Manual on Traceability Systems for Fish and Fishery Products

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Cover Photo: Lobster tails are an important export from the region, requiring traceability to origin

CONTENTS

List of Figures

GLOSSARY OF TERMS

Good Agricultural Practices	Specific methods which, when applied to agriculture, create food for consumers or further processing that is safe and wholesome.
Hazard Analysis and Critical Control Points (HACCP)	A systematic preventive approach to food safety from biological, chemical, and physical hazards in production processes that can cause the finished product to be unsafe, and design measurements to reduce these risks to a safe level.

LIST OF ABBREVIATIONS

CA	Competent Authorities
CAC	Codex Alimentarius Commission
CARIFORM	Grouping of 15 Caribbean Community states, along with the Dominican Republic
EU	European Union
FDA	Food and Drug Administration
GTIN	Global Trade Item Number
HACCP	Hazard Analysis and Critical Control Point
ISO	International Standards Organisation
RFID	Radio Frequency Identification
SPS	Sanitary and Phytosanitary
US	United States
XML	Extensible Mark-up Language

FOREWORD

The fishery sector is of great importance for CARIFORUM States, as it provides employment for an estimated 121,000 persons, and contributes significantly to food security and export earnings. The marine capture sector is mostly characterized by a small-scale multi-gear fishery, but several countries have also developed distant water fleets of industrial vessels. Aquaculture is also becoming more important, with some large-scale investments in shrimp and tilapia production as well as numerous experimental and small-scale operations. The fishery sector of CARICOM countries also engages in significant international trade with combined exports worth US$390 million in 2015, with imports over US$180 million (which supply not only domestic markets, but also help to sustain our tourism sector). All this business, and the resulting benefits to the people of our region, depend wholly on the fishery products we produce and market being safe for human consumption. However, ensuring such safety against the background of a diversified and globally integrated fishery sector presents significant challenges, requiring not only considerable resources, but also a high level of expertise and knowledge.

The Caribbean Regional Fisheries Mechanism was formed in 2002 with the objective to promote and facilitate the responsible utilization of the Region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region. In line with this aim, we are therefore pleased to present this Manual, which is one of a series, which provides valuable, up-to-date, regionally relevant and practical advice on ensuring the food safety of Caribbean fishery products. The Manuals are intended for use by both fishery sector operators, as well as those involved in protecting our consumers, through the implementation and enforcement of sanitary regulations. We are sure that these documents will help to provide a solid technical basis for the ensuring the continued and sustainable growth of our seafood sector.

1 INTRODUCTION

1.1 Background

This operational manual was developed within the framework of the EU funded 10th EDF Sanitary and Phytosanitary (SPS) Project, under the terms of a contract "Capacity Building of regulatory and industry stakeholders in Aquaculture and Fisheries Health and Food Safety to meet the SPS requirements of international trade", implemented by Megapesca Lda, Portugal.

The primary objective of the project is to:

> *Build capacities of CARIFORUM States in health and food safety requirements of fisheries and aquaculture (inland, marine) products, and as such ensure safe food standards for fisheries products in the region, while meeting the requirements of the region's trading partners worldwide.*

The expected result is that capacities will be built at the national and regional levels for health and food safety requirements of fisheries and aquaculture (inland, marine) products, which will also ensure safe food standards for fisheries products in the region, while meeting the requirements of the region's trading partners worldwide.

This operational manual is one of eight manuals aimed at providing structured guidelines to ensuring the safety of fish and fishery products for human consumption, in terms of best practices and official controls. The strengthening of sanitary conditions throughout the region is expected to lead to improved health and well-being of national populations, and increased international trade in fishery products.

1.2 About this manual

This manual provides guidance for the traceability of fishery and aquaculture products. It defines traceability concepts and sets out the reasons why it is becoming increasingly important, both as a tool for assuring food safety, and for efficient operation of food businesses, especially for those that trade internationally, and need to meet increasingly strict regulatory requirements.

The manual describes the principles to be expressed within a traceability system, and sets out how these can be applied in fishery and aquaculture businesses, to ensure the most effective and efficient implementation. It therefore covers traceability data regarding inputs and outputs (external traceability), and provides advice on how operators can track the flow of products within their own operations (internal traceability). It also discusses some of the financial implications of establishing traceability systems, which of course incur additional costs, but also deliver specific benefits. Traceability systems are applied when a product recall and withdrawal procedure is implemented, with a view to removing unsafe products from the market, and these systems are also described.

The manual reflects up to date approaches in food safety conditions in the fishery sector. The contents are coherent with the 2004 "food hygiene package" of EU legislation, which brings into full effect all of the food safety policies proposed in the 2000 White Paper on Food Safety. They are also in line with the US Food Safety Modernisation Act of 2011. The manual also takes into account the Codex Code of Practice for Fish and Fishery Products (Codex Standard CAC/RCP 52-2003).

