			M

Table 4.2 (con't) Finfish Aquaculture: Traceability Requirements for the Transporter

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish	Additional data elemetns to allow traceability between feed and fish	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Food Business ID	M				M			M
Transport vehicle/vessel establishment ID	M				M			M
Vessel/vehicle ID	M				M			M
Name of Responsible Individual			M					M
Address	M		M		M			M
Telephone Number			M		M			M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Food Safety Certification ID	O							O
For each unit received								
Identity Information								
Lot#					R			R
Unit ID (logistic unit or individual trade unit)	M		R					M
Trade unit ID's	M		R					M
Source Information								
Previous food business ID	M		M		M			M
Name of Responsible Individual			M					M
Address	M		M		M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Date and time of reception	M		M					M
Control Checks (either on logistic unit or separate trade units								
Temperature check	R							R
For each new logisitic unit created by the transporter								
Identity Information								
Lot#					R			R
Unit ID	M		R					M
Trade unit ID	M		R					M
For each unit dispatched (either as logistic unit or separate trade unit)								
Identity Information								
Lot#			R		R			R
Unit ID	M		R					M
Production history								
Temperature control method	R							R
Temperature record	R							R
Destination Information								
Next food business ID	M				M			M
Name of Responsible Individual			M					M
Address	M		M		M			M
Telephone Number			M					M
Cell Phone Number			O					O
Fax Number			O					O
Email Address			O					O
Date and time of dispatch	M		M		M			M
Place of delivery	M		M					M

Table 4.3 Shellfish Aquaculture: Traceability Requirements for the Breeder/Hatchery

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish & industry suggestions	CFIA Canadian Shellfish Sanitation Program	CFIA - Quality Management Program	Vibrio Parahaemolyticus Control Program	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2003/804/EC, 2004/319/EC Effective May, 2004	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Breeder/hatchery business	M						M				M
Breeder/hatchery establishment	M						M				M
Responsible Individual							M				M
License Number	M						M				M
Address	M						M				M
Breeder food/quality safety certification	O										O
For each trade unit created											
Identity Information											
Lot#							R				R
Unit ID	M										M
Descriptive Information											
Species	M						M				M
Average weight/quantity	R						R				R
Product description	M						R				M
Viability	O										O
Genetic characteristics	O										O
Genetic ID	O										O
Breeder/Hatchery Production History											
Country of origin	M					M					M
Method of production	M					M					M
Zone source of broodstock	M										M
Set date	M										M
Farm unit ID	R						R				R
Temperature Record	R										R
Disease record	R										R
Treatment record	O										O
For each logistic unit created											
Identity Information											
Lot#							R				R
Unit ID	M										M
Trade unit ID's	M										M
For each unit dispatched (either as logistic unit or separate trade unit)											
Unit ID	M						M				M
Destination Information											
Next food business ID	M						M				M
Address	M						M				M
Date and time of dispatch	M						M				M

Table 4.3 (con't) Shellfish Aquaculture: Traceability Requirements for the Nursery

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish & industry suggestions	CFIA Canadian Shellfish Sanitation Program	CFIA - Quality Management Program	Vibrio Parahaemolyticus Control Program	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2003/804/EC, 2004/319/EC Effective May, 2004	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Food Business ID	M						M				M
Hatchery establishment ID	M						M				M
Responsible Individual							M				M
Aquaculture license Number	M						M				M
Address	M						M				M
Nursery food safety certification	O										M
For each unit received from breeder/hatchery (either logistic unit or trade unit)											
Identity Information											
Unit ID	M						M				M
Trade unit ID's	M						M				M
Source Information											
Previous food business ID	M						M				M
Responsible Individual							M				M
Address	M						M				M
Date and time of reception	M						M				M
Control checks											
Temperature check	R										R
Temperature record	O										O
Quality control checks	O										O
Transformation Information											
Related created trade unit ID's	M										M
Fractions	R										R
For each new trade unit created											
Identity Information											
Unit ID	M						M				M
Descriptive Information											
Species	M						R				M
Size	M										M
Average weight/quantity	R						R				M
Nursery Production History											
Country of origin						M					M
Primary production method						M					M
Farm unit ID	R										R
Temperature record	R										R
Oxygen record	R										R
Shellfish ish density record	O										O
Disease record	R										R
Treatment record	O										O
Transformation Information											
Related received trade unit ID's	M										M
Fractions	R										R
For each logistic unit created											
Identity Information											
Lot#							R				R
Unit ID	M										M
Trade unit ID's	M										M
For each unit dispatched (either as logistic unit or separate trade unit)											
Lot#							R				R
Unit ID	M										M
Destination Information											
Next food business ID	M						M				M
Address	M						M				M
Date and time of dispatch	M						M				M

Table 4.3 (con't) Shellfish Aquaculture: Traceability Requirements for the Farm

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish & industry suggestions	CFIA Canadian Shellfish Sanitation Program	CFIA - Quality Management Program	Vibrio Parahaemolyticus Control Program	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2003/804/EC, 2004/319/EC Effective May, 2004	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
Farm ID	M	M		M			M		M		M
Name of farm owner	M		M	M	M		M		M		M
Aquaculture License Number	M	M	M				M				M
Name of Responsible Individual				M	M		M				M
Address	M			M	M		M		M		M
Telephone Number			M		M						M
Cell Phone Number					O						O
Fax Number					O						O
Email Address					O						O
Food Safety Certification ID	O										O
For each unit received from nursery											
Identity Information											
Lot#							R				R
Unit ID (logistic unit or individual trade unit)	M				R						M
Trade unit ID's (contained within logistic unit)	M				R						M
Source											
Previous Food Business (hatchery/transporter etc)	M						M		M		M
Responsible Individual									M		M
Address	M						M		M		M
Date and time of reception	M						M		M		M
Control Checks (either on logistic unit or separate trade units											
Temperature Check in received unit	R										R
Temperature record	O										O
Quality control checks	O										O
Transformation Information											
Related created trade unit ID's	M						M				M
Fractions	R										R
For each new trade unit created by shellfish farm											
Identity Information											
Unit ID	M				R		M				M
Lot #				M					R		M
Descriptive Information											
Location of shellfish tenure	R	M		M		R		M	M		M
CFIA Canadian Shellfish Sanitation Program Area designation (approved, conditionally approved etc)		M								R	M
Wet storage location		M									M
Species (commercial and scientific names)	M	M	M	M	M		M	M	M		M
Age									M		M
Life cycle stage									M		M
Type of package					M		R				M
Size (grade)	R			M	M				M		R
Net weight/quantity	O	M	M	M	M		R		M		M
Time & date of harvest	M	M	M	M							M
Farm Production History											
Farm unit ID	R										R
Country of origin						M			M		M
Primary production method						M		M	M		M
Farm stocks free from unexplained/abnormal mortalities in 2 previous years (Y/N)									M		M
Farm stocks free from bonamiosis, marteiliosis, microcitiosis, perkinsosis, haplosporidiosis, witheirng syndrome in 2 previous years (Y/N)									M		M
Area open for PSP (yes/no)				M							M
Area open for VP (yes/no)				M							M
Area open for Growing Water Classification (yes/no)											M
Harvest contol measure				M							M
Meat temperature at harvest				M							M
Air temperature at harvest				M							M
Temperature control method				M							M
Meat temperature at harvest			M	M							M
Temperature record	R		M								R
Disease record	R									M	M
Transformation Information											
Related received trade unit ID's	M										M
Fractions	R										R

Table 4.3 (con't) Shellfish Aquaculture: Traceability Requirements for the Farm

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish & industry suggestions	CFIA Canadian Shellfish Sanitation Program	CFIA - Quality Management Program	Vibrio Parahaemolyticus Control Program	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2003/804/EC, 2004/319/EC Effective May, 2004	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than January 1, 2006	Cumulative Requirements
For each logistic unit created *Identity Information*											
Lot#							R				R
Unit ID	M										M
Trade unit ID's	M										M
For each unit dispatched (either as logistic unit or separate trade unit)											
Lot#							R				R
Unit ID	M				M						M
Destination Information											
Next food business ID	M				M		M		M		M
Name of Responsible Individual					M		M				M
Address	M				M		M		M		M
Telephone Number					M						M
Cell Phone Number					O						O
Fax Number					O						O
Email Address					O						O
Date and time of dispatch	M						M				M

Table 4.3 (con't) Shellfish Aquaculture: Traceability Requirements for the Live Shellfish Transporter

Data Requirement M=mandatory; R=recommended O=Optional	Tracefish & industry suggestions	CFIA Canadian Shellfish Sanitation Program	CFIA - Quality Management Program	Vibrio Parahaemolyticus Control Program	US Bioterrorism Effective: December 2003	US Country of Origin Labelling Effective: September 30, 2004	EU General Food Law Effective January 1, 2005	EC 2065/2001 Effective October 2001	2003/804/EC, 2004/319/EC Effective May, 2004	2004/852/EC, 2004/853/EC, 2004/854/EC Effective no earlier than	Cumulative Requirements
Food Business ID	M			M	M		M				M
Transport vehicle/vessel establishment ID	M				M		M				M
Vessel/vehicle ID	M				M		M				M
Name of Responsible Individual					M		M				M
Address	M				M		M				M
Telephone Number					M						M
Cell Phone Number					O						O
Fax Number					O						O
Email Address					O						O
Food Safety Certification ID	O				O						O
For each unit received											
Identity Information											
Lot#							R				R
Unit ID	M				R						M
Trade unit ID's (contained within logistic unit)	M				R						M
Source Information											
Previous food business ID	M				M		M				M
Name of Responsible Individual					M		M				M
Address	M				M		M				M
Telephone Number					M						M
Cell Phone Number					O						O
Fax Number					O						O
Email Address					O						O
Date and time of reception	M				M		M				M
Control Checks (either on logistic unit or separate trade units											
Temperature check	R		R	M							M
Temperature record	O		R								O
For each new logistic unit created by transporter											
Identity Information											
Lot#							R				R
Unit ID	M				R						M
Trade unit ID's	M				R						M
For each trade unit within all logistic units											
Trade unit ID					R						R
Descriptive Information for trade units within logistic unit											
Net weight/quantity					M						M
Species					M						M
Production description					M						M
For each unit dispatched (either as logistic unit or separate trade unit)											
Identity Information											
Lot#							R				R
Unit ID	M			M	R						M
Production History											
Temperature Contol method	R		M	M							R
Temperature record	R		R								R
Disinfecting date	R										R
Transportation Information											
Mode of transportation			M								M
Destination Information											
Next food business ID	M			M	M		M				M
Name of Responsible Individual				M	M		M				M
Address	M				M		M				M
Telephone Number					M						M
Cell Phone Number					O						O
Fax Number					O						O
Email Address					O						O
Place of delivery	M				O						M
Date and time of dispatch	M			M	M		M				M
Meat temperature at dispatch				M							M

Table 4.6 Fisheries Management Data Requirements

	Data Requirement	Halibut	Sablefish	Rockfish H&L	Schedule II Lingcod, Dogfish, Skate	Groundfish Trawl	Herring Roe	Herring SOK	Tuna	Salmon Gillnet	Salmon Troll	Salmon Seine	Geoduck	Prawn Trap	Red Urchin	Green Urchin	Sea Cucumber	Crab	Shrimp Trawl
Who	Vessel name	R O G	R O G	R O G	R O G	R O G	O	R O	R G	R G	R G	R G	R O G	R G	R O G	R O G	R O G	R G	R G
	VRN	R O G	R O G	R O G	R O G	R O G		R O	R G	R G	R G	R G	R O G	R G	R O G	R O G	R O G	R G	R G
	Tab/Licence	R O		O	O	R		R O					R O		R O	R O	R O		
	Vessel operator/fisher/diver	R O G	R O G	R O G	R O G	R O G		R O	R G	R G	R G	R G	R O G	R G	R O G	R O G	R O G	R G	R G
	FRC									R	R	R							
	Crew size	R	R						R										
	Contact information	R G	G	G	G	G		R O G	G	G	G	G	G	G	G	G	G	G	G
	Pond number							R O											
	Pool ID						R O												
Where	PFMA	O G	O G	R O	O	R O	R O G		R	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G
	PFMSA	O G	O G	R O	O	R O	R O G		R	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G
	Licence Area			R O	R O	R O	R O		R	R	R	R O	R O	R O	R O	R O	R O		
	Species Mgmt Area	O		R O	R O	R							R O		R O	R O	R O		R
	Harvest location/coordinates	R	R	R	R	R O	O	R O	R				R	R	R	R	R	R	R
	Country of Origin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Area of Harvest (FAO,BC?)																		
	Depth	R	R	R	R	R O							R	R	R	R	R	R	R
	Pond location							R O											
	Depth under pond							R O											
	Water temperature								R										
When	Harvest date	R	R	R	R	R O	O	R O	R	R	R	R	R	R	R	R	R	R	R
	Date of ponding (fish/kelp)							R O											
	Date of fish release							R O											
	Date of SOK harvest							R O											
	Harvest time	R	R	R	R	R O	O	R O						R					R
	Fish transfer time							R O											
	Trip number	R	R O			R			R										
	Hail number	R	R O	O	O	R O	O		R	R	R	R			R O	R O	R O		R
Gear	Gear type	R G	R O G	R O G	R G	R O G	R O	R O	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G
	Gear specs	R	R	R	R	R O			R	R				R				R	R
	Wild or farmed	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Environmental Cert.																		
	Bait/iritatant		R	R	R													R	
	Set/dive number	R	R	R	R	R O		R O		R		R	R	R	R	R	R	R	R
	Set/dive/fishing duration	R G	R O G	R G	R G	R O G		R O	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G	R G
	Set/Tow distance	R		R	R	R O		R O											R
	Tow speed					R O													R
	Selectivity gear		R																R
	Gear lost	R		R	R														
	Gear performance					O													
	Pond type							R O											
	Pond dimensions							R O											
	Depth of web in pond							R O											
	Number of kelp lines							R O											
	Length of kelp lines							R O											
	Number of traps		R											R				R	
	Number of hooks	R	R	R	R				R										

R = Collected and reported by skipper

O = Collected and reported by observer

G = Collected and reported by buyer

Table 4.6 Fisheries Management Data Requirements

	Data Requirement	Halibut	Sablefish	Rockfish H&L	Schedule II Lingcod, Dogfish, Skate	Groundfish Trawl	Herring Roe	Herring SOK	Tuna	Salmon Gillnet	Salmon Troll	Salmon Seine	Geoduck	Prawn Trap	Red Urchin	Green Urchin	Sea Cucumber	Crab	Shrimp Trawl
Catch	Species(comm & sci) kept	R B G	R B G	R B G	R B G	R B G	R B	R B G	R G	R G	R G	R G	R B G	R G	R B G	R B G	R B G	R G	R G
	Species released	R	R	R	R	R B				R	R	R							
	Target species					R B													R
	Est. weight	R	R	R	R	R B	R	R B	R					R				R	R
	Est. Weight ponded							R B											
	Est. weight of SOK							R B											
	Est. weight of trim returned							R B											
	Est. weight of trim to FSC							R B											
	Est. pieces	R		R	R	B			R	R	R	R	R				R	R	
	Product condition							R B											
	Dry salt used per container							R B											
	Brine used							R B											
	Storage temp record																		
	Wt of fish in area																		
	Wt of fish set on																		
At-sea	At-sea Observer		R			R B		R B											
	Sampling method					B													
	Condition																		
	Length																		
	Sex																		
	Maturity																		
	Spawning activity level							R B											
	Depth of spawn on web							R											
	Layers of spawn on web							R											
	Estimated mortality							R											
	Date morts removed							R											
	Location of mort removal							R											
	Date web removed							R											
Packer	Date onto packer							B					R						
	Packer name or collector	G	G	G	G	G	R B	R B G	G	G	G	R G	R G	G	R G	R G	R G	G	G
	Packer VRN							G	G	G	G	G	G		G	G	G		
	Weight							B					R		R	R	R		
	percent full							B											
	product temperature							B											
	salinity of brine							B											
	No. of containers												R		R	R	R		
	Container type												R		R	R	R		