1.3 How to use the document

The manual will aid Caribbean fishery business operators, at all levels of the distribution chain, to design traceability systems to meet the requirements of their regulators and international clients.

Operators adopting the recommendations set out in the manual can expect to meet international food safety (and other origin control) requirements for traceability.

Furthermore, the manual also provides useful guidance for inspectors from Competent Authorities responsible for undertaking inspections of fishery sector operations against traceability requirements. It responds to a need to extend good practices within the Caribbean region for a sustainable fishery sector. which requires safe production systems that meet food safety requirements. For this reason, it includes outline checklists that can be applied to assess whether essential elements of a traceability system are in place and functioning effectively.

It should be noted that the term fish, used in the context of this manual, includes fish, crustaceans and other aquaculture products.

2 WHAT IS TRACEABILITY

Traceability is defined by the Codex Alimentarius Commission[1] as "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution".

Traceability therefore facilitates knowledge regarding the identity, history and source of a product, or of materials contained within a product. It also facilitates knowledge regarding the destination of a product, or any ingredient contained within it. Traceability systems are therefore information management tools.

In the fishery sector, traceability information is used in relation to:

a) food safety: to ensure that products and materials from which they are made, come from origins that meet food safety conditions

b) application of tariffs and quota tariffs, to ensure that appropriate rates of duty are applied

c) ensuring that the fish is derived from sustainable sources, such as from vessels which follow conservation rules (e.g. for catch certification schemes)

This manual focuses on the first of these uses, where traceability can allow operators to guarantee the safe origin of their product, and to take appropriate actions (such as withdrawal or recall), if food is found not to be safe. However, the principles and methods set out are equally applicable to all uses of the data generated.

3 NEED FOR TRACEABILITY

3.1 Meeting specific regulatory food safety conditions

Traceability may be an explicit requirement set out in regulations. These may be national requirements, or be applied as condition of supply to an export market. This is the case in the EU, where there is a specific requirement expressed under Article 18 of Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority, and laying down procedures in matters of food safety (see Box 1).

The EU therefore requires all food business operators, feed producers and primary producers of animals to have in place a "one-up and one-down" traceability system. This provision is applied to food and feed business operators in third countries which supply the EU with products, under the

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[1] The Procedural Manual of the Codex Alimentarius Commission, 17th Edition, Joint FAO/WHO Food Standards Programme

requirement that such supply should be subject to conditions at least equivalent to those set out in EU legislation.

The Code of Federal Regulations requires importers to the U.S. to maintain records that identify the immediate sources of their foods. They must maintain these records for at least two years and make them available to the US Food and Drug Administration (USFDA) within four hours, if requested. The Bioterrorism Act of 2002 also requires domestic and foreign facilities that manufacture, process, pack or import food for human consumption in the United States to register with the US FDA.

Box 1: Article 18 of regulation 178/2002 sets out the EU's traceability requirements

1. 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.

2. Food and feed business operators shall be able to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any substance intended to be, or expected to be, incorporated into a food or feed. To this end, such operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.

3. Food and feed business operators shall have in place systems and procedures to identify the other businesses to which their products have been supplied. This information shall be made available to the competent authorities on demand.

4. Food or feed placed on the market, or likely to be placed on the market in the Community, shall be adequately labelled or identified to facilitate its traceability, through relevant documentation or information in accordance with the relevant requirements of more specific provisions.

Furthermore, Section 204 of the US Food Safety Modernisation Act requires the US FDA to establish a system that will enhance its ability to track and trace both domestic and imported foods. It has launched pilot studies on the feasibility of establishing product tracing systems and as a result, the FDA is recommended to establish a uniform set of record-keeping requirements for all foods. It is also recommended to require food business operators at all levels of the food chain to develop, document, and implement a product tracing plan. It is therefore possible that traceability will become a specific requirement for supply to the US market in future. Enhanced controls may also be applied for high risk foods and importers, subject to third party certification.

3.2   Voluntary measures

As well as regulatory requirements, several voluntary certification schemes related to production conditions for fishery products require traceability systems to be in place. Examples are:

- Marine Stewardship Council (MSC) certification for sustainable fisheries,
  https://www.msc.org/get-certified/fisheries

- Global GAP (Good Agricultural Practices, Aquaculture Standard Version 5 (see
  http://www.globalgap.org/uk_en/for-producers/aquaculture/index.html

- ISO 22000:2005 Food safety management systems -- Requirements for any organization in the food chain
  http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=35466

In some cases, traceability is referred to as chain of custody. In all cases the requirement is to have in place a system that can prove that product displayed with the certification logo is derived from the fishery or aquaculture operation that is certified as meeting the standards.

As well as meeting the requirements of regulations and standards, traceability systems can make good business sense for responsible business operators. Without such systems in place, the management of food safety incidents becomes impossible. Systems for trace-back, trace-forward, product withdrawal and product recall, cannot function without provisions for traceability. Operated in conjunction with Good Manufacturing Practices and Hazard Analysis and Critical Control Point (HACCP), optimally safe food can be delivered.

3.3 Complexity of supply chains

Meeting these requirements in the context of modern supply chains for food represents a considerable challenge. The supply chain can consist of numerous separate business operators. An example of a supply chain for aquaculture products is shown in Figure 1. In a modern fisheries and aquaculture business this is complicated by the spatial dimensions of the supply chain, where inputs (feed, fish etc.) and outputs (final products) may all be traded internationally. Such complexity may occur even within vertically integrated businesses (for example in multi-site operations). Compliance with SPS measures is required to ensure a sustainable business, and this also requires traceability systems to be in place and operating, often across international borders.

FIGURE 1: TYPICAL SUPPLY CHAIN FOR FARMED FISH
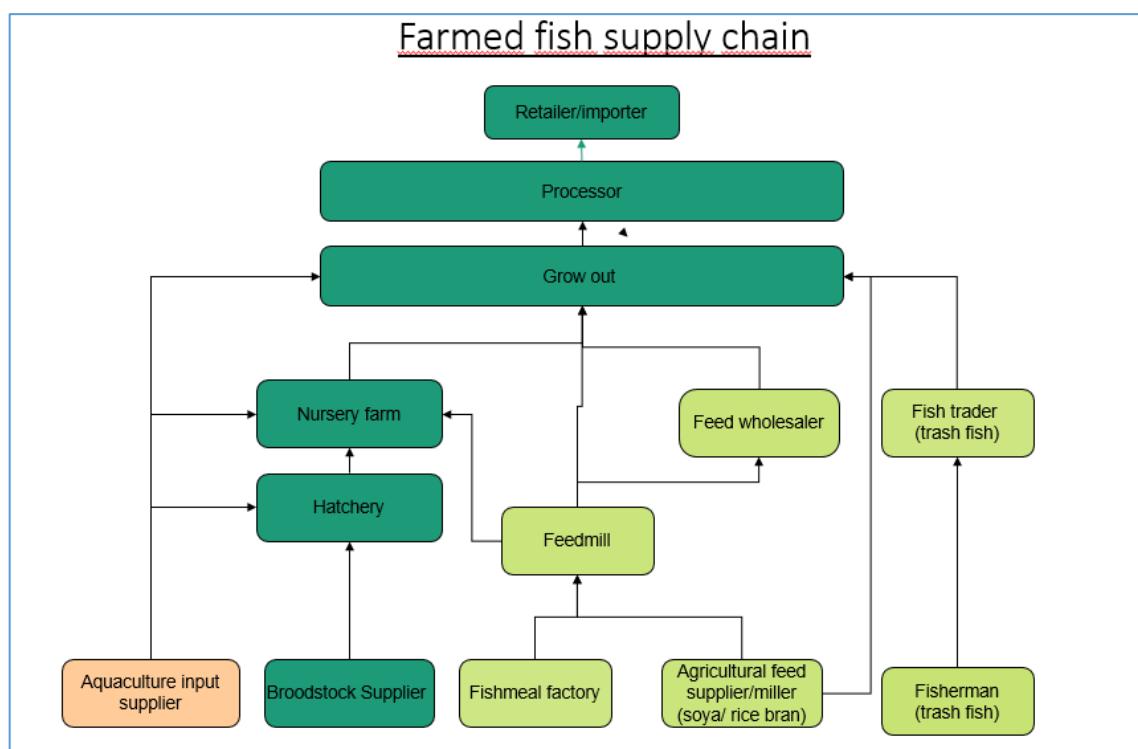
4 KEY ELEMENTS OF A TRACEABILITY SYSTEM

4.1 Objectives

The ISO Standard[2] 22005:2007 "Traceability in the feed and food chain – General principles and basic requirements for system design and implementation" comprehensively explains the principles and requirements for the design and implementation of a feed and food traceability system.

The standard forms one of the ISO22000 series of food safety standards and sets out the conditions for certification of a traceability system. It defines the objective of a traceability system (see Box 2).

Box 2: The objective of a traceability system (at any step in the supply chain) is to:

1. Trace the flow of materials (feed, food, their ingredients and packaging);

2. Identify necessary documentation and tracking for each stage of production;

3. Ensure adequate coordination between the different parties involved;

4. Improve communication among the involved parties and, most importantly;

5. Improve the appropriate use and reliability of information, effectiveness, and productivity of the organization.

4.2 Basic characteristics of a traceability system

The basic characteristics of a traceability system within a business operation are:

   a) identification of incoming products (or raw material and ingredients) and their sources
   b) identification and recording of information on activities linked to these products or batches during processing and storage
   c) identification of outgoing products, and their destinations

The traceability system comprises a data recording and retrieval system that links these steps. Activities a) and c) require gathering data at the interface with suppliers and customers respectively, and b) requires tracking of the operations within the business operation, by means of labelling, separation of different batches, and recording when batches are split or mixed.

4.3 Data on inputs

Data on inputs will firstly identify an exclusive list of suppliers of materials and ingredients which could form part of the final product.