R = Collected and reported by skipper

B = Collected and reported by observer

G = Collected and reported by buyer

Table 4.6 Fisheries Management Data Requirements

	Data Requirement	Halibut	Sablefish	Rockfish H&L	Schedule II Lingcod, Dogfish, Skate, Groundfish Trawl	Herring Roe	Herring SOK	Tuna	Salmon Gillnet	Salmon Troll	Salmon Seine	Geoduck	Prawn Trap	Red Urchin	Green Urchin	Sea Cucumber	Crab	Shrimp Trawl
Offload	Date	R O	R O	R O	R O	R O	R O	O	R		R	R O		R O	R O	R O		R
	Time	R O	R O	R O	R O	R O	O					R O		R O	R O	R O		R
	Port	R O	R O	R O	R O	R O	O	R			R	R O		R O	R O	R O		R
	Offload location	R O	R O	R O	R O	R O						R O		R O	R O	R O		R
	Offloader			O	O	O												
	Buyer (incl public or FSC)	R O G	R O G	R O G	R O G	R O	O G	R G	G	G	R G	R O G	G	R O G	R O G	R O G	G	R O G
	Split Load											O		R	R	R		
	Number of parts											O		R	R	R		
	Observer	O	O	O	O	O	O					O		O	O	O		
	Validation number	O	O	O	O	O	O					O		O	O	O		
	Product Type	R O G	R O G	O	O	G	O	G	G R	G	G	O	G	G	G	O	G	R O G
	No. of containers						O	O			R	O		R O	R O	R O		
	Container/package type	O	O				O				R	O		R O	R O	R O		
	Container number						R O											
	Number of liners											O						
	Draining start time					O												
	Draining finish time					O												
	Gross weight											O		O	O	O		
	Container weight					O						O		O	O	O		
	Net weight	R O	O	O	O	O	O	R			R	O		O	O	O		R
	Weighing method																	
	Trip limit	O		O	O	O												
	Previous remaining quota	O	O	O	O	O						O		O	O	O		
	New remaining quota	O	O	O	O	O						O		O	O	O		
	Overage	O	O	O	O	O						O		O	O	O		
	Overage transfer to/from tab											O		O	O	O		
	Temperature of product						O											
	Salinity of brine						O											
	Spacers						O											
	Level of brine						O											
	Discolouration/odour						O											
	Tag number(s)	O																
	shipment number						R O											
	Num of Log Units in ship.																	
	Roe Yeild					O												
Trucking	Company	O	O															
	Address																	
	ETA	O	O															
	Truck seal number	O	O															
	Truck No																	
Sales	Address																	
	Sales date	R G	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G
	Processing date						O											
	Plant	G	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G
	Crew share info	G	G	G	G	G		G	G	G	G	G	G	G	G	G	G	G
	Fish quality/storage method	G	G	G	G	G		G	G	G	G	G						
	Temperature of storage						O											
	Location of storage						O											
	Number of pails						O											
	Pail wt						O											
	Product weight	G	G	G	G	G	O G	G	G	G	G	G	G	G	G	G	G	G
	Pieces	G	G	G	G	G	G	G	G	G	G							
	Size grading method																	
	Price per unit	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
	Total price	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
	Fish slip number	G	G	G	G	G	G	G	G	G R	G	G	G	G	G	G	G	G

R O = Collected and reported by skipper
O = Collected and reported by observer
G = Collected and reported by buyer

Table 4.8 Comparison of Traceability Requirements With Harvester Fisheries Data Requirements

Food Business	Data Requirement		Cumulative Req.'s	Halibut	Sablefish	Rockfish H&L	Schedule II Lingcod, Dogfish, Skate, Groundfish Trawl	Herring Roe	Herring SOK	Tuna	Salmon Gillnet	Salmon Troll	Salmon Seine	Geoduck	Prawn Trap	Red Urchin	Green Urchin	Sea Cucumber	Crab	Shrimp Trawl
VESSEL/HARVESTER																				
	Vessel ID	M																		
	Vessel name																			
	VRN																			
	Pool ID																			
	Name of vessel owner/harvester	M																		
	License Number	M																		
	Name of Responsible Individual	M																		
	Address	M																		
	Telephone Number	M																		
	Cell Phone Number	O																		
	Fax Number	O																		
	Email Address	O																		
	Food Safety Certification ID	O																		
	For each trade unit created by Vessel																			
	Identity Information																			
	Batch/lot #	M																		
	Shipment #																			
	Validation #																			
	Halibut tag #'s																			
	Trip number																			
	Trade Unit ID	M																		
	Descriptive Information																			
	Type of package	M																		
	Net weight/quantity	M																		
	Estimated weight																			
	Estimated pieces																			
	Offloaded wt																			
	Buyer wt																			
	Species (commercial and scientific names)	M																		
	Age (molluscs)	M																		
	Life cycle stage (molluscs)	M																		
	Country of origin - Harvested	M																		
	Country of origin - Processed (if processed on vessel)	M																		
	Product description (eg. Form, grade, storage condition etc)	M																		
	Product type																			
	Product grade																			
	Production history information																			
	Date of harvest	M																		
	Catch Area	M																		
	PFMA																			
	PFMSA																			
	Licence Area																			
	Species Mgmt Area																			
	Harvest location/coordinates																			
	Pond number																			
	Method of production (wild/farmed)	M																		
	CFIA CSSP area designation (approved, conditionally approved, etc.)	M																		
	Wild stocks free from unexplained mortalities in 2 previous yrs (molluscs only)	M																		
	Wild stocks free from bonamiosis, martelliosis, microcthosis, perkinsosis, haplosporidiosis, withering syndrome in 2 previous yrs (molluscs only)	M																		
	Fishing method	R																		
	Trawl or soak time	O																		
	Ethical aspects of fishery (e.g. environmental certification etc.)	O																		
	Size grading method	O																		
	Weighing method	O																		
	Stowage method	R																		
	Storage temperature control method	R																		
	Storage temperature record	R																		

Table 4.8 (con't) Comparison of Traceability Requirements With Harvester Fisheries Data Requirements

Food Business Data Requirement		Comokstice Reg.'s	Halibut	Sablefish	Rockfish H&L	Schedule II Lingcod, Dogfish, Skate	Groundfish Trawl	Herring Roe	Herring SOK	Tuna	Salmon Gillnet	Salmon Troll	Salmon Seine	Geoduck	Prawn Trap	Red Urchin	Green Urchin	Sea Cucumber	Crab	Shrimp Trawl
For each logistic unit created																				
Identity Information																				
Logistic unit ID	M								O O											
Trade unit ID's that make up the logistic unit	M																			
Number of trade units in logistic unit	M																			
Number of logistic units in shipment	M							O	O				O	O		O O	O O	O O		
For each unit dispatched (either logistic unit or trade unit)																				
Unit ID	M								O O											
Destination Information																				
Name of next food business	M	O O O	O O O	O O O	O O O	O O O	O O O	O O	O O	O O	O	O	O	O O O O	O	O O O	O O O	O O O	O O	O O O
Name of Responsible Individual	M																			
Email Address																				
Transportation Information																				
Date/time of dispatch	M																			
Date onto packer									O				O							
Date onto truck		O	O										O							
Place of dispatch	M																			
Packer																				
Truck		O O	O O	O O	O O	O O	O O	O	O				O	O O		O O	O O	O O		O
Name of transport firm	M																			
Packer																				
Truck		O	O																	
Name of Responsible Individual	M																			
Email Address																				

M =manditory R =recommended O =optional

O = reported by skipper O = reported by observe O = reported by buyer

5.0 STATE OF READINESS REPORT

5.1 READINESS REPORT CARDS

"State of Readiness" report cards have been prepared for each of the major British Columbia wild fisheries as well as the finfish and shellfish aquaculture sectors (see end of Section 5 for individual reports). The purpose of these report cards is to:

1. Summarize the fishery or aquaculture sector from a water to buyer traceability perspective (management regime, product pathways, product form and markets),
2. assess traceability data issues (data gaps, accessibility, data transfer and mapping),
3. identify factors impeding and aiding the ability of the sector to meet traceability requirements, and
4. identify traceability goals and opportunities for each fishery or aquaculture sector.

The report cards provide an overall State of Readiness Rating (A, B, C, D) based on five rating categories:

1. Data Availability (taken primarily from Tables 4.1 – 4.8)
2. Use of Product Identifiers
3. Effective Data Transfer and Information Mapping
4. Industry Leadership
5. Processor Level Constraints

The first three categories reflect the basic elements of traceability as summarized in Figure 2.2:

1. Is the data being collected and is it accessible?
2. Can product units be identified?
3. Is the data effectively transferred along the water to buyer supply chain and is data mapping effective?

The last two categories identify important opportunities or constraints to achieving traceability.

1. The ability of industry to provide coordinated leadership to address this issue, and
2. outstanding issues at the processor level which might constrain traceability upstream of the water to buyer component.

Scoring criteria for each rating category are provided in Table 5.1. Ratings were done independently by three project team members who subsequently reviewed the ratings jointly, reaching consensus on an overall rating for each sector. Ratings for each sector are summarized in Table 5.2, with a lower overall rating indicating higher state of readiness.

Table 5.1 Scoring criteria for rating traceability readiness

Rating Category	Score	Criteria
Data Availability	1	All required product and business data is collected and can be accessed by industry
	2	Essentially all required product and business data is collected but data is not fully accessible to industry
	3	Significant data gaps and accessibility constraints
Product Identifiers	1	Product identifiers are used for all product units
	2	Product identifiers are used for some product units and could be developed for others
	3	Product identifiers are not used and/or significant barriers exist to implementing product identities
Effective Data Transfer and Information Mapping	1	Integrated electronic data system which permits rapid and effective product tracking
	2	Paper based systems and/or databases which permit relatively effective information tracking
	3	Poor or no linking of data records (paper or electronic) through the water to buyer supply chain
Industry Leadership	1	Coordinated industry association which does or can take responsibility for traceability data
	2	Moderate level of coordinated industry representation, may not be responsible for data programs
	3	Little or no coordinated industry association. Existing associations are not responsible for data programs
Processor Level Constraints	1	No impediments at the processor level to addressing harvest/producer level traceability
	2	Moderate impediments at the processor level to addressing harvest/producer level traceability
	3	Significant impediments at the processor level to addressing harvest/producer level traceability

While it is acknowledged that this assessment is "opinion based", a number of important observations can be made:

1. Salmon aquaculture sets the standard for traceability readiness
The BC salmon aquaculture industry is currently meeting all required traceability standards and can serve as a model to other sectors with respect to developing appropriate traceability data systems. In particular the finfish aquaculture industry can provide leadership on use of product identifiers and information technology systems.

2. Bivalve fisheries and shellfish aquaculture are well positioned due to Canadian Sanitary Shellfish Program (CSSP)
Due to public health and safety concerns about consumption of raw or cooked product, bivalve fisheries as well as oyster, clam and mussel aquaculture have the basic elements of upstream traceability to the harvest or grow-out site. Shellfish aquaculture still has problems tracing product to the hatchery and nursery level due to product pooling (Section 4.5) and both the wild

Table 5.2. State of readiness ratings for the major BC fisheries and aquaculture sectors. See individual report cards for further detail

Seafood Sector	Management Regime	Readiness Criteria					Overall Rating	
		Data Availability	Use of Product Identifiers	Information Mapping	State of Sector Leadership	Processor Constraints		
Sablefish	IQ	1	3	2	1	1	**8**	**B+**
Halibut	IQ	1	2	2	1	2	**8**	**B+**
Rockfish Hook and Line	Area/Species Quotas	2	3	3	2	2	**12**	**C**
Schedule II Fisheries	Area/Species Quotas	2	3	3	2	2	**12**	**C**
Groundfish Trawl	IQ	1.5	3	2	1.5	2	**10**	**B-**
Roe Herring	Pooled Quota	1	3	2	1.5	1.5	**9**	**B**
Herring Spawn on Kelp	IQ	1	1.5	1.5	1	1	**6**	**A**
Tuna		2	3	3	2	2	**12**	**C**
Salmon all gear types	Time and Area	2.5	3	3	2.5	3	**14**	**D**
Geoduck	IQ	1	2	2	1	1	**7**	**A-**
Prawn	Time and Area	2	2	2	1.5	1	**8.5**	**B+**
Red and Green Urchins	IQ	1	2.5	2	1	1	**7.5**	**A-**
Sea Cucumber	IQ	1	2.5	2	1	1	**7.5**	**A-**
Crab (trap)	Area, Time, size	2	3	3	2.5	2	**12.5**	**C**
Shrimp Trawl	Time and Area quotas	2	3	2	2	2	**11**	**C+**
Wild Fishery Totals		**23**	**39.5**	**34.5**	**23.5**	**24.5**		
Salmon Aquaculture	N/A	1	1	1	1.5	1	**5.5**	**A**
Shellfish Aquaculture	N/A	1	1.5	1.5	1.5	1	**6.5**	**A-**

and aquaculture sectors would benefit by improved information technology for data mapping.

3. Individual quota (IQ) fisheries are better positioned than non-IQ fisheries.
The overall State of Readiness ratings for the seven IQ fisheries range from 6.0 to 10.0 (mean of 7.7). Overall ratings for the eight non-IQ fisheries range from 9.5 to 14.0 (mean of 11.4). IQ fisheries rank higher primarily due to the presence of a verifiable landings data (dockside monitoring programs), better data accessibility (industry is an acknowledged partner in data collection and management in many, but not all, IQ fisheries), and the degree of industry leadership (all IQ fisheries are represented by a cohesive industry association). Non-IQ fisheries with relatively high ratings (herring roe and prawn) each have some management practices similar to IQ fisheries. Roe herring is managed by pooling fishing effort and vessel landings are tracked using independent dockside monitors. Most of the prawn catch is frozen at sea and packaging is labelled with a vessel identification code, facilitating traceability to the harvest level.

4. Almost all wild harvest fisheries need to develop or improve product identification, effective data transfer and information mapping.

Ratings for use of product identifiers as well as effective data transfer and information mapping were consistently poorer across all fisheries that other rating categories (see totals at the bottom of Table 5.2). Herring spawn-on-kelp was the only fishery with top ratings in each of these two categories, as it is the only wild fishery to use unique product identifiers on individual totes of spawn-on-kelp product.

5. Quality driven fisheries have fewer processor level constraints.
Fisheries where payment to the harvester is based on the quality of product leaving the processing plant face fewer constraints to traceability at the processing level (Section 3.6). Examples include sablefish, herring roe, herring spawn-on-kelp and groundfish trawl.

6. Wild salmon fisheries have significant traceability issues
From a "Water to Buyer" perspective the wild salmon fishery in British Columbia, as currently practiced, faces significant traceability issues, including lack of verifiable landings data, poor documentation of product pooling at the packer level and the absence of a coordinated harvester association to address traceability issues. At the processor level excellent systems exist to trace canned product upstream from retailer to the processor and processing batch lot. In contrast, product grading and cold storage practices make it practically impossible to trace product upstream from the processor shipping gate to individual harvesters (or pools of harvesters) for fresh, frozen and canned product. It is clear that changes to product handling and management from packer to cold storage needs to occur in the wild salmon sector in order to meet the basic elements of traceability.