A batch records should be prepared on receipt of the physical inputs. They should record the supplier, the date, the description of the product and any batch codes contained within the received consignments.

The operator should apply his own codes or identifiers to be used for internal purposes. Thus, irrespective of the nature of the operation, an identifying code is applied to a batch of raw material on reception. Supply information such as name of supplier, date, quantity, species and other characteristics, and any supplier batch codes, is recorded against this code.

In capture fisheries, being a hunting process, the only material inputs to the product that could be considered to require traceability are water and ice. The vessel operator should record information relating to the supply of these substances.

In aquaculture however, there are several inputs that need to be considered, notably eggs or juveniles, feed materials (including additives and supplements), and veterinary medicines.

In processing operations, inputs will include fish, along with other ingredients (if the product is a composite one, such as canned fish in oil) and additives. Packaging materials are also usually included as an input in food traceability systems due to the potential contamination of the product.

4.4   Data on production

In capture fisheries, a record of the vessel (including registration number), date, fishing location, gear used, and time of capture is often made. Other useful information could be ambient temperature and seawater temperature (which could impact on food safety conditions in tropical regions such as the Caribbean). Batch separation should be practised (avoiding mixing of old and new catches) as a matter of good handling practice, and such separation should be maintained during discharge.

Aquaculture operators should record all activities involved in the production of the fish concerned. These include location (e.g. pond or cage number), dates, and quantities of application of feed (indicating the batch numbers of the feed used), along with other treatments applied (supplements, grading activities, veterinary treatments).

In fish processing steps, all treatments and associated data (for example HACCP records) applied to that batch are registered to that code. Associated data could also include storage location and conditions, date and shift of work, along with production yields.

4.5   Batch separation, mixing and combination

It is essential to ensure that there is effective batch separation of batches during the production process, otherwise there will be a loss of traceability. In aquaculture operations, fish are grown in separate ponds, cages, or tanks which define effective separation between batches. In processing lines, batch separation will require processing different batches on different lines, or at different times. Typically, fish processors will use labelled or colour-coded fish boxes and tags to identify different batches during the process.

However, it is often an intentional part of the process that batches of fish are either mixed (for example after a grading exercise in aquaculture), or in a composite product (in the case of a processor). These actions should to be recorded. Clearly, after such mixing, there is a loss of integrity in the traceability data, since it will no longer be possible to identify with certainty the precise origin of a specific final product. However, by keeping a record of batch mixing, the range of possibilities can be limited.

Similarly, it is often necessary to split a batch and proceed with different processes applied to the separate parts. Batch splitting should be recorded. Effectively two new batches are generated, but both of the codes allocated should relate to the original code of the parent.

In the fishery sector, where supplies are often derived from large numbers of small scale fishing vessels, it is an essential feature of the business that batches are mixed, and it may not always be possible to maintain traceability to a single fishing vessel. In such cases, efforts should be made to preserve as far as possible the integrity of traceability data, for example to the level of the landing site (e.g. by labelling fish-boxes with an appropriate code).

4.6   Data on outputs

The operator should maintain a record of outputs, which should contain sufficient information to link the final product to all of the data collected thus far (on inputs and processing) regarding the material it contains.

In simple operations (such as a processor, with one supplier, supplying one batch of a single species per day), the date of production will be sufficient. However, in more complex operations it will be necessary to devise and apply a batch coding system, to allow the process batch and its associated variables to be identified. The code is affixed to the product, or to the packing, or contained in the associated documentation, so that the receiver can make reference to this in case of need. It is this data which provides the essential data link to the next operator in the supply chain. An example of a fishery product label containing traceability data is provided in Figure 2.

FIGURE 2: EXAMPLE OF A LABEL FOR FISHERY PRODUCTS PROVIDING FULL TRACEABILITY DATA

The receiver should of course be identified as part of the data collected on the outputs. Batch codes do not need to be understandable by the receiver (i.e. it can be an internal code unique to the business operator applying them). This is referred to as an internal traceability system.

4.7   Recording, storage and retrieval of data

All the data collected on inputs, process, and outputs should be collated by the business operator and stored in a data retrieval system. The system should be able to provide a full history of any batch of product. There are two core tasks which the data system should be able to perform:

- Given a reference to a specific input, the system should be able to identify the business operators who received any product containing that input
- Given a reference to a specific output, the system should be able to identify the business operators who supplied, and the inputs contained in that output

These tasks are the core of all traceability systems, without which traceability cannot be established. They represent the basis of the "one-up, one-down" concept of minimum traceability, in which an operator should be able to identify the supplier and the receiver of any given product which has been in his possession. If the business operators provide written invoices, the information can be recorded on the invoice. If not, the form in the box provides a means of capturing transaction data in a small scale fishery or aquaculture business. Such a form may be used by fishery business operators to record their transactions. Two copies are made of the form, and supplier and receiver each keep one for their records (Box 3).

Consideration should be given to the medium of storage. Small operators, or operators with limited supply and marketing channels, can use paper-based systems. However, traceability systems are amenable to computerisation, and many software packages are available. Several are dedicated to fishery sector operations (see Section 5).

In all cases, a minimum period should be specified during which records should be kept. This depends partly on the expected shelf life of the product during its subsequent distribution. Clearly, records for long shelf products (such as canned fishery products) will need to be kept for several years (typically 2 to 5 years), whereas for fresh fishery products, the period could be a matter of months.

Box 3: Simple transaction form for traceability records

Supplier name:	Supplier Registratioin Code:
Supplier contacts:	

Batch no./identification	Description	Quantity

Receiver name:	Receiver Registration Code
Recever contacts:	

Supplier /representative	Receiver signature/represenative:
Name	Name
	Signature
Signature	Date
Date	

4.8   Internal and external traceability

4.8.1   Internal traceability

The above description of a traceability system applies to a single business operator, the system being internal to that operator. Each operator in the chain develops such a system and applies it. Providing the two core tasks described above can be performed, the conditions are in place for a "one-up, one-down" traceability (see the example below)

FIGURE 3: ONE-UP. ONE-DOWN TRACEABILITY IN THE SUPPLY CHAIN
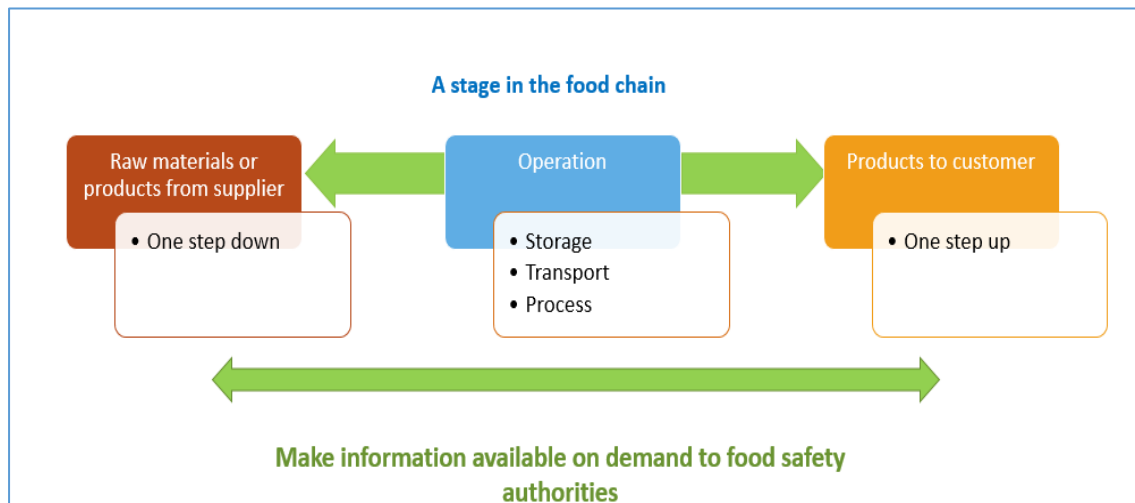
With internal traceability, each operator within a supply chain maintains their own independent system. They are obliged to exchange information with their suppliers (for example batch identifiers), but not the data which allows this to be interpreted. Thus, operators in the supply chain which receive product, will also receive an associated code, which identifies for example the fishing vessel supplying the product, but will not be able to identify that vessel since they cannot interpret the code.

Obviously, data regarding suppliers and customers is sensitive information for any business, and traceability systems should not compromise this. With internal traceability, this data resides within the business operators' system until required, for example for tracing the cause and origin of a food safety problem or non-compliance identified later in the supply chain. In these circumstances, the operator applies the system to make the information available on demand, for example on request of the competent authority.

With internal traceability therefore, each operator in the food chain is responsible for the operations under their control, and there is no requirement for whole chain traceability.

4.8.2 External traceability
In contrast to internal traceability, an external traceability system requires all traceable items to be uniquely identified, and information on them to be shared between all of the participants within the supply chain. Thus, an operator at the consumer end of the chain has the capacity to identify, not only his direct supplier, but also their suppliers.

To maintain such a system requires a standardised approach to traceability identifiers. Such systems may be imposed by major buyers. For example, multiple retail operators, who receive an own-brand product from several suppliers, will often require them to adopt an in-house traceability system, as part of the conditions of sale.

A range of international standards have been developed by ISO, that apply a systematic approach to operation of an external traceability system. Some references are provided in Annex 1.

5 TRACEABILITY TOOLS
5.1.1 GS1 Barcode systems
GS1 is a neutral, not-for-profit, international organization that develops and maintains standards for supply and demand chains across multiple sectors. GS1 works with communities of trading

partners, industry organizations, governments and technology providers, and responds to their business needs through the adoption and implementation of global standards.