Traceability Readiness Report Card

Fishery:

Sablefish Trap and Longline

State of Readiness Assessment:

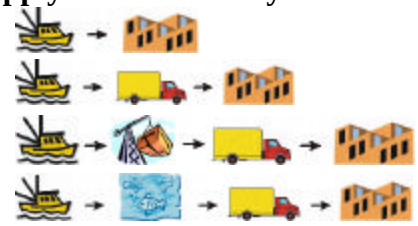
Total Score =

B+

Fishery Overview:

- Individual vessel quota with dockside monitoring
- Open year round with effort driven by price and market demand.
- Fishing occurs in offshore areas of the BC coast
- Retained catch is sablefish
- Pooling of product does not occur
- Vessels are paid based on size, grade and quality.
- Batch=offload, Trade unit= totes of fish, Logistic unit=totes of fish
- One overall industry association – Canadian Sablefish Association (CSA)

Supply Chain Pathways



Unit Transformations

Markets:

- Market is primarily for frozen sablefish in Japan. Smaller markets in China, US and Canada also exist.
- Frozen at sea j-cut sablefish is delivered to buyers
- Product quality concerns are based on freezing quality, markings and freshness
- Japanese traceability regulations are not yet developed.

Data Availability from Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, data access contact persons (data responsible party) for the harvester, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with offload tallys sent to the buyer.

Industry Leadership: **Score = 1**

One well organized industry association

Processor Level Constraints: **Score = 1**

Minimal – product is traced for quality purposes through the processing plant

Factors impeding ability to meet traceability:

Factors aiding ability to meet traceability:

- A data system is in place (DMP) and most of the required information is already collected.
- Fish are large and handled individually
- IQ fishery regime allows market driven fishing and time for specialized product handling
- Single species fishery
- Frozen at sea product is not as time sensitive as fresh
- Limited number of sablefish buyers
- Harvesters paid on quality basis

Opportunities:

Goal 1 - Traceability to an offload or container level.

Goal 2 – Good candidate fishery for a pilot project

- Identify containers with trade/logistic unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for

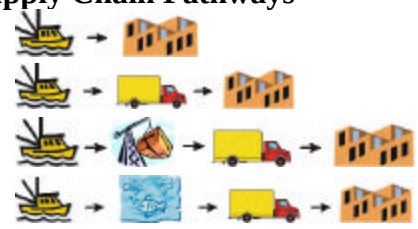
Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Halibut Hook and Line	**Total Score =** **B+**

Fishery Overview:

- Individual vessel quota system with dockside monitoring
- Open season March – November with effort driven by price and convenience of scheduling around other fishing activities.
- Fishing primarily occurs in offshore areas of the BC coast
- Bycatch includes other groundfish (rockfish, lingcod, dogfish, skate)
- Pooling of product prior to buyer is rare
- Batch=offload, Trade unit=individual fish or totes of fish, Logistic unit=totes of fish
- Fishers are generally paid a standard price. Differentials are occasionally paid based on size and/or chaulkiness.
- The Pacific Halibut Management Association (PHMA) represents industry

Supply Chain Pathways



Unit Transformations

Markets:

- Market is primarily for fresh halibut exports to the US. Domestic market is small.
- Primarily fresh dressed and iced halibut are delivered to buyers. Live and FAS occurs but is rare.
- Product quality concerns are based on freshness and chaulkiness.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Data Availability from Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, data access contact persons (data responsible party) for the harvester, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 2**

Serial numbered fish tags are used (halibut only). Logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with offload tallys sent to the buyer.

Industry Leadership: **Score = 1**

One well organized association represents industry

Processor Level Constraints **Score = 2**

Pooling of product can occur at the processor

Factors impeding ability to meet traceability:

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically.
- Fish are large, handled individually and tagged with a unique serial number (identifies halibut as Canadian and validated). This is the only fishery that is traceable on a piece by piece basis to a specific offload.
- Limited number of halibut buyers

Opportunities:

Goal 1 - Traceability to an offload or container level.

Goal 2 – Good candidate fishery for a pilot project

- Identify containers with trade/logistic unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication.
- Halibut tags could be coded with digitally readable information for partial piece by piece traceability or marketing purposes

Traceability Readiness Report Card

Fishery:

Rockfish Hook and Line

State of Readiness Assessment:

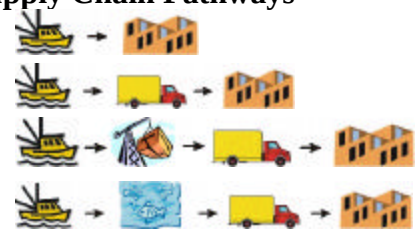
Total Score =

C

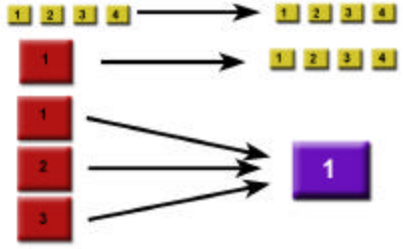
Fishery Overview:

- Fishery managed through area and species Total Allowable Catches
- Open year round with time and area closures. Effort driven by competition and fishing opportunity.
- Fishing occurs in all areas of the BC coast
- Catch is a mix of several species of rockfish and other groundfish species
- Pooling from various offloads occurs for transportation, especially with live fish
- Vessels are paid a differential price primarily based on species and product form, not quality.
- Batch= offload, Trade unit = totes of fish, Logistic unit = totes of fish
- Several fleet based associations represent the industry

Supply Chain Pathways



Unit Transformations



Markets:

- Market is primarily for fresh and live fish in the US. A moderate domestic market exists
- Primarily fresh iced and live fish are delivered to buyers
- Product quality concerns are based on freshness.
- Rockfish are not accurately labeled by species but sold under aggregate names like snapper.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Data Availability From Fisheries Monitoring Programs: **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, type of package, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 3**

Current data systems are paper based with offload tallys sent to the buyer.

Industry Leadership: **Score = 2**

No one association to represent industry.

Processor to Consumer Constraints: **Score = 2**

Product batching occurs in the transportation and storage of live product.

Factors impeding ability to meet traceability:	Factors aiding ability to meet traceability:
• Dockside monitoring contract is administered by DFO • A variety of species are harvested	• An industry wide landings data system is in place through 100% dockside validation • Most of the required information is collected on paper and stored electronically.

Opportunities:

Goal 1 - Traceability to an offload or container level

- Identify containers with trade/logistic unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.

Traceability Readiness Report Card

Fishery:

Schedule II Lingcod, Dogfish and Skate Hook and Line

State of Readiness Assessment:

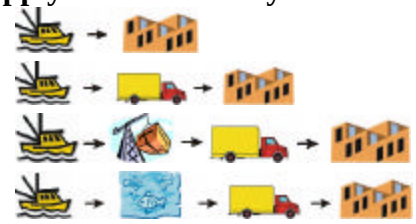
Total Score =

C

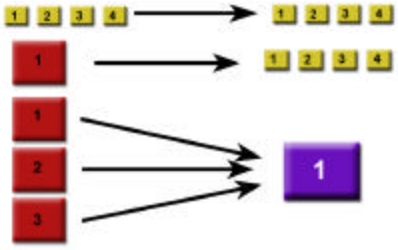
Fishery Overview:

- Fishery managed through monthly limits and area Total Allowable Catches (TAC's)
- Open year round with some time and area closures. Lingcod effort driven by competition. Dogfish effort driven by market as TAC's are not a concern.
- Fishing occurs in all areas of the BC coast
- Catch is primarily lingcod, dogfish and skate (targeted separately)
- Pooling may occur during transportation, especially of live fish
- Vessels are paid a differential price based primarily on species and product form.
- Batch=Offload, Trade unit=totes of fish, Logistic unit=totes of fish
- Several fleet based associations represent industry

Supply Chain Pathways



Unit Transformations



Markets:

- Lingcod market is primarily for fresh and live fish in the US, while dogfish market is fresh and frozen to the UK.
- Fresh iced, live and frozen lingcod are delivered to buyers. Dogfish and skate are delivered fresh iced.
- Product quality concerns are based on freshness.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Data Availability From Fisheries Monitoring Programs: **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter	Validation Record – MSP Offload Tally – MSP and custom offloader Transit Slip – MSP Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, type of package, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 3**

Current data systems are paper based with offload tallys sent to the buyer.

Industry Leadership: **Score = 2**

No one association to represent industry.

Processor Level Constraints: **Score = 2**

Product batching occurs in the transportation and storage of live product.

Factors impeding ability to meet traceability:

- Dockside monitoring contract is administered by DFO
- A variety of species are harvested

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically.

Opportunities:

Goal 1 - Traceability to an offload or container level

- Identify containers with trade/logistic unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.

Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Groundfish Trawl	**Total Score =** **B-**

Fishery Overview:

- Individual vessel quota
- Open year round with effort driven by price and market demand.
- Fishing occurs in all areas of the BC coast
- Catch consists of dozens of species of groundfish (primarily rockfish, sole, hake and pollock)
- Pooling of product prior to buyer does not occur
- Vessels are paid a differential price based on quality and recovery.
- Batch=offload, Trade unit=totes of fish (entire offload for hake), Logistic unit=totes of fish
- The Canadian Groundfish Research Conservation Society (CGRCS) represents several fleet based associations

Supply Chain Pathways

Unit Transformations

Markets:

- Market is primarily for fresh fish exported to the US. Frozen thornyheads are exported to Asia and Hake is exported to the EU, Asia and the US. Fresh and live markets exist domestically.
- Fresh iced, live and frozen at sea fish is delivered to buyers
- Product quality concerns are based on harvest volume, trip duration (freshness) and damage.
- COOL, US Bioterrorism Act and EU Food Law are the main traceability regulations of concern.

Data Availability from Fisheries Monitoring Programs: **Score = 1.5**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Validation Record – MSP Offload Tally – MSP and custom offloader	Validation Record – MSP Offload Tally – MSP and custom offloader	Validation Record – MSP Offload Tally – MSP and custom offloader Bill of Lading – transporter	Validation Record – MSP Offload Tally – MSP and custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records - buyer

What product or business data is missing?

number of units in shipment, type of package, transport firm, data access contact persons (data responsible party) for the harvester, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with offload tallys sent to the buyer.

Industry Leadership: **Score = 1.5**

Two closely cooperating associations represent the majority of the industry

Processor Level Constraints: **Score = 2.0**

Species batching during processing accompanied by poor species documentation

Factors impeding ability to meet traceability:

- Catch volumes are large
- High diversity of species landed

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically (MSP).
- IQ fishery regime allows market driven fishing
- Harvesters are paid on a recovery and quality basis

Opportunities:

Goal 1 - Traceability to an offload or container level.

- Identify containers with trade/logistic unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication
- Provide more accurate information to sales team prior to processing. Selling product from skipper hails results in having to fill “order shorts” to compensate for inaccuracies.
- Improve species documentation including use of scientific names
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.

Traceability Readiness Report Card

Fishery:

Roe Herring Seine and Gillnet

State of Readiness Assessment:

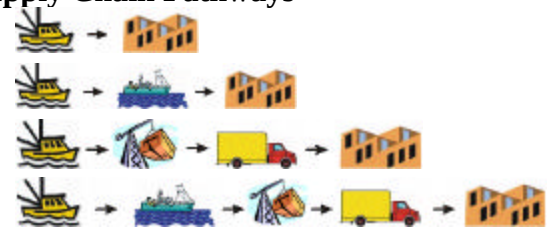
Total Score =

B

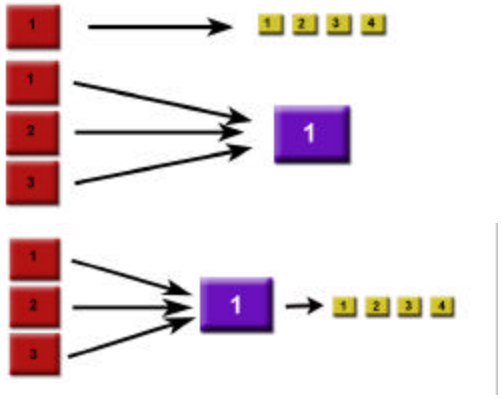
Fishery Overview:

- Short openings with area Total Allowable Catches and pooled fishing effort
- Effort is based on competition and fishing opportunity (stock forecasts).
- Fishing occurs in specific nearshore areas throughout the BC coast
- Catch is primarily herring. There are no bycatch issues
- Pooling of product is infrequent for seine caught herring but common on packers for gillnet caught herring.
- Batch = offload, Trade unit = totes of fish, Logistic unit = totes of fish
- A differential price is paid based on quality (delivery for a single vessel or pooled packer load).
- One association represents industry – Herring Conservation and Research Society (HCRS)

Supply Chain Pathways



Unit Transformations



Markets:

- Market is primarily for salted roe to Japan. Domestic market is extremely small.
- Fresh iced herring is delivered to buyers
- Product quality concerns are based on freshness, size, texture and colour of eggs.
- Japanese traceability regulations are not yet developed, will also be of concern.

Data Availability from Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Transporter	Buyer
Validation Record - MSP Offload Tally – custom offloader	Validation Record – MSP Offload Tally – MSP and custom offloader Bill of Lading – transporter	Validation Record – MSP Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

units in shipment, type of package, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes through 100% dockside validation

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are hail and paper based with validation records accompanying deliveries to the buyer.

Industry Leadership: **Score = 1.5**

One association represents industry

Processor Level Constraints: **Score = 1.5**

Minimal as pooled product is traced through the plant for quality monitoring

Factors impeding ability to meet traceability:	Factors aiding ability to meet traceability:
• No harvest log exists. Harvest information is hailed from the grounds to MSP which provides lack of verifiable harvest data during pooling.	• An industry wide landings data system is in place through 100% dockside validation • Most of the required information is collected on paper and stored electronically. • Japanese market is very quality oriented • Single species fishery

Opportunities:

Goal 1 - Traceability to a pool level

- Identify containers with trade/logistic unit identifiers
- Improve documentation of pooling for gillnet product
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication

Traceability Readiness Report Card

Fishery:

Herring Spawn on Kelp

State of Readiness Assessment:

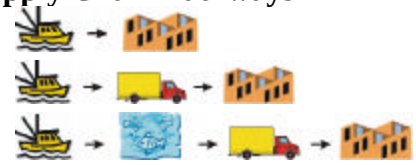
Total Score =

A

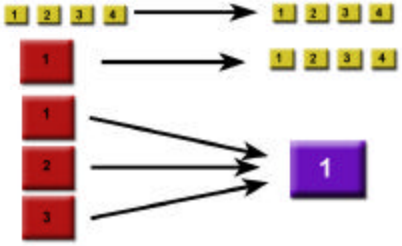
Fishery Overview:

- Individual quota system for spawn on kelp produced
- Fishing occurs in the spring when herring are ready to spawn. Fish are caught and held in pens with kelp for spawning.
- Fishing and ponding occurs in specific harvest areas of the BC coast
- Herring are captured or directed to ponds for spawning and then released. *Macrocystis* kelp is harvested and placed in ponds. No bycatch issues
- Pooling of product is allowed from within harvest areas.
- Price determined by market demand and product quality.
- Batch =shipment, Trade unit=totes of SOK, Logistic unit=totes of SOK
- Spawn on Kelp Operators Association (SOKOA) represents industry
- Fishery operation is somewhat similar to finfish aquaculture in that product inputs (fish and kelp quantity, quality, environmental conditions) can be traced

Supply Chain Pathways



Unit Transformations



Markets:

- Market is primarily for brined spawn on kelp to Japan. Domestic market is extremely small.
- Fresh brined spawn on kelp is delivered to buyers
- Product quality concerns are based on temperature, salinity, kelp quality, size, texture and colour of eggs.
- Japanese traceability regulations are not yet developed.

Data Availability from Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester/Operator	Transporter	Buyer
Harvest Log – operator/MSP Validation Record - MSP Quality checklist – MSP/buyer	Validation Record – MSP Bill of Lading – transporter	Validation Record – MSP Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

transport firm, data access contact persons (data responsible party) for the harvester/operator, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% on grounds and dockside validation

Product Identifiers: **Score = 1**

Tote numbers and shipment numbers are used.

Data Transfer and Information Mapping: **Score = 1.5**

Current data systems are paper based with validation records accompanying deliveries to the buyer.

Industry Leadership: **Score = 1**

One association represents industry

Processor Level Constraints: **Score = 1.5**

Pooling of product for trimming, grading and packing

Factors impeding ability to meet traceability:	Factors aiding ability to meet traceability:
• Alaskan product landed and processed in BC	• An industry wide landings data system is in place through 100% dockside validation. • Most of the required information is collected on paper and stored electronically. • Japanese market is very quality oriented • Operators are paid based on quality • Tote labels with shipment number and tote number are mandatory (some form of batch numbering and trade unit identifier system already exists)

Opportunities:

Goal 1 – Traceability to a container level that provides data electronically to the supply chain.

Goal 2 – Good candidate fishery for a pilot project.

- Use of unique and digitally recognized product identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication

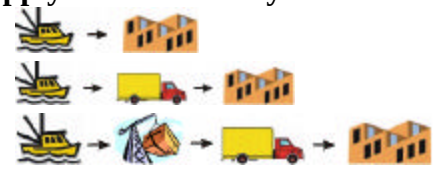
Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Tuna Troll	**Total Score =** **C**

Fishery Overview:

- Open season with no Total Allowable Catch
- Open year round with effort driven by market demand and weather.
- Fishing occurs in offshore areas of the Pacific Ocean
- Catch is primarily albacore tuna
- Pooling of product does not occur
- Vessels are paid a standard rate.
- Batch = offload, Trade unit = totes of fish, Logistic unit = totes of fish
- More than one association represents industry

Supply Chain Pathways



Unit Transformations

Markets:

- Markets include fresh, frozen, smoked and canned tuna in Canada, US, EU and Japan.
- Most tuna are delivered frozen at sea to buyers.
- Product quality concerns are based on freezing quality and freshness.
- COOL, US Bioterrorism Act and EU Food Law are the main traceability regulations of concern. Japanese traceability regulations are not yet developed.

Data Availability From Fisheries Monitoring Programs: **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, batch number, type of package, date and time of dispatch, place of dispatch, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter

Is the data electronically accessible to the supply chain?

No. Paper harvest records are maintained by the harvester

Is the data verifiable?

No third party validation or audits are conducted.

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 3**

Current data systems are paper based with poor transfer of data to the buyer.

Industry Leadership: **Score = 2**

The Canadian Highly Migratory Species Foundation represents industry

Processor Level Constraints: **Score = 2**

Cold storage is common where grading and pooling of product may occur. The associated inventory management is poor.

Factors impeding ability to meet traceability:

- An industry wide data system for offloads does not currently exist
- Landings data is not verifiable (ie. Dockside Monitoring Program)
- Canadian harvesters land tuna in Canada and the US

Factors aiding ability to meet traceability:

- Tuna are large, handled individually and frozen at sea

Opportunities:

Goal 1 - Traceability to an offload or container level.

- Develop an industry wide landings data system from which business information is accessible, transferable, and verifiable.
- Identify containers with unique trade unit identifiers.
- Foster cooperation among businesses and a unified approach in addressing industry business

Traceability Readiness Report Card

Fishery:

Salmon Seine, Gillnet and Troll

State of Readiness Assessment:

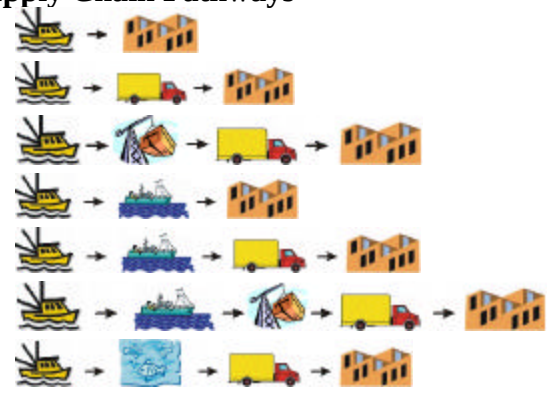
Total Score =

D

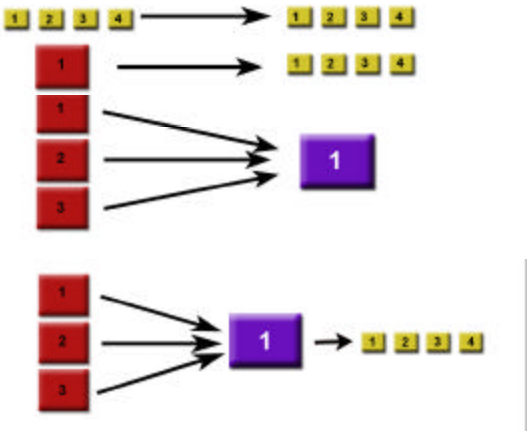
Fishery Overview:

- Derby style openings, generally of short duration (1-2 days) with area and species Total Allowable Catches. Troll openings are typically longer (up to several weeks)
- Generally, fishing opportunities are in the summer months but troll opportunities occur year round. Effort is based on competition and fishing opportunity (run forecasts).
- Fishing occurs in all areas of the BC coast
- Catch consists of five salmon species: chinook, coho, sockeye, pink and chum
- Pooling of product is common
- Fishers are not paid a differential price based on quality.
- Batch = offload, Trade unit = totes of fish, Logistic unit = totes of fish
- Many fleet based associations represent industry

Supply Chain Pathways



Unit Transformations



Markets:

- Market is diverse for fresh, frozen, canned and smoked product to the US, Asia, and EU. Domestic market is moderate for all product forms.
- Fresh iced and frozen at sea fish is delivered to buyers
- Product quality concerns are based on freshness, texture, colour and markings.
- COOL, US Bioterrorism Act and EU Food Law are the main traceability regulations of concern. Japanese traceability regulations are not yet developed.

Data Availability from Fisheries Monitoring Programs: **Score = 2.5**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, batch number, type of package, date and time of dispatch, place of dispatch, transport firm, data access contact persons (data responsible party) for the harvester, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper harvest records are maintained by the harvester

Is the data verifiable?

No third party validation or audits are conducted for landings.

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 3**

Current data systems are paper based with poor transfer of data to the buyer.

Industry Leadership: **Score = 2.5**

Several area and gear based associations exist that have a lack of common vision for the fishery.

Processor Level Constraints: **Score = 3**

- Salmon are purchased by a large number of buyers
- Grading and re-grading occurs at the buyer.
- Cold storage is common and the associated inventory management is poor

Factors impeding ability to meet traceability:

- An industry wide data system for offloads does not currently exist. Harvest data is entered into a DFO database and is not accessible to industry
- Landings data is not verifiable (ie. DMP)
- Product pooling is common on packers and may occur on trucks
- The salmon fishery has the highest degree of water to buyer supply chain pathways and unit transformations
- There is a lack of partnership in the historic salmon harvester/buyer relationship

Factors aiding ability to meet traceability:

- BC canneries are regarded as having advanced traceability back to the canning process through coded embossing on cans.

Opportunities:

Goal 1 - Traceability at an offload or container level

Goal 2 – Restructure the fishery operations and industry representation to facilitate traceability

- Develop an industry wide landings data system from which traceability information is accessible, transferable, and verifiable.
- Develop protocols for batching product during transportation and storage at the buyer
- Identify batches and label products with trade unit identifiers
- Improve product quality by facilitating differential price payment based on quality
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.
- Fish tags could be used that are coded with digitally readable information for partial piece by piece traceability or marketing purposes

Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Geoduck by Dive	**Total Score =** **A-**

Fishery Overview:

- Individual vessel quota
- Open year round with effort closely controlled by buyers and based on market demand
- Fishing occurs in all areas of the BC coast
- Catch consists of geoduck clam and incidental horse clams
- Pooling does not occur
- Batch =offload, Trade unit=cage, Logistic unit=cage
- One association represents industry – Underwater Harvesters Association (UHA)

Chain of Custody Pathways

Unit Transformations

Market/s:

- Market is primarily for live clams in China. Domestic market is extremely small.
- Live clams are delivered to buyers in industry standard cages (plastic crates)
- Product quality concerns are based on skin colour, broken shell and survival.
- There are no traceability regulations of concern for exports to China.

Data Availability From Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Transporter	Buyer
Harvest/Validation Record – skipper and MSP	Harvest/Validation Record – skipper and MSP Bill of Lading – transporter	Harvest/Validation Record – skipper and MSP Bill of Lading – transporter Delivery Record – buyer Sales Records - buyer

What product or business data is missing?

CFIA CSSP area designation, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 2**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with validation records accompanying deliveries to the buyer.

Industry Leadership: **Score = 1**

One well organized industry association represents industry

Processor Level Constraints: **Score = 1**

Batching for quality occurs at the buyer

Factors impeding ability to meet traceability:

- Current export practices to mainland China do not support full chain traceability

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically(MSP).
- IQ fishery regime allows market driven fishing and time for specialized product handling
- Primarily single species fishery
- Number of geoduck buyers are limited
- No unit transformations occur from water to buyer
- Trade/logistic units can be readily identified through the use of standardized cages.
- Cage tags are required on every cage transported
- Each geoduck is banded and packed individually

Opportunities:

Goal 1 – Traceability to a cage level

Goal 2 – Good candidate fishery for a pilot project

- Identify cages with trade unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more efficient and timely data communication

Traceability Readiness Report Card

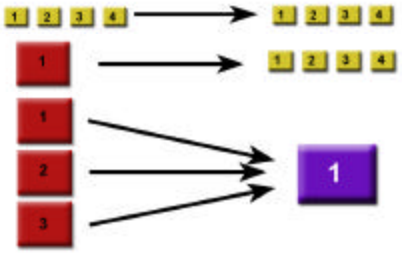
Fishery:	**State of Readiness Assessment:**
Prawn by Trap	**Total Score =** **B+**

Fishery Overview:

- Fishery is managed with trap limits, size limit and spawner index levels.
- Effort is based on trap fishing opportunity and markets.
- Fishing occurs primarily in nearshore areas of the BC coast
- Catch is primarily spot shrimp (prawn) with small catches of other shrimp species.
- Product pooling does not occur
- Vessels are paid on size and product form.
- Batch =offload, Trade unit=box, Logistic unit=case
- One association represents industry – Pacific Prawn Fishermen's Association (PPFA)

Supply Chain Pathways

Unit Transformations



Markets:

- Market is primarily for frozen prawns in Japan. Domestic market is small.
- Fresh, frozen at sea and live prawns are delivered to buyers
- Product quality concerns are based on freshness and size.
- Japanese traceability regulations are not yet developed.

Data Availability from Fisheries Monitoring Programs — **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper	Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, type of package, date and time of dispatch, place of dispatch, transport firm, data access contact persons (data responsible party) for the harvester, transporter and buyer.

Is the data electronically accessible to the supply chain?

No. Paper harvest records are maintained by the harvester

Is the data verifiable?

No third party validation or audits are conducted.

Product Identifiers: — **Score = 2**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: — **Score = 2**

Current data systems are paper based with poor transfer of data to the buyer.

Industry Leadership: — **Score = 1.5**

One association represents industry

Processor Level Constraints: — **Score = 1**

Minimal, most product delivered frozen and boxed, pooling of live or fresh product

Factors impeding ability to meet traceability:

- An industry wide data system for offloads does not currently exist
- Landings data is not verifiable(e.g. dockside monitoring program)

Factors aiding ability to meet traceability:

- Primarily single species fishery
- Most prawns are frozen in boxes at sea with a code identifying the date and vessel.

Opportunities:

Goal 1 - Traceability to an FAS box level.

- Develop an industry wide landings data system from which business information is accessible, transferable, and verifiable.
- Identify containers with unique trade unit identifiers. Replace box codes with digitally readable labels.
- Improved traceability for fresh product.
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.

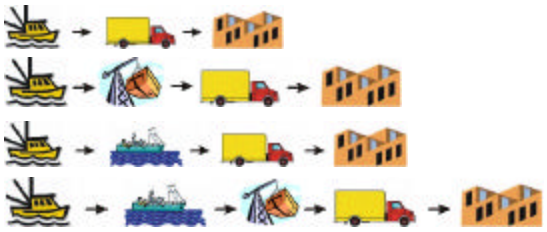
Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Red and Green Sea Urchin by Dive	**Total Score =** **A-**

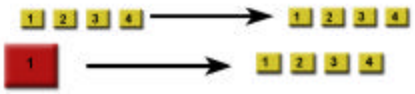
Fishery Overview:

- Individual vessel quota
- Red sea urchins are open year round and green sea urchins are fished in the winter. Effort is based on roe quality and market demand
- Fishing occurs in nearshore areas of the BC coast
- Catch consists of red and green sea urchins (separately licenced fisheries)
- Pooling does not occur
- Vessels are paid based on roe quality
- Batch =offload, Trade unit=tote, cage(green urchins), Logistic unit=tote, cage(green urchins)
- Pacific Urchin Harvesters Association (PUHA) represents the red sea urchin industry and West Coast Green Urchin Association (WCGUA) represents the green sea urchin industry

Chain of Custody Pathways



Unit Transformations



Market/s:

- Market is primarily for fresh roe to Japan. Small markets exist in France, US and Canada.
- Live sea urchins are delivered to buyers
- Product quality concerns are based on roe colour, size and texture.
- Japanese traceability regulations are not yet developed.

Product and Business Data Availability: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest/Validation Record – skipper and MSP	Validation/Harvest Log – skipper and MSP Offload Tally – custom offloader	Validation/Harvest Log – skipper and MSP Offload Tally – custom offloader Bill of Lading – transporter	Validation/Harvest Log – skipper and MSP Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 2.5**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with validation records accompanying deliveries to the buyer.

Industry Leadership: **Score = 1**

One association represents industry

Processor Level Constraints: **Score = 1**

Factors impeding ability to meet traceability:

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically(MSP).
- IQ fishery regime allows market driven fishing and time for specialized product handling
- Single species fishery
- Number of sea urchin buyers are limited
- No unit transformations occur from water to buyer
- Container tags are required on every container transported

Opportunities:

Goal 1 – Traceability to a container level

Goal 2 – Good candidate fishery for a pilot project

- Identify containers with trade unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more

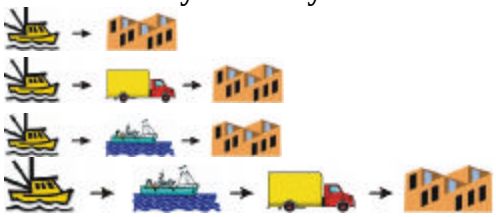
Traceability Readiness Report Card

Fishery:	**State of Readiness Assessment:**
Sea Cucumber by Dive	**Total Score =** **A-**

Fishery Overview:

- Individual vessel quota
- Open September to November with effort based on fishing opportunity.
- Fishing occurs in specific nearshore areas throughout the BC coast
- Catch is sea cucumber
- Pooling does not occur
- Vessels are paid a standard price.
- Batch =offload, Trade unit=tote, Logistic unit=tote
- One industry association – Pacific Sea Cucumber Harvester's Association (PSCHA)

Chain of Custody Pathways



Unit Transformations

Market/s:

- Market is primarily for fresh and frozen meat and dried skins to China and Japan. Domestic market is extremely small.
- Fresh eviscerated sea cucumbers are delivered to buyers
- There are no product quality concerns.
- Japanese traceability regulations have are yet developed.

Data Availability From Fisheries Monitoring Programs: **Score = 1**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest/Validation Record – skipper and MSP	Validation/Harvest Record – skipper and MSP Offload Tally – custom offloader	Validation/Harvest Record– skipper and MSP Offload Tally – custom offloader Bill of Lading – transporter	Validation/Harvest Record– skipper and MSP Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper validation records are maintained by the harvester. A confidential electronic database is maintained by the MSP.

Is the data verifiable?

Yes, through 100% dockside validation

Product Identifiers: **Score = 2.5**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with validation records accompanying deliveries to the buyer.