The GS1 has established a private international standard for product barcodes, and has developed specific external traceability systems for the different segments of the food industry, including the fishery sector. These employ a standardised approach based on the following GS1 principles shown in the Box 4.

Box 4: GS1 principles of product coding

Identify: The globally unique / globally recognisable identification of trade items, products and locations using GS1 identification standards (i.e. unique numbering standards).

Capture: Capturing the unique identification of trade items, products and locations using automatic data capturing technologies (i.e. barcode scanning, Radio Frequency Identifying technologies).

Share: Sharing the information about trade items, products and locations internally within the business and with trading partners, in a standardised manner using computer networks and messaging standards.

Use: Applying the foundational standards to business processes

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Source: GS1 Foundation for Fish, Seafood and Aquaculture Traceability Implementation Guidelines, 2015 (www.gs1.org)

The system defines GS1 Application Identifiers in the form of database fields which can be expressed in a numerical code. These can be printed as a barcode, or coded in to a RFID or other system (see section 5 below) and read accordingly. A barcode is an optical machine-readable representation of data relating to the object to which it is attached. Barcodes systematically represent data by varying the widths and spacing of parallel lines (1D) or rectangles, dots, hexagons and other geometric patterns in two dimensions (2D). Barcodes were originally scanned by special optical scanners (barcode readers) but now interpretive software is available on smartphones.

Product traceability initiatives use a Global Trade Item Number (GTIN) to achieve traceability. A GTIN includes a GS1 company prefix and a unique item reference number compatible with Universal Product Code bar codes, and RFID (see following section) or human readable codes. The GS1 Global Traceability Standards are available on the GS1 website www.gs1.org

5.1.2 Radio-frequency identification

A number of operators in the fishery sector employ radio-frequency identification (RFID). Wikipedia states "this uses electromagnetic fields to automatically identify and track tags attached to objects. The tags are written with electronically stored information (such as the traceability code). Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags require a local power source such as a battery and may operate at hundreds of meters from the RFID reader".

RFID offers advantages over manual systems or use of bar codes. Unlike a barcode, the tag need not be within the line of sight of the reader, so it can be embedded in the tracked object such as fish box or pallet. Unlike barcodes, which can only be read one at a time, RFID tags can be read hundreds at a time. The cost of passive tags starts at just a few cents each.

5.1.3 TraceFish standards

TraceFish was the short title for the "Traceability of Fish Products" an EU funded project which ran from 2000 until 2002, and was co-ordinated by the Norwegian Institute of Fisheries and Aquaculture. The aim of the project was to bring together companies and research institutes to

establish common views on what data should follow a fish product through the chain from the time it is caught or farmed until it reaches the consumer. The project went beyond the demanded "one-up one-down" traceability, and thereby made it possible to offer its users the extra benefits from standardized exchange of traceability information. The project developed three consensus-based standards for recording and exchange of traceability information in the fishery supply chain:

- Farmed Fish Traceability Standard
- Captured Fish Traceability Standard
- Technical Standard

The standards lay down where, what and how data should be recorded in the farmed and wild caught fish chain for full chain traceability. They also identify how modern electronics and software can be used to transmit external traceability data through the chain, and the standards to be used to successfully obtain the data if and when required. All three TraceFish standards are publicly available. The two fish industry standards are sold and distributed through CEN, the European Committee for Standardization. The third standard is an XML data standard, TraceCore (see Box 5)

Box 5: TraceCore Data Standard

The technical data standard (TraceCore) is an open source XML software package currently distributed freely by members of the TraceFish technical group. It provides a standardised way to transfer data on traceability, with standard names, reference values, terms, measurements and values. It allows suppliers to deliver information in one known format, and for receivers to be able to read it in the same format.

More information is available from the Tracefish partners (via tracefood@fiskeriforskning.no)

5.1.4 Proprietary software applications

A number of software applications have been developed specifically to meet the needs of fishery business operators for traceability. They usually incorporate some other form of data logging, such as HACCP variables, cold chain integrity etc., which can themselves be largely automated, this reducing the cost of data collection and removing the scope for human error. Some of the most used packages are supplied by:

- Trace Register (http://www.traceregister.com/)

- Shellcatch (http://www.shellcatch.com/)

- Scoring Ag (https://www.scoringag.com)

- TraceTracker (https://www.tracetracker.com/)

A good review of the strengths and weaknesses of the different services available is provided by Mariah Boyle (2012)[3].

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[3] Boyle MD (2012), Without a trace: a summary of traceability efforts in the seafood industry, Fishwise, https://www.fishwise.org/services/traceability-support/

6 RECALL AND WITHDRAWAL PROCEDURES

From a food safety point of view, the value of traceability systems comes to the fore during incident management, when a food safety problem is detected. This could be a non-compliance (for example during a routine HACCP monitoring, or as a result of a regulatory sampling and testing), or due to a food poisoning outbreak.

In all cases, it is the responsibility of the food business operator to follow up the problem, and to identify its cause and origin. This action may be undertaken voluntarily, or it may be forced on the business operator under legal powers of the Competent Authority. Most jurisdictions have power to require food business operators to provide information when requested.