Industry Leadership: **Score = 1**

One association represents industry

Processor Level Constraints: **Score = 1**

Factors impeding ability to meet traceability:

Factors aiding ability to meet traceability:

- An industry wide landings data system is in place through 100% dockside validation
- Most of the required information is collected on paper and stored electronically(MSP).
- IQ fishery regime allows market driven fishing and time for specialized product handling
- Single species fishery
- Number of sea cucumber buyers are limited
- No unit transformations occur from water to buyer
- Container tags are required on every container transported

Opportunities:

Goal 1 – Traceability to a container level

Goal 2 – Good candidate fishery for a pilot project

- Identify containers with trade unit identifiers
- Integrate existing data systems and streamline data transfer through the supply chain for more

Traceability Readiness Report Card

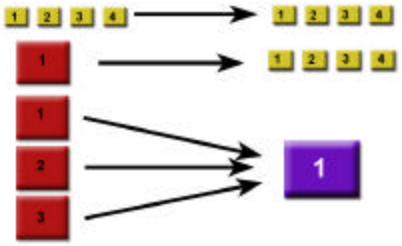
Fishery:	**State of Readiness Assessment:**
Crab by Trap	**Total Score =** **C**

Fishery Overview:

- Fishery is managed with trap limits, size limits and non-retention of females.
- Open year round with some seasonal and area softshell closures. Effort is based on market demand and catch rates.
- Fishing occurs in all areas of the BC coast
- Catch is primarily Dungeness crab
- Pooling may occur for transporting live crab
- Vessels are generally paid a standard price.
- Batch = offload, Trade unit = tote, Logistic unit = tote
- Several area based industry associations.

Supply Chain Pathways

Unit Transformations



Markets:

- Market is primarily for live and fresh-cooked crab in the US. A moderate domestic market exists.
- Live crabs are delivered to buyers
- Product quality concerns are based on missing claws and legs, softshell and survival.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Data Availability From Fisheries Monitoring Programs: **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper	Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

Batch #, type of package, number of units in shipment, date and time of dispactch, place of dispatch, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper harvest records are maintained by the harvester

Is the data verifiable?

No third party validation or audits are conducted.

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 3**

Current data systems are paper based with poor transfer of data to the buyer.

Industry Leadership: **Score = 2.5**

No one association represents crab harvesters. Several area based associations exist that have varying levels of organization and leadership.

Processor Level Constraints: **Score = 2**

- Product batching occurs in the transportation and storage of live product.

Factors impeding ability to meet traceability:

- An industry wide data system for offloads does not currently exist
- Landings data is not verifiable (ie. DMP)

Factors aiding ability to meet traceability:

- Primarily single species fishery

Opportunities:

Goal 1 - Traceability to an offload or container level.

Goal 2 – Restructure the fishery operations and industry representation to facilitate traceability

- Develop an industry wide landings data system from which traceability information is accessible, transferable, and verifiable.
- Develop protocols for batching product during transportation and storage at the buyer
- Identify batches and label products with trade unit identifiers
- Foster cooperation among businesses and a unified approach in addressing industry business and fisheries issues.

Traceability Readiness Report Card

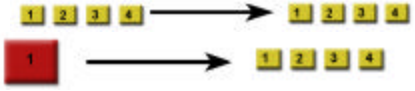
Fishery:	**State of Readiness Assessment:**
Shrimp Trawl	**Total Score =** **C+**

Fishery Overview:

- Fishery is managed with area Total Allowable Catches.
- Open year round with some seasonal closures. Effort based on competition, market demand and catch rates.
- Fishing occurs in all areas of the BC coast
- Catch primarily consists of spiny pink, smooth pink, humpback, sidestripe and coonstripe shrimp
- Pooling of product does not occur
- Vessels are paid on recovered weight for fresh iced product.
- Batch = offload, Trade unit = tote, Logistic unit = tote
- The Pacific Coast Shrimpers' Cooperative Association (PCSCA) represents industry.

Supply Chain Pathways

Unit Transformations



Markets:

- Market is primarily for fresh-cooked shrimp in the US. A moderate domestic market exists which includes small volumes of live shrimp. FAS shrimp are sold to Japan
- Fresh iced, FAS, and live shrimp are delivered to buyers
- Product quality concerns are based on freshness and meat colour.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Data Availability From Fisheries Monitoring Programs: **Score = 2**

Traceability data is currently collected through the following processes.

Harvester	Custom Offloader	Transporter	Buyer
Harvest Log – skipper	Harvest Log – skipper Offload Tally – custom offloader	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter	Harvest Log – skipper Offload Tally – custom offloader Bill of Lading – transporter Delivery Record – buyer Processing Records – buyer Sales Records - buyer

What product or business data is missing?

number of units in shipment, type of package, date and time of dispatch, place of dispatch, transport firm, data access contact persons (data responsible party) for the harvester, buyer and transporter.

Is the data electronically accessible to the supply chain?

No. Paper harvest records are maintained by the harvester.

Is the data verifiable?

Partially. Third party audits are conducted on less than 5% of the offloads.

Product Identifiers: **Score = 3**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 2**

Current data systems are paper based with poor transfer of data to the buyer.

Industry Leadership: **Score = 2**

One association represents industry but industry members lack a common vision for the fishery.

Processor Level Constraints: **Score = 2**

Shrimp may be put into cold storage with poor inventory practices

Factors impeding ability to meet traceability:

- Landings data is not verifiable (ie. Dockside Monitoring Program)
- Less than 50% of licence holders fish due to a lack of profitable markets
- Up to seven species may be landed. Accuracy of species documentation is variable.

Factors aiding ability to meet traceability:

- A hail based industry wide data system for offloads currently exists
- Price differential is paid based on quality and product form.

Opportunities:

Goal 1 - Traceability to an offload or container level.

- Develop an industry wide landings data system from which business information is accessible, transferable, and verifiable.
- Identify containers with unique trade unit identifiers.
- Improve species documentation including use of scientific names

Traceability Readiness Report Card

Industry:	**State of Readiness Assessment:**
Finfish Aquaculture	**Total Score =** **A**

Industry Overview:

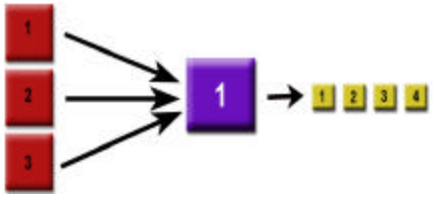
- Five salmon aquaculture companies comprise over 80% of BC farmed salmon production. One of these companies is Canadian owned, while the others are large European multinationals. All five companies farm salmon in other parts of the world such as Norway, Chile, UK, New Brunswick, and the US (Maine).
- Most product is sold on the commodity market. To achieve a competitive advantage, some companies are beginning to focus on product differentiation mechanisms e.g. 3rd party audited quality management programs, organic certification, higher value species.
- Production is primarily Atlantic salmon. Other species include chinook, coho, steelhead and sturgeon.
- Most BC finfish aquaculture businesses exhibit a high level of vertical integration; their involvement in many stages of the aquaculture supply chain allows them to implement effective traceability systems covering the entire upstream chain – from breeder to processor.
- Depending upon the specific stage in the supply chain, the identification of products within the finfish aquaculture supply chain is based upon batch numbers, tray numbers, tank numbers, pen numbers and lot numbers. These designations are applied in a manner that is readily equated to the EAN trade unit/logistic unit system.
- Pooling of product at both the hatchery and farm is common. The linkages between input units and pooled units is well maintained.
- Industry association – BC Salmon Farmers Association (BCSFA) & Canadian Aquaculture Industry Alliance (CAIA)

Chain of Custody Pathways

Breeder→Truck→ Hatchery→Truck→Farm→Boat→Processor

Unit Transformations

Units may undergo multiple pooling and subdivisions between breeder and processor



Market(s):

- Primary market is US.
- The majority of product is sold in fresh whole form - although processing of farmed salmon into fillets and portions is increasing.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

Product and Business Data Availability:	**Score = 1**
The BC finfish aquaculture industry records its traceability data elements in computer-based data recording systems. In some cases, paper-based records are also maintained. Examples of the computer-based traceability systems used in finfish aquaculture include NuTrace, FarmControl (now known as WiseFarming) and Superior Control. The underlying concept for some systems – e.g. NuTrace - is that of a data warehouse: data from each stage of the value chain is submitted on a continuous basis to a central server. The NuTrace software is designed to identify, link and cross link data to create a chain of knowledge from feeding and breeding to delivered product. **What product or business data is missing?** None. Finfish aquaculture companies collect a comprehensive set of product identity, business unit identity, product description, production history and transportation-related information **Is the data electronically accessible to the supply chain?** Yes. Most companies maintain computer information systems which contain traceability information. The implementation of a single traceability system by all units of a vertically integrated business provides managers with easy access to unit-specific information. **Is the data verifiable?** One company is certified by the ISO 9001 Quality Management Program. As part of this program, a third party auditor will verify its traceability system. Due to the competitive nature of the finfish aquaculture industry, it is likely that other BC companies will undertake similar certification in the future.	
Product Identifiers: Unique trade and/or logistic unit identifiers are used.	**Score = 1**
Data Transfer and Information Mapping: Vertical integration and computer-based traceability systems facilitate the effective transfer of information	**Score = 1**
Industry Leadership Primarily one umbrella organization represents industry but other aquaculture groups exist	**Score = 1.5**
Processor Level Constraints Product is occasionally stored at cold storage warehouses with poor inventory management practices	**Score = 1**

Factors impeding ability to meet traceability:	**Factors aiding ability to meet traceability:** • Vertical integration of upstream supply chain • Computer based traceability systems • Good product unit identification • Good linkages between inputs and outputs • Comprehensive data collection • Good appreciation of benefits of traceability
Opportunities: • Maintain verifiable traceability information through third party audits. • Exchange traceability information with other supply chain partners using a globally recognized standard such as the EAN.UCC system.	

Traceability Readiness Report Card

Industry:

Shellfish Aquaculture

State of Readiness Assessment:

Total Score =

A-

Industry Overview:

- The BC shellfish aquaculture industry is made up primarily of independent growers. Vertical integration within the industry is limited.
- Production is primarily oysters and clams. Smaller quantities of mussels and scallops are commercially farmed. Species being considered - or under early development – for culture in BC include: geoducks, abalone, sea cucumber, sea urchins and cockles.
- Most product is sold on the commodity market. There is a limited amount of product differentiation and value adding.
- Extensive pooling of product may occur at the hatchery, nursery and farm as a result of grading/sorting activities. The amount of product pooling associated with grading/sorting makes the mapping of identity relationships extremely difficult.
- The farm-to-processor link has a level of traceability associated with compliance with CSSP, QMP and Vp regulations.
- Industry association – BC Shellfish Growers Association (BCSGA); Canadian Aquaculture Industry Alliance (CAIA)

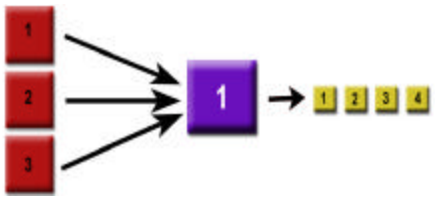
Chain of Custody Pathways

Hatchery→Truck→ Nursery→Truck→ Farm→Truck→ Processor

Hatchery→Truck →Nursery→Boat→ Farm→Truck→ Processor

Unit Transformations

Units may undergo multiple pooling and subdivisions between hatchery and processor



Market(s):

- Market is primarily for fresh exports to the US Pacific Northwest. Smaller amounts of frozen half shell oysters are exported to Asia.
- COOL and US Bioterrorism Act are the main traceability regulations of concern.

CSSP=Canadian Shellfish Sanitation Program QMP=Quality Management Program Vp=*Vibrio parahaemolyticus*

Product and Business Data Availability: **Score = 1**

Traceability requirements are currently available through the following systems.

Hatchery	Nursery	Transporter	Farm
Invoices Shipping documents Sales Records	Invoices Shipping documents Sales Records	Bill of Lading	Invoices Shipping documents Sales Records Vp Program Bill of Lading CSSP tag

What product or business data is missing?

place of dispatch, CSSP area designation, disease records/history.

Is the data electronically accessible to the supply chain?

No. Paper records are maintained by supply chain partners. The accessibility of information upstream from the farm-processor link may be much more difficult to efficiently access.

Is the data verifiable?

Growing water classification and PSP status are verifiable through CFIA. There is no 3rd party verification of other data elements.

Product Identifiers: **Score = 1.5**

Unique trade and/or logistic unit identifiers are not used.

Data Transfer and Information Mapping: **Score = 1.5**

Current data systems are paper based with data transferred to the buyer through harvest tags as required by CSSP, QMP and Vp Programs. The level of data transfer that exists upstream form the farm is limited to paper records (invoices, bills of lading etc.) passed from one business to the next.

Industry Leadership: **Score = 1.5**

Primarily one umbrella organization represents industry but other aquaculture groups exist.

Processor Level Constraints **Score = 1**

Factors impeding ability to meet traceability:	Factors aiding ability to meet traceability:
• Electronic information systems in which traceability information could be stored are not common among shellfish growers. • Hatchery to farm record keeping practices are poor.	• CAIA recognizes the necessity to achieve a 'Tracefish' level of traceability to ensure market access. Traceability is one of the pillars of its Brand Canada marketing strategy. • Most of the required traceability information is collected through CSSP, Vp and QMP programs.

Opportunities:

Goal 1 - Traceability to a container (sack, bag) level.

- Identify batches and label products with trade and logistic unit identifiers
- The upstream supply chain may not currently be in compliance with the record keeping and labeling requirements of the US COOL. Given the importance of the US market, an initiative should be undertaken to ensure compliance through improved traceability and labeling.
- To comply with the requirements of EC regulation 2003/804, the BC shellfish industry will need to implement a surveillance and recording system for documenting/verifying the incidence of mortality and disease on farms.
- Given the significant level of product sorting and pooling, protocols for mapping the relationships between input units and pooled units should be developed.
- Traceability would be beneficial as a production/marketing tool.

5.2 CONTRASTING AQUACULTURE AND WILD FISHERIES

Salmon aquaculture is an acknowledged leader in the implementation of product traceability in the seafood sector (Section 5.1 above). Why is this so? What can be learned from salmon aquaculture traceability practices which may be applied to the wild harvest sector? One important factor is that the finfish aquaculture industry has significant operational advantages over most wild fisheries; harvesting and processing is done on a well defined batch basis (net-pen batches of uniform sized, single species with a well documented husbandry data set). However there are also two important supply chain issues which have permitted the aquaculture sector meet traceability requirements more readily than the wild harvest sector.

A. The aquaculture supply chain is highly vertically integrated; the wild harvest supply chain is far less integrated.

Most BC finfish aquaculture businesses are global in scope and highly vertically integrated, with close business relationships along the entire supply chain from hatchery to retail. This enables a single company to track product through the supply chain by using integrated information technology (e.g. bar codes and proprietary traceability software). In contrast the wild harvest fisheries is far less integrated. Most harvesters are single business entities and may sell product to several processors. Most processing companies are small (on a global scale) and distribute to a complex network of wholesalers and distributors. In some cases the supply chain is intentionally de-linked as processors or distributors do not want their clients to obtain information about the source of product, for fear of being cut from the supply chain.

B. Aquaculture information systems are primarily market and business management driven; wild harvest information systems are primarily regulatory driven

While both the wild harvest and aquaculture sectors need to provide product information to regulators for management purposes, this is a far more important driver in the wild harvest sector. For wild fisheries this has led to an ever evolving and increasingly complex data collection programs (Section 4.3.1) initiated by regulatory agencies (primarily DFO). The information data set is multi-faceted and only poorly linked to the supply chain (Figure 5.1, upper section). In addition these data sets may not be readily accessible, both because of confidentiality issues and the fact that they are held by the regulatory agencies rather that members of the supply chain (see Section 5.3 below). In contrast the finfish aquaculture sector has used these information systems both to meet market information demands and as a production/management tool to develop more effective husbandry, processing and distribution practices (Section 4.4.3). To achieve these goals the product information systems must be closely linked to the supply chain (Figure 5.1, lower section).

While it is evident that the operational practices of finfish aquaculture provide a distinct advantage for traceability over wild harvest fisheries, there are opportunities for wild fisheries to move toward better supply chain integration to address the fundamental shortfalls for implementing traceability in the wild harvest sector, namely use of product identifiers and effective data transfer and mapping. The tools and integrated data management systems used within the finfish aquaculture industry can serve as a model for adaptation to wild fisheries. In other words wild fisheries need to move from the data mapping model outlined in the upper part of Figure 5.1 to the model shown in lower portion of the same figure. Moving this way in a non-

vertically integrated supply chain will require strong industry leadership at both the harvester and processor levels. Those fisheries with effective industry associations will be much better positioned to meet this challenge. In addition the wild harvest sector must re-examine the rationale for a de-linked supply chain model by asking "Are there still business reasons for one level in the supply chain to shield downstream links from upstream links?" This does not mean that the industry needs to fully integrate or move to a larger corporate model; rather better access to traceability information for both businesses and consumers may ultimately be more attractive from both a marketing and financial perspective (see Sections 3.0 and 5.4).

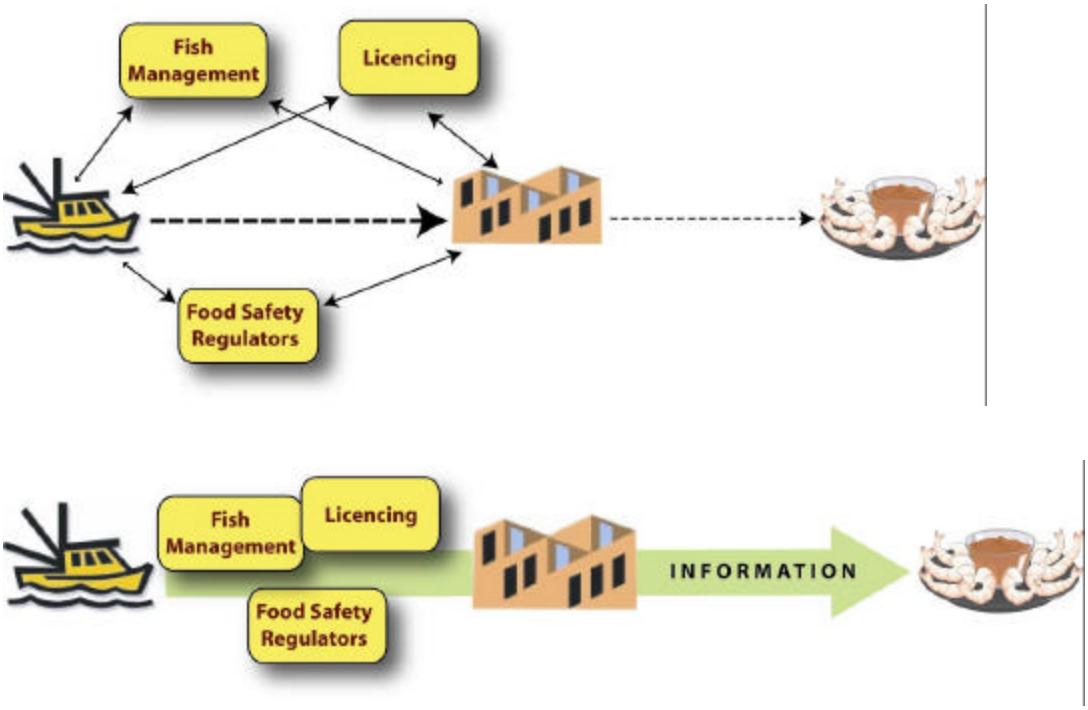


Figure 5.1. Upper Figure - Regulation driven information pathway
Lower Figure – Supply chain driven information pathway

5.3 CONSTRAINTS AND OPPORTUNITIES

5.3.1 Fisheries with Dockside Monitoring

Since 1989 seven British Columbia fisheries (Table 5.2) have adopted a individual quota (IQ) management system, whereby each licensed vessel is assigned a portion of a coastal wide or area quota. All these fisheries have dockside monitoring programs, with verification of landings by an independent, third party monitor. Some non-IQ fisheries, such as roe herring and rockfish hook and line, also use third party landings monitoring as a management tool. These fisheries are well positioned to meet traceability requirements in that:

1. All harvest data is vessel/fishing event (a fishing trip) based, meeting almost all product description and business information requirements.
2. The data is verifiable and is collected directly at offload and entered into data systems in a timely manner.
3. These data systems can serve as sources for supply chain information flow (Figure 5.1).

4. IQ fisheries generally have cohesive and effective industry associations facilitating leadership and coordination of traceability initiatives within their sector.

In British Columbia dockside monitoring programs have matured over the past decade to a state where technological innovation can be readily accommodated. For example electronic data entry from dockside, likely over a web portal, will enable more timely and cost effective data entry into systems such as DFO's Fisheries Operations System (FOS). With the development of appropriate data confidentiality protocols, elements of this data set could also be logged directly into supply chain data systems, eliminating redundant data acquisition and entry. It is important to note that, although dockside monitoring programs are a requirement for IQ fisheries management, these programs can also be initiated in non-IQ fisheries for any purpose requiring third party landings verification. By example, there may be both business and fisheries management reasons for dockside monitoring in the wild salmon fisheries, without necessarily moving to individual quotas.

At Sea observer programs and, more recently, electronic monitoring programs are focused on catch monitoring and fisheries compliance monitoring, and are of limited value for traceability. At sea observers or electronic monitoring could possibly provide validation/information services for segregation of catch at sea (by species, date of harvest, by geographic area) but only when warranted by specific circumstances such as a harvest of MSC certified stocks, when other stocks of the same species could be taken in different areas.

A. Key Constraints

Lack of product identifiers

As noted in Table 5.2 the major constraint to traceability "readiness" for monitored fisheries is the lack of product identifiers. Currently the spawn-on-kelp fishery is the only monitored fishery using unique product identifiers at the logistic unit level. However many monitored fisheries could incorporate a unique product identifier at the logistic unit level with little change in operational practices. For example, currently each tote of landed halibut is labelled and initialled by the dockside monitor, certifying that the contents of the tote have been verified by a third party monitor. A unique number or bar code can easily be incorporated into the labelling process as a product identifier.

Lack of transport data

As noted in Section 4.3.3 transport data (name of transporter, location, time of receipt and delivery, truck identification) are poorly documented within existing fisheries monitoring programs, but are generally available in the processing plants with bill of ladling and delivery records. Transport information needs to be integrated into the supply chain data system to meet traceability standards.

Data confidentially and accessibility

Dockside monitoring programs were developed to manage fishing quota allocation and, historically, the data have been the property of the Department of Fisheries and Oceans with confidentiality protected under the Privacy Act (see Section 4.3.3). Accessibility is an issue for use of these data sets for traceability purposes, particularly any data related to an individual or business entity. In addition the perceived need for data confidentiality generates redundant

landings data acquisition and management effort. For many fisheries both dockside monitoring records and offload tally sheets are generated for each landing. These data are entered separately into DFO data sets and plant data logs.

Over the past decade the fishing industry has increasingly paid for the cost of dockside monitoring programs such that, today, in all seven IQ fisheries as well as ZN rockfish and roe herring, industry now pays 100% of the dockside monitoring program costs. Payment should impart some degree of data ownership and industry needs to become more involved in discussions with DFO as to how to access and use fisheries monitoring data in ways which serve business needs (including traceability). This will become an increasingly important issue given DFO's current initiative to revise and centralize the Fisheries Operations System (see Key Opportunities below).

B. Key Opportunities

Key opportunities for fisheries with dockside monitoring programs include:

Initiate discussions with DFO on the use of fisheries monitoring data for traceability purposes

DFO is currently revising and upgrading their internal centralized database, the Fisheries Operation System (FOS), which houses dockside and at sea monitoring data. One possible outcome of this process could be that harvest data will become increasingly difficult to access if monitoring service providers role in data management (as opposed to data acquisition and data transfer) is reduced. Alternatively, the FOS revision provides an opportunity to incorporate new technologies and efficiencies into monitoring data acquisition and information sharing. A conceptual model for more effective data sharing of dockside monitoring data is provided in Figure 5.2. In this model a single offload data set can be transferred, within appropriate confidentiality criteria, to a variety of potential users directly from dockside using web portals. It is important that industry inform and lead discussions with regulatory agencies (particularly DFO) as to the need to "add value" to the monitoring data set by ensuring that it is available for other regulatory and business purposes, including traceability.

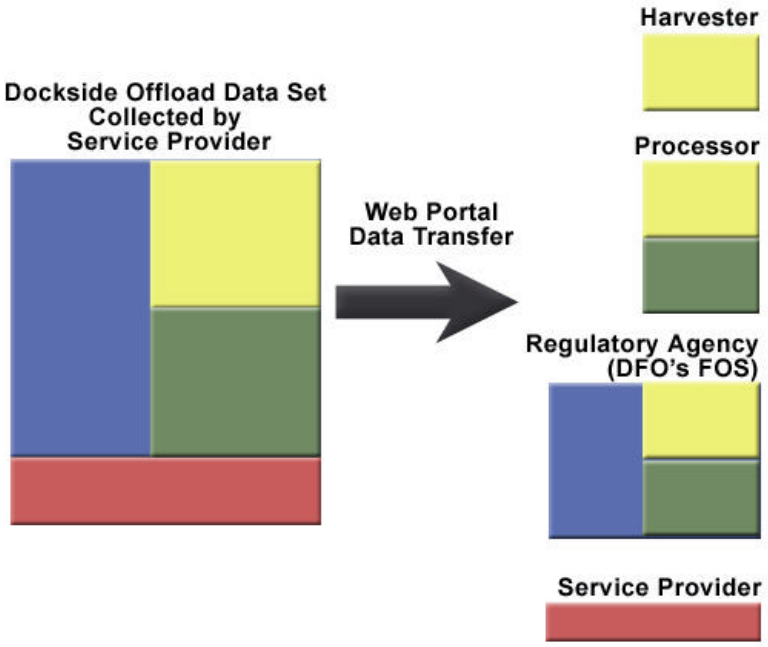


Figure 5.2. Conceptual model for effective transfer of dockside monitoring data

Identify redundant data and streamline data acquisition and entry.
When interviewed many processors remarked about the time and cost of entering and submitting the same data to a growing number of regulatory and business information data sets. Although streamlining these information systems and reducing redundant data entry is a long term endeavour, traceability requirements and modern information technology provides an opportunity to identify and reduce, rather than add to, the effort and cost of redundant data systems.

Work with processors to identify appropriate logistic and trade units for product identification
As noted above, lack of product identifiers is a major gap for all wild fisheries, except spawn-on-kelp. For each fishery it will be important to identify logistic units (e.g. totes and pallets) as well as trade units (e.g. boxes) suitable for product identification. It is important that the units selected are suitable for offload, transport and processing operations.

Encourage and enable dockside monitoring service providers to improve information technology
Currently most dockside monitoring data is collected on paper forms at the dock, forwarded to the service providers for QA/QC processes and entered into a database which is forwarded to DFO. To enable efficient and effective supply chain information flow the landings data could be electronically entered at dockside, subject to QA/QC processes electronically and forwarded to both regulators and the supply chain (buyer) over the Internet. Monitoring service providers should be encouraged to adopt these technological improvements and industry should work with regulators to reduce or remove barriers to this approach.

Develop an operational pilot for one or two monitored fisheries
This group of fisheries is best positioned to implement a full traceability program. An operational pilot program for these fisheries should include one or two processing plants and implementation of one-up, one-down traceability at least from harvester to processor shipping gate level. The objective of the operational pilots should be to demonstrate a traceability system which can be implemented on a sector wide basis if desired. Likely candidate fisheries include halibut, sablefish, geoduck and sea urchins. The finfish aquaculture industry may provide suitable data models for these pilots (Section 5.2).

5.3.2 Fisheries without Dockside Monitoring

Fisheries without dockside monitoring programs, with several notable exceptions, have lower "state of readiness" ratings than fisheries with dockside monitoring programs (Section 5.1). The primary issue is that most of these fisheries do not have verifiable product and business information on a vessel/fishing event basis and there is no data system in place to manage the information. Certain fisheries (see specific readiness report cards) will have to make changes to operational practices (how fish are landed, transported, processed and stored) in order to reach a level of readiness where the basic structure of a traceability program (e.g. appropriate product identifiers, data management systems) can begin to be planned for.

A. Constraints
At the water to buyer level, major challenges exist with:

1. Lack of verifiable and timely landing records,
2. Documentation of product pooling by transporters (salmon packers, live crab and rockfish, gill net herring),
3. Lack of a data management system,
4. The complete lack of unique product identifiers.

Current product grading practices in processing plants, particularly for salmon, is a major constraint and cold storage inventory practices are an issue for both monitoring and non-monitored fisheries (Section 4.3.4).

B. Opportunities
In contrast to monitored fisheries, where opportunities exist to build and test pilot traceability models, the focus for non-monitored fisheries needs to be building a structure to support traceability initiatives, including making changes to operational practices in order to bring these fisheries to a state of readiness where pilot programs can be considered. These initiatives include:
Harvest Level -

1. Building verifiable, third party landings monitoring programs,
2. Segregation of catch at packer and transporter level,
3. Building a delivery system which can support use of product ID codes,
4. Building a coordinated industry response to traceability challenges and opportunities (improved industry leadership).

Primary Processor Level

1. Better product segregation at processing (grading salmon),
2. Product labelling and cold storage inventory management.

The readiness report cards provide detail on how these initiatives relate to specific fisheries.

It is unlikely that a sector-wide traceability pilot could be undertaken in any of these fisheries until the changes to operational practices outlined above (or in the readiness report cards) have been addressed. However there is value in conducting smaller scale pilots at both the harvest level (e.g. a component of the salmon troll fishery) or with a specific processor in order to better understand and then demonstrate the degree of change necessary to meet traceability standards.

THE CRISIS IN SALMON CATCH ACCOUNTING

Catch and landings monitoring is a cornerstone of sustainable fisheries in today's environmentally conscious world[1]. It is generally acknowledged that catch accounting in the recreational and First Nations salmon fisheries is deficient and that commercial catch accounting (primarily from fisheries hails) is not verifiable[2]. As stated by Pearse McRae "This need for accurate catch accounting converges with the growing pressure on producers of meat, fish and other foods to be able to trace production back to the producer".

In 1992, 1994 and 2004 a large number of sockeye salmon returning to the Fraser River were unaccounted for somewhere between the Mission counting fence and upriver spawning grounds. A series of reviews and enquiries[3] have repeatedly failed to verify or quantify potential causes, which include inaccurate upstream and spawning grounds counting, warm river water conditions, and/or illegal or unreported harvesting. Clearly improved catch accounting by all harvest sectors coupled with a supply chain traceability would resolve the question as to whether significant quantities of unreported sockeye were entering the seafood supply chain.

Accurate and verifiable catch accounting is a pre-requisite for full chain traceability and significant improvements to salmon catch monitoring, through dock monitoring programs or other means, will be required in order to meet the enforcement and sustainability benefits conveyed by traceability (see Section 3.9 and Appendix B).

[1] GSGislason and Associates 2004. British Columbia seafood sector and tidal recreational fishing; A strengths, weaknesses, opportunities and treats assessment.
[2] McRae and Pearse 2004. Treaties and Transition, Towards a sustainable fishery on Canada's west coast.
[3] Here we go again…or the 2004 Fraser River salmon fishery. Report of the Standing Committee on Fisheries and Oceans. March 2005.

5.4 BEYOND THE REGULATORY FRAMEWORK

Section 3.0 provides a business case for traceability that extends beyond the regulatory framework and includes supply chain management, improved product quality and business information, supporting audit and enforcement efforts (also see Appendix B), and verifying labelling claims. In essence traceability is about society's demand for product information, a demand which, particularly in the food industry, is growing.