Many food safety problems originate elsewhere in the supply chain other than the point where they are detected, and there is a need to undertake a trace-back operation, to allow checks, such as inspections, checks on HACCP records, sampling and testing, to be made on the food safety conditions at each stage, until the source of the problem is identified.

Once the source and nature of the problem is understood, there is a need to consider that the deficiency may have also resulted in unsafe products distributed via other supply chains. There may be a need to trace forward, to identify all operators who may have received the unsafe food, and inform them to withdraw or recall the product. The approach to trace-back and trace-forward is illustrated in Figure 4.

The food safety problem is detected in Caterer 1, and subsequently withdrawn from Caterers 2 and 3.

FIGURE 4: TRACE BACK AND TRACE FORWARD FOR WITHDRAWAL AND RECALL OF UNSAFE FOOD
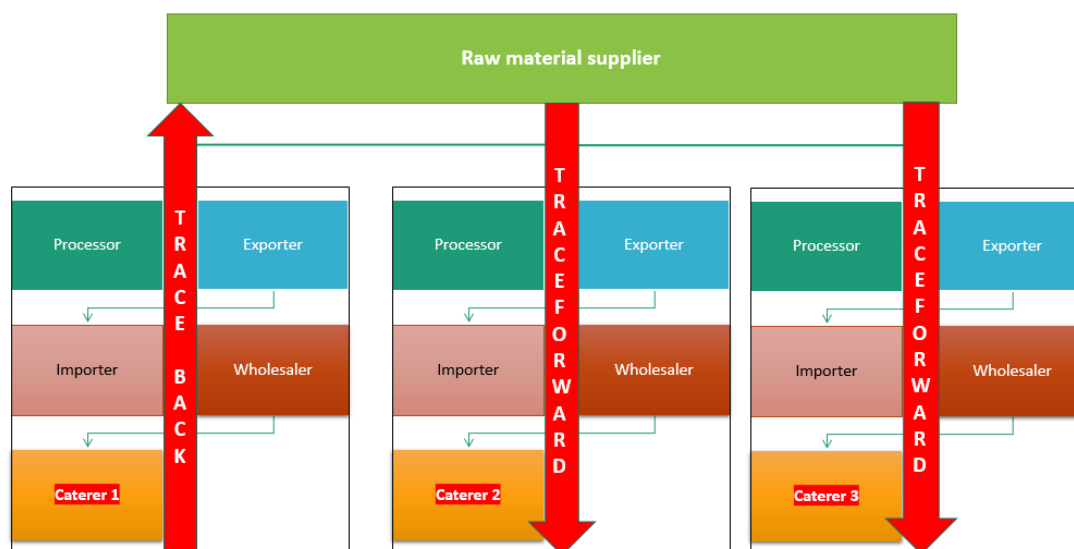
To be able to implement systems to remove unsafe product from the supply chain, food business operators should have in place withdrawal and recall plans.

A **withdrawal plan** is implemented when the product has not reached the consumer. Here the main aim is to ensure an effective communication with other businesses, in terms of trace back and trace forward operations. The plan should set out the procedures, contain up to date contact details of nominated responsible persons in supplying and receiving organisations, and set out the options for instructions as to how to deal with withdrawn product (depending on the nature and severity of the hazard).

A **recall plan** should be implemented when the food has reached the consumer, but may not have been consumed. The aim of the recall plan is to inform the consumer that the product should not be consumed and that they should return it to where they bought it, and seek a replacement or refund. Ensuring that food recalls are properly designed and implemented is a major part of the work of a modern food safety competent authority.

The plans should be written. Most business operators will cooperate and implement the plan on instruction. However, if they are reluctant to do so, Competent Authorities should have the legal power to require product withdrawal or recall. Product recalls should be publicised by the Competent Authority and widely circulated in the press to make sure that consumers are aware of what they should do. More information on this aspect of the control system is provided in the CRFM Manual for the Inspection and Official Control of Caribbean Fishery Products.

Normally such plans are only required of processors and distributors. Primary producers (fishers and aquaculture operators) often do not have the capacity, but should provide traceability information when requested.

7 COSTS AND BENEFITS OF TRACEABILITY

7.1 Costs

7.1.1 Additional investment

The traceability system should be considered as a capital investment, in terms of system design, preparation of forms, and recruitment and training of the additional staff required and purchase of any special equipment or software required.

In addition, the implementation of a traceability system requires more space for storage of raw material and final products, to ensure effective batch separation. In some cases, this will require expansion of storage capacity.

Small scale operators, such as small fishermen or farmers, often find these investments to be prohibitive, irrespective of the benefits they can deliver (described below). In many cases, they do not have the technical capacity, or even literacy or numeracy skills, to be able to design and implement such systems. In these cases, there is a strong argument for establishing a traceability programme via a cooperative or a producer organisation, which can implement the system collectively. There will be loss potential of data integrity (for example if fish cannot be traced to a specific vessel, or pond) but this is an inevitable compromise and better than no traceability at all.