It should be recognized that, at the water to buyer level, traceability is important component for supporting sustainable harvest and aquaculture practices, providing assurance for such claims as:

- legally harvested product (both licensed harvester and legal area)
- product from a verified, sustainable quota
- fish feed from sustainably harvested fisheries
- Product harvested with bycatch friendly fishing gear
- Eco-certified product (e.g. MSC)

Increasingly the "burden of proof" for these assurances is shifting to industry and traceability provides a vital information tool to address these assurances (see inset box, The Crisis in Salmon Catch Accounting).

Accommodating society's growing demand for product information conveys a market advantage and there is growing realisation that fisheries monitoring information can be used to address these holistic information requirements. To achieve this, a new integrated data management model emerges that is responsive to meeting societal demands for seafood that is caught sustainably, is safe and healthy to eat and is of a high quality (Figure 5.3). It is important to recognise that society including consumers, not regulators or fisheries managers, drive the information requirements in this kind of model. Inevitably society's demand for information will evolve, most likely increasing information demands. Traceability will remain a moving target, rather than an information endpoint, and players in the seafood industry who are willing and able to accommodate changing information demands will continue to be advantaged in the seafood marketplace.

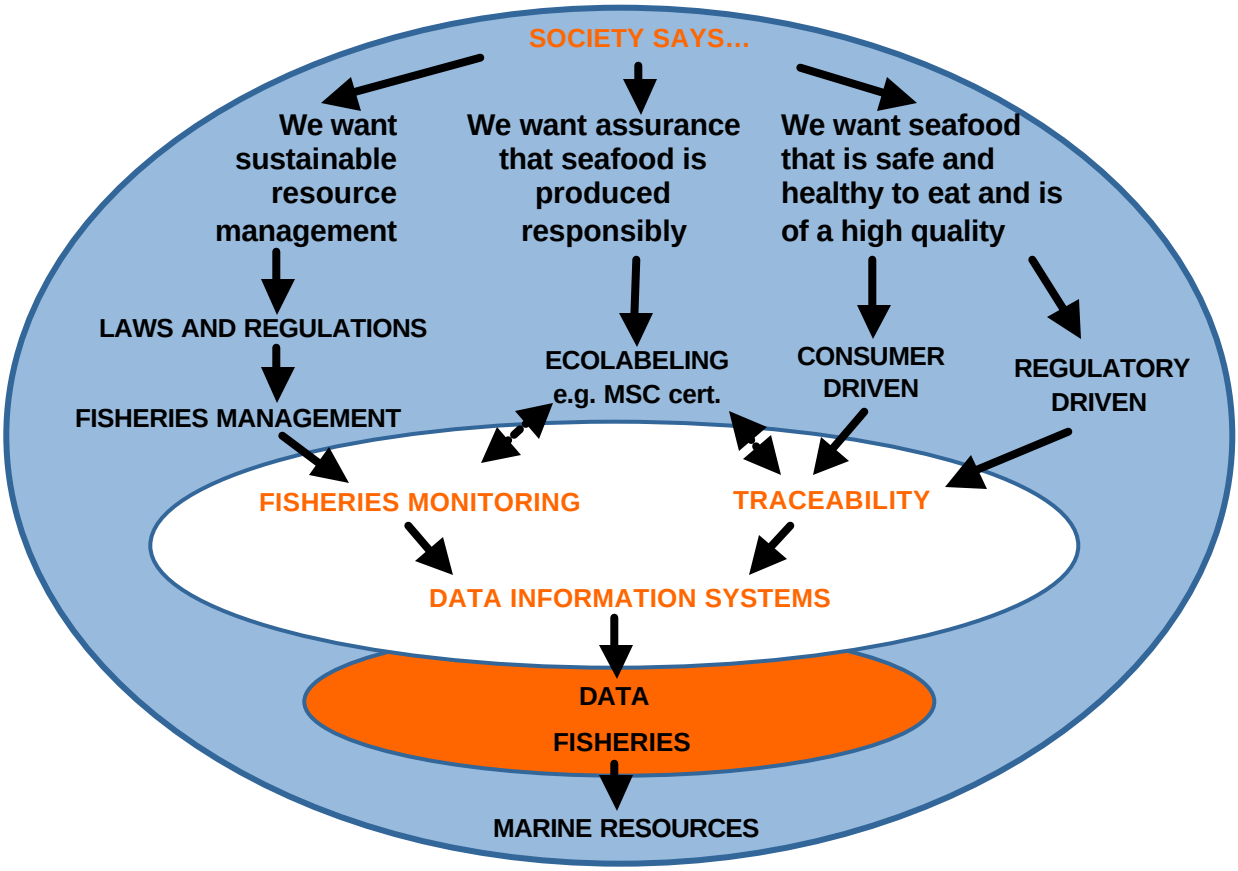


Figure 5.3. A market driven model for fisheries information systems.

APPENDIX A
BAR CODES AND THE EAN/UCC SYSTEM

Bar Codes and the EAN/UCC System[1]

Introduction

Through the use of the EAN/UCC Numbering System, products, shipments, locations, production lines, boats, trucks, and most other physical assets can be individually identified by giving each one a unique number. In addition to uniquely identifying a product, the EAN/UCC System also provides the ability to record important information regarding the product (e.g. date of harvest; net weight). Currently, not all of the product attribute information important for the traceability of BC seafood (e.g. method of production; country of origin) can be recorded numerically by the EAN/UCC System – information that cannot be numerically recorded must be recorded in a 'human readable' form (see section on Application Identifiers).

To facilitate the collection, sharing, and storage of the identification numbers and numerical attribute information, the EAN/UCC System converts the numbers into a *bar code.* A bar code is simply a precise arrangement of parallel lines (bars) and spaces that vary in width to represent the numerical data. In other words, the fundamental key to the EAN/UCC System is its use of numbers – bar codes simply enables the automation of the traceability process through the use of scanners and electronic databases.

Example: Scanning this bar code yields the sequence of numbers shown beneath it. This sequence of numbers contains product information including a unique identification number, net weight and harvest date.

Company Prefix

A key element in uniquely identifying – as well as linking - a company's products, shipments and locations is the EAN Company Prefix. A Company Prefix uniquely identifies a company any where in the world through a unique numerical sequence of 6-10 digits. In Canada, the Electronic Commerce Council of Canada (ECCC) is responsible for assigning and maintaining a registry of all Company Prefixes licensed to Canadian organizations.

The Company Prefix is essential to linking a specific company with the location of its physical assets as well as with its products.

[1] This information and associated figures are taken primarily from CanTrace's draft Traceability of Seafood Guidelines and the EAN Traceability of Fish Guidelines

Global Location Numbers (GLN's) & Locations

Traceability generally requires the identification of physical entities involved in the supply chain. Using the EAN/UCC System, every location is uniquely identified by a Global Location Number (GLN). The 13-digit GLN can be used to identify locations (a processing plant, grow-out site, holding pond, customer warehouse, receiving door, etc.), physical assets (a fishing vessel, forklift truck, trailer), legal entities (subsidiary company, division, supplier, customer), and functional entities (production line, freezer, unloading equipment).

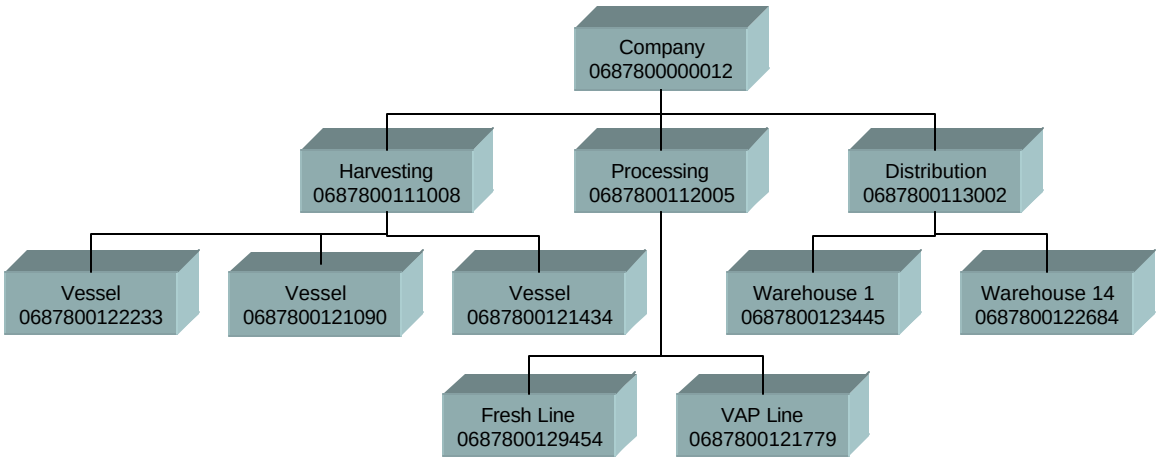
The GLN generally consists of three elements:

- Company Prefix + Location Reference Number + Check Digit.

The Location Reference Number is a 1-5 digit number assigned by the licensed user of the Company Prefix to each location, physical asset, or functional entity

The Check Digit refers to the single digit number at the end of each GLN. A formula is used to calculate this number – and it is re-calculated each time the GLN is used to ensure that it has been read, transmitted, or stored correctly.

Example: The following figure demonstrates how a company can use GLN's to identify the various entities in its business structure. In this example, the company has been assigned an EAN/UCC Company Prefix of 68780 (Note: the first 0 is a left filler digit). The company has then assigned a location reference number to each entity to create a unique GLN.



The ECCC has considered the creation of a national GLN Directory that would serve as a centralized data bank linking GLN's with vital company information. For example, in the figure shown above, the GLN 0687800122233 has been assigned to a harvest vessel. Through a GLN Directory, this GLN could be linked to information such as the Name of the Vessel Owner, Contact Person, Address, Telephone number, Fax number, Cell number, E-mail address, Vessel Name, Name of the Vessel's Captain, Captain's address, Telephone number, Fax number, Cell number, E-mail address, and Vessel License Number. In other words, the existence of a GLN

Directory would allow seafood supply chain partners to retrieve complete, up-to-date information on whatever is identified by the specific GLN.

Recently, an ECCC representative indicated that the Directory initiative was not proceeding due to a lack of industry interest/funding. However, the ECCC is a service provider - and the ECCC representative indicated that they would create such a directory if financial support were forthcoming.

Regardless of whether a national GLN Directory is created, any group of supply chain partners could create a mini-directory to meet their specific requirements. For example, a supply chain participant could provide a list of relevant GLN's (linked to associated vital information) to all of its upstream and downstream business partners – thereby creating a one-up/one-down GLN directory.

A GLN can also include Global Positioning System (GPS) co-ordinates to precisely identify where a Location, physical asset, or functional entity is physically situated. The technology also allows the GLN to be used to track a moving target (e.g. a trailer) by linking the GLN to a Global Positioning Mapping System.

Global Trade Item Numbers (GTIN's) & Trade Units

Traceability requires the identification of every product. Using the EAN/UCC System, each trade unit is uniquely identified by a Global Trade Item Number (GTIN).

The GTIN consists of three elements:

- Company Prefix + Item Reference Number + Check digit

The Item Reference Number is a unique number assigned by the holder of the Company Prefix to uniquely identify a product, by-product, or item of waste.

The Check Digit refers to the single digit number at the end of each GTIN. A formula is used to calculate this number – and it is re-calculated each time the GTIN is used to ensure that it has been read, transmitted, or stored correctly.

Example: The following figure demonstrates how the GTIN links a product to the company that produces it: the sequence '012345' uniquely identifies the company while the ' 67890' is the Item Reference Number that uniquely identifies the product (Note: the final '5' is the check digit)

Application Identifiers (AI's))

In addition to bearing a unique identification (the GTIN), a seafood product must also carry important product-related information (e.g. net weight, harvest date etc.) as it passes along the supply chain. Some of this information can be carried via the EAN/UCC System using Application Identifiers.

Application Identifiers (AI's) are numerical descriptors in the EAN/UCC System that provide context and meaning for a number in a bar code. For example, the number 040501 is simply a number without context or meaning. However, if that number is preceded by an AI, a bar code scanner is instructed to read the number as a specific piece of product information

Example:

> *If 040501 is preceded by AI 15 in the bar code, then the bar code scanner will read (15)040501 as a date in the format Year, Month, Day. In other words, a bar code carrying the numbering structure of (15)040501 would be read as May 1, 2004.*

Example:

> *The same number 040501 with the AI (**32**02) would mean that the net weight of product is expressed in lbs. to two decimal places. In other words, (3202)040501 would mean the net weight of product in the container is 405.01 lbs. An AI of (**31**02) would mean the net weight of product in the container is 405.01 kg.*

The EAN/UCC System defines more than 90 Application Identifiers to identify batch and lot numbers, serial numbers, production and packing dates, best before dates, ship to, ship from, etc. Those AI's applicable to the seafood supply chain are shown in the following figure.

AI	Full Title	Data Title
00	Identification number of a logistic unit	SSCC
01	Global Trade Item Number	GTIN
02	Global Trade Item Number	GTIN
10	Batch/Lot number	BATCH/LOT
11	Production date of a trade item (Catch date)	PROD DATE
13	Packaging date of a trade item	PACK DATE
15	Best before/minimum durability date of a trade item	BEST BEFORE or SELL By
30	Count of items contained in a variable measure trade item	VAR. COUNT
310(n)	Net weight	NET WEIGHT (kg)
330(n)	Gross weight	GROSS WEIGHT (kg)
37	Count of trade items contained in a logistic unit	COUNT
410	Delivery to Global Location Number	GLN
412	Global Location Number of supplier	GLN
414	Global Location Number physical location	GLN
7030 up to 7039	Approval no. of processor with ISO-code	PROCESSOR # s

Example: Bar code containing identity information:

- *(01)97612345000285: Global Trade Item Number*
- *(10)4512XA: Lot or Batch Number*

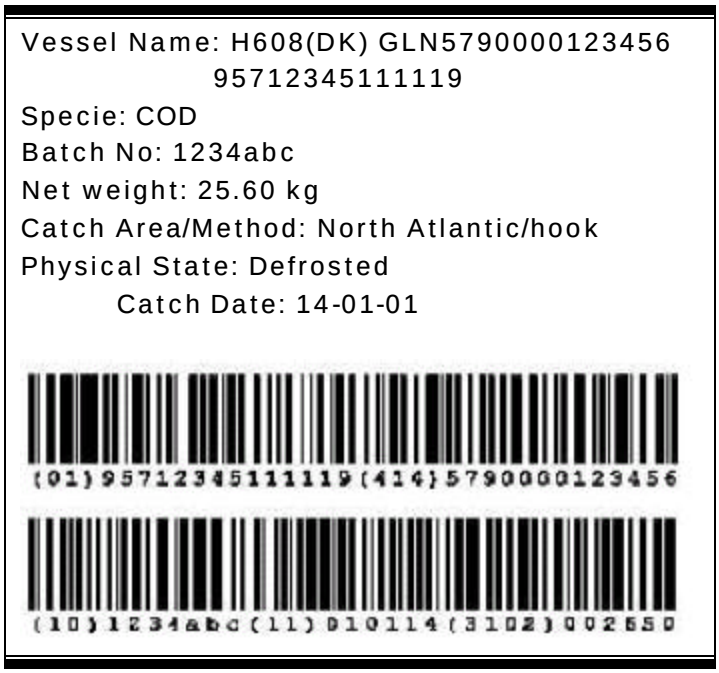
Example: Bar code containing both identity and attribute information:

- *(01)90123456123451: Global Trade Item Number*
- *(3202)004410: Net weight = 44.10 lbs.*
- *(11)010170: Date of Harvest = January 7, 2001*
- *(21)00700001: Unit Serial Number = 001700001*

Information Transfer Between Partners in Supply Chain

As a trade unit moves along the supply chain, all of its essential information (e.g. GTIN, Supplier GLN, Receiver GLN, product attributes) accompanies it in the form of a label bearing bar code and human readable formats.

Example of EAN/UCC label bearing bar code and human readable format.



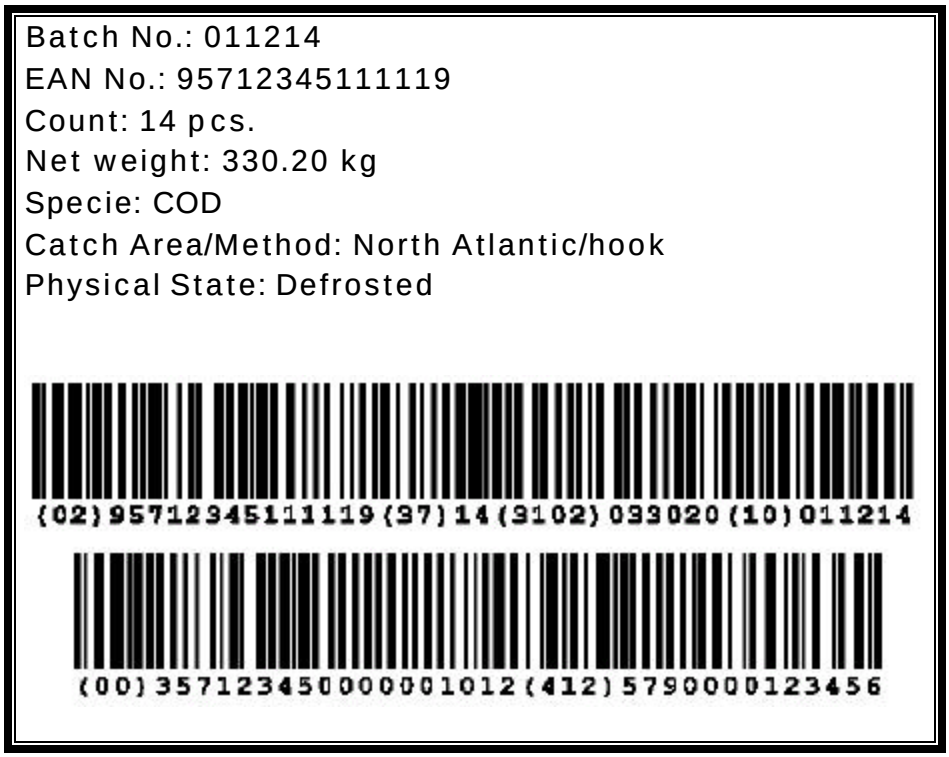
The 2 bar codes in the above label include the following information:

- *(01)95712345111119: GTIN*
- *(414)5790000123456: GLN of vessel*
- *(10)1234abc: Lot or Batch Number*
- *(11)010114: Harvest Date = January 14, 2001*
- *(3102)0022560: Net weight = 25.60 kg*

Standardized Shipping Container Codes (SSCC's) & Logistic Units

For shipping, trade units may be assembled into a larger logistic unit (e.g. a pallet). To facilitate traceability, the EAN/UCC System assigns a uniquely identified Standardized Shipping Container Code (SSCC) to each logistic unit. The Application Identifier for the SSCC is AI(00). Even a single box – if it is sent on its own – is labeled with an SSCC.

Example of a logistic unit label with SSCC and human readable information:



Bar coded information includes:

- *(02)95712345111119: GTIN = 95712345111119*
- *(37)14: 14 trade units contained with the logistic unit*
- *(3102)0333020: Net weight = 330.20 kg*
- *(10)011214: Lot or Batch Number*
- *(00)35712345000001012: SSCC*
- *(412)5790000123456: GLN of Supplier*

Use of EAN/UCC System to Record BC Seafood Data Requirements

When used together, the GTIN and Global Location Number (GLN) will tell you what is moving, where it came from, and where it is going.

Matrix A (available as an Excel file in CD format) is intended to demonstrate how the EAN/UCC Numbering System could be used to record the data requirements necessary to facilitate traceability of BC seafood. As revealed in the matrix, some data elements may be expressed via Application Identifiers while other data elements may be expressed only in a human readable format.

APPENDIX B
ENFORCEMENT AND AUDIT OPPORTUNITIES WITH TRACEABILITY SUPPORTING SUSTAINABLE FISHING

ENFORCEMENT AND AUDIT OPPORTUNITIES WITH TRACEABILITY SUPPORTING SUSTAINABLE FISHING

It is estimated that about 30% of the global fisheries catch comes from illegal, unreported and unregulated (IUU) fisheries (REF). The growth of IUU fisheries is considered to be one of the greatest threats to global fish stocks and the development of sustainable fisheries. In March 2005, Canada released a national plan of action on IUU fishing (http://www.dfo-mpo.gc.ca/misc/npoa-iuu_e.htm) including implementation of internationally agreed market related measures aimed at identifying illegal or unreported fish products in the marketplace. Many of these measures require elements of product traceability.

Illegal fish products come from the following sources:

1. Unlicensed individuals catching and selling fish products to processors or through private sales and exporting out of the province and the country.
2. Licensed commercial fishers fishing during a closed time and selling their catch as caught in a legitimate fishery.
3. Licensed commercial fishers fishing during an open time and failing to report their catch through a landing station (DMP) or through a processing plant (Sales Slip).
4. Licensed commercial fishers fishing during an open time but not fishing in an area that is open and selling their catch as legitimately caught fish from the open area.
5. Fish taken from a contaminated area and sold into a legitimate commercial fishery and or mixed with legally taken product.
6. Individuals exceeding their ITQ or IVQ.
7. First Nation Food Social and Ceremonial fish (FSCF) mixed with commercial catches.
8. Illegal harvest laundered through aquaculture sites.
9. Mixing of prohibited species with legal species.
10. Mixing of undersize product with legal product.
11. Canadian caught product declared as foreign product and processed as such.
12. Illegal harvest laundered through processing plants and exported utilizing duplicate manifest from previously exported legitimate fish products.

In British Columbia illegal and unreported catch has been and continues to be an important fisheries sustainability issue. Although commercial, recreational and First Nation harvest of abalone has been closed since 1991, illegal poaching continues to be a major impediment to stock recovery (REF 1999). Illegal and unreported harvest is also a concern in highly valued fisheries such a geoduck and it is generally acknowledged that the illegal catch and sales of salmon is considerable but impossible to estimate due, in part, to the lack of verifiable information on the amount of legal catch and the inability to trace product in the marketplace to its source.

Enforcement officers can use sales slip and logbook information to assist in verifying the legitimacy of fish products. However, not all the information needed to validate a load of fish can be obtained from a sales slip or logbook. For an enforcement officer to be able to verify that

fish have been caught within a legitimate fishery, the following basic information on the product is important:

1. The name of the commercial fisher, phone number and address.
2. The name of the commercial fishing vessel.
3. The commercial fishing vessel registration number.
4. The type of validation tab issued to the vessel.
5. The Management area, Sub area fished.
6. The date the fish were caught.
7. The method the fish were caught by.
8. The species of fish caught.
9. The quantity of fish caught, by pieces and or pounds.
10. The place where the fish were landed.
11. The name of the packer vessel used to transport the fish from the fishing grounds to the landing port and its skipper name, phone number and address.
12. The name of the truck transporting company, phone number and address who transported the fish from the landing port to the processing plant and or boarder crossing and the name(s) of the driver(s) of the truck(s) used to transport the fish and their phone number and address.

Prior to 1991, Department of Fisheries and Oceans Canada (DFO) Fishery Officers were heavily involved in the on grounds management and enforcement of fisheries on the Pacific Coast, particularly salmon and herring. Small vessel patrols, Canadian Coast Guard grey fleet and air coverage provided platforms from which Fishery Officers conducted enforcement and collected fleet size and hail catch information which were radioed to fishery managers to estimate the total catch for the fishery. After the fishery was closed, hand written sales slips were physically collected by Fishery Officers from packers on the fishing grounds and from processing plants and the data used to verify the estimated catch for the fishery. Data adjustments were made and management decisions finalized for the next fishery and the expected escapement of the run of fish. Fishery Officers relied on these sales slips (or lack there of) to identify illegally harvested fish. Officers checked for false information on sales slip such as wrong area of capture, wrong species for the fishery, wrong date of capture, etc or observed inconsistencies in the condition of totes of fish with other fish from the same fishery or with the condition of the fish and the date of capture reported on the sales slip. These inconsistencies led officers to conduct further investigations to verify if the fish had or had not been taken legally.

Today Fisheries Officers lack the resources and staff to act on the grounds as formerly and fishery managers are attempting to manage fisheries with real time data utilizing cell phone and satellite technology along with GPS tracking devices and computers. In an attempt to collect more management data fishers are being required to hail out before fishing and hail in before leaving the fishing grounds and or landing fish. They are required to provide documentary information in a timely manner. This information is being collected (depending on the fishery) by at sea observers, fisher hails, logbook reports, sales slips and dockside monitors. Sales slips, which Fishery Officers relied on for catch verification, are becoming less relevant. The data is time consuming to enter and often duplicates the logbook and dockside monitoring information. Fishery Officers no longer collect the sales slips and fishers knowing this may not use them.

Officers today are relying more on logbook data, but this information is often not verifiable nor available at processing plants.

Dockside Monitoring Programs and At Sea Observer Programs for some fisheries (many of which are individual quota fisheries or IQ), along with designated ports of landing and hail-in and hail-out information, have made the monitoring and validation of fish products at processing plants, fish stores, restaurants and export locations easier for Fishery Officers. For non-IQ fisheries, such as salmon, current monitoring and validation of landings of fish are more difficult. Failure by fishers, processing plants and cold storage facilities to fill out sales slip information and the lack of the requirement to track and identify logistic units of fish products within a processing plant makes it very difficult for Fishery Officers to prove the origin of fish products processed and or stored at these locations. In the case of under size product and the possession of prohibited species, the individual or company in possession may be charged for illegal possession, however, this may not lead to charging the one who caught the fish in the first place due to lack of traceability of the product from the fisher to the processor.

The introduction of a traceability program using unique product identifiers, such as bar codes, will enable consumers to know where and how fish products were caught and or were farmed. Traceability will also provide regulatory agencies such as Fisheries and Oceans Canada (DFO) a huge opportunity to improve on how they carry out fisheries enforcement by enhancing their ability to verify the legitimacy of inspected fish products in a timely and efficient manner. The new networking technologies available today along with product identifier data (e.g. bar codes) will make these task easier to perform and in a more timely manner.

The storage of catch, transportation, processing, sales and export data by fishers, packers, off-loaders, transporters and processors provides the opportunity, with the new wireless networking technology, to access all relevant information in a timely manner to audit data to ensure compliance with fisheries plans and prevent the introduction of illegally harvested fish into the lawful market. This audit process will also assure those in world trade markets that Canada's intent and obligations with respect to IUU catch are being adhered to.

Auditors will be able to follow harvested fish from the capture vessel to the transporter, to the processor to cold storage and to the export market as well as sales of fish to local restaurants and fish stores.

A traceability program incorporates one-up and one-down transfer of information. As this information will already be transferred from one business to another, businesses could also passing on the same information to DFO or any other regulatory authority. Alternatively the regulatory authority can be granted access, with proper security controls, to the information via internet portals. Auditors within DFO would verify landings against commercial fishing openings, hails from fishing vessels, and ensure that product into a processing plant would equal product leaving a processing plant. A regulator such as DFO would be able to track all fish from the place of capture to the consumer while ensuring illegally caught fish are not entering the system.

Field Fishery Officers would, through random inspections, collect product identifier information (e.g. bar code data) at places of inspection. They would carry out random inspections of the

contents of boxes, containers and totes to ensure that the product contained in these items are indeed the product and quantity of product identified by the bar code.

While traceability will not be a foolproof way of preventing IUU product from entering the legal seafood supply chain, it should greatly reduce the ability of illegal operators to process and ship large and sustained quantities of illegal product to both domestic and export markets (ref to salmon catch accounting crisis inset box).

APPENDIX C
CAN-TRACE BACKGROUND

Can-Trace Background

In July 2003, the Canadian Council of Grocery Distributors, the Canadian Federation of Independent Grocers and the Food and Consumer Products Manufacturers of Canada joined with the Electronic Commerce Council of Canada to create the Can-Trace Traceability Program. This program was established in response to mounting regulatory and market pressures – both in Canada and internationally. These regulatory and market pressures included:

A. Regulatory Drivers

Within Canada, policy and regulations contributing to the creation of Can-Trace included:

1. The Quebec Department of Agriculture, Fisheries and Food (MAPAQ) will require mandatory traceability of beef by 2005. One up/one down traceability will be a minimum requirement of Quebec's traceability initiative. In addition, MAPAQ will require whole-chain traceback of a product within 24 hours.

   Numerous other provinces are examining the issue of traceability within their jurisdictions to better understand the challenges and issues surrounding the tracking and tracing of food products.
2. The Agricultural Policy Framework established an objective of achieving 80% traceability for Canadian food by 2008.

Internationally, the impetus to create Can-Trace came from:

1. The European Union will require full traceability by January 2005.
2. The US is currently in the process of implementing its Bio-terrorism and County of Origin Legislation.

B. Market Drivers

In addition to regulatory pressures, the creation of Can-Trace was also driven by pressures from within the marketplace:

1. Food Safety and Recall Effectiveness. Public concern regarding food safety has been stimulated through high profile events such as BSE in cattle, avian flu etc.
2. Food Content and Quality Attributes. Markets and consumers are increasingly demanding to know specific content and quality attributes of the products they purchase.

Why Can-Trace?

As a result of these (and other) drivers, many companies and organizations had begun to develop traceability systems for their specific supply chain requirements prior to the creation of Can-Trace. However, the founders of Can-Trace noted that there was little commonality of traceability standards or approaches being undertaken by these various groups. In other words, the various companies and organizations were independently determining what data elements they would record – as well as what system they would use to record and store the data. A major

limitation of such independently created traceability systems is the lack of interoperability between them. For example, rather than adopting a single traceability system to cover all of the products it carries, a food retailer would have to support the unique traceability system adopted by *each* of its suppliers. Recognizing the inefficiencies and cost that this would generate, Can-Trace is therefore dedicated to the ideal of a national, whole-chain, cross commodity traceability system that is capable of meeting *domestic* requirements.

According to the draft Can-Trace *Canadian Food Traceability Standards* document, the primary objective of Can-Trace is:

> *…to define and develop minimum information requirements for a national whole-chain all-product traceability standard based on the globally recognized EAN/UCC System.*

While earlier versions of the *Canadian Food Traceability Standards* document stated that the standards would accommodate both domestic and export requirements, the latest version states that the standard will apply only to "domestic and imported product" (i.e the domestic market). In addition, the issue of how the standard will be implemented in a business setting - or in a particular food sector - falls outside the current mandate of Can-Trace.

At present, the application of the Can-Trace standard is to be voluntary. However, there is currently an internal discussion within Can-Trace regarding a future objective of fostering the development and implementation of legislation to mandate the use of the Can-Trace system. Moreover, it should also be noted that some of the major food retailers in Canada have taken a leadership role in the Can-Trace initiative. As discussed earlier, these retailers would clearly benefit from the existence of a whole-chain all-product system. If they elected to require their suppliers to adopt the Can-Trace standard, these retailers could bring about the widespread use of this standard within the Canadian food industry – without the imposition of legislation.

A Work in Progress

While Can-Trace has undoubtedly made progress toward its objective, it remains a 'work in progress'. For example:

- To date, they have focused solely upon the development of standards for single ingredient products –multi-ingredient foods have not been considered.
- The *Canadian Food Traceability Standards* document continues to undergo revisions
- While some pilot projects have been completed, a lack of funding has prevented the initiation of the seafood pilot project.
- While the Can-Trace Seafood Guidelines have been quite widely distributed, they are not yet complete. In fact, the current BC Seafood Alliance project has examined seafood export requirements more completely than the most recent Can-Trace document. Therefore, the BC seafood sector cannot look to Can-Trace to guide seafood data requirements.