7.1.2 Increased operating costs

As well requiring investment, traceability incurs a significant increase in operating costs. because of recording information, storing it and retrieving it when required. This all requires time, and operators therefore need to consider the additional staff time required on an ongoing basis.

Furthermore, traceability can slow down the production process, not only in the keeping of records, but also in terms of separation of batches, requiring more staff to be employed. Especially in fish processing, operators should be prepared to see a reduction in efficiency of processing and storage to account for this.

7.2 Benefits

7.2.1 Damage limitation in food safety failure

The impact of a food safety failure in terms of illness or death can be limited if the distribution of the affected product is limited. Traceability provides a tool to achieve this. Furthermore, if the

source of the problem and the precise batches affected cannot be identified, then the food business operator will be obliged to withdraw and destroy all batches which could potentially be affected. There are numerous cases where food safety failures were discovered in only part of a consignment, but the affected part could not be identified, since traceability batch codes were not applied. Testing every unit in a batch is often not feasible. If the affected products cannot be identified and separated, an inspector is obliged to consider any detectable food safety non-compliance as grounds for the batch to be condemned.

By applying the systems described in this manual, a fishery business operator can limit the cost of the non-compliance, both in terms of preventing illness and reducing the cost of withdrawal

7.2.2 Better process controls
Correctly implemented, traceability can improve stock control and reduce out-of-date product losses (by allowing efficient operation of first-in-first-out systems), lower inventory levels, quicken the identification of process and supplier difficulties, and raise the effectiveness of logistics and distribution operations.

In addition to quality related data, operators can collect quantitative data on yields associated with specific batch codes. Over time, by relating yields to independent variables concerning the process conditions, operators can often gain a better understanding of the critical process variables and thus improve the efficiency of their production processes. Improved process control to manage yields can provide significant financial benefit to the operator.

7.2.3 More secure markets
In the longer term, the better food safety management resulting from improved traceability, provides greater guarantees in terms of sustained market access and buyer confidence. Improved customer confidence also helps with branding and improved brand equity. In fact, traceability can be employed as a marketing tool, by providing your customers with unique information about the product they are buying and its origins, see Figure 5.

FIGURE 5: AN EXAMPLE OF TRACEABILITY IN WHICH CONSUMERS CAN IDENTIFY THE FISHERMAN CATCHING THE PRODUCT THEY BUY

8 INSPECTION AND OFFICIAL CONTROL

Traceability is well established as an important food safety requirement encapsulated in legal systems, as described in Section 3. This means that inspectors have a responsibility in their official controls of fishery and aquaculture business operators, to check that the traceability obligations are being met.

Checks on the existence of a traceability system and its implementation, as well as the presence of withdrawal and recall plans where required, should therefore be made as part of the routine inspections of the fishery establishment. A suitable checklist for this purpose is shown in Figure 6.

Typically, if revealed by an inspection, the following would be considered actionable offences, leading to launch of a non-compliance procedure:

- failure to keep traceability records; make false records

- failure to disclose information when lawfully requested

- failure to keep a recall or withdrawal plan;

- failure to implement a notice to implement a recall or withdrawal

FIGURE 6: MODEL CHECKLIST FOR INSPECTION OF A TRACEABILITY SYSTEM

Criteria	Satisfactory	Non-satisfactory	Comments
Supplier/origin clearly identified			
Receiving raw material identified by code n°			
Lots separated during transport			
Lots identified during process			
The codes include all essential information			
Separation/or addition of lots recorded			
Label codes permits to trace back the product			
Recall plan formalised and operational			
Data on suppliers and clients available			
Product distribution plans available			
Recall plan verifications recorded			
Conclusions:			
Non-satisfactory aspects	Correction requested	Date Limit	Done or not
Comments:			
Conclusion: compliant / non-compliant			
Inspector/s Signature:		Company responsible person Signature:	

FIGURE 6: MODEL CHECKLIST FOR INSPECTION OF A TRACEABILITY SYSTEM

Annex 1: Further reading

SUB-COMMITTEE ON FISH TRADE, Thirteenth Session, Hyderabad, India, 20-24 February 2012, Traceability best practice guidelines

ftp://ftp.fao.org/fi/DOCUMENT/COFI/cofift_13/5e.pdf

ISO 12875:2011: Traceability of finfish products -- Specification on the information to be recorded in captured finfish distribution chains

http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?ics1=67&ics2=120&ics3=30&csnumber=52084

ISO 16741:2015 Traceability of crustacean products -- Specifications on the information to be recorded in farmed crustacean distribution chains

http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?ics1=67&ics2=120&ics3=30&csnumber=57564

ISO 18538:2015: Traceability of molluscan products — Specifications on the information to be recorded in farmed molluscan distribution chains

http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?ics1=67&ics2=120&ics3=30&csnumber=62